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ENVIRONMENTAL
IMPACT STATEMENT

DIAMOND BROOK
WATERSHED

NORFOLK COUNTY, MASSACHUSETTS



PREPARED BY: UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
AMHERST, MASSACHUSETTS



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DIAMOND BROOK WATERSHED
Norfolk County, Massachusetts

FINAL ENVIRONMENTAL IMPACT STATEMENT

Benjamin Isgur, State Conservationist
Soil Conservation Service

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- SPONSORING LOCAL ORGANIZATIONS -

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Town of Walpole
Walpole, Massachusetts 02081

DECEMBER 1975

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
29 Cottage Street
Amherst, Massachusetts 01002

USDA ENVIRONMENTAL IMPACT STATEMENT
Diamond Brook Watershed Project
Norfolk County, Massachusetts

Prepared in Accordance with
Sec. 102(2)(C) of PL 91-190

Summary Sheet

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Action: A watershed project to be carried out in Norfolk County, Massachusetts, by the Norfolk Conservation District and the town of Walpole, the sponsoring local organizations, with federal assistance under the provisions of Public Law-566, 83rd Congress, 68 Stat. 666, as amended. The purposes of the project are watershed protection, flood prevention and improvement of fish and wildlife habitat. It will be carried out in accordance with a watershed plan and consists of conservation land treatment, a multiple-purpose reservoir structure, and about 1,180 feet of channel work on a perennially flowing and previously modified stream. The channel work involves the installation of about 780 feet of reinforced concrete conduit to supplement an existing conduit, and enlargement of about 400 feet of stream channel.
- V. Summary of Environmental Impacts and Adverse Environmental Effects: The project will reduce erosion and sedimentation, particularly during urbanization of the watershed and provides resource inventory data needed for sound land use decisions. Flood problems will be alleviated by protecting existing property. Average annual floodwater damages to roads, bridges, 15 residences, 45 commercial establishments and 1 school will be reduced by about 99 percent or \$82,340. The major damage areas of downtown Walpole will be protected from a storm equal to the August 1955 event, (about a 500-year frequency). A 17-acre pool will be created that will support a warm water fishery and wetland wildlife. The opportunity for fishing and other forms of passive recreation will be provided by the pool and 20 acres of adjacent public land.

About 58 acres of land will be required to install the multiple-purpose structure and channel work. The effects on existing resources of this area include: loss of 13 acres of wetland wildlife habitat and 15 acres of woodland wildlife habitat; impaired value of wildlife habitat on 16 acres of wetland and 14 acres of woodland; loss of the forest resource on 27 acres of land, loss of 850 feet of perennial stream habitat and 400 feet of intermittent stream habitat; and, a reduction in the habitat quality of 400 feet of perennial stream. Temporary effects during construction activities include an increase in noise, air pollution, erosion and sedimentation, and the disruption of traffic, utility services and business.

VI. Alternatives Considered: Nonstructural Alternatives - (A) Land Treatment.

Structural Alternatives (with land treatment) - (A) Floodwater Retarding Structure, and (B) Channel Work.

No Project Alternative.

VII. Agencies From Which Comments Have Been Received on the Draft Statement:

Massachusetts Water Resources Commission
(Designated by the Governor)
Office of State Planning and Management
(State Clearinghouse)
Metropolitan Area Planning Council
(Regional Clearinghouse)
Massachusetts Historical Commission
Department of the Army
Department of Health, Education and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency

VIII. Draft Statement Transmitted to the Council on Environmental Quality on May 12, 1975.

TABLE OF CONTENTS

	<u>Page</u>
SPONSORING LOCAL ORGANIZATIONS	1
PROJECT OBJECTIVES AND PURPOSES	1
PLANNED PROJECT	
Land Treatment	2
Structural Measures	3
Nonstructural Measures	12
Land Use Changes	14
Operation and Maintenance	20
Project Costs	22
ENVIRONMENTAL SETTING	
Physical Resources	23
Plant and Animal Resources	39
Economic Resources	52
Recreational Resources	54
Archaeological, Historical and Unique Scenic Resources	55
Soil, Water and Plant Management Status	55
WATER AND RELATED LAND RESOURCE PROBLEMS	
Land and Water Management	57
Floodwater Damage	57
Erosion and Sediment Damage	58
Municipal and Industrial Water Supply Problems	58
Recreation Problems	61
Plant and Animal Resource Problems	61
Water Quality Problems	61
ENVIRONMENTAL IMPACTS	
Conservation Land Treatment	62
Structural Measures	62
Economic and Social	65
FAVORABLE ENVIRONMENTAL EFFECTS	67
ADVERSE ENVIRONMENTAL EFFECTS	68

TABLE OF CONTENTS (continued)

	<u>Page</u>
ALTERNATIVES	69
SHORT-TERM VS. LONG-TERM USE OF RESOURCES	73
IRREVERSIBLE & IRRETRIEVABLE COMMITMENT OF RESOURCES	74
CONSULTATION & REVIEW WITH APPROPRIATE AGENCIES & OTHERS	75
LIST OF APPENDICES	82

LIST OF FIGURES

<u>No.</u>	<u>Title</u>	<u>Page</u>
1.	Allen Site Reservoir	7
2.	Channel Improvement	8
3.	Typical Multiple-Purpose Structure	9
4.	Location Map	24
5.	Bedrock Geology	27
6.	Surficial Geology	29
7.	Location of Water Sampling Stations	38
8.	Plant Communities Map	51
9.	Boston Standard Metropolitan Statistical Area	53

LIST OF TABLES

<u>No.</u>	<u>Title</u>	<u>Page</u>
1.	Present Land Use of Area Required for Structures	14
2.	Project Costs	22
3.	Wetlands in the Watershed	31
4.	Low Flow Measurements	34
5.	Water Quality Measurements	36 - 37
6.	Relative Abundance of Principal Game Species	49
7.	Summary of Plant Communities	50

USDA, SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL STATEMENT

for

Diamond Brook Watershed
Norfolk County, Massachusetts

Installation of the project constitutes an administrative action. Federal assistance will be provided under authority of Public Law-83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Norfolk Conservation District and Town of Walpole

PROJECT OBJECTIVES AND PURPOSES

1. Provide protection to the major residential and commercial areas from floodwater caused by a storm equivalent to the storm of record (August 1955).
2. Provide recreation and improve fish and wildlife habitat and open space values.
3. Achieve wise use and management of land, water and related natural resources consistent with a balance of economic use and the protection and improvement of environmental quality.

PLANNED PROJECT

The Diamond Brook (also known as Spring Brook) Watershed, located about twenty miles south of Boston, has a total drainage area of approximately 1,270 ^{1/} acres situated in the towns of Walpole and Sharon, within Norfolk County, Massachusetts. Present land uses and areas are: forest land, 587 acres (46 percent); cropland, 24 acres (2 percent); urban, 609 acres (48 percent); and wetlands (excluding wooded wetlands), 50 acres (4 percent).

Flooding of roads, bridges, residential and commercial properties located along the lower reaches of Diamond Brook is a major problem. Increased runoff, accelerated erosion and sediment production on lands being or to be converted to urban use is also a major concern. The need to preserve and improve the quality of the environment is of parallel and equal concern.

In response to project objectives and purposes a watershed protection and flood prevention project has been planned and will be carried out by the sponsoring local organizations with federal assistance under the provisions of Public Law-566. The project consists of conservation land treatment measures; one multiple-purpose structure providing storage capacity for floodwater and fish and wildlife; and a section of channel work for flood prevention.

Land Treatment

Land treatment measures will be installed throughout the watershed during the five year project installation period. Essential conservation treatment will be applied to all watershed lands. About 291 acres will receive treatment to achieve the desired level of protection or improvement. The remaining lands will receive treatment to supplement that which has already been applied. To accomplish this treatment, technical assistance will be provided through the Norfolk Conservation District to town boards, community leaders, and others for resource inventories, consultations, planning, and application of treatment measures. Measures will be installed for control of runoff and erosion, and protection and improvement of fish and wildlife, recreation and environmental values.

Essential conservation land treatment will be applied on about 40 acres of land expected to undergo development for residential, commercial, and related urban uses during the project installation period. To determine treatment needs, town boards will submit proposed development plans for the Conservation District to review and provide recommendations for treatment measures. Technical assistance will be provided to developers for installing the recommended measures. The measures to be recommended and

^{1/} All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigations by the Soil Conservation Service, U.S. Department of Agriculture and the Forest Service, U.S. Department of Agriculture.

installed could include: protection and maintenance of existing vegetation; temporary basins to trap sediment and other waterborne debris; structural measures to convey runoff water, in a non-erosive manner, to a suitable outlet; seeding, tree planting and mulchings; and establishment of forest buffer or other infiltration zones.

It is expected that improved land treatment or protection will also be applied to about 4 acres of cropland, 47 acres of land dedicated to wild life and recreation uses, and 200 acres of woodland. To accomplish this treatment, technical assistance will be provided to landowners and operators for planning and applying treatment measures. Treatment could include wildlife habitat improvement and management; soil protection through proper water control and disposal and vegetative practices; and protection and management of woodland areas.

Assistance will also be provided to the watershed towns in preparing natural resource plans. These plans will provide resource inventory information and data to serve as a basis for planning and implementing land use changes and other measures to protect and enhance the towns' natural resources and environmental values. Natural resource plans will indicate the needs for measures and changes such as: preservation of minimum acreages of woodland, wildlife land, agricultural land, recreation land and open space; protection of wetland, historical and scenic natural areas; installation of water bodies for recreation, fish and/or wildlife; changes in land use; and detailed planning for future urban land use.

Consultive assistance and technical data will be provided to aid town boards in revising and developing land use and control ordinances.

Detailed soil surveys of the watershed have been completed. The survey is a scientific inventory of the soils which occur, and is used to indicate suitability, economic considerations, and conservation requirements of a land area for various uses. Soil surveys will provide basic information to guide land use and treatment decisions.

Structural Measures

The project includes a multiple-purpose structure at the Allen site for flood prevention and fish and wildlife, and a section of channel work for flood prevention. Both structures are located on Diamond Brook (see Project Map, Appendix C). Figures 1, 2 and 3 illustrate the major features of these structural measures. The multiple-purpose structure will provide a total storage capacity of 255 acre-feet, of which 207 acre-feet are for temporary floodwater detention, 43 acre-feet for fish and wildlife, and 5 acre-feet for sediment which is expected to accumulate during the project evaluation period (100 years). This structure will control runoff from 1.0 square mile or about 50 percent of the total drainage area of Diamond Brook.

The multiple-purpose structure will consist of an earth fill dam, a drop inlet principal spillway and an emergency spillway.

The dam will be of compacted earth fill about 22 feet in height and 1,350 feet in length. Fill material will consist of silts and till material in the core and coarser, more pervious glacial materials in the shell of the fill. The earth fill will be vegetated and landscaped as necessary to blend into its surroundings. The approximately 54,000 cubic yards of fill material required will be obtained from the emergency spillway and vicinity and upstream of the right abutment. The foundation of the dam is glacial deposition. The dam site is within an area where earthquakes occur that could be of sufficient magnitude to induce damages. Geologic conditions at the site that may lead to adverse effects during earthquakes include relatively thin swamp deposits, localized aquifers of glacio-fluvial sand, and gravel containing artesian water with hydrostatic heads above ground. The results of the foundation investigation indicate that corrective measures can be provided in the final design and construction of the dam.

In operation for the prevention of floods, the dam will automatically regulate runoff from a 100-year frequency storm by a principal spillway and the floodwater storage provided. The principal spillway consists of a reinforced concrete riser, outlet conduit, and impact structure. This outlet works will automatically release the temporarily stored floodwater at a rate which will minimize downstream flooding.

The impact structure is an energy dissipator to reduce the erosion potential of the released water before it enters the stream channel. A water control gate will be provided near the base of the riser to permit draining the reservoir for management of the fish and wildlife pool or during emergencies.

An emergency spillway will be excavated in earth on the left abutment of the dam. This spillway will be vegetated to pass storm flows in excess of the volume controlled by the floodwater storage and principal spillway release with minimum erosion. The emergency spillway is designed to operate, on the average, less often than once in 100 years.

The fish and wildlife pool provided by the Allen site multiple-purpose structure will have a surface area of 17 acres, maximum depth of about 7 feet and an average depth of about 3 feet. The pool will be managed as a warm water fish habitat and with its periphery as a nesting and resting area for waterfowl. About 20 acres of town-owned land adjacent to the fish and wildlife pool will be managed for wildlife. This 20 acre area consists of about 7 acres of shrub swamp with the remaining area being mostly wooded.

In consideration of the intended use of the fish and wildlife pool and adjacent public land area, the town of Walpole decided that construction of sanitary facilities is not needed. The pool and land area will be developed and managed for fish and wildlife habitat and used primarily for fishing, nature study, wildlife observation, and other forms of passive recreation. If a need becomes apparent, based on a monitoring program by the Walpole Board of Health, sanitary facilities that meet state and local requirements will be provided by the town.

Clearing during construction will be limited to the dam, emergency spillway, fish and wildlife pool, and borrow and other areas necessary to facilitate construction, and will total about 27 acres. Except for the fish and wildlife pool, these areas will be revegetated with suitable grasses, legumes, trees, or shrubs. Topsoil that is stockpiled during construction of the dam will be used as needed to help ensure adequate establishment of vegetation.

The existing vegetative cover will be retained on the 33-acre area of the floodpool that will be subject to occasional inundation, except for about 3 acres which will be removed to obtain borrow in constructing the dam.

There are no known existing improvements that will require alteration, modification, or change in location as a result of installing the multiple-purpose structure. Installation of the structure will not require relocations of persons, businesses or farm operations.

About 1,180 feet of channel work will be installed to supplement the multiple-purpose structure in providing flood protection for the business district of Walpole. In the channel work area, Diamond Brook is a perennial, previously modified stream. Glacial deposits along a major portion of the proposed floodwater conduit and outlet channel have been altered by excavations and fillings during urban development.

The channel work consists primarily of installation of approximately 780 feet of reinforced concrete conduit to supplement the existing conduit, and enlargement of approximately 400 feet of existing stream channel to provide an adequate outlet for both conduits. Other works related to the channel work are minor improvements of the entrance of the existing conduit and improvement of the entrance channel to the existing and proposed conduits. The proposed conduit will have reinforced concrete head-wall structures and short sections of riprap to provide stable conditions at the inlet and outlet ends.

The new conduit will be located generally adjacent and parallel to the existing conduit within the business district of Walpole. It will cross the intersection of Main Street, (State Route 1A) and East Street, (State Route 27) and extend through a parking lot and under the Penn Central Railroad tracks to the stream channel downstream of the railroad. Through the street intersection, the conduit will cross water, sewage, drainage, telephone and electric utility lines. The conduit will be "jacked" through the railroad embankment, if necessary, to avoid interruption of railroad service.

The existing conduit has a capacity of 160 cubic feet per second and will continue to carry normal flows. The planned conduit designed to carry flood flows will have a capacity of about 510 cubic feet per second. The combined capacity will be about 670 cubic feet per second.

Excavation for the floodwater conduit will be in manmade fill and glacial deposits. Suitable excavated materials will be used as backfill; unsuitable and excess materials will be removed and placed in a disposal area to be designated by appropriate town authorities. Care will be taken to avoid adverse environmental effects.

Enlargement of the existing stream channel will extend from near the downstream end of the planned conduit to the confluence with the Neponset River. The proposed channel will have a bottom width of 20 feet, depth of about 5 feet and side slopes of 1.5 to 1. Excavation of about 1,700 cubic yards of earth will be required. Alternating the channel work from one side to the other will be done to minimize damage to the higher quality wildlife habitat. Channel excavation and spoil spreading on the upstream 200 feet will be conducted from and on the left (west) bank. On the remaining 200 feet, this work will be conducted on the right bank. To avoid pocketing of water and creating potential disease vector hazards, all spoil will be spread so as to provide adequate surface drainage.

An existing disposal area for broken concrete pavement, occupying about one-fourth acre on the west bank, will be covered with spoil. This and the other disturbed areas, excepting the channel bottom will be vegetated with reed canarygrass and silky dogwood for soil protection and to restore food, cover and nesting sites for wildlife.

There is no indication that bedrock will be encountered with the depths of excavation required for installing the floodwater conduit and outlet channel, or that foundation or stability problems will be encountered.

Backwater from the Neponset River, particularly during flood periods, will adversely affect the proposed floodwater conduit and existing conduit by reducing the elevation drop (energy head) available. The purpose

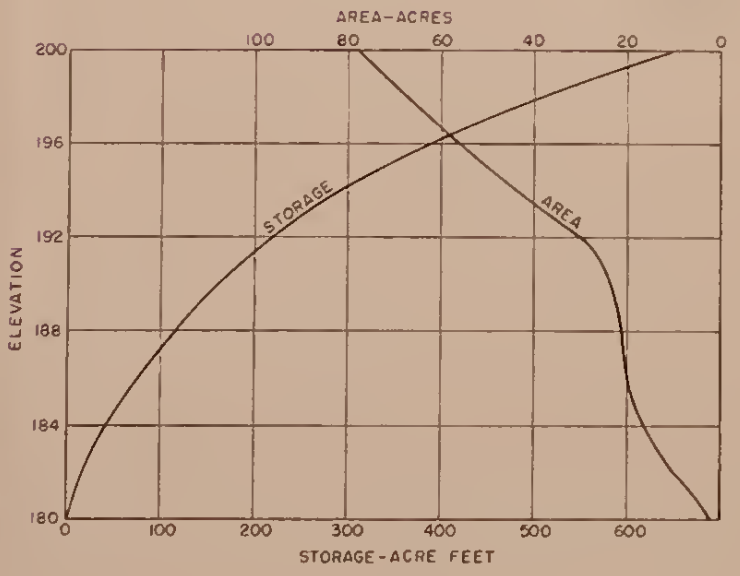
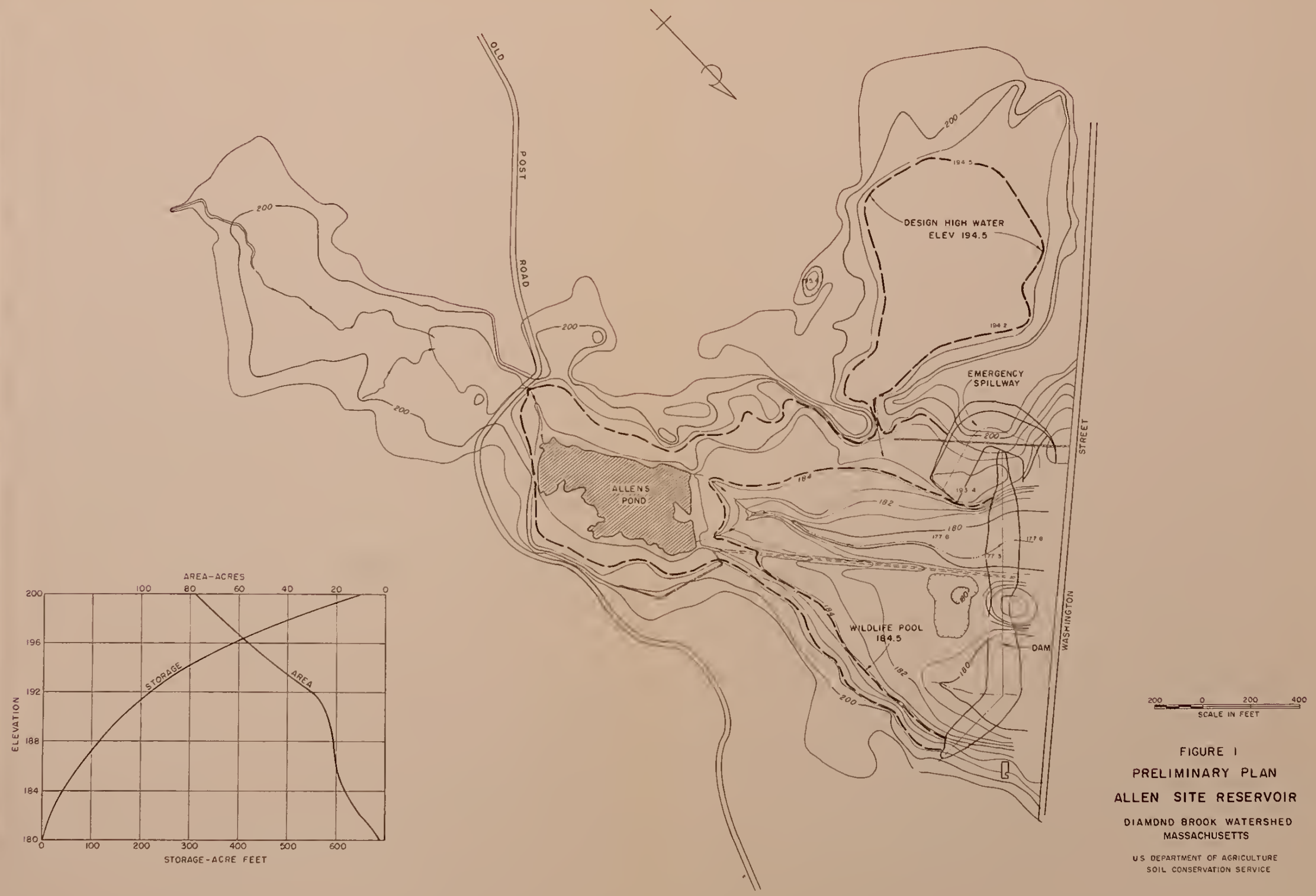


FIGURE 1
 PRELIMINARY PLAN
 ALLEN SITE RESERVOIR
 DIAMOND BROOK WATERSHED
 MASSACHUSETTS
 U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

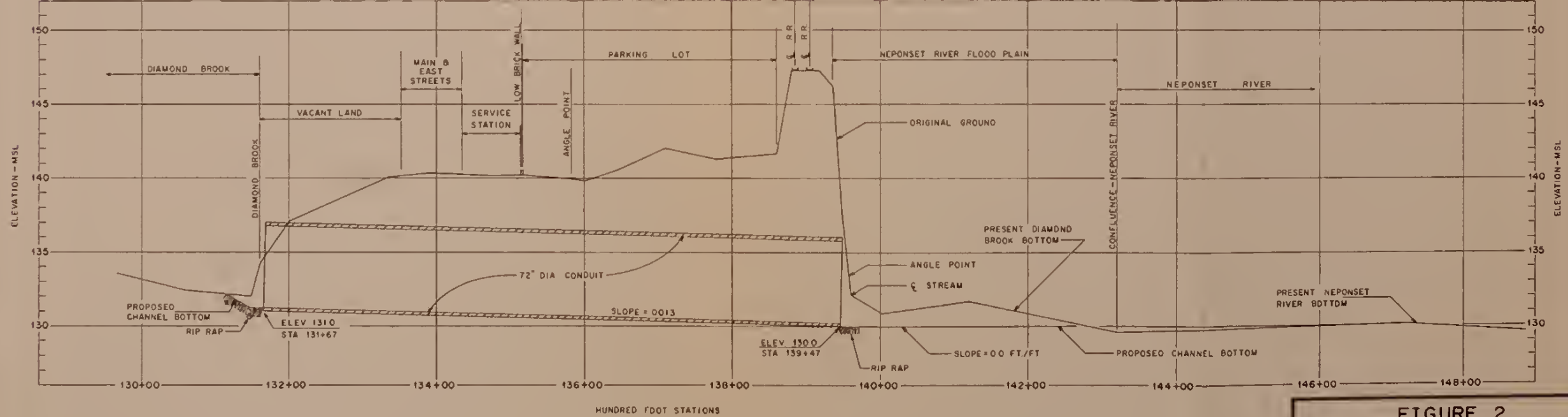
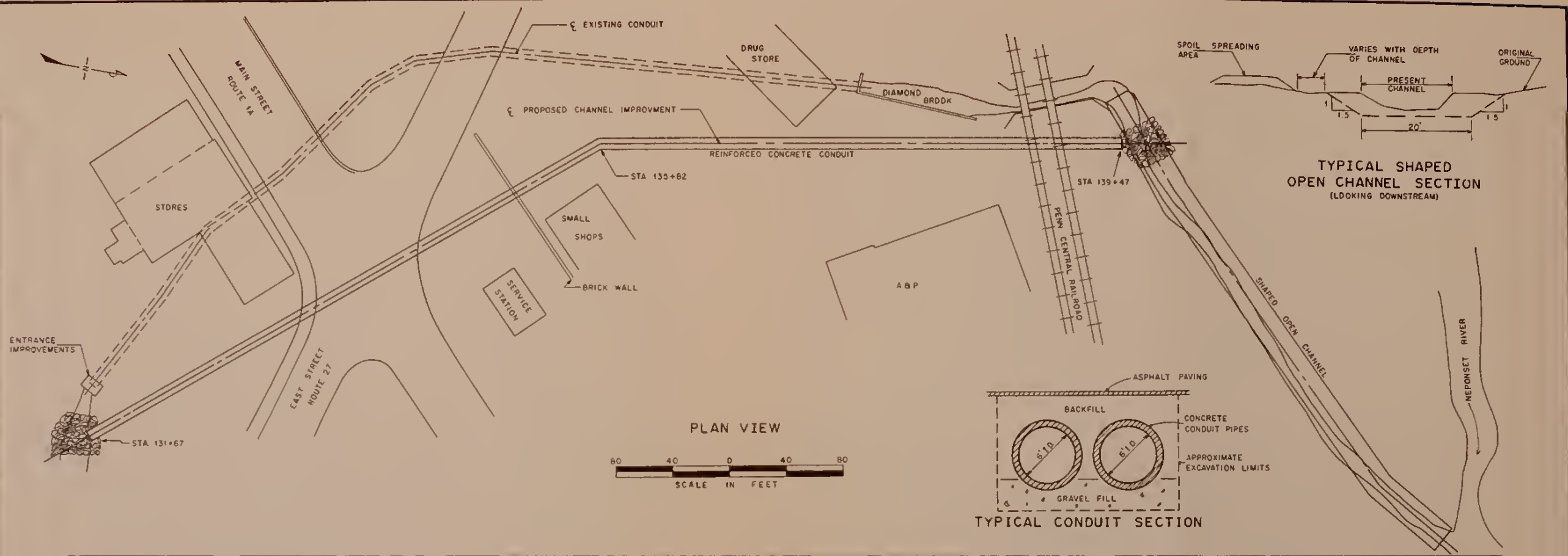
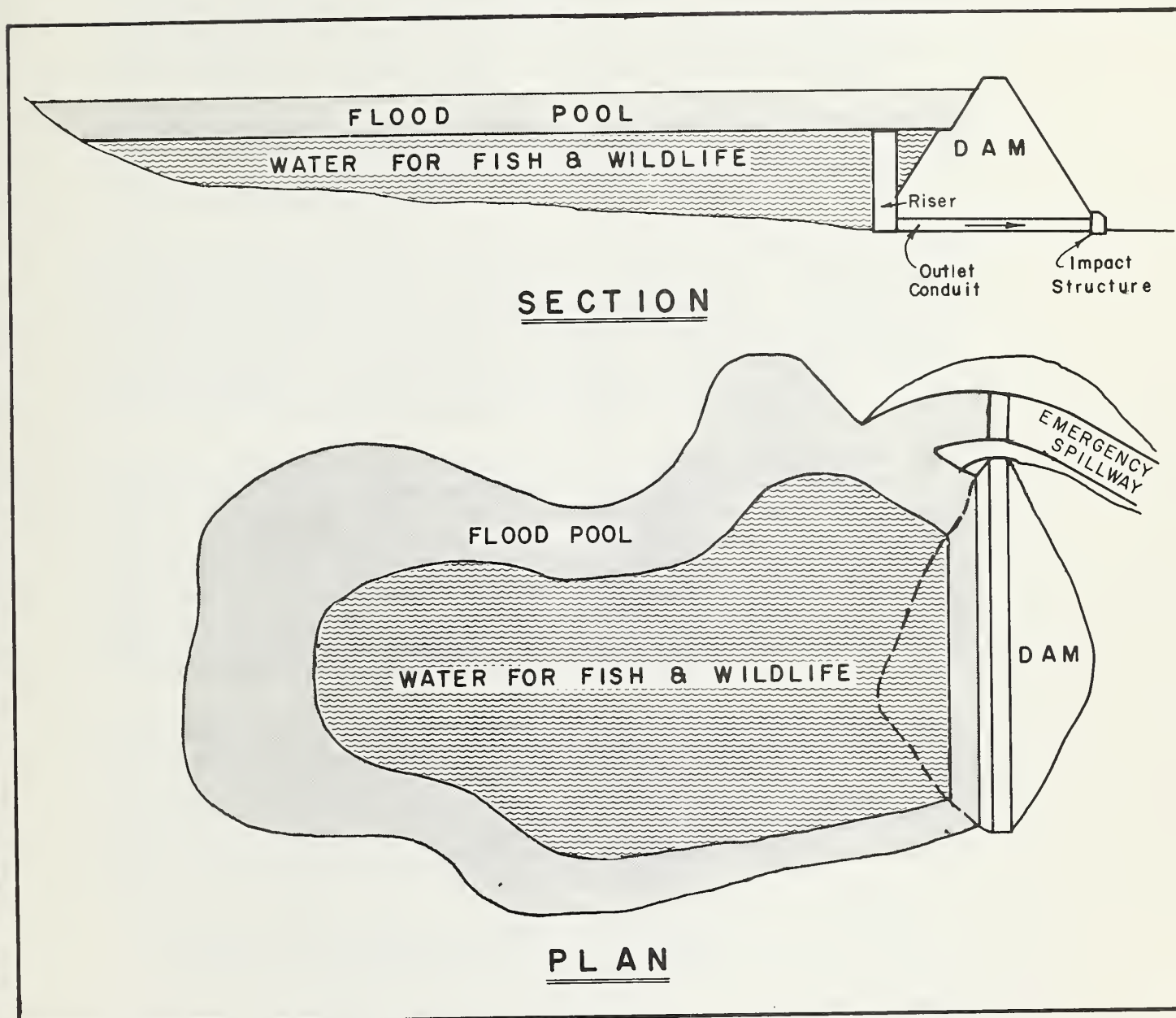


FIGURE 2
 PRELIMINARY PLAN
 CHANNEL IMPROVEMENT
 DIAMOND BROOK WATERSHED
 MASSACHUSETTS
 U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

TYPICAL MULTIPLE-PURPOSE STRUCTURE



NOTE: Fish and Wildlife pool includes storage for expected sediment accumulation.

Figure 3

CROSS-SECTION AND PLAN VIEWS OF MULTIPLE PURPOSE STRUCTURE WATER FOR FISH AND WILDLIFE USES IS STORED BETWEEN FLOOD POOL (ABOVE) AND SEDIMENT STORAGE (BOTTOM POOL)

of enlarging the stream channel section between the conduit outlets and the Neponset River is to minimize this backwater effect at the conduits.

The design capacity of the floodwater conduit and outlet channel is based on the capacity needed to safely pass the peak flood flow of a storm equal to the August 1955 event, as modified by expected future watershed conditions and the multiple-purpose structure.

Partial clearing of about one acre of idle land will be necessary to install the channel. Dense herbaceous plants, and scattered shrubs and trees comprise the vegetative cover on this area. Care will be taken to preserve desirable tree specimens of existing species.

No relocations of persons, business or farm operations will result from installation of the channel work. Alterations, modifications, and possible changes in locations of existing public utilities will be required by installation of the proposed conduit in the area of the intersection of Main and East Streets. The responsible public works department or public utility company will supervise or perform the work to ensure minimum disruption of service.

The final designs of the structural measures and construction procedures will give maximum consideration to minimizing adverse effects to the environment. Erosion and pollution control will be a major concern. Areas to be cleared will be planned for the minimum amount necessary for construction and maintenance. Plant materials used for vegetating disturbed areas will be selected for their ability to control erosion, provide wildlife food and cover, and for beauty and ease of maintenance. Project induced vector problems will be minimized to the extent possible.

Requirements for erosion and pollution control during construction will be outlined in construction contracts. If special problems of pollution arise during construction or measures not in the contract are needed, a contract modification will be prepared or other appropriate action taken. To minimize erosion and water and air pollution the following measures or techniques will be considered in preparing construction plans and specifications:

1. The area and duration of exposure of erodible soils will be reduced to the greatest extent practicable.
2. Soils will be protected by using temporary vegetation or mulch or by accelerated establishment of permanent vegetation. Segments of work will be completed and protected as rapidly as is practicable.

3. The rate of runoff from the construction site will be mechanically retarded and the disposal of runoff will be controlled.
4. Sediment resulting from construction will be trapped in temporary or permanent debris basins.
5. Dust will be kept within tolerable limits on haul roads and at construction sites by application of methods acceptable under Regulation No. 9 of the State Air Pollution Implementation Plan.
6. Temporary bridges or culverts will be used where fording of streams is objectionable.
7. Temporary measures will be used to keep erosion under control if construction is suspended for any appreciable length of time.
8. Protection against pollutants such as chemicals, fuels, lubricants, sewage, etc., will be provided.
9. Construction will be timed to avoid rainy seasons if practical.
10. Sanitary facilities will not be located over or adjacent to streams, wells, or springs.
11. Grass or brush fires will be prevented.

Contractors must comply with the manual, Safety and Health Regulations for Construction, published by the U.S. Department of the Interior, Bureau of Reclamation, and must also comply with state and local health, sanitation and pollution regulations.

During construction, care will be taken to avoid creating breeding areas for mosquitoes and other aquatic insects that are vectors of human disease organisms. Work will include grading of borrow areas to be self draining, placing and grading of spoil material so as not to pocket water, and care during other construction operations that could cause shallow water breeding areas. Other consideration will be given to minimizing project induced vector problems to the maximum degree permitted by the primary functions of the structures, and other environmental concerns as agreed to by the sponsors and responsible health agencies.

Trees or other cleared materials will be salvaged for merchantable wood products as practicable. Waste products will be burned or buried, depending on the nature of the material, applicable regulations and the desires of town authorities.

The National Register of Historic Places lists no properties within the watershed. During consultations with the Massachusetts Historical Commission and the State Archaeologist they advised that no properties of historical or archaeological value listed in their present inventory would be affected by installation of the structural measures. In addition, a survey has been conducted by a qualified archaeologist. This survey indicates that no archaeological resources will be affected by project measures (a summary report is included as Appendix D). However, the archaeologist points out that the existence of such resources cannot be totally ruled out. As recommended by the archaeologist, construction personnel will be made aware of the possibility of archaeological resources, especially when removing fill from borrow areas. If any discoveries are made during construction, the National Park Service and appropriate state interests will be notified in compliance with the Federal Reservoir Salvage Act of 1960, (PL86-523). Construction would not be continued until necessary actions satisfactory to the sponsors and appropriate authorities have been implemented. Since this is a federally assisted local project, there will be no change in existing responsibilities of any federal agency under Executive Order 11593 with respect to archaeological and historical resources.

Nonstructural Measures

Needed flood plain management measures have been or are being instituted in the watershed. These measures are not dependent on the project and are therefore considered to be "without project" conditions. The town of Walpole has enacted a flood plain zoning bylaw and is participating in the National Flood Insurance Program. The town has been approved for participation under the emergency flood insurance program. Steps are now being taken to enable participation under the regular program.

Assistance will be provided to the town through ongoing programs for effective application of regulatory measures. Technical assistance will be provided for such items as: delineation of flood prone areas; establishment of flood level reference elevations at specific locations; establishment of encroachment lines; and review of development plans for possible effects on flood plain storage and flow capacity.

There are three instruments, in addition to flood plain zoning, by which towns in Massachusetts are able to regulate the use of wetland and flood plain areas. These methods of regulation, in addition to public acquisition, will be used when appropriate to protect the natural ecological and hydrological values of wetlands. Each of these methods is authorized (granted) by state legislation under one or more of the General Laws of the Commonwealth. A brief description of each of these Acts follows:

1. Wetlands Protection Act (General Laws, Chapter 131, Section 40, as amended in 1974 by Chapter 818). This law requires that any person, firm, or corporation, public or private, intending to remove, fill, dredge, or alter a wetland must insure, by

following various procedural and technical steps, that the activity will have no significant adverse effect on ground water supply, to flood control, to storm damage prevention, to prevention of pollution, to protection of land containing shellfish, or to the protection of fisheries. In effect, the owner must develop his wetlands in accord with the public's interest and safety. (Wetland is interpreted as just about any land which is periodically wet).

2. Inland Wetlands Restriction Act (General Laws, Chapter 131, Section 40A, as amended in 1972 by Chapter 782). This law is designed to supplement the regulative approach of the Wetlands Protection Act. This law establishes a planning approach to wetland protection, and initiation is not dependent upon any proposed adverse action on a wetland or flood plain. Through this law, the Commissioner of the Department of Natural Resources in order to preserve and promote public safety, private property, wildlife, fisheries, water resources, flood plain areas and agriculture, is empowered and directed to issue orders restricting development of inland wetlands.
3. Conservation Restriction Act (General Laws, Chapter 666 of the Acts of 1969). This law serves as a useful device to assist conservation commissions in the preservation of open spaces. A conservation restriction is a right (received as a gift or purchased) which is written into a will or deed appropriate to retaining land or water areas predominantly in their natural, scenic or open conditions or in agricultural or forest use and to forbid or limit some activity or activities such as: construction, dumping, excavation, dredging, destruction of trees, activities detrimental to such retention of land or water areas.

Flood plain areas that should be protected for their ecological and other environmental values will be identified in the natural resource inventories and plans carried out under the land treatment phase of the project.

Land Use Changes

Present land uses on about 58 acres of watershed land will be changed by installation of the planned structural measures. In addition, it is expected that land use changes will result from implementation of flood plain management. Residential, commercial and related development during the project installation period are expected to occur on about 40 acres of land.

The present land uses of the area required for each major feature of the structural measures are as follows in Table 1:

TABLE 1 PRESENT LAND USE OF AREA REQUIRED* FOR STRUCTURES

Structural Measures & Major Feature	Total Land Area Req'd (Acres)	Present Land Use (Acres)		
		Forest Land	Idle (Grass and Shrub)	Water Surface
<u>Multiple-Purpose Structure</u>				
Dam & Spillway	7	6	1	
Fish & Wildlife Pool	17	17 ^{1/}		
Flood Pool	33	16 ^{2/}	13 ^{3/}	4
<u>Channel Work</u>				
Floodwater Conduit*				
Outlet Channel	1		1	
TOTALS	58	39	15	4

The 57 acres of land that will be committed to the multiple-purpose structure is now mostly wooded. This woodland, with the smaller areas of other cover that are present, constitutes a generally good wildlife habitat. The woodland consists of a moderate to low quality timber stand.

* Present urban use (streets, parking lots, etc.), will not be changed.

^{1/} Includes 12 acres of wooded swamp (Type 7) wetland.

^{2/} Includes 4 acres of wooded swamp (Type 7) wetland.

^{3/} Includes 8 acres of shrub swamp (Type 6) wetland.

The present use and quality of the multiple-purpose structure site for wildlife habitat is related to the vegetative cover which exists. Also, how this vegetative cover will be affected will vary with the major features of the structure. Therefore, the following descriptions of vegetative cover types are provided for the land area required by each major feature.

The dam and emergency spillway will require 7 acres of land which will be cleared of all existing vegetation and vegetated with suitable grasses and legumes when construction is completed. This 7 acres presently consists of the following three cover types:

1. Hardwood-Softwood Woodland - There are 3 acres of a high density stand of mixed hardwood-softwood woodland in a size range of sapling to small sawlog (2-14 inch diameter). White, red, and scarlet oak, American beech, and white pine are the dominant tree species. Understory vegetation is generally thick and consists of witch hazel, greenbrier, arrowwood, spicebush, sassafras, and sprouts of American chestnut.
2. Hardwood Woodland - There are 3 acres of predominantly hardwood woodland in a pole to small sawlog size range (5-14 inch diameter). Tree stand density ranges from low to high. The dominant tree species are white, red, and scarlet oaks. American beech, and red maple. Understory vegetation is sparse, consisting largely of flowering dogwood, sassafras, greenbrier, and American chestnut sprouts.
3. Abandoned Agricultural Land - There is a 1 acre abandoned field which is undergoing rapid plant succession. Invading woody plants are pin cherry, staghorn sumac, red cedar, and red maple. Invading shrubs are tatarian honeysuckle and arrowwood. Herbaceous vegetation is timothy grass, fescue grass, little bluestem grass, wild strawberry, goldenrod, and various species of aster (Compositae).

The fish and wildlife pool area consists of 17 acres of land which will be cleared and permanently inundated. It is composed of the following two cover types:

1. Hardwood Woodland - There are 13 acres of predominantly hardwood woodland in the pole to small sawlog size range (5-14 inch diameter) which ranges from a low to high stand density. White, red, and scarlet oak, American beech, and red maple are the dominant species. Understory plants are witch hazel, greenbrier, spicebush, sarsaparilla, and flowering dogwood. About 8 acres of this area meet the classification of a wooded swamp, Type 7 wetland 1/.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

2. Hardwood-Softwood Woodland - There are 4 acres of mixed hardwood-softwood woodland with hardwood predominating. The size range varies from sapling to small sawlog (2-14 inch diameter) and is of high stand density. White, red, and scarlet oak, American beech, red maple, and white pine are the dominant tree species. Understory vegetation consists of scattered plants to very thick growth of witch hazel, greenbrier, arrowwood, spicebush, and sassafras. This area meets the definition of a wooded swamp, Type 7, wetland 1/.

The flood pool area consists of 33 acres of land which will be occasionally inundated by storage of floodwater. Except for 3 acres, the present vegetation of this area will remain. The 3 acres will be cleared of vegetation for removal of soil material for building the dam and will be revegetated upon completion of construction. This area presently supports a hardwood woodland of white, red, and scarlet oaks, and American beech. The remaining 30 acres of the flood pool is composed of the following five cover types:

1. Abandoned Agricultural Land - There are 3 small fields which total 5 acres in area. Woody vegetation is pin cherry, staghorn sumac, tatarian honeysuckle, red cedar (erect form), arrowwood, and red maple seedlings. Herbaceous vegetation at ground level is timothy grass, fescue grass, and wild strawberry.
2. Shrub Swamp- There are 8 acres classified as a Type 6 wetland 1/. Highbush blueberry, silky dogwood, speckled alder, arrowwood, and spicebush are the dominant shrub vegetation. Seedling and sapling size red maple line the perimeter of this wetland area.
3. Fresh Open Water - A 4 acre manmade pond is located in the upstream end of the flood pool. This pond is greater than three feet deep and is classified as a Type 5 wetland 1/. The pond supports duckweed and one or more species of pondweed (Potomageton).
4. Hardwood Woodland - The 6 acres of predominantly hardwood woodland range in size from sapling to small sawlog (2-14 inch diameter) and is of low to high density. About 4 acres of this area meet the classification of a wooded swamp, Type 7 wetland 1/. Dominant trees are white, red, and scarlet oaks, American beech and red maple. Understory vegetation is sparse and consists of scattered plants of flowering dogwood, sassafras, greenbrier, and sprouts of American chestnut.
5. Hardwood-Softwood Woodland - There are 7 acres of mixed hardwood-softwood with hardwoods predominating. The size range varies from pole to small sawlog (5-14 inches diameter) and the woodland is of high density. Dominant trees are white, red and scarlet oak, American beech, red maple, and white pine. Understory vegetation ranges from scattered plants to very thick in places and consists of witch hazel, arrowwood, spicebush, greenbrier, and sassafras.

The present use and quality of the multiple-purpose structure site as a wildlife habitat is as follows for the cover types that exist:

1. Wetlands - The 8 acres of shrub swamp, Type 6 wetland 1/, and 4 acres of fresh open water, Type 5 wetland 1/ in the flood pool area provide feeding and resting habitat for migrating waterfowl, and are used particularly during spring and fall migrations. Mallard, black, and wood ducks are the primary waterfowl species which use these wetlands in inland portions of Massachusetts. These wetlands provide good feeding habitat for green heron and the open water area provides a fair feeding habitat for the belted kingfisher.

Excellent habitat is provided for the muskrat and other water oriented mammals, particularly around the open water area of Allen Pond.

In Massachusetts, wooded swamps (Type 7 1/ wetland) are only important as nesting and feeding areas to wood and black ducks when the wetland borders permanent open water. The U.S. Fish and Wildlife Service 2/ has classified more than one half of Massachusetts wooded swamps (25,865 of 47,710 acres) as having negligible waterfowl value. Only 5,075 acres are classified as providing high to moderately high waterfowl value. Within the area encompassed by the planned permanent pool there are presently no bodies of open water adjacent to the 12 acres of wooded swamp, consequently the waterfowl value is negligible.

In the flood pool, there is a wooded swamp wetland adjacent to an 8 acre shrub swamp. Since the shrub swamp has a one-half acre area of open water, the overall value of the shrub swamp and wooded swamp would be moderately high for waterfowl, especially black and wood duck.

Mammals which find suitable habitat in the wooded swamp wetlands within the planned fish and wildlife pool and flood pool area include short-tail weasel and raccoon.

Water associated songbirds such as yellow warbler, red winged black-bird, swamp sparrow, tree swallow, and northern yellowthroat warbler are present around the wetland areas. Good nesting and feeding habitat is present for these and other songbird species as well as the woodcock, a migratory game bird.

Excellent habitat for amphibians such as common newt, leopard frog, wood frog, green frog, and spring peeper is available in and around the wetland acreage.

The wetlands also provide excellent habitat for certain reptile species. Reptiles found in the area include northern water garter snake, ribbon snake, painted turtle, wood turtle, and snapping turtle.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

2/ Wetlands of Massachusetts, United States Department of the Interior, Fish and Wildlife Service, Bureau of River Basin Studies, revised, October 1959.

2. Hardwood Woodland - This cover type provides good habitat for gray squirrel and eastern chipmunk. Habitat for gray squirrel will improve as oaks reach maturity and provide an increased acorn crop and more numerous cavities for nesting. Habitat for woodland songbirds such as chickadees, nuthatches, blue jays, hairy woodpeckers, and downy woodpeckers is good and will improve with maturity of the forest trees. Eastern cottontail rabbit habitat is poor in this cover type since understory shrubs are scattered and sparse.
3. Hardwood-Softwood Woodland - The mixed hardwood-softwood woodland provides fair to good habitat for gray squirrel and eastern chipmunks depending primarily on the size of the oaks and beech. Areas with the larger oak and beech trees are providing a better source of food and suitable nesting cavities. Habitat for woodland songbirds is good. Eastern cottontail rabbit habitat is poor to fair depending primarily on the density of understory shrubs which provide the bulk of the food and escape cover.
4. Abandoned Agricultural Land - The abandoned agricultural land is providing good habitat for the meadow voles, white-footed mice and short-tailed shrew all of which are present in or around the perimeter of the abandoned fields. Good habitat is also provided for songbirds associated with reverting open land and shrub thickets, such as the yellow-shafted flicker, rufous-sided towhee, goldfinch, catbird, and cardinal. These species find good nesting and feeding habitat in and around the perimeter of the abandoned fields. Habitat for the eastern cottontail rabbit is good in and around these overgrown fields. Food and nesting and escape cover is readily available to cottontail rabbits which are common in and near this vegetative cover type.

Whitetail deer do not use or traverse the area planned for the structure and pool. Adjacent urban areas make this particular area too small to constitute a viable deer habitat area. A resident who has lived near the site for 25 years reports that deer have not been seen in this area since Interstate Route 95 (I-95) was constructed. This highway has apparently disrupted deer movements from the large wooded area in the Moose Hill area south of the highway. No evidence of deer use was observed in the area during field investigations.

Many species of songbirds are either infrequently found in the site area or are abundant only during spring and fall migration periods. Other species are abundant in winter when they use the general area as a wintering ground.

The outlet channel will require 1 acre of idle land which will be cleared as necessary to permit excavation and the spreading of spoil material. This area is a Type 2 wetland ^{1/} (Inland Fresh Meadow) consisting predominately of herbaceous plants which are by order of dominance: purple loosestrife, goldenrod, knotweed, cinnamon fern and various sedge species (Carex) pokeberry, and nightshade. Scattered through the area are clumps of the following shrubs by order of dominance: silky dogwood, arrowwood, speckled alder, elderberry and wild spirea. Also scattered through the area are the following tree species and their size range (diameter, measured 4.5 feet above ground): boxelder (12 inch - 1 only), white ash (10 inch-16 inch), red maple (to 4 inch), American elm (3 inch-8 inch), black willow (16 inch -1 only) and black cherry (7 inch - 1 only).

Because of the close proximity of the planned outlet channel to urban development, the wildlife habitat value of this area is primarily for songbirds, cottontail rabbits, and muskrats. A local resident reports that ringneck pheasants are occasionally seen in this vicinity. Only non-consumptive uses of the wildlife resource are acceptable in this area.

No stream sport fishing exists on Diamond Brook within the multiple-purpose structure site or in the channel work area. A warm water fishery is present in Allen Pond, which is within the flood pool area of the multiple-purpose structure. Warm water fish species present in the pond include brown bullhead, bluegill sunfish, and largemouth bass.

Other uses will be made of the land areas required by the structural measures that are compatible with their planned functions. The dam and spillway and the outlet channel area will provide open space and wildlife habitat. The flood pool area will also provide wildlife habitat and open space, and can serve for other conservation and recreation uses that are compatible with occasional inundation by storage of floodwater.

^{1/} Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

Operation and Maintenance

Land Treatment

Operation and maintenance of land treatment measures will be the responsibility of the Norfolk Conservation District and will be performed by the landowners of properties on which the measures are installed. Technical assistance will be provided by the Norfolk Conservation District with assistance from the Soil Conservation Service and the Massachusetts Department of Natural Resources, Division of Forests and Parks, in cooperation with U.S. Forest Service.

Structural Measures

Structural measures will be operated and maintained by the town of Walpole from available tax funds. Operation and maintenance will be carried out in accordance with the "Commonwealth of Massachusetts Watershed Operation and Maintenance Handbook for Projects Installed with the Assistance of the Soil Conservation Service," dated May 1971. The average annual cost for operation and maintenance is estimated to be \$3,130.

For three years after completion of the structure, the sponsors and the Soil Conservation Service will inspect each structural measure annually, and after each major storm or other unusual occurrence. After three years, the town of Walpole will make the inspections with participation by the Service and the Norfolk Conservation District as deemed necessary. The needed maintenance will be decided at the time of the inspection. The town of Walpole will perform the needed maintenance work in a timely and otherwise appropriate manner to assure safe and efficient operation of the structural measures for the life of the project.

Specific operation and maintenance agreements between the town of Walpole and the Service will be executed for each structural measure prior to the issuance of invitations to bid for any construction contract. A plan of operation and maintenance detailing the major needs will be included in the operation and maintenance agreement. Maintaining and improving the aesthetic value of the structural sites will be an important consideration in the maintenance program.

Operation and maintenance work at the Allen site dam will include such activities as the removal of brush and debris around the dam and spillways; maintenance of vegetal cover by reseeding, fertilizing, and mowing; control of unwanted vegetation; and replacement or repair of the metal and concrete appurtenances. Access for operation and maintenance will be provided from Washington Street.

Principal items of operation and maintenance for the fish and wildlife pool will include: stocking and periodic reclamation for the fishery, control of undesirable vegetation, policing the site to remove litter, and upkeep of access facilities. The town will request consultation and technical assistance from the Massachusetts Division of Fisheries and Game to develop a management program so that the fish and wildlife measure will serve the purpose for which it is installed. To preclude the development of unsanitary conditions at the Allen site, the town of Walpole will make periodic inspections during and after each season of use. The town will request the Massachusetts Department of Public Health to participate in these inspections. Should these inspections show that unsanitary conditions exist, the town of Walpole will install adequate sanitary facilities to ensure that sanitation is maintained and that operations are in agreement with state and local health laws and regulations.

The total estimated average annual operation and maintenance cost for the Allen site multiple-purpose structure is \$1,220.

Operation and maintenance of the floodwater conduit and outlet channel will include maintenance of vegetation, upkeep of access roads, and travelways; removal of trash and debris; control of undesirable vegetation in the inlet and outlet channel areas; and maintenance of riprap and concrete appurtenances in a good state of repair.

Operation and maintenance of the existing conduit is essential to provide the planned degree of flood protection. Operation and maintenance items will include the removal of trash, debris and undesirable vegetation at the inlet and outlet areas and maintenance of the structural integrity of the conduit.

Operation and maintenance costs for the floodwater conduit, outlet channel, and existing conduit is estimated at \$1,910 annually.

An establishment period of three years is provided for the structural measures and associated vegetative cover. During this period, PL-566 funds may be used by the Soil Conservation Service to cost share on repairs or other work resulting from unknown conditions or construction deficiencies. The cost of such work would be shared in the same ratio as the construction cost of the structure. Maintenance work and work resulting from improper operation and maintenance are not eligible for PL-566 financial assistance. However, technical assistance that may be needed will be provided by the Soil Conservation Service.

Nonstructural Measures

The town of Walpole will continue to implement and enforce the non-structural measures throughout the project life.

Project Costs

The total estimated installation cost of project measures is \$952,500. Components of this cost are shown in the following Table 2:

TABLE 2 - PROJECT COSTS

Project Measure	Project Costs (dollars)		
	PL-566 ^{4/}	Other ^{5/}	Total
Land Treatment ^{1/}	4,300	77,000	81,300
Structural			
Construction ^{2/}	618,900	31,100	650,000
Other Installation ^{3/}	180,200	103,400	283,600
Subtotal	799,100	134,500	933,600
Total Project	803,400	211,500	1,014,900

^{1/} Land treatment costs are the installation and technical assistance costs for land treatment measures.

^{2/} Construction costs include the contract or force account costs for constructing structural measures.

^{3/} Other installation costs include engineering services, landrights, water rights, and project administration costs.

^{4/} Funds appropriated under authority of PL-83-566 for installation of project measures.

^{5/} Funds from sources other than PL-83-566 appropriations. Other funds may include sponsors cost, donations, landowners and operators costs, and cost-sharing from other public programs.

ENVIRONMENTAL SETTING

Physical Resources

Area and Location

The Diamond Brook Watershed, in the headwaters of the Neponset River, has a total drainage area of about 1,270 acres. It is a residential and commercial area located about 20 miles southwest of Boston in Norfolk County, Massachusetts. Portions of the towns of Walpole and Sharon comprise the watershed, with respective areas of 930 and 340 acres.

This watershed is within the North Atlantic Region^{1/} (Figure 4) which stretches along the Atlantic Coast from the North Carolina-Virginia state boundary to the northern tip of Maine. The region extends inland to encompass all of the land drainage which flows into the Atlantic Ocean through the coastal zone. The region is divided into six subregions as shown in Figure 4. The Diamond Brook watershed is within the southern New England subregion (subregion 2).

Population

The watershed is within one of the more densely populated areas of the North Atlantic Region which is described as "an urban belt following the coastline from Boston to Washington"^{2/}. It is estimated that 5000 ^{3/} people live within the watershed area. Most of the population is in the northwestern or lower portion of the watershed within the town of Walpole.

Population is expected to increase in the watershed area at a rate of 100 people annually^{4/} during the project installation period.

^{1/} Water resource regions as delineated by the United States Water Resources Council, Washington, D.C.

^{2/} North Atlantic Regional Water Resources Study, North Atlantic Regional Water Resources Study Coordinating Committee, May 1972.

^{3/} Based on 3.76 persons per dwelling unit. From Comprehensive Plan Study, Walpole, Massachusetts, by Charles E. Downe, Planning Consultant, 1971.

^{4/} Based on Census Data; population of the town of Walpole increased about 2 percent yearly between 1965 and 1970.



Figure 4
LOCATION MAP
LOCATION OF THE DIAMOND BROOK WATERSHED
WITHIN THE NORTH ATLANTIC REGION

Soils ^{1/}

Soils over most of the watershed are derived from glacial deposits. Exceptions are the organic soils in the wetlands and alluvial soils along the streams, both of which are of recent geologic origin; and areas of exposed bedrock in the higher elevations of the Moose Hill area where the drainage of Diamond Brook originates.

Upland soils of glacial till origin are the primary watershed soils. Glacial outwash soils are common in the lower elevations and are typically sandy and gravelly. There are smaller areas of muck and other poorly drained soils in depressions and along the stream channels. The upland soils are stony, and although permeable, are limited in their water holding capacity due to the presence of shallow bedrock or compact glacial till. The sand and gravel soils in the lower elevations are well drained and permit large amounts of water to percolate into them.

Approximately 80 percent of the watershed area has severe soil limitations for septic tank sewage disposal. The severity of the soil limitations normally preclude use of septic tank disposal systems in these areas for high density housing. However, some of the areas in this class have less severe soil limitations and therefore, may be satisfactory for lower density housing. The soil problems involve one or more of the following conditions: (1) slow or moderately slow permeability in the substratum, (2) high water tables, that range in duration from about four or five months of the year to seven to nine months of the year or more, (3) bedrock generally within two to three feet of the surface, and (4) slopes greater than 15 percent.

Excluding soil limitations for onsite sewage disposal, there still remain severe soil limitations for housing on about 15 percent of the watershed area. These limitations involve bedrock within four feet of the surface and high water tables during most of the year.

Geology

The watershed is located in the coastal lowland section of the New England Physiographic Province. Elevations vary from about 130 feet at the confluence of Diamond Brook and the Neponset River to 525 feet at Moose Hill, the highest hill in the watershed. Most of the area consists of low rolling hills and terraces. The diversity of the topography is caused partly by the irregular bedrock surface and partly by the varied glacial and postglacial deposits.

^{1/} Soils and Their Interpretations for Various Land Uses, (Walpole, Sharon), U.S. Soil Conservation Service in Cooperation with the Norfolk Conservation District, 1965 and 1966.

Both sedimentary and igneous rocks occur in the area. Sedimentary rocks consist of interbedded shales, sandstones, and conglomerates of Pennsylvanian age. These rocks occur in the northern portion of the watershed, and are buried beneath variable thicknesses of Pleistocene and recent soil units. Igneous rocks consist of syenite with small lenses of granite, and are Pennsylvanian or older in age. These rocks occur in the southern portion of the watershed, and are usually buried beneath soil units. However, the igneous rocks are exposed in the higher elevations of the Moose Hill area in the extreme southeastern corner of the watershed.

Fault zones are the principal features of the bedrock structure which are of engineering interest. Bedrock in these zones is highly fractured, chemically altered, and often weathered and decomposed. Previous studies in surrounding areas suggest a major fault zone may run through the southeastern portion of the watershed in a northeast-southwest direction. The Blue Star Memorial Highway (U.S. Route 1) runs along the inferred location of the fault zone. Minor fault zones and highly fractured bedrock may be present locally in other parts of the watershed. Figure 5 shows bedrock geology and the location of the fault zone.

Pleistocene glacial deposits essentially cover the entire watershed. Silty, compact, glacial till is found at the ground surface in many places, usually on the higher hills. Locally, looser, water-washed ground moraine is found overlying the more compact till. Ice contact and glacial outwash deposits consisting of poorly graded, bedded sand, and gravel form the many low hills and terraces in the watershed. The thickness of Pleistocene deposits is highly variable, and the maximum thickness in the watershed is not known. However, previous studies suggest that maximum thicknesses in the order of 200 feet or more are likely.

Recent deposits occur in swamps and along flood plains of the major streams. These consist of various mixtures of muck, silt, sand fine gravel, and peat. Deposits are usually less than five feet thick.

The general course of the Neponset River is believed to follow a pre-glacial, buried valley in the bedrock surface. The exact location of the axis, or deepest portion, of the buried valley in the watershed is not known. The axis may be located anywhere between the present river and the bedrock hills in the southern part of the watershed. Buried valleys often contain relatively thick sections of permeable glacial sediments and locally may contain preserved lenses of pre-glacial, permeable channel fill. Therefore, a buried valley may be an important source of ground water supply.

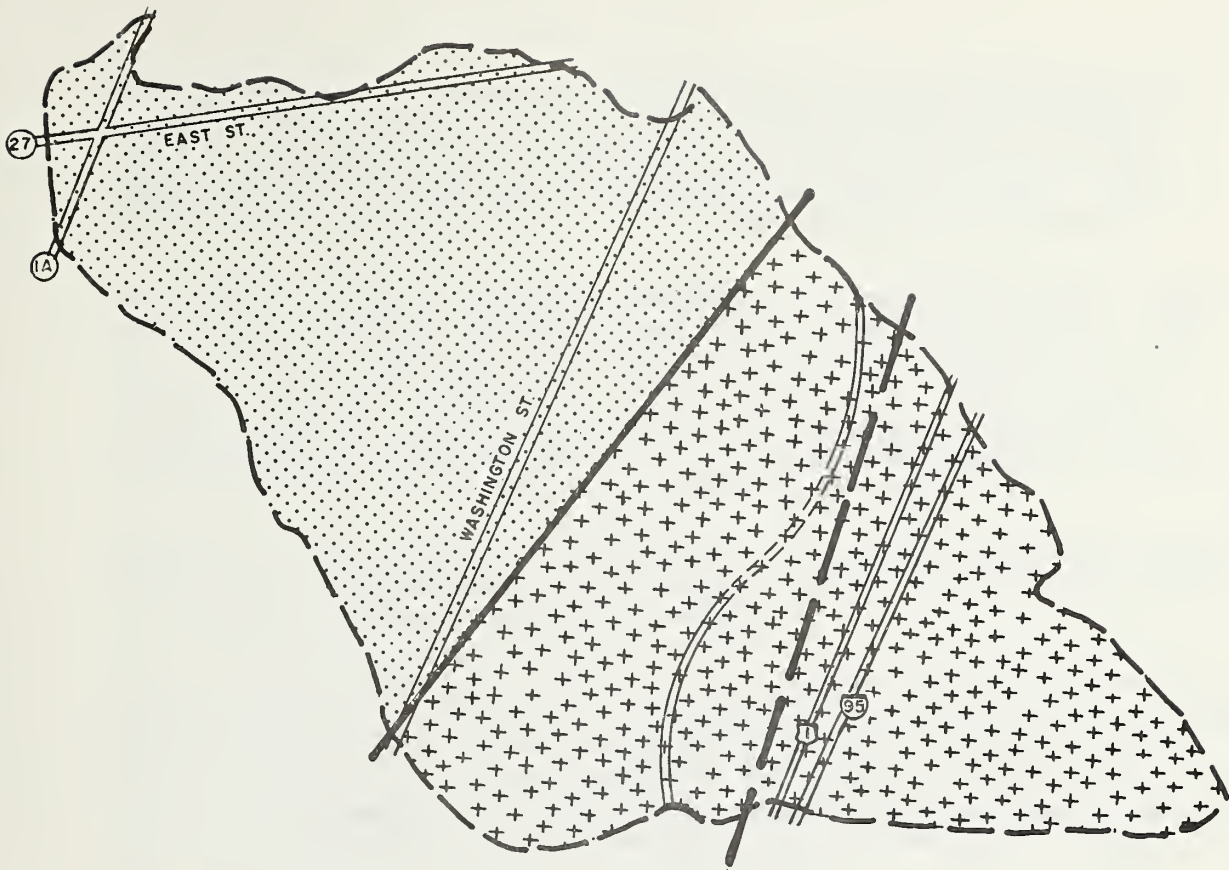
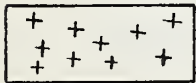


Figure 5 BEDROCK GEOLOGY^{1/}

LEGEND



Pennsylvanian sedimentary rocks including interbedded shale, sandstone and conglomerate.



Pennsylvania or older igneous rocks mostly syenite with small lenses of granite.



Inferred fault. Bedrock may be expected to be highly fractured, chemically altered, and decomposed along any existing fault zones.

Note: Bedrock is concealed by thick sections of glacial sediments throughout most of the area. Therefore, locations of contacts, faults, etc., on the map are inferred and can be expected to be somewhat in error.

^{1/} Geology of the Norwood quadrangle, Norfolk and Suffolk Counties, Massachusetts, U.S. Geological Survey Bulletin 1163-B, U.S. Government Printing Office, Washington: 1966.

Some ground water sources in the watershed are indicated to exist in the sand and gravel soil areas of glacial outwash and ice contact origin. However, the towns within the watershed obtain water from ground water and surface sources outside the watershed area. There are no known wells to extract ground water within the watershed.

Ice contact deposits are highly variable in their distribution, grain size, and other physical properties, but, on the average, have a medium to high permeability and are favorable sources for ground water supply. Coarse, permeable ice channel deposits are buried beneath finer grained ice contact units in a few localities. Under these circumstances, the ground water in the channel deposits may be under artesian pressure with hydrostatic heads above ground.

Deposits of ice contact sand and gravel are the most important mineral resources in the watershed. Some of the igneous rock may be suitable for crushed stone and as building material.

The only notable mineral resources of economic importance produced in Norfolk County, as reported by the Bureau of Mines, United States Department of the Interior, are stone, sand, gravel, and clays^{1/}. Potentially good sources of sand and gravel are indicated in about 25 percent of the soil areas of the watershed^{2/}. Sand and gravel constitutes one of the North Atlantic Regions principal mineral resources. Figure 6 shows the surficial geology of the watershed.

Earthquakes in the northeastern United States ^{3/} have not been frequent or intense in comparison to other areas of the world. However, damaging earthquakes have occurred in the past, and some may be expected in the future. The Boston area has a higher frequency of damaging earthquakes than most other areas in the northeastern United States. Actual ground movement along old faults in the watershed is not anticipated even if an earthquake should occur in the Boston area.

^{1/} North Atlantic Regional Water Resources Study, North Atlantic Regional Water Resources Study Coordinating Committee, May 1972.

^{2/} Soils and Their Interpretations for Various Land Uses, (Walpole, Sharon), U.S. Soil Conservation Service in Cooperation with the Norfolk Conservation District, 1965 and 1966.

^{3/} Fred L. Fox, Seismic Geology of the Eastern United States, Association of Engineering Geologists Bulletin, Volume VII, pages 21-43.



Figure 6 SURFICIAL GEOLOGY ^{1/}

LEGEND



Recent alluvium and swamp deposits, including muck, peat, sand and fine gravel.



Ice contact and glacial outwash deposits consisting of poorly graded, bedded sand and gravel. These deposits are expressed in a variety of land forms including kames, kame fields, kame terraces, eskers, and outwash terraces.



Generally very dense silty sand with gravel, cobbles, and boulders. Locally, a looser unit of water-washed ground moraine is found overlying the more compact lodgement till. Glacial till probably underlies other surficial deposits in many places.

Climate^{1/}

The climate is typical of lower coastal New England, with an average January temperature of 29°F. and an average July temperature of 71°F. The normal growing season of 176 days extends from about the first of May to mid-October. Average annual precipitation is about 43 inches with a runoff of 20 inches and is generally well distributed throughout the year. The average snowfall is 30 inches and may occur in appreciable amounts from November to April each year. The watershed experiences both tropical cyclonic storms originating on the continent and occasional coastal storms. Winter coastal storms often bring rainfall, in contrast to snow in interior areas. Hurricanes can occur particularly during the months of August, September, and October.

Land Use

Urban land is the major land use, covering about 609 acres or 48 percent of the watershed area. Other land use is: 587 acres (46 percent) forest land; 24 acres (2 percent) cropland; and 50 acres (4 percent) wetlands (excluding wooded wetlands). A portion of one part-time farming enterprise operates in the watershed. The urban development is located mostly in the lower or downstream portion of the watershed.

The lower portion of the watershed, because of its concentration of urban development, has high runoff producing characteristics. The hydrologic condition of the remaining portion of the watershed is poor to fair and is largely determined by the forest cover which is predominant in this area.

During the preparation of this work plan it was learned that an existing 18 hole golf course (Walpole Country Club) located east of Diamond Pond had been sold. The 80-acre area will be used for condominium housing with the retention of a 9-hole course. A new 18 hole course and country club is to be developed on about 120 acres of land which is presently about 80 acres of forest land and 40 acres of abandoned orchard. This new course will border the land acquired for the planned multiple-purpose structure site on the south and east.

Flood plain land use along Diamond Brook consists of about 50 acres of urban, 30 acres of water surface, and 50 acres in other uses, mostly woodland.

The trend of expanding urbanization indicates that most land will eventually be converted to urban uses, except for town owned recreation and conservation lands including land related to the proposed reservoir, and flood plain and other areas that may be publicly acquired or otherwise restricted in use. It is expected that a total of about 40 acres in scattered upland areas will be converted during the project installation period.

^{1/} Temperature and precipitation data from National Weather Service Records (formerly U.S. Weather Service).

Wetlands

There are 70 acres of wetlands within the watershed which are listed by type^{1/} and amount in Table 3:

TABLE 3 - WETLANDS IN THE WATERSHED

Type	Area (Acres)
Type 2 - Inland Fresh Meadow	1
Type 5 - Inland Open Fresh Water	35
Type 6 - Shrub Swamp	14
Type 7 - Wooded Swamp	20
TOTAL	70

Wetlands comprise approximately 5.5 percent of the watershed area. However, within four miles of the watershed there are over 2,000 acres (about 9 percent of the area) of shrub swamps and wooded swamps in the headwaters of the Neponset River.

Surface Water Resources

The Diamond Brook drainage originates at Moose Hill in the town of Sharon. The stream flows northwesterly through a series of ponds and the business area of Walpole to its confluence with the Neponset River. The watershed is about 2.5 miles long and averages about 0.8 miles in width. The elevations in the watershed range from 130 feet above mean sea level at its outlet to 525 feet on Moose Hill.

From the stream's origin, about 300 feet east of Old Post Road and downstream to about 500 feet below Allen Pond, Diamond Brook is an intermittent stream. This distance is about 2,200 feet of which 600 feet is through Allen Pond. From 500 feet below Allen Pond to the Neponset River, the stream flows perennially for 7,780 feet of which 3,050 feet is through three manmade impoundments and 645 feet is through an underground conduit under the Walpole business area. Stream gradients through this area range from 0.007 ft./ft.

^{1/} Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C. 1956

downstream of the conduit to a maximum of about 0.029 ft./ft. downstream of Clark Pond. Channel widths range from 5 feet at Washington Street to about 8 feet downstream of the conduit. Through this reach, depths are a maximum of about 3 feet. Stream bottom substrata from Washington Street downstream to Memorial Pond consists largely of stones, gravel, and coarse sand, depending on the specific location within a pool. Riffles are primarily stony throughout this reach. Downstream of Memorial Pond to the conduit, the stream bottom contains gravel, coarse sand, and silt, since the gradient is much flatter. From the outlet of the conduit to about 200 feet downstream, the channel bottom contains stone, gravel, and coarse sand. For the remaining 200 feet to the confluence with the Neponset River, the stream bottom consists chiefly of fine sand and silts. The stream meanders gently throughout its length except for the area to be enlarged to provide an outlet for the existing and planned conduits. This section is essentially straight in alignment and shows evidence of being previously modified.

Diamond Brook flows almost totally through a red maple dominated woodland from its origin to Diamond Pond. Understory vegetation varies from very sparse to dense, depending on crown closure of the woodland. From Diamond Pond downstream to the entrance of the existing conduit through the business area of Walpole, the stream is within an urban area where vegetation along the channel is primarily grass with scattered shade trees. From the outlet of the conduit to the mouth of the brook, stream side vegetation is herbaceous plants, and scattered shrubs and trees.

There are 6 ponds in the Diamond Brook drainage area totaling about 35 acres in area, with maximum depths of less than 10 feet. Allen Pond in the flood pool of the multiple-purpose structure site is about 4 acres in area. The 3 ponds downstream of Washington Street on the main channel are Clark, Diamond, and Memorial Ponds. These ponds are about equal in area, averaging approximately 8 acres. Rainbow Pond and an unnamed pond just north of Diamond Pond are about 5 and 2 acres in area, respectively.

Vegetative cover bordering the 4 ponds on Diamond Brook is as follows: (Approximate percentage of shoreline footage)

Memorial Pond - 15 percent woody plants including red maple, American elm, and arrowwood.
85 percent herbaceous plants including sedges, cattail, and lawn grasses.

Diamond Pond

Lower Pool -100 percent woody plants including red maple, gray birch, and white pine.

Upper Pool -50 percent woody plants including red maple, gray birch, and white pine.
50 percent herbaceous plants including sedges, cattail, and lawn grasses.

Clark Pond -50 percent woody plants including red maple, American elm, gray birch, and white pine.
50 percent herbaceous plants including sedges, cattail, and lawn grasses.

Allen Pond -20 percent woody plants, including silky dogwood, speckled alder, and red maple.
80 percent herbaceous plants, including sedges, cattail, and timothy grass.

There are no stream gaging stations on Diamond Brook to provide data necessary for an adequate quantification of base flow. However, records exist for a low-flow partial-record station^{1/} for 1966 and 1967. Most measurements were taken at this station during periods of base flow when stream flow is primarily from ground water storage. The flows recorded are shown in Table 4:

^{1/} Water Resource Data for Massachusetts, New Hampshire, Rhode Island, and Vermont. United States Department of the Interior, Geological Surveys, 1966 and 1967.

TABLE 4 - LOW FLOW MEASUREMENTS

Station Name	Location	Drainage Area Sq. Miles	Measurements	
			Date	Discharge (cfs) ^{1/}
Spring (Diamond) Brook at Walpole, Mass.	200 feet below outlet of Memorial Pond	1.84	8-16-66	.58
			9-12-66	.96
			5- 1-67	2.77
			8-17-67	1.47
			8-21-67	.79
			9- 6-67	1.68
			9-20-67	.98

Surface water quality in the watershed is adversely affected by residences and businesses located on sites with soils poorly suited for on-site septic systems. Data provided by the towns show approximately 350 residences and business properties having on-site sewage disposal systems. This represents about 30 percent of the residences and business properties within the watershed. Reference to the town operational soils reports indicates that about 15 percent of the on-site systems are located on soils having severe limitations for this use. These limitations are due to soils having a hardpan or compact layer which limits percolation and wet soils with a seasonally high water table.

Urban runoff containing pollutants (gas, oil, trash, animal wastes, etc.), also contributes to lower water quality, particularly during and following storms.

In 1967, all tributaries of the Neponset River were assigned a water quality classification of "B"^{2/} by the Massachusetts Division of Water Pollution Control. This classification or goal for future water quality was made in accordance with the tributaries anticipated uses and recognized that to achieve this desired water quality level all wastes discharged into the streams would require a high degree of treatment.

^{1/} cfs is an abbreviation for cubic feet per second. One cubic foot per second is about 7.48 gallons per second.

^{2/} Class B - Suitable for bathing and recreational purposes including water contact sports. Acceptable for public water supply with appropriate treatment. Suitable for agricultural, and certain industrial cooling and process uses; excellent fish and wildlife habitat; excellent aesthetic value.

Water quality data collected by the Massachusetts Division of Water Pollution Control shows that Diamond Brook, downstream from the Clark Pond inlet, does not meet the standard of class "B" water for dissolved oxygen content. This data also indicated that coliform count exceeds the allowable standard. However, coliform measurements over a longer time period are necessary to properly assess this parameter.

Table 5 gives the water quality standards^{1/} of class "B" water and the water quality parameters measured by the Massachusetts Division of Water Pollution Control on August 16 and 17, 1973. There were four sampling stations on Diamond Brook, (see Figure 7 for locations).

^{1/} Water Quality Standards and River Basin Classifications, Massachusetts Water Resources Commission, Division of Water Pollution Control, 1967.

TABLE 5 - WATER QUALITY MEASUREMENTS

WATER QUALITY PARAMETER	STATE STANDARD FOR CLASS "B"	Measurements-August 16-17, 1973- ^{1/} SAMPLING STATION 2/ ^{2/}			
		DIAMOND BROOK			
		1	2	3	4
1. DISSOLVED OXYGEN	mg/l 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 one time.	4.8	4.9	4.8	7.1
		5.0	4.9	4.3	7.1
		6.3	6.5	7.0	7.9
		7.1	7.2	7.4	7.3
2. COLIFORM BACTERIA (TOTAL)	per 100ml Not to exceed an average value of 1,000 during any monthly sampling period nor 2400 in more than 20% of samples examined during such period.	2500	1600	1000	1800
3. PH		6.8	7.3	6.5	6.5
4. TEMPERATURE	°F 6.5 - 8.0 No increase 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.	71.0	71.0	71.0	60.0
		70.0	70.0	69.0	60.0
		74.0	73.0	73.0	62.0
		73.0	74.0	72.0	59.0

^{1/} Dissolved oxygen and temperature were measured four times during the sampling period at about 6 hour intervals beginning at 4 to 5 a.m.

^{2/} Location of Sampling Stations:

- 1. Diamond Brook
- 1. Downstream from existing conduit outlet.
- 2. Upstream from existing conduit inlet.
- 3. Downstream from Clark Pond outlet.
- 4. Downstream from Old Post Road.

TABLE 5 (Continued) WATER QUALITY MEASUREMENTS

WATER QUALITY PARAMETER	UNITS	STATE STANDARD FOR CLASS "B"			
		Measurements-August 16-17, 1973 1/ SAMPLING STATIONS 2/			
		1	2	3	4
5. TOTAL ALKALINITY	mg/l	21	20	15	12
6. BIOCHEMICAL OXYGEN DEMAND	mg/l	1.2	2.2	2.4	0.6
7. SUSPENDED SOLIDS	mg/l	6	3	12	3
8. AMMONIA as N	mg/l	0.13	0.12	0.09	0.06
9. NITRATE as N	mg/l	0.1	0.1	0	0.4
10. TOTAL PHOSPHATE	mg/l	0.06	0.04	0.03	0.02
11. IRON	mg/l	1.3	1.4	0.90	0.25

NOTE: Water quality parameters not specifically denoted shall not exceed the recommended limits on the most sensitive and governing water class use. In areas where fisheries are the governing consideration and approved limits have not been established, bio-assays shall be performed as required by the appropriate agencies.

1/ Dissolved oxygen and temperature were measured four times during the sampling period at about 6 hour intervals beginning at 4 to 5 a.m.

- 2/ Location of Sampling Stations:
Diamond Brook
1. Downstream from existing conduit outlet.
 2. Upstream from existing conduit inlet.
 3. Downstream from Clark Pond outlet.
 4. Downstream from Old Post Road.

SAMPLING STATIONS

DIAMOND BROOK

- ① DOWNSTREAM FROM EXISTING CONDUIT OUTLET
- ② UPSTREAM FROM EXISTING CONDUIT INLET
- ③ DOWNSTREAM FROM CLARK POND OUTLET
- ④ DOWNSTREAM FROM OLD POST ROAD

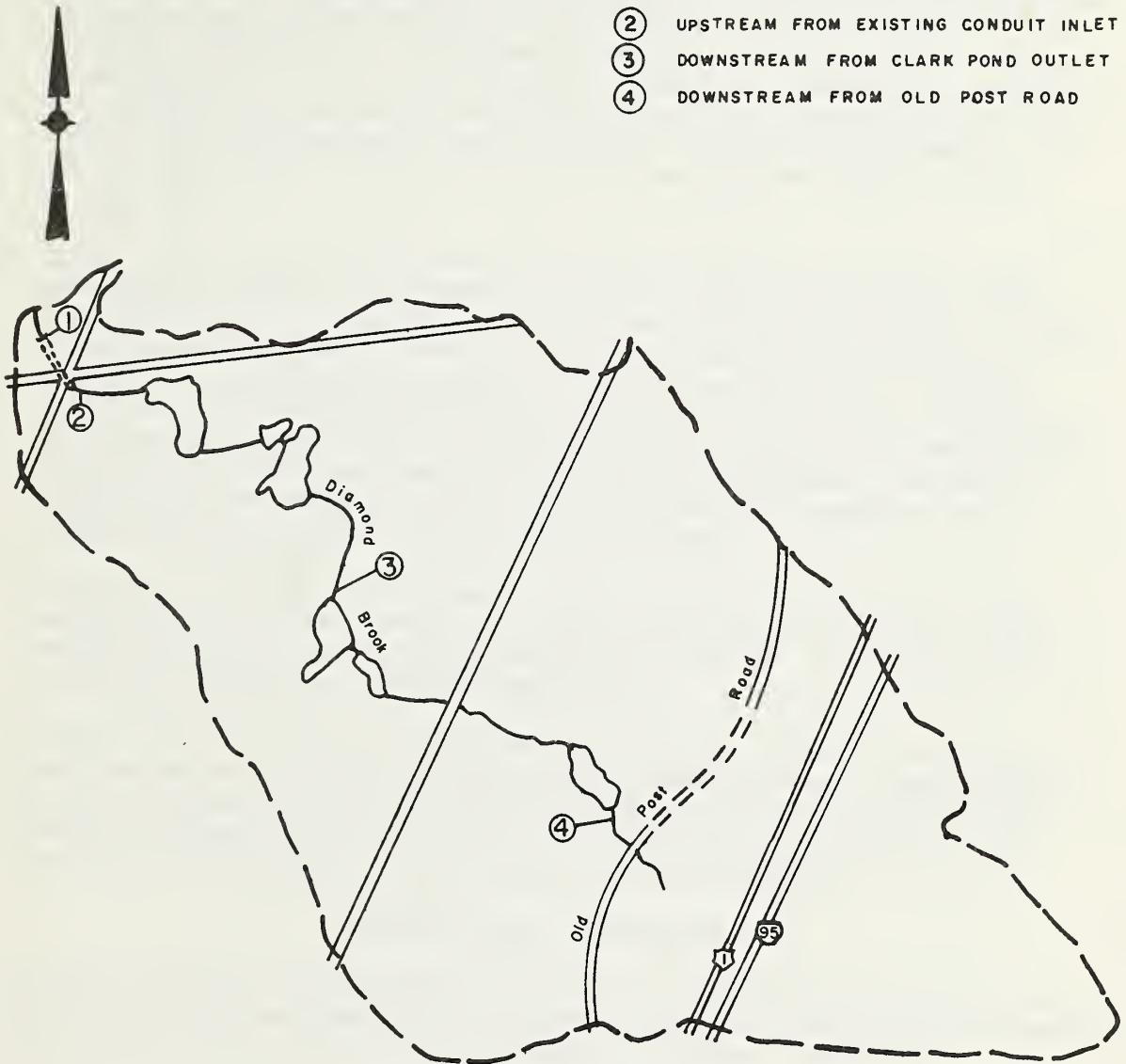
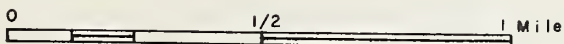


Figure 7

LOCATION OF WATER SAMPLING STATIONS
 DIAMOND BROOK WATERSHED
 NORFOLK COUNTY, MASSACHUSETTS

U S DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE



THE [illegible]

[illegible text]

[illegible text]

[illegible text]

[illegible text]

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[illegible text]

Plant and Animal Resources

In this small watershed, wildlife resources are enjoyed primarily by the people in a nonconsumptive manner rather than by consumptive forms of recreation. Songbird feeders and nesting boxes are common in the suburban residential neighborhoods throughout the watershed. Hunting is permitted in the towns of Sharon and Walpole. Hunting is permitted, with landowner permission, on about 300 acres or approximately 24 percent of the 1,270 acres in the watershed. The relative abundance of the principal game species within the watershed are shown in Table 6, page 49.

Timber values of woodland are generally regarded in a similar non-consumptive manner. Landowners of forest land regard their woodland acreage as privately owned recreation and open space and place a higher value on walking through the woodland and looking at the trees than they do on any commercial sale of trees on the stump to a logging contractor. Consequently, the only logging conducted in the watershed is in preparing the land for development of residences or commercial enterprises. Land use trends in the watershed indicate that most lands will eventually be used for residential and commercial uses unless publicly owned or otherwise restricted.

Agricultural use of land is not a viable economic enterprise in the watershed and has not been for a long period of time. Pole to small sawlog woodland is dominant. Abandoned fields and other early forest succession stages are almost nonexistent.

None of the plant and animal species discussed in the following pages are designated as rare or endangered in Massachusetts. Consultation with the Massachusetts Division of Fisheries and Game and the United States Fish and Wildlife Service revealed that it is unlikely that any rare or endangered species occur in the watershed.

Plant and Animal Communities

Table 7, on page 50 summarizes the plant communities by acres and the percent of the watershed area that each comprise. The general locations of various plant communities are shown on Figure 8 page 51.

Following is a description of the plant communities and associated wildlife as identified in the watershed:

Forest Land

Five plant communities comprise the 587 acres (46 percent) of forest land in the watershed. These communities are: upland oak-hickory,

upland northern hardwood, mixed hardwood-softwood, coniferous, and the bottom land or wetland hardwoods.

1. Upland Oak-Hickory Community - This plant community comprises about 326 acres or 55 percent of the forest land in the watershed. White, red, and scarlet oak and shagbark hickory are dominant tree species and stands vary from young saplings to mature trees with pole size stands (5-11 inch diameter) making up the bulk of the acreage. Scattered pitch pine are often found in this community. Understory vegetation is scarce and consists of flowering dogwood, sassafras, and greenbrier. This community is most common on the dry, upland slopes such as those on Moose Hill. This plant community provides good habitat for gray squirrel and eastern chipmunk. This habitat will improve as oaks reach maturity providing an increased acorn crop and more numerous cavities for squirrel dens and songbird nesting. Habitat for woodland songbirds such as black-capped chickadee, white breasted nuthatch, blue jay, hairy woodpeckers, and downy woodpeckers is good and will also improve with maturity of the forest trees. Whitetail deer and eastern cottontail rabbit habitat is poor due to the stand size and sparsity of understory vegetation. Habitat for deer is also limited due to the small parcels of wooded areas intermingled with residential and commercial properties. Deer habitat (and deer movement) is located primarily in the 0.3 square mile area south of I-95 known as the Moose Hill area.

The following mammals find suitable habitat in this plant community: striped skunk, woodland jumping mouse, white-footed mouse, deer mouse, gray squirrel, eastern chipmunk, star-nosed mole, hairy-tailed mole, short-tailed shrew, opossum, whitetail deer (poor habitat), eastern cottontail (poor habitat), and gray fox (south of I-95).

Birds which can be found in this plant community for nesting or feeding or which use the community for feeding on a seasonal basis are: ruffed grouse, red-tailed hawk, yellow-shafted flicker, hairy-woodpecker, downy woodpecker, blue jay, black-capped chickadee, white breasted nuthatch, scarlet tanager, rufous-sided towhee, slate-colored junco, and black and white warbler.

Reptiles and amphibians which find suitable habitat are: the northern black racer, common garter snake, eastern milk snake, and American toad.

2. Upland Northern Hardwood Community - This community comprises about 16 acres or 3 percent of the forest land in the watershed.

Sugar maple, northern red oak, black cherry, American beech, white ash, white birch, basswood, quaking aspen, and red maple are all common members of this community. Stands vary from pole size to mature timber with small saw timber size stands (11-14 inch diameter) making up the majority. The soils on which this plant community is found are mostly moderate to well drained. Understory plants are scarce to abundant depending upon the amount of light getting through the forest canopy. The most common understory plants are: arrowwood, wild raisin, spicebush, greenbrier, sprouts of American chestnut, witch hazel, and sarsaparilla.

Wildlife habitat for many species of mammals and birds depends largely on the density of the understory shrubs and herbaceous plants. The quality of wildlife habitat provided by this plant community varies from poor to good in the watershed with most of the acreage ranking as fair.

Mammals which find suitable habitat in this plant community of the watershed are: whitetail deer, gray fox, short-tailed weasel, opossum, short-tailed shrew, hairy-tailed mole, star-nosed mole, eastern cottontail (fair habitat), raccoon, eastern chipmunk, gray squirrel, northern flying squirrel, white-footed mouse, woodland-jumping mouse, and striped skunk.

Birds which often can be found in this plant community are: ruffed grouse, screech owl, red-tailed hawk, hairy woodpecker, downy woodpecker, yellow-bellied sapsucker, blue jay, common crow, black-capped chickadee, white breasted nuthatch, red breasted nuthatch, myrtle warbler, scarlet tanager, cardinal, rufous-sided towhee, slate-colored junco, and white-throated sparrow.

Reptiles and amphibians which find suitable habitat in this plant community are: common garter snake, northern black racer, eastern milk snake, and American toad.

3. Mixed Hardwood-Softwood Community - This community consists of mixed stands of deciduous and coniferous trees in varying amounts of each. This community comprises about 195 acres or 33 percent of the forest land in the watershed. It is a common community along the higher gradient reaches of Diamond Brook. White pine, eastern hemlock, pitch pine, red oak, sugar maple, white ash, American beech, American elm, basswood, and red maple are commonly found in this stand mixture. Stands vary from pole to mature aged, with small saw timber sized trees being the most common. Soils on which this plant community is found varies from moist to well drained. Understory plants

are scarce to abundant depending upon crown closure. Common understory plants are: arrowwood, honeysuckle, wild raisin, spicebush, greenbrier, sassafras, wild grape, witchhazel, shining clubmoss, sarsaparilla, wintergreen, and partridge berry.

The value of this community as wildlife habitat varies widely but overall is rated as fair in the watershed. Along Diamond Brook there are several areas where this plant community provides good habitat for songbird and cottontail rabbit since there is adequate light penetration for a high density of understory shrubs and herbaceous plants.

Mammals which find suitable habitat in this plant community of the watershed are: whitetail deer, gray fox, raccoon, opossum, short-tailed shrew, star-nosed mole, hairy-tailed mole, eastern cottontail, eastern chipmunk, gray squirrel, red squirrel, northern flying squirrel, white-footed mouse, woodland-jumping mouse, porcupine, and striped skunk.

Birds commonly (resident or seasonal resident) found in this community are: ruffed grouse, long-eared owl, red-tailed hawk, pileated woodpecker (occasionally observed) yellow-bellied sapsucker, hairy woodpecker, downy woodpecker, blue jay, common crow, black-capped chickadee, white breasted nuthatch, red-breasted nuthatch, myrtle warbler, scarlet tanager, rufous-sided towhee, slate-colored junco, white-throated sparrow, Baltimore oriole, and evening grosbeak (winter).

Reptiles and amphibians which find suitable habitat in this community are: common garter snake, northern black racer, eastern milk snake, American toad, common newt (terrestrial stage), and spotted salamander.

4. Coniferous Community - This community comprises about 30 acres or 5 percent of the forest land in the watershed. Coniferous trees make up at least 80 percent of the stand composition and hardwoods comprise the remainder. The major species in this community are white pine, eastern hemlock, and pitch pine. Other species and particularly those species in plantation stands are scotch pine, Norway spruce, red pine, and white spruce. Stands vary from sapling (less than 5 inches in diameter), to large saw-timber (greater than 14 inches in diameter), with small saw-timber stands making up the majority of the coniferous forest acreage. This plant community provides habitat for fewer species of wildlife than any other in the watershed. Understory plants are few or lacking altogether due to deep needle accumulations and a closed canopy which severely reduces light penetration. Understory plants that are occasionally found are greenbrier and honeysuckle.

Mammal species which find suitable habitat in this community are whitetail deer (protection during severe weather and escape cover), red squirrel, and porcupine.

Species of birds which find suitable habitat in this plant community are: screech owl (roosting cover), long-eared owl (roosting cover), blue jay, common crow (nesting and roosting), black-capped chickadee, slate-colored junco, starling (roosting), and pine grosbeak.

No species of reptiles or amphibians native to the watershed are known to prefer or depend upon this plant community.

5. Bottom Land Hardwoods Community - This community comprises about 20 acres or 3 percent of the forest land in the watershed. Dominant tree species are red maple, American elm, and an occasional black willow. Understory plants vary from scarce to abundant depending upon the amount of light penetrating the forest canopy. On most of the acreage of this plant community in the watershed there is adequate understory growth to provide good habitat for a large variety of wildlife species. Common understory plant species are: silky dogwood, speckled alder, witch hazel, greenbrier, honeysuckle, arrowwood, spicebush, and highbush blueberry.

This community occurs on very poorly drained soils in upland depressions. It also occurs along the flatter gradient reaches of Diamond Brook and is classified as a Type 71/ wooded swamp wetland.

Species of mammals which find suitable habitat in this plant community of the watershed are: raccoon, red-backed vole, whitetail deer, short-tailed weasel, opossum, eastern cottontail, northern flying squirrel, little brown Myotis, and eastern pipistrelle.

Birds which are commonly (resident or seasonal resident) found in this community are: woodcock, tufted titmouse, catbird, wood thrush, veery, ruby-crowned kinglet, cedar waxwing, brown thrasher, yellow warbler, myrtle warbler, northern waterthrush, common grackle, American redstart, common redpoll (winter), red crossbill (winter), eastern green heron, and tree swallow. In spring when depressions and streamside flats are flooded, this wetland type is occasionally used for resting and feeding by black, wood and mallard duck.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

Reptiles and amphibians which find suitable habitat in this plant community are: common garter snake, eastern ribbon snake, wood frog, spring peeper, spotted salamander, Jefferson salamander, and gray treefrog.

Open Land (Agricultural)

Only one vegetative cover type - grassland is identified in this land use. A total of 24 acres of hayland found mostly on one part-time farm operation comprises about 2 percent of the watershed area. Although the primary purpose of this acreage is to provide forage for livestock, there are also benefits to wildlife in the form of providing habitat for species which require open grassy areas and habitat diversity for species which use grassy vegetation for some particular life function such as courting, nesting, or as an occasional or preferred feeding area. Woodland surrounds most of this grassy agricultural land creating approximately 4000 feet of valuable wildlife "edge". This edge provides an interface between escape cover and a feeding area and is a preferred habitat condition of many species of mammals and birds.

Species of mammals in the watershed which find suitable habitat within the grassland cover type or at the edge along its wooded margin are: whitetail deer (occasionally seen feeding the hayland acreage on Moose Hill, (south of I-95)), woodchuck (fields and edge), red fox (hunts mice in field and edge), short-tailed weasel (edge), short-tailed shrew (field and edge), star-nosed mole (field and edge), eastern cottontail rabbit (especially edge), meadow vole (field), meadow-jumping mouse (edge), striped skunk (edge), and eastern chipmunk (edge).

Species of birds which find suitable habitat within the grassland cover type or at the wooded edge are: yellow-shafted flicker (edge), catbird (edge), robin, sparrow hawk (hunts over field), red-tailed hawk (hunts over field), common grackle, red winged blackbird, cowbird, English sparrow, eastern meadowlark, mourning dove, blue jay, field sparrow, eastern kingbird, ruffed grouse (edge), eastern phoebe, rufous-sided towhee (edge), song sparrow (edge), ringneck pheasant (scarce in the watershed), common goldfinch, and starling.

Reptiles and amphibians which find suitable habitat within or around the fields are: eastern milk snake, eastern smooth green snake, northern black racer, eastern garter snake, and American toad.

Wetland

Four wetland plant communities are identified in the watershed which total 70 acres. Twenty acres of this total is described under Forest Land as the bottom land hardwoods community. The other three communities are the shrub swamp of which there is 14 acres; inland open fresh water (35 acres) and inland fresh meadow (1 acre). In total, wetland acreage comprises about 5 percent of the land area in the watershed.

1. Inland Fresh Meadow Community - This wetland plant community constitutes the Type 2 wetland as described in Circular 39 ^{1/}. One acre of this wetland type is located along Diamond Brook in the vicinity of its confluence with the Neponset River. The dominant vegetation in this community is purple loosestrife, various species of sedges (*Carex*), and cattail. Other plants scattered throughout this community are: goldenrod, slender nettle, Japanese knotweed, cinnamon fern, pokeberry, nightshade, and widely scattered clumps of arrowwood, wild spirea, silky dogwood, elderberry, red maple, and American elm. This community provides good habitat for a variety of wildlife.

Mammals which find suitable habitat in this plant community of the watershed are: muskrat (especially adjacent to the stream channels), mink, raccoon (especially where this type borders on adjacent woodland as in the Neponset River flood plain), red backed vole, meadow vole, meadow-jumping mouse, and little brown Myotis.

Birds found in this community are: ringneck pheasant (low numbers in the watershed), American bittern, mallard duck (feeding areas during spring), black duck (feeding areas during spring), green-winged teal (feeding areas during spring), red-tailed hawk, Wilsons snipe, tree swallow, catbird, yellow warbler, yellow-throat warbler, red-winged blackbird, swamp sparrow, and common grackle.

Reptiles and amphibians found in this plant community are: snapping turtle (in and along stream channel), common garter snake, eastern ribbon snake, northern water snake (along stream edge), spring peeper, green frog, leopard frog, pickerel frog, and wood frog.

^{1/} Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C. 1956.

2. Shrub Swamp Community - This wetland plant community totals 14 acres in the watershed and constitutes the Type 6 wetland as described in Circular 39 1/. In the watershed, this community is found in the flood pool of the planned structure (8 acres) and in an area south of Memorial Pond. The vegetation in this community is: silky dogwood, arrowwood, spicebush, highbush blueberry, and speckled alder.

The little brown Myotis, eastern pipistrelle, and hoary bat find suitable feeding areas over this plant community during late evening and night hours. These flying mammals feed upon the flying insects which are usually prolific over this plant community.

Species of birds which find suitable habitat in this plant community are: woodcock (around margin), tufted titmouse, catbird, wood thrush, veery, ruby-crowned kinglet, cedar waxwing, brown thrasher, parula warbler, yellow warbler, myrtle warbler, black-poll warbler, and common redpoll.

Reptiles and amphibians of the watershed which find suitable habitat in this plant community are: northern water snake (adjacent to open water), wood turtle, common garter snake, ribbon snake, spring peeper, leopard frog, pickerel frog, wood frog, gray treefrog, spotted salamander, and Jefferson salamander.

3. Inland Open Fresh Water Community - This wetland plant community totals 35 acres in the watershed and constitutes the Type 5 wetland as described in Circular 39 1/. This wetland community includes the four ponds on Diamond Brook, Rainbow Pond, and three other small ponds. Common plants found in this community of the watershed are: pondweeds (Potamogeton), coontail, cattail, sedges, and waterlily.

This plant community often provides good waterfowl brood rearing habitat around its margin. However, in this watershed the urbanization adjacent to most of the ponds and human activity severely limits the use of the ponds for brood rearing by wild ducks. Semi-domestic mallards are present on the ponds on Diamond Brook and move back and forth between these ponds and other ponds outside the watershed. Light use is made of most of the ponds by waterfowl for resting and feeding during spring and fall migration.

The most valuable acreage of Type 5 1/ wetland in the watershed is four acre Allen Pond. Black, wood, and mallard duck prefer this wetland for resting and feeding during spring and fall migration since it is quite remote from residences and human activity. In 1973, a pair of Canada geese reared a small brood of goslings at this pond.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956

Mammals which find suitable habitat in or around this wetland type are: muskrat, and little brown Myotis, eastern pipistrelle, and hoary bat which feed on insects over the pond during evening and night hours.

Birds which find suitable habitat in or around this wetland plant community are: great blue heron, eastern green heron, kingfisher, green-winged teal, mallard duck, black duck, wood duck, tree swallow (feed on insects over pond), catbird, yellow-throat warbler, barn swallow (feed on insects over pond), chimney swift (feed over pond), red-winged blackbird, and Canada goose (limited to Allen Pond).

Reptiles and amphibians which find suitable habitat in or around this wetland type in the watershed are: snapping turtle, spotted turtle, painted turtle, northern water snake, common garter snake, ribbon snake, spring peeper, bullfrog, green frog, leopard frog, common newt (when larvae and adults), pickerel frog, American toad, wood frog, and spotted salamander.

Other Plant Communities and Habitats

Much of the 609 acres of urban land and especially suburban residential land has grassy areas with scattered ornamental shrubs and trees which provide nesting sites for songbirds. Landowner interests in songbirds and other wildlife often lead to setting out artificial feeders and nesting boxes and planting certain shrubs which can and do increase the amount of wildlife in urban areas despite the perils of cats, dogs, and people. Some very good wildlife habitat occurs in this somewhat artificial way especially in suburban areas with low density housing.

Some specific habitats occur in the watershed's urban and suburban areas which seldom occur in more rural areas. Some of these habitats are worthy of note and include the nighthawk nesting habitat provided by flat roofed buildings in the business area of Walpole. Nighthawks nest and rear their young on the roofs of these buildings and feed on insects over the downtown area during the cooler evening hours when the young birds do not require shading from the sun. The steep banks found in sand and gravel pits provide nesting areas for bank swallows in the suburban areas. Rock doves and English sparrows nest in crevices and shelves provided by the architectural style of older buildings in the business area.

Most of the land in the watershed is providing habitat for one or more species of wildlife. However, the long term trend is that fewer and fewer species will continue to find their particular habitat requirements in the watershed area. This continuous reduction in the quantity and diversity of wildlife habitats is largely the result of increasing urbanization and is the most significant factor affecting wildlife in the watershed area.

Fisheries Resources

No stream sport fishery exists in Diamond Brook. Native species include blacknose dace and common white sucker. High summer water temperatures and low dissolved oxygen levels in summer make the stream unsuited to a trout fishery.

For information on streamside vegetation and streambed material see the Physical Data section entitled Surface Water Resources.

All four of the manmade ponds on Diamond Brook contain self-sustaining warm water fisheries. Memorial, Clark and Diamond Ponds support a population of brown bullhead, bluegill sunfish, yellow perch, largemouth bass, blacknose dace, and common white sucker. Largemouth bass to a size of four pounds are reportedly caught in Memorial Pond. Clark Pond is stocked annually with trout by the Walpole Conservation Commission as a put and take fishery. Allen Pond contains a population of brown bullhead, bluegill sunfish, and largemouth bass.

Public Access to Existing Fish and Wildlife Resources

The town of Walpole owns and permits public access to eight acre Memorial Pond and eight acre Clark Pond for fishing, nature study, wildlife observation and ice skating.

There is no publicly owned land to provide access to Diamond Pond and Allen Pond. However, some public fishing use is allowed on Diamond Pond.

No stream sport fishery exists in Diamond Brook, consequently, there is no demand for stream access for fishing. Since the stream flows largely through residential areas the primary uses made of the songbirds and other wildlife found along the channel are for nature study and wildlife observation. Since these activities are nonconsumptive and have little to no adverse effects on wildlife or private property, access has not been a problem.

Of the 661 acres of open space lands in the watershed, approximately 300 acres of predominantly forest land is available (with landowner permission) for hunting. This available acreage is the area remaining beyond the legal hunting distances from occupied dwellings and public roads. The entire 661 acres of open space lands is available (with landowner permission) for nonconsumptive uses of the wildlife resources. No publicly owned hunting areas are present in the watershed.

TABLE 6 - RELATIVE ABUNDANCE OF PRINCIPAL GAME SPECIES

Species	Average Habitat Value	Abundance (Spring Population)
Deer	Poor	2 to 3 per square mile of suitable habitat. Approximately 0.3 square miles of suitable habitat in the watershed south of I-95.
Eastern Cotton-tail Rabbit	Fair	1 to 2 per 10 acres of suitable habitat. Approximately 500 acres of suitable habitat. Also, fairly common in residential areas of the watershed.
Gray Squirrel	Good	1 to 2 per 3 acres of forest land. Approximately 550 acres of suitable forest habitat. Also, common in recreation and suburban residential areas in the watershed.
Ruffed Grouse	Poor	1 per 35 acres of forest land. About 500 acres of suitable habitat.
Woodcock	Fair	Native breeding population; 4 per 100 acres of shrub and tree cover in the watershed. About 40 acres of particularly suitable habitat. Seasonal highs during migration in April and October.
Waterfowl (primarily black, mallard, and wood duck)	Fair	Low breeding population on existing ponds and marshes due largely to close proximity of residences. Semi-domesticated mallards are fairly common on three of the man-made impoundments on Diamond Brook. Seasonal highs during migration in spring and fall.






TABLE 7 - SUMMARY OF PLANT COMMUNITIES IN THE WATERSHED

Cover Type	Plant Community	Acres	Percent of Watershed
<u>Forest Land</u>	Upland Oak-Hickory	326	25.7
	Upland Northern Hardwood	16	1.2
	Mixed Hardwood-Softwood	195	15.3
	Coniferous	30	2.4
	Bottom Land Hardwoods	20	1.6
TOTAL OF FOREST LAND:		587	46.2
<u>Open Land</u> (Agricultural)	Grassland	24	1.9
	TOTAL OF OPEN LAND:	24	1.9
<u>Wetland</u> ^{1/}	Inland Fresh Meadow	1	0.1
	Shrub Swamp	14	1.1
	Inland Open Fresh Water	35	2.7
	TOTAL OF WETLAND:	50	3.9

^{1/} 20 Acres of wooded swamp is included under Forest Land as the bottomland hardwoods community.

LEGEND

FOREST LAND

-  Oak hickory community
-  Northern hardwood community
-  Bottomland hardwoods community
-  Coniferous community
-  Mixed hardwood-softwood community

OPEN LAND (agricultural)

-  Grassland

URBAN LAND



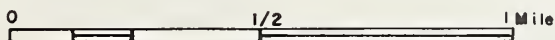
-  Land used for urban and related uses
-  Open fresh water



Figure 8

PLANT COMMUNITIES MAP^{1/}
 DIAMOND BROOK WATERSHED
 NORFOLK COUNTY, MASSACHUSETTS

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE



^{1/} does not include wetland plant communities; these areas are too small to be illustrated on a map of this scale



Economic Resources

Except for approximately 60 acres in several town-owned parcels, watershed lands are in private ownership. The trend of expanding urbanization indicates that most of this privately owned land will eventually be converted to urban uses unless publicly acquired, restricted, or managed. Most undeveloped land is zoned for residential use.

There is a total of about 24 acres of agricultural land within the watershed, most of which is hayland used to provide forage for beef cattle.

Land values based on recent sales for residential, commercial, or industrial development are \$2,500 to \$10,000 per acre. There appears to be little difference in price between upland and flood plain land values. Price differences appear to result from nearness to access and other developments, such as service areas, shopping centers, and existing utilities.

An excellent network of streets and secondary roads provides access within the watershed and to the major highways traversing the area which are U.S. Route 1 and I-95. The Penn Central Railroad serves as a vital transportation link for the area's industries.

The watershed is within the Boston Standard Metropolitan Statistical Area (Figure 9) as defined by the U.S. Bureau of the Census. The economy of the watershed is keyed to that of this metropolitan area.

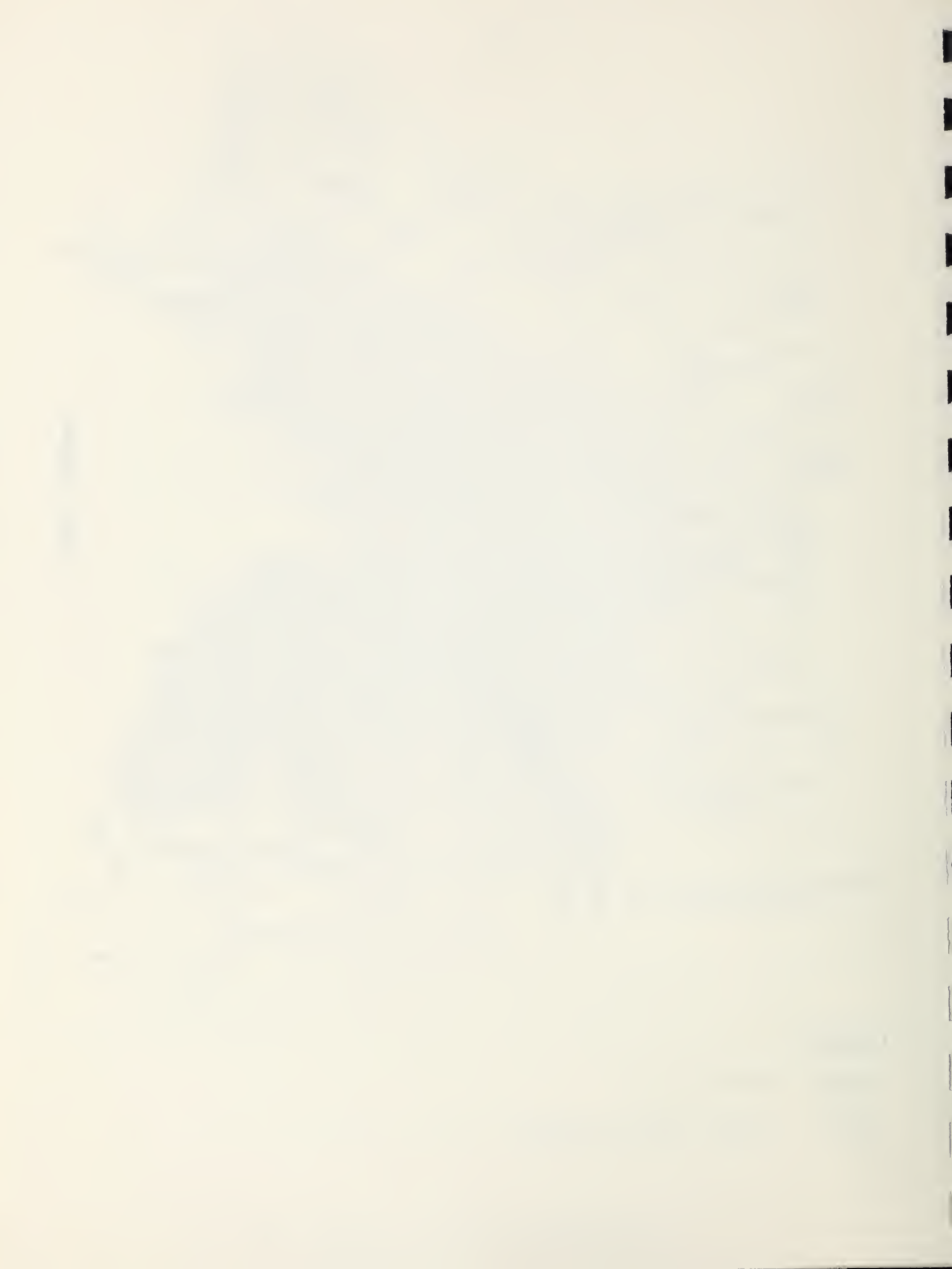
A number of large industries along the Neponset River adjacent to the watershed provide employment for many of the watershed residents. Others, particularly those residents in the newer suburban areas, commute to nearby cities and towns for employment.

Within Walpole, which is the center of economic activity for the watershed, manufacturing provides over two-thirds of the employment. Wholesale and retail businesses provide a major portion of the remaining employment.

The Comprehensive Plan for Walpole (1971)^{1/} summarized the area's economic status as follows: "Walpole's location near major centers of employment and population, combined with a well established employment base, good public services and utilities and a choice of both public and private transportation, seems likely to maintain the town's economic health and assure it a large share of any regional economic expansion."

^{1/} Comprehensive Plan Study, Walpole, Massachusetts, 1971,
Charles E. Downe, Planning Consultant.





Recreational Resources

Numerous major recreational areas that provide intensive recreational opportunities exist along the Atlantic Coast close enough to permit same-day return. Limited opportunities exist within the watershed for short-term daily recreational uses, such as hiking, picnicking, nature study, and other forms of passive recreation. The primary factor which limits such recreational opportunities is the scarcity of large tracts of open space available for public use.

The planned fish and wildlife pool, of the multiple-purpose structure, and adjacent public land will provide an opportunity for nature study, wildlife observation and other forms of passive recreation. The town operational soils report for Walpole 1/ shows soils to be suitable for the planned uses.

Recreational opportunities are provided by town owned lands, which permit public access to Memorial Pond and Clark Pond. Memorial Pond provides winter ice skating, spring, summer, and fall fishing for warm water species and a limited opportunity for nature study and wildlife observation. Clark Pond provides warm water fishing and is stocked annually by the Walpole Sportsman's Association to provide trout fishing.

No cold water sport fishery exists in Diamond Brook due to high temperature and low dissolved oxygen of the stream in late summer. Trout are not stocked in the brook or ponds by the state fish and game agency because of these water quality limitations. No warm water fishery exists in the brook due to its small size and low summer flow.

Potential small game hunting opportunities exist on about 300 acres of watershed land, located mostly in the upstream portion of the watershed south of I-95. This acreage would provide sufficient range for about 38 hunters 2/ at any one point in time. Portions of the 300 acres is posted requiring hunters or other recreationists to obtain landowner's permission prior to entry.

1/ Soils and their Interpretations for Various Land Uses, (Walpole, Sharon) U.S. Soil Conservation Service in Cooperation with the Norfolk Conservation District, 1965 and 1966.

2/ Based on data in Outdoor Recreation Space Standards, Bureau of Outdoor Recreation, United States Department of the Interior, U.S. Government Printing Office, Washington, D.C., March 1970

No opportunities are provided for swimming in Diamond Brook. Water quality data indicates that a health hazard exists for this activity. The total coliform count exceeds the Massachusetts Department of Public Health's standard for this use.

Archaeological, Historical and Unique Scenic Resources

The Massachusetts Historical Society and the State Archaeologist have advised the Soil Conservation Service that their listings show no sites of historical or archaeological value in the areas that would be affected by the planned structural measures. In addition, a survey has been carried out by a qualified archaeologist. This survey shows that no archaeological resources will be adversely affected by project measures. A copy of the survey report is included as Appendix D.

Soil, Water & Plant Management Status

The Norfolk Conservation District is the legally constituted unit of State government that administers soil, water and related conservation work as specified in Chapter 21, of the Massachusetts General Laws. Technical assistance is provided to individual landowners, towns, and others through working agreements with the Soil Conservation Service and other federal and state agencies. Conservation plans have been developed for the one farm with a portion within the watershed, and for a country club.

Technical assistance provided through the District to the towns in developing town operational soils reports ^{1/} and town natural resource inventories is of particular importance in this developing urban watershed. Town operational soils reports which contain an inventory of soils with interpretations for various uses have been prepared for Walpole and Sharon by the Soil Conservation Service. Town natural resource inventories also have been developed for Walpole and Sharon. This is an inventory and appraisal of resource potentials related to the town's specified objectives. The town of Walpole has utilized its natural resources inventory to develop a town conservation plan and has correlated it with the town master plan.

Assistance to towns in developing and utilizing a natural resource inventory is provided through the District by an interagency Natural Resources Technical Team. Agencies represented include: the Massachusetts Department of Natural Resources through its Division of Forests and Parks and Division of Conservation Services, the Massachusetts Division of Fisheries and Game, the Cooperative Extension Service, and the Soil Conservation Service. Other agencies also participate, depending on local problems and needs.

^{1/} Soils and their Interpretations for Various Land Uses, (Walpole, Sharon). U.S. Soil Conservation Service in Cooperation with the Norfolk Conservation District, 1965 and 1966.

Adequate forest fire protection is provided by the Massachusetts Department of Natural Resources, Division of Forests and Parks, in cooperation with the U.S. Forest Service, through the Clarke-McNary Cooperative Fire Control Program and by the local fire departments. Other available federal-state forestry programs include: Cooperative Forest Management, Cooperative Forestation, and Cooperative Insect and Disease Control.

This watershed is within the Neponset study area of the Massachusetts Water Resources Study (Type IV River Basin) and also, in the Southeastern New England Study (Level B River Basin), which are presently under way.

The Comprehensive Plan for Walpole (1971)^{1/} includes the following objectives that will likely affect land use and management within the Walpole portion of the watershed:

1. To Preserve and Improve the Natural and Visual Environment of the Town

This objective recognized the need to preserve the natural assets which make Walpole attractive, to enhance the visual character, form and features of both the natural and manmade features of the community and to reduce unsightly conditions in the town.

2. To Provide for the Proper and Orderly Growth of the Town

This objective recognizes the need to reach realistic decisions about the future use of land, to provide for a variety of development (residential, business and industry) in order to arrive at a desirable "balance," and at the same time to provide for a proper distribution and location of land use by kind and intensity.

^{1/} Comprehensive Plan Study, Walpole, Massachusetts, 1971,
Charles E. Downe, Planning Consultant.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Land use and treatment problems are primarily associated with future use and development. Expanding urbanization has made it necessary that wise land use decisions be made and appropriate treatment be applied to enhance and preserve open space, fish and wildlife resources, and other values necessary for a quality environment. As urban development and associated service facilities encroach on present rural areas, there is an increasing need for technical assistance to planning bodies, developers and individuals to assure orderly growth compatible with the proper use of natural resources.

Floodwater Damage

This watershed has experienced damaging floods in 1936, 1938, 1955, and 1968. Flooding caused by Hurricane "Diane" in August 1955 was the most severe. Rainfall during the August 1955 storm was a maximum of about 11.5 inches for a 24-hour period and a total of 15 inches for the two-day storm period.

The area of flood plain which is subject to flooding from a 100-year frequency event amounts to about 100 acres along Diamond Brook. Residential, commercial, and related development occupies about 50 acres in the lower reaches while the remaining flood plain acreage is largely under forest cover and water surface.

As forest and grassland are replaced by urbanization, the rate of runoff will increase, thus increasing flood stages and resulting floodwater damages. Proper planning, management, and controls are necessary to minimize these effects of urbanization.

The major damage area is in Reaches 1 and 2, the business section of Walpole, where the brook has been channeled into a conduit. Adjacent to and over this conduit, a two-story commercial building, supermarket, shopping center, and paved parking area have been developed.

The combination of uncontrolled runoff and inadequate capacity of the conduit causes serious flooding problems. These problems are further aggravated by debris collecting on the inlet trash rack of the conduit. Filling in the flood plain for playgrounds, parking lots, and commercial expansion has increased the flood hazard.

The average annual direct and indirect damages are \$12,010 to residences, \$56,490 to commercial properties, and \$15,020 to roads and bridges. Flood flows exceeding the magnitude of a 3 to 5 year frequency event cause damages along Diamond Brook. The 1968 flood was estimated at between a 10 and 25 year frequency event. A recurrence of the 1968 storm at this time would cause damages of about \$180,000.

In the August 1955 flood, roads, bridges, 14 houses, 1 school and 42 commercial establishments were flooded by the waters from Diamond Brook. The brook overtopped the headwall of the conduit and flowed through the business section (Reaches 1 and 2) of the town of Walpole (see photographs, pages 59 and 60). Transportation was disrupted and public health and safety were jeopardized. Relatively minor damages occurred, principally to roads and bridges, upstream of Reaches 1 and 2.

Under present conditions, the August 1955 storm would produce flood peaks on Diamond Brook about 60 percent greater than a 100-year frequency event. Damages totalling about \$1,140,000 would be caused to roads, bridges, 15 residences, 1 school, and 45 commercial properties.

Erosion and Sediment Damage

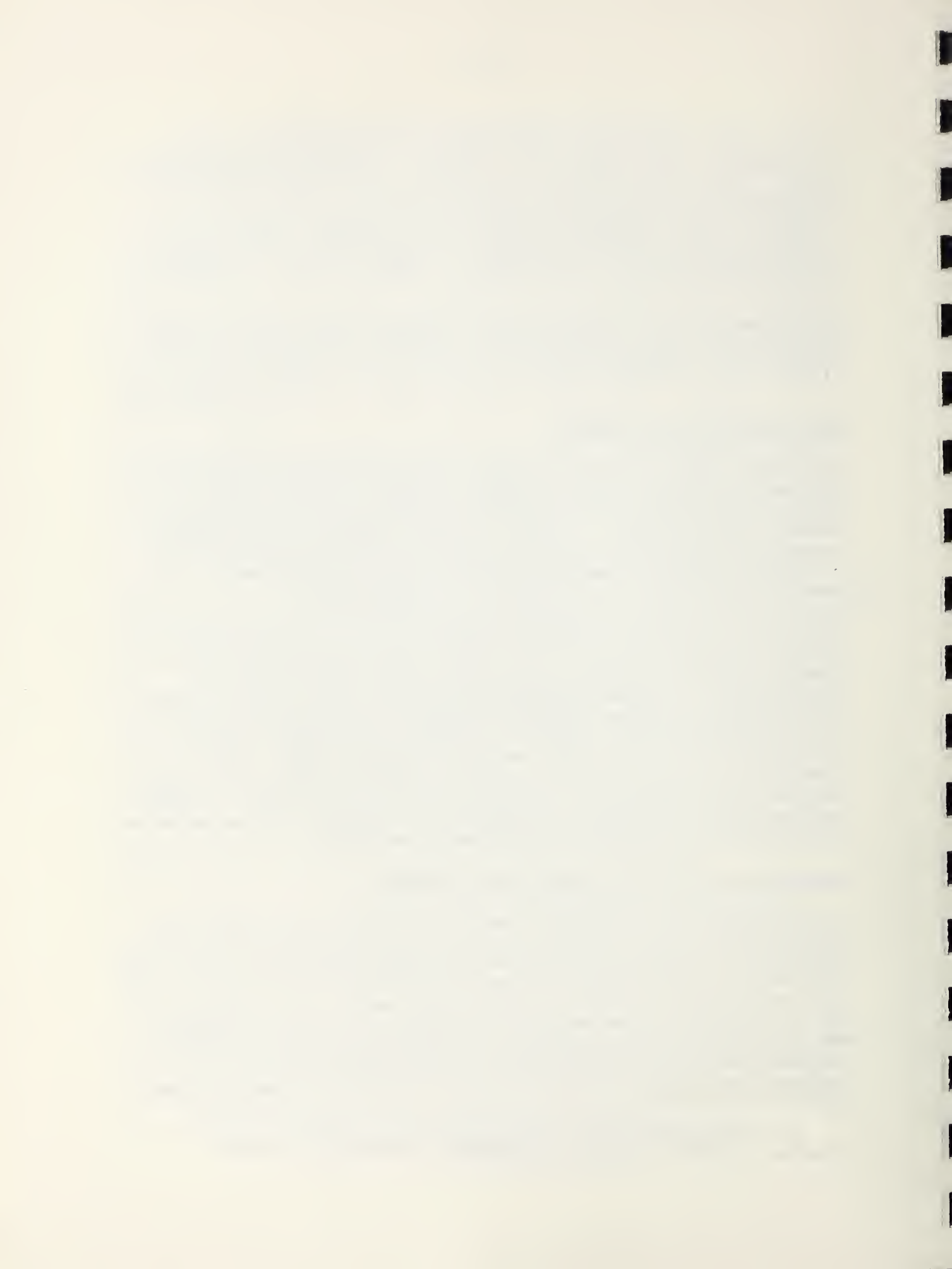
The present state of vegetative cover in the watershed keeps erosion and sediment damages within acceptable limits. However, most of the forest and grassland will eventually be developed for urban uses. During urban development, proper planning, management and control measures are necessary to control soil loss and sedimentation which could adversely affect water quality, fish and wildlife habitat, and generally reduce the quality of the environment.

There is a scattering of small (one-half acre or less) sources of erosion over the watershed area. They are the result of various forms of urban construction. Erosion is primarily of the sheet and rill type. Erosion that does occur is the result of construction on sites after removing vegetative cover. The estimated average annual erosion rate for such areas is 18 tons per acre. The severity of erosion that occurs on any one area is dependent on a number of factors which include: slope, rainfall intensity, season of the year, and the time interval until revegetated or surfaced. There is little evidence of eroded material reaching stream channels. Impoundments on Diamond Brook show little accumulation of sediment.

Municipal and Industrial Water Supply Problems

A study^{1/} conducted in 1967 for the town of Walpole by a consulting firm concludes that: (1) the present water supply for the town of Walpole is inadequate, (2) future water supply would most economically be provided by ground water sources, and (3) projected requirements by 1990 will exceed the potential ground water supply. The population to be served by 1990 is estimated to be 39,900 in the town of Walpole. The Northeastern Water Supply Study, authorized by Public Law 89-298, suggests that future water needs be derived from the Metropolitan District Commission which serves the water needs of the Boston area.

^{1/} Comprehensive Plan Study, Walpole, Massachusetts, 1971
Charles E. Downe, Planning Consultant.

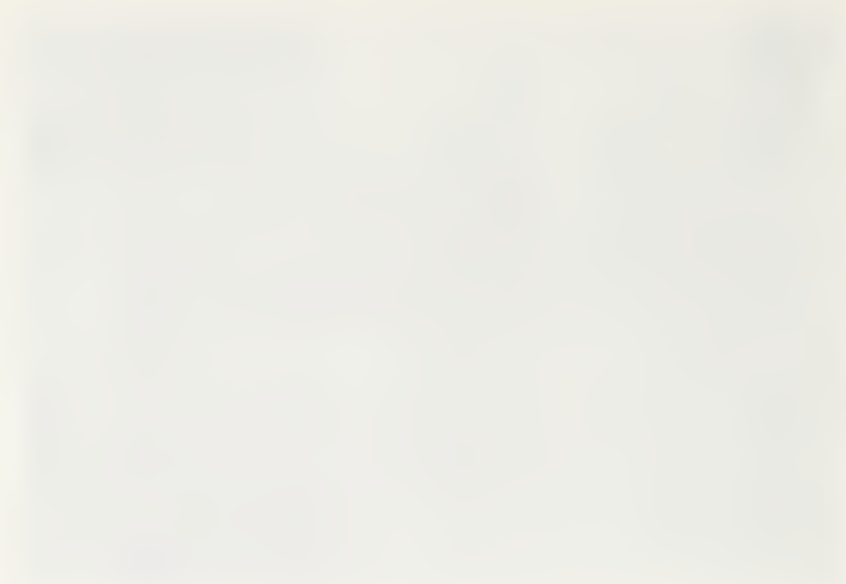




East Street, below Main Street, on
August 19, 1955



East and Main Streets, shortly after the
flood peak on August 19, 1955.

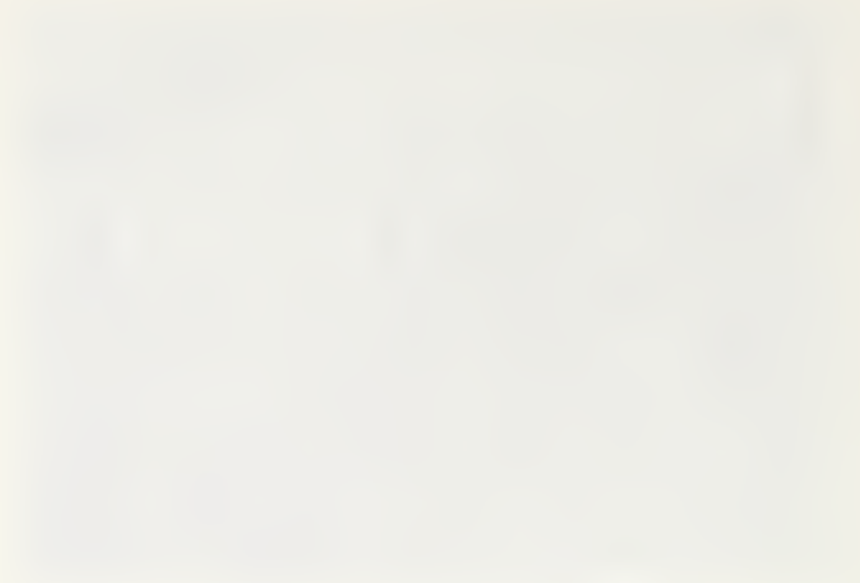




Behind East Street at the culvert inlet,
on August 19, 1955.



Along East Street, on August 19, 1955,
the day of the "Diane" flood.



Providing water storage for municipal water supply was considered for the multiple-purpose structure site. However, the small drainage area and limited storage of the site ruled out this possibility and an alternative site with greater storage capacity was not available.

Recreation Problems

The future water quality classification assigned to Diamond Brook is Class B. The stream does not presently meet this standard, and consequently the recreational use of the stream and its existing impoundments is limited to activities other than water contact types.

There is no public access to Diamond and Allen Ponds. Also, as rapid urbanization continues, a decreasing amount of existing open space will be available to the public for outdoor recreation. If the towns continue to have a high interest and active programs for acquiring open space for outdoor recreation, this problem will be lessened.

Plant and Animal Resource Problems

Lack of agricultural land, predominance of pole size forest stands and lack of habitat management combine to provide large blocks of similar cover with a limited diversity of plant and animal communities.

Wildlife habitat is a secondary use of most of the land in the watershed, and urbanization is resulting in an estimated average loss of 10 acres of this land per year.

Water Quality Problems

Approximately 50 residences and business properties with on-site sewage disposal systems have been constructed on soils with severe limitations for on-site sewage systems. When on-site sewage disposal systems are installed on such soils, failure of the system usually occurs. This failure can result in the leachate finding its way into water courses and subsequently lowering the water quality of the receiving water. This situation may be occurring in Diamond Brook as indicated by high coliform counts (See Table 5, pages 36 and 37).

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

Conservation land treatment will reduce soil erosion and sedimentation from areas disturbed during urban development. Resource inventories will provide information needed by local government, developers, and others in making sound land use decisions. Assistance in preparing natural resource plans will provide information and data to serve as a basis for planning and implementing land use changes and other measures necessary for protecting and enhancing natural resources and their environmental values.

Use of natural resource plans by planning boards, conservation commissions and developers will result in better land use patterns and more orderly town development. Installed measures and multiple use management of natural resources will provide recreation, fish and wildlife habitat, and will protect environmental values.

Structural Measures

The total reduction in average annual flood damages along Diamond Brook with the installation of the project is estimated to be 99 percent of which 97 percent will result from the structural measures. In the six damage reaches (see Appendix C, Project Map), this reduction ranged from 82 percent to nearly 100 percent. In addition to roads and bridges, about 15 residences, 45 commercial establishments and a school will be protected.

The works of improvement included in this plan will provide protection from a storm equal to the August 1955 event, in the major damage areas of downtown Walpole (Reaches 1, 2 and 3, from the railroad bridge upstream to Diamond Street), and to the area from Clark Pond upstream to the multiple-purpose structure (Reach 6, Washington Street area). A lesser degree of protection will be provided to the area from Diamond Street to Clark Pond (Reaches 4 and 5). In this area, roads and bridges and a residence will be subject to damage from a 25 to 50-year frequency event, with project. This is a reduction from the present frequency of flooding of about once in 3 years. Nuisance-type flooding will occur from a 100-year frequency flood in the low areas near the mouth of Diamond Brook due to backwater from the Neponset River and in the Memorial Pond area. With the project, a recurrence of the 1968 storm would cause no damage to existing development along Diamond Brook. The frequency of a storm causing flood damages in the major areas of downtown Walpole will be reduced from about a 5-year frequency to about a 500-year frequency event.

The peak flow that would occur during an event equivalent to the August 1955 storm, would be reduced about 45 percent or from 1,270 cubic feet per second to 670 cubic feet per second at the mouth of Diamond Brook.

Installation of structural measures will cause temporary increases in noise, air pollution by dust and exhaust emission, and turbidity and sediment in Diamond Brook and the Neponset River.

Installation of the floodwater conduit portion of the channel work will cause temporary interruptions to traffic flow and services provided by water, sewage, drainage, telephone, and electric utilities.

About 58 acres of land will be required to install the planned structural measures. For the areas affected, a description of the vegetative cover types and their quality and use as wildlife habitat is provided in the "PLANNED PROJECT" section of this environmental statement under "Land Use Changes."

Ten acres of forest resources and associated woodland wildlife habitat will be lost to provide space for the dam and emergency spillway of the multiple-purpose structure and to obtain borrow material for the earth fill dam. The fish and wildlife pool will necessitate the loss of 17 acres of forest resources and associated wildlife habitat. This 17 acres of habitat consists of 12 acres of wetland habitat (wooded swamp) and 5 acres of woodland habitat. The total of 27 acres of forest resources to be lost due to installation of the dam and pool represents about 1 percent of the forest area in the watershed.

Sixteen acres of wetland wildlife habitat and 14 acres of woodland wildlife habitat which occur in the flood pool will be occasionally inundated by the temporary storage of floodwater. The wildlife habitat value will be impaired or temporarily lost depending upon the frequency, duration, season and depth of inundation.

Habitat in 850 feet of perennial stream and 400 feet of intermittent stream will be lost due to construction of the dam and permanent inundation by the 17-acre fish and wildlife pool. Inundation of 250 feet of intermittent stream will occur occasionally from the storage of floodwater. The stream habitat will be impaired or temporarily lost depending upon the frequency, duration, season and depth of inundation.

The 17-acre fish and wildlife pool may raise downstream water temperature 2° to 4° F. This amount would not be sufficient to change the state water quality classification of Diamond Brook (see Table 5). Bottom water release, to prevent water temperature increases, is not practical since the planned permanent pool is shallow (7 feet maximum) and thermal stratification of the pool will not occur. Flow from the drains in the foundation of the dam could cause a temperature decrease depending upon the amount of flow, especially during late summer. This drain flow could negate any water temperature increase incurred in the impoundment.

The recreational use of the permanent pool and adjacent conservation area is not expected to be heavy. However, the public use of this 37-acre area may result in some impairment of its value as wildlife habitat.

Erosion that will occur during dam construction could range from about 10 tons to 300 tons depending on rainfall intensity and duration during the construction period. Preventive measures will be taken to control erosion and sedimentation during construction. However, it is expected that some eroded material will enter Diamond Brook and be deposited in Clark Pond, and may reduce water storage volume and temporarily impair its aquatic habitat.

The 10 acres of land committed to the dam, spillway, and borrow area will be revegetated with grasses and legumes. The established vegetation will provide habitat for openland wildlife and a feeding area for various species of woodland wildlife.

The vegetated dam and spillway will create 2,800 feet of wildlife "edge" consisting of the interface between openland and woodland vegetation.

The 17-acre fish and wildlife pool will provide habitat for warm water fish and wetland wildlife, and will also provide warm water fishing recreation. This pool will have potential for a peak use $\frac{1}{2}$ of about 70 fisherman at any point in time. Approximately 20 acres of public land adjacent to the pool will provide opportunity for nature study, wildlife observation and other passive recreation. Hunting will not be permitted on this 37-acre area as it was judged to be incompatible with the planned nonconsumptive wildlife uses.

Dedication and use of the 57-acre land area for flood control, recreation, and conservation purposes assures that it will not be subject to urban development. This land area will also serve as an eventual oasis of open space land where the visitor can find solitude and a temporary retreat from the urban pressures which he daily encounters. The present open space values of this acreage are probably very small as compared to what their future values will be as urbanization consumes an increasing percentage of the watershed area.

Channel work will reduce the quality of the aquatic habitat in the 400-foot reach where the existing channel will be enlarged, and will destroy 1 acre of wetland (Type 2, Inland Fresh Meadow) ^{2/} wildlife habitat. Reed canarygrass and silky dogwood will be planted on the graded spoil and banks to replace some of the wetland wildlife habitat values lost by construction. Covering and revegetating the one-quarter acre disposal area for broken concrete pavement that exists within the graded spoil area will provide food and cover for wildlife on an area where it was previously lost.

^{1/} Outdoor Recreation Space Standards, United States Department of the Interior, Bureau of Outdoor Recreation, U.S. Government Printing Office, Washington, D.C., March 1970.

^{2/} Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D. C., 1956.

The loss of 13 acres of wetland amounts to a 19-percent reduction in total wetland acreage in the watershed due to the planned project. However, the 17-acre permanent pool will undergo natural plant succession and will eventually constitute a manmade inland open fresh water (Type 5 1/) wetland. Once this plant succession has occurred the wetland acreage within the watershed will have increased by 4 acres or 2 percent over the present amount.

The National Register of Historic Places lists no properties within the watershed. During consultations with the Massachusetts Historical Commission and the State Archaeologist, they advised that no properties of historical or archaeological value listed in their present inventory would be affected by installation of the structural measures. In addition, a survey has been conducted by a qualified archaeologist. This survey shows that no archaeological resources will be affected by project measures (a summary report is included as Appendix D). If any discoveries are made during construction the National Park Service and appropriate state interests will be notified in compliance with the Federal Reservoir Salvage Act of 1960, (PL86-523). Construction would not be continued until necessary actions satisfactory to the sponsors and appropriate authorities have been implemented.

Economic and Social

The effect of the proposed project on the economy of the area, other than the flood prevention benefits, would be minimal. Project measures will not facilitate increased production of goods or services other than passive recreational uses. Residential or commercial development is not planned or expected to occur as a result of the project, nor will land values be measurably altered. The loss of production or use of lands within the dam and pool area would have little economic significance.

Of the approximately one half million dollars to be expended for construction of the structural measures, probably less than 5 percent of this amount will be for local labor and materials. Some additional local expenditures will likely be made by construction workers for meals, rooms, and entertainment.

Business disruptions during installation of the floodwater conduit will have a negligible effect on a townwide basis. There may be a temporary loss of business in the immediate vicinity during construction.

The economic effects from operation and maintenance of project measures will be minor. Less than 1 man-year of employment annually will be

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

required. Materials needed for operation and maintenance, such as lime, fertilizer, seed, and machinery will not require a significant expenditure.

In addition to monetary benefits from the project measures, the project will tend to improve public health, increase employment security, lessen hazards to life and property, provide a sense of stability of the communities and contribute to maintaining and improving the quality of the environment.

Average annual flood prevention benefits to direct beneficiaries that will result from the land treatment and structural measures are estimated to be \$82,340. Secondary benefits from flood damage reduction are estimated to be about \$6,630 annually and would likely result primarily from expenditures for home improvement and commercial expansion.

Economic benefits foregone by direct beneficiaries for a 1-year delay of the project will depend primarily on flood losses incurred during the delay period and are unpredictable. However, if the August 1955 flood were to recur during the delay, it would cause damages of about \$1,140,000 along Diamond Brook. Based on past experience, it is expected that a 1-year delay of the project would result in an increased installation cost of 5 to 8 percent.

An economic summary of findings is shown in Appendix A, "Comparison of Benefits and Costs for Structural Measures."

FAVORABLE ENVIRONMENTAL EFFECTS

1. Reduction of sediment and erosion from areas being urbanized.
2. Project derived resource inventory data will be available for future land use planning.
3. Reduction of average annual floodwater damages along Diamond Brook by 99 percent or \$32,340. Protection provided for roads, bridges, 15 residences, a school, and 45 commercial establishments.
4. Creation of a 17-acre pool which will support a warm water fishery and wetland wildlife. This manmade aquatic environment will constitute a Type 5 1/ wetland after plant succession.
5. Creation of 10 acres of openland wildlife habitat resulting from installation of the multiple-purpose structure.
6. Creation of 2,800 feet of wildlife "edge" formed by the perimeter of the dam and spillway and the adjacent woodland.
7. Creation of a 17-acre pool for public fishing and provision of 20 acres of adjacent public land for passive recreation.
8. Provision of dedicated open space consisting of 57 acres of land committed to the multiple-purpose structure.
9. Increase wildlife habitat value of one-quarter acre now covered with broken concrete pavement.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

ADVERSE ENVIRONMENTAL EFFECTS

1. Reduction of 12 acres of Type 7 1/₂ wetland and 1 acre of Type 2 1/₂ wetland will result from the fish and wildlife pool and channel work. The 12-acres of Type 7 1/₂ wetland also constitutes a forest resource.
2. Reduction of 15 acres of forest resource and associated wildlife habitat will result from clearing for the dam, spillway, borrow area and fish and wildlife pool.
3. Occasional temporary loss of 16 acres of wetland wildlife habitat and 14 acres of woodland wildlife habitat will result from floodwater storage.
4. Reduction of 850 feet of perennial stream habitat will result from the dam and fish and wildlife pool.
5. Reduction of 400 feet of intermittent stream habitat will result from the fish and wildlife pool.
6. Occasional temporary loss of 250 feet of intermittent stream habitat will result from floodwater storage.
7. Loss of hunter use on 37 acres of land.
8. Increase water temperature downstream of the fish and wildlife pool by 2° to 4° F.
9. Impairment of 37 acres of wildlife habitat due to recreational use.
10. Temporary increase of noise, air pollution, erosion and sedimentation during construction period.
11. Temporary disruption of traffic, utility services, and business during installation of the conduit.
12. Reduced quality of aquatic habitat in 400 feet of perennial stream will result from the channel work.

1/2 Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

ALTERNATIVES

Alternative actions have been considered with particular attention to those actions that might avoid some or all of the adverse environmental effects of the planned project. These alternatives are: land treatment; land treatment and a floodwater retarding structure; land treatment and channel work; and no project.

Land Treatment

This alternative would consist of the land treatment phase of the planned project, which includes accelerated land treatment to supplement the ongoing land treatment program. Technical assistance would be provided to town boards, community leaders, and others for preparing town resource inventories and plans, reviewing urban development plans and planning and applying treatment measures on land requiring treatment. Essential conservation treatment would be applied to all watershed lands. About 291 acres would receive treatment to achieve the desired level of protection or improvement. The remaining lands would receive treatment to supplement that which has already been applied. The estimated cost of this alternative is \$81,300.

A reduction in erosion and sediment from areas undergoing urban development would result from this alternative. The adverse effects of urban development on the hydrologic condition of the watershed, fish and wildlife habitat and other natural resources would be reduced. Improvement of recreation, fish and wildlife and environmental values would also be achieved.

This alternative would not meet the selected objective of the sponsors for providing flood protection of the major residential and commercial areas from a storm equivalent to the August 1955 event, nor would it provide a 17-acre pool and its recreation, open space and fish and wildlife values. This alternative would, however, avoid the adverse environmental effects of the planned project structural measures.

Land Treatment and Floodwater Retarding Structure

The land treatment phase of this alternative would be the same as included in the planned project, which includes accelerated land treatment to supplement the ongoing land treatment program. The costs, benefits, and effects would also be the same.

A single-purpose reservoir structure would be constructed at the site of the multiple-purpose structure included in the planned project. The structural features and size would be essentially the same as the multiple-purpose structure. The dam would be about one foot lower in

the storage for fish and wildlife. The principal spillway would have an opening at its base to permit the passage of normal streamflow. Only temporary storage for floodwater would be provided within the reservoir area.

The cost of this alternative would be about \$589,200.

The level of protection that would be provided for the major damage area (business section of Walpole) is such that damaging floods would occur from a 25-year frequency event.

The objective of the sponsors for flood protection would not be met by this alternative.

About 45 acres of land would be committed to this alternative. There would be a temporary increase of noise, air pollution, erosion, and sedimentation caused by construction activities.

This option would not include the fish and wildlife pool nor the channel work of the planned project.

Adverse environmental effects of the planned project which would be avoided if this alternative were implemented, would include (1) the reduction of 12 acres of Type 7 1/ wetland and one acre of Type 2 1/ wetland resulting from the fish and wildlife pool and channel work; (2) the reduction of 700 feet of perennial stream habitat and 400 feet of intermittent stream habitat resulting from the fish and wildlife pool; and (3) increase downstream water temperature 2° to 4°F by the fish and wildlife pool.

Land Treatment and Channel Work

This alternative consists of the same land treatment phase (accelerated plus ongoing program) and channel work included in the planned project. All costs, benefits, and effects of the land treatment phase would also be the same.

The total cost of this alternative would be about \$507,000.

Flood protection would be provided for the major damage areas of Walpole (Reaches 1, 2, and 3, from the railroad bridge upstream to Diamond Street). A 100-year level of protection would not quite be achieved. However, damages from a 100-year frequency flood would be reduced by about 80 percent. The areas upstream (Reaches 4, 5, and 6) would receive no protection from this alternative.

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

The channel work would cause temporary interruptions to traffic flow and services provided by water, sewage, drainage, telephone, and electric utilities. There would be temporary increases in noise, air pollution, turbidity and sediment. A reduction in the quality of the aquatic habitat in 400 feet of existing channel would result from its enlargement. The channel work would induce higher peak flows downstream and would reduce Type 2 1/ wetland habitat by one acre. This alternative does not include the multiple-purpose structure of the planned project.

Adverse environmental effects that would be avoided if this alternative were implemented, would include (1) the reduction of 12 acres of Type 7 1/ wetland resulting from the fish and wildlife pool; (2) the reduction of 15 acres of forest resource and associated wildlife habitat resulting from clearing for the dam, spillway and borrow area; (3) the occasional temporary loss of 16 acres of wetland wildlife habitat and 14 acres of woodland wildlife habitat resulting from floodwater storage; (4) the reduction of 850 feet of perennial stream habitat and 400 feet of intermittent stream habitat resulting from the dam and fish and wildlife pool; (5) the increase of water temperature downstream of the fish and wildlife pool by 20 to 40F.; and (6) the temporary increase of noise, air pollution, erosion, and sedimentation resulting from construction of the multiple-purpose structure.

No Project

If no project is chosen there would be no concerted activity directed toward solving the water and related land resource problems that exist in the watershed. Existing conditions, needs and trends, as described in the "ENVIRONMENTAL SETTING" section of this report, would continue.

The ongoing land treatment program of the Norfolk Conservation District would continue to be applied to the lands in the watershed. However, accelerated assistance would not be provided toward minimizing the adverse effects of urban development of the area's natural resources and environmental quality.

Flood plain zoning bylaws enacted by Walpole through town meeting action, as authorized by the Massachusetts Zoning Enabling Act, would be enforced to prohibit future development which would be subject to significant economic flood losses or jeopardize human health and safety. Filling and placing of other obstructions in the course of flood flows would also be

1/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C., 1956.

prohibited where such obstructions would contribute to higher flood flows and possible water course changes that would increase damages to existing property.

Flood insurance would be made available through the federally subsidized National Flood Insurance Program administered by the Department of Housing and Urban Development. The town of Walpole was recently approved for participation in this program. Insured property owners would be compensated according to the guidelines of the program for financial losses incurred from flooding. To qualify for this program, a community must submit an application and receive approval and enact flood plain zoning bylaws.

With this alternative, flooding of the major residential and commercial areas and the resulting damages to existing development and threat to human health and safety would remain. The dedicated open space area of 57 acres committed to the multiple-purpose structure would not be realized. The creation of a 17-acre pool to provide recreation and improve fish and wildlife habitat would not be achieved. The net annual monetary benefits that would be foregone by not implementing the project are about \$37,620.

All of the adverse environmental effects of the planned project would be avoided if this alternative were selected.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Long-term projections indicate that most land will be converted to residential and commercial uses except that which is publicly owned or controlled. Land now in forest comprises most of the area expected to be converted to residential and commercial uses.

The project is designed to meet the problems associated with present and future land use and development. In addition to the reduction of erosion and sediment, the project provides for protection and enhancement of fish and wildlife resources, open space areas and other values necessary for a quality environment. This will benefit present and future generations.

The project was formulated to provide the needed flood protection for existing development. Unwise future development will be prevented through existing flood plain zoning. Together, the project and existing regulations will provide a long-term solution to flooding problems and an opportunity for conservation and other open space uses which will add to the environmental quality of this urban watershed.

The project is designed to be fully effective for 100 years and with proper maintenance should provide benefits after this period.

The works of improvement proposed in this plan will contribute to the overall development of water resources in the Neponset River Basin with no apparent conflict with any existing or proposed works of improvement, and are compatible with current and long-term objectives of area water and related land resource study objectives. The Massachusetts Water Resources Commission is currently conducting a study of the Neponset River Basin to establish quantitative relationships between the effects of urban development on the wetland and flood plains of the basin and the increases in flood stages resulting therefrom. Information developed in the planning studies for this project will be incorporated in the Neponset River Basin Study.

This watershed is within the Neponset study area of the Massachusetts Water Resources Study (Type IV River Basin) and also, in the Southeastern New England Study (Level B River Basin), which are presently under way. There is one approved Public Law-566 project covering about 8 square miles within the Neponset River drainage which is about 125 square miles in area. Neither of the above river basin studies have identified other potential projects within the Neponset River Basin. Therefore, the potential for significant cumulative hydrologic effects does not appear to exist. Also, the project area of about 2.0 square miles is too small to contribute significantly to potential cumulative effects within the Neponset River Basin or regionally.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Forest and wildlife uses will be eliminated on the 17-acres of land occupied by the fish and wildlife pool. Periodic inundation of up to 33 acres of mostly wooded land in the floodwater detention pool will impair its wildlife habitat value.

Forest use will be eliminated on about nine acres of construction area, including the area to be occupied by the dam and spillway. Wildlife use of this area will be lost until revegetated after construction. About 0.1 mile of intermittent stream channel and 0.2 mile of perennial flowing stream will be lost to the fish and wildlife pool and earth fill. The commitment of about 57 acres of land to the multiple-purpose structure will preclude the use of this area for urban development and other uses not compatible with the intended purpose of the structure.

Other commitments including the labor and materials which will be expended to install, operate and maintain the project are irreversible. These commitments however can and will be retrieved in the form of project benefits. The only commitments which can be retrieved in a form other than project benefits are fill and other related materials used in construction.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES & OTHERS

General

The application for assistance was submitted to and approved by the Massachusetts Water Resources Commission acting for the Governor of the Commonwealth. Through this procedure, the intent of the Sponsors to develop a project plan was made known to concerned state resource agencies. Concerned federal agencies were also advised of the Sponsors' intent. Development of the project plan was carried out in full consultation with the interested federal, state, and local agencies through correspondence, meetings and numerous contacts. Interested members of the local public were timely informed through numerous newspaper articles during the planning stage. Upon completion of the tentative plan, a public information meeting was held for affected property owners and the general public. Interested state agencies were also represented. Draft copies of the plan were provided to interested state and local agencies inviting comments.

An appraisal of the effects on fish and wildlife resources was made by the Fish and Wildlife Service, United States Department of the Interior, based on preliminary project plans. The report pointed out "the construction and operation of the project would not significantly effect fish and wildlife resources of the area."

The fish and wildlife feature of the multiple-purpose structure was developed in cooperation with the Massachusetts Division of Fisheries and Wildlife.

The Massachusetts Historical Commission and the State Archaeologist were consulted regarding the presence of historical and archaeological sites that may be affected by the project. Both responded that their present listings show no sites that would be affected (See Appendix E). In addition a survey has been conducted by a qualified archaeologist. This survey indicates that no archaeological resources will be affected by project measures (a summary report is included as an appendix to the environmental impact statement for this project).

As a sponsor of the project, the town of Walpole was involved throughout the planning process. In addition to the Board of Selectmen, appropriate town boards were involved through meetings, correspondence, and personal contacts.

An informal field review of the preliminary draft watershed plan and environmental impact statement was requested of interested local and state agencies, and field offices of federal agencies. Written comments were invited. The watershed plan and the environmental statement have been prepared in consideration of the comments and recommendations received.

Following the informal field review and consideration of the comments received, the watershed plan and environmental impact statement were

reviewed at a public meeting on April 4, 1973. The general public and representatives of interested state and federal agencies were invited to participate.

A question and discussion period following the presentation of the plan and statement revealed no opposition to the project.

The following agencies and individuals were asked to comment on the draft environmental statement and they responded as follows:

Massachusetts Water Resources Commission (Designated by the Governor)	Responded
Office of State Planning and Management (State Clearinghouse)	Responded
Metropolitan Area Planning Council (Regional Clearinghouse)	Responded
Massachusetts Historical Commission	Responded
State Archaeologist	No Response
Advisory Council on Historic Preservation	No Response
Department of the Army	Responded
Department of Commerce	No Response
Department of Health, Education and Welfare	Responded
Department of the Interior	Responded
Department of Transportation	Responded
Environmental Protection Agency	Responded
Federal Power Commission	No Response
Office of Equal Opportunity, USDA	No Response

The Fish and Wildlife Service, United States Department of the Interior was consulted regarding resolution of the comment on clearing the fish and wildlife pool of the multiple-purpose structure (see Comment 3, page 78). It was proposed that this aspect of the plan be reviewed with the sponsors, giving appropriate consideration to all significant probable effects on the environment. The results of the review are discussed in the response to Comment 3 on page 78.

Discussion and Disposition of Each Problem, Objection or Issue Raised on the Draft Environmental Impact Statement

OFFICE OF STATE PLANNING AND MANAGEMENT (STATE CLEARINGHOUSE)

1. Comment: "Although the report discusses the existing pollution of the streams due to septic leaching - no mention is made of how this may effect the condition of the water quality of the proposed impoundment - will vegetative growth become a reoccurring problem?"

Response: In the drainage area of the proposed impoundment, there are about 85 residences. Of these, 47 are presently on the town sewerage system. Eighteen of the 38 residences with onsite systems are scheduled for connection to the town system by 1980. The remaining 20 homes, not scheduled for connection by 1980, are on soils with moderate or severe limitations for onsite sewerage disposal. Although not obvious, some leachate may be reaching the impoundment site from these

OFFICE OF STATE PLANNING AND MANAGEMENT (STATE CLEARINGHOUSE) (Cont'd.)

dwellings. However, available water quality data at Old Post Road immediately upstream of the site does not indicate a level of nutrient inflow that would cause excessive plant growth.

2. Comment: "There is no mention of the present land use or aesthetic values in the area of the stream channelization - or indication, of any damage from letting the brook naturally flood its banks?"

Response: Information is provided in Table 1, page 14 and in the first paragraph, page 19 on the present land use and vegetative cover in the area of the channel work. A portion of the area has also been used as a disposal area for broken concrete pavement (fifth paragraph, page 6). Regarding the section of channel to be enlarged, the first paragraph, page 32 states that, "This section is essentially straight in alignment and shows evidence of being previously modified." Also, the channel has been littered with cans, bottles and other refuse. The present aesthetic value of the channel work area is judged to be low.

The channel work should result in improved aesthetic values. Excavated debris will be removed or buried. The disposal area of broken concrete pavement will be covered and vegetated (fifth paragraph, page 6). Channel excavation and clearing will be done so as to preserve the more desirable vegetation (fourth paragraph, page 6 and third paragraph, page 10).

There are no improvements subject to damage from overflow of the present open channel, which is to be enlarged. The purpose of enlarging the channel is to provide an improved outlet for the existing and planned conduits by reducing a backwater effect from the Neponset River. The last paragraph on page 6 has been modified to clarify the purpose of this portion of the channel work.

3. Comment: "There is little discussion of the impacts of stream channelization of Diamond Brook upon the Neponset River, if any."

Response: No impacts on the Neponset River are expected, other than those described in the statement. The last paragraph, page 62 states that, "The peak flow that would occur during an event equivalent to the August 1955 storm, would be reduced about 45 percent or from 1,270 cubic feet per second to 670 cubic feet per second at the mouth of Diamond Brook." Further information on expected hydrologic effects is given in the last paragraph, page 73. Short-term effects which will occur during project installation are described in the first paragraph, page 63.

DEPARTMENT OF THE INTERIOR

1. Comment: "While the work plan (page 36) and the draft environmental statement (pages 55,74, and Appendix D) portray appropriate concern for cultural resources, both historical and archaeological, the final statement should display the commentaries of the State Historic Preservation Officer and the State Archeologist, which are referred to on page 75 of the draft environmental statement."

Response: As suggested, the commentaries have been included as Appendix E.

2. Comment: "The archeological report (Appendix D) clearly indicates the low potential of archeological values to be disturbed by this project. However, the archeologist did make recommendations (sheet 9 of 14) which should be presented in the final plan and final statement indicating special conditions in the project to be accomplished while the physical works are underway."

Response: The recommendations of the archeologist are now included in the final watershed plan (third paragraph, page 56) and environmental impact statement (first paragraph, page 12).

3. Comment: "Page 5, paragraph 2, of the draft statement states that the fish and wildlife pool will be cleared during construction. In our review of the preliminary draft environmental statement dated January 18, 1973, we stated: "We have consulted with the Massachusetts Division of Fisheries and Game and we believe that maximum benefits to fish and wildlife, including waterfowl, would occur if trees and woody vegetation of the fish and wildlife pool are allowed to remain uncleared." We maintain that position and request that the work plan and final environmental statement be modified to indicate that the fish and wildlife pool will be left uncleared."

Response: It was the decision of the sponsors during project planning to clear the fish and wildlife pool. In response to this comment, we have again reviewed this aspect of the plan with the sponsors and they have reaffirmed their desire to clear the pool. Although maximum benefits to fish and wildlife would occur if the pool is left uncleared, effects on water quality and aesthetics were necessary considerations in this situation. A substantial benefit to fish and wildlife will occur although the pool is cleared. The probable adverse effects of dead and decaying trees and other woody vegetation on aesthetics and water quality will be avoided.

DEPARTMENT OF THE INTERIOR (Continued)

4. Comment: "The statement should explain the reasons why hunting will not be allowed in the project area. These explanations should be included in the sections pertinent to pages 48 and 67 of the statement."

Response: The 37 acres of land where hunter use will be lost, as expressed in the section, "ADVERSE ENVIRONMENTAL EFFECTS," includes the 17-acre fish and wildlife pool of the planned multiple-purpose structure and about 20 acres of town owned land adjacent to the pool. As expressed on page 5 of the statement, "This pool and land area will be developed and managed for fish and wildlife habitat and used primarily for fishing, nature study, wildlife observation, and other forms of passive recreation." Hunting on this area is not a planned use, because it was judged to be incompatible with the planned nonconsumptive uses.

The section, "ENVIRONMENTAL IMPACTS," (fifth paragraph, page 64) has been modified to explain why hunting will not be allowed on the 37 acres.

5. Comment: "Although some consideration of impacts on ground water resources is suggested by numerous scattered reference to sanitation problems, the environmental statement should describe ground water resources in a more systematic manner, should indicate whether and to what extent ground water is used for other than municipal supplies, and should indicate how significant the ground water from fractured crystalline rocks may be and what effect the project will have on these supplies. It should then address beneficial or adverse impacts of the proposed project on ground water resources, including especially such subjects as the extent, if any, of waterlogging, effects of the project on the quality of ground water, and effects on the contribution of ground water to stream flow."

Response: Within the watershed, there are no known wells for extracting ground water. The first paragraph, page 28 has been modified to add this information.

Wells in fractured bedrock can be expected to produce average yields of 75 to 90 gallons per minute. However, many wells probably will be unsuccessful or produce very

DEPARTMENT OF THE INTERIOR (Continued)

low yields. Wells in the major bedrock fault zone might produce up to a few hundred gallons per minute. However, the location and even the existence of this fault zone in the watershed is not entirely certain.

The discussion on ground water resources on pages 26 and 27 attempts only to provide resource information in the degree of detail consistent with the problems, objectives, and potential impacts relative to the project.

Impacts of the project on ground water resources, beneficial or adverse, are expected to be insignificant. The expected contribution of the permanent pool of the planned impoundment to ground water volume is very small compared to the saturated volume of the sand and gravel in the watershed. Therefore, the pool is expected to have only a very slight effect on the quality and quantity of the general ground water reserves and on increasing the contribution of ground water to stream flow.

Swamping or waterlogging along the perimeter of the permanent pool is a distinct possibility since sand and gravel aquifers are known to exist in this area. However, the land slope is sufficiently steep to restrict possible effects to a small area which is within the flood pool where only land uses compatible with occasional inundation will occur.

6. Comment: "It is suggested that a note be added to Table 1 under the appropriate heading to indicate that eight or nine additional acres of wetland have not been accounted for, in the 58-acre area required for project structures, in addition to the four acres of water surface that are accounted for. Presumably, the eight acres of swamp to be lost as a result of the project are included in the 39 acres of forest land shown on the table (page 14)."

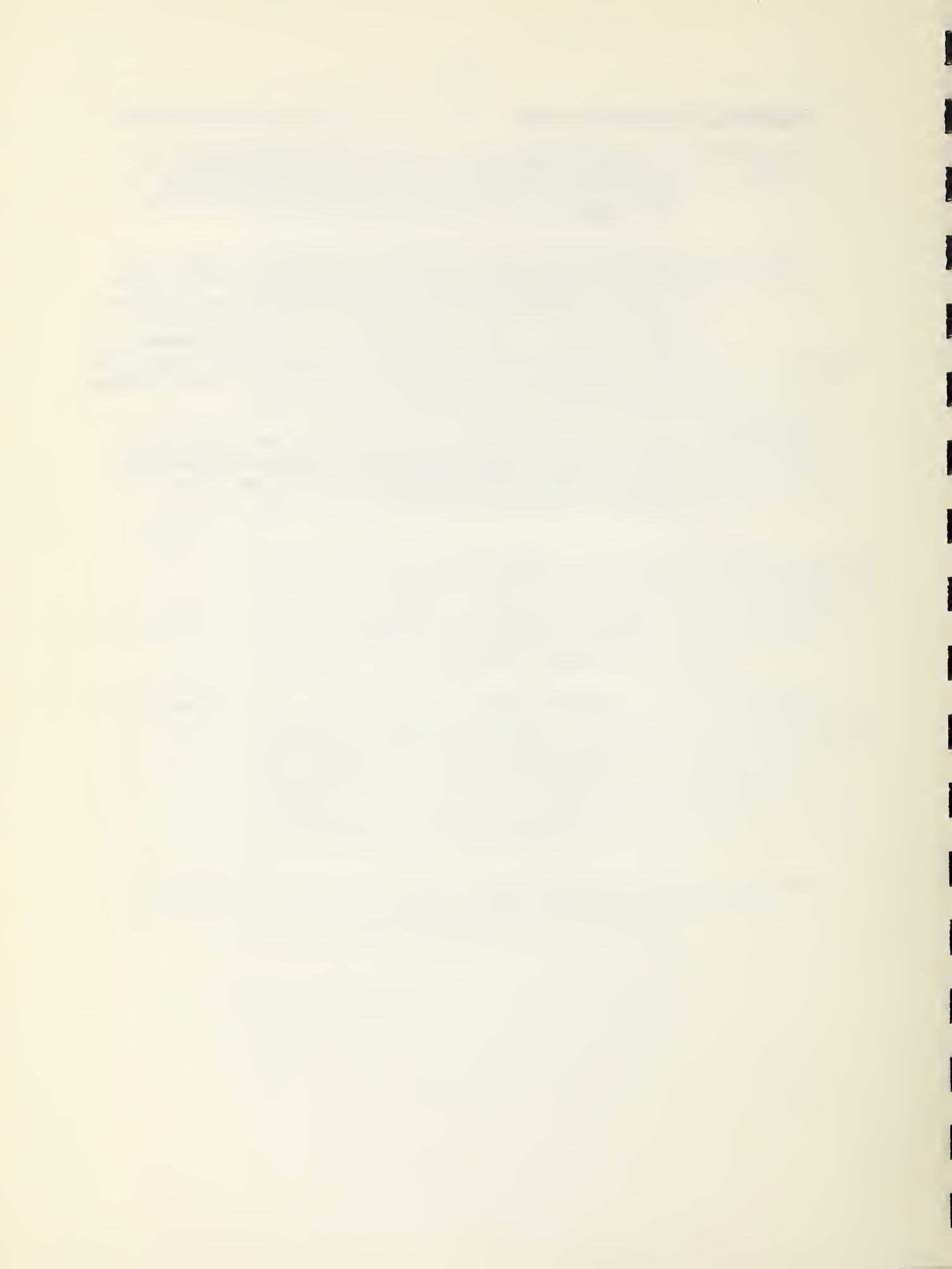
Response: Footnotes have been added to Table 1, page 14, to denote the wetland acreages which are included in the forest land and idle land categories of land use.

ENVIRONMENTAL PROTECTION AGENCY

1. Comment: "The draft appears to be a fairly complete presentation of the environmental impact of the proposed project. We would, however, suggest the following addition to the final EIS:

Page 63 mentions that temporary increases in noise, air pollution by dust and exhaust emission will occur. Dust pollution resulting from construction is subject to regulation by the State Air Pollution Implementation Plan, Regulation No. 9 (Dust and Odor). The State Department of Environmental Affairs, Division of Air Pollution should be able to explain what dust prevention methods are considered acceptable under this regulation."

Response: Item 5 on page 11 of the statement has been modified to state that dust prevention methods will be employed that are acceptable under Regulation No. 9 of the State Air Pollution Implementation Plan.



LIST OF APPENDICES

APPENDIX A - Comparison of Benefits and Costs for Structural Measures

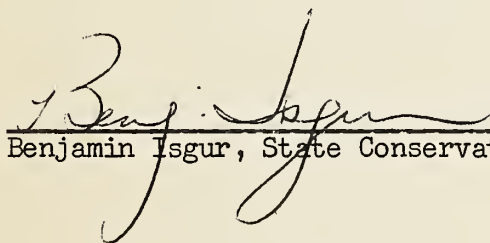
APPENDIX B - Letters of Comment Received on the Draft Environmental Impact Statement

APPENDIX C - Project Map

APPENDIX D - Archeologist's Survey Report

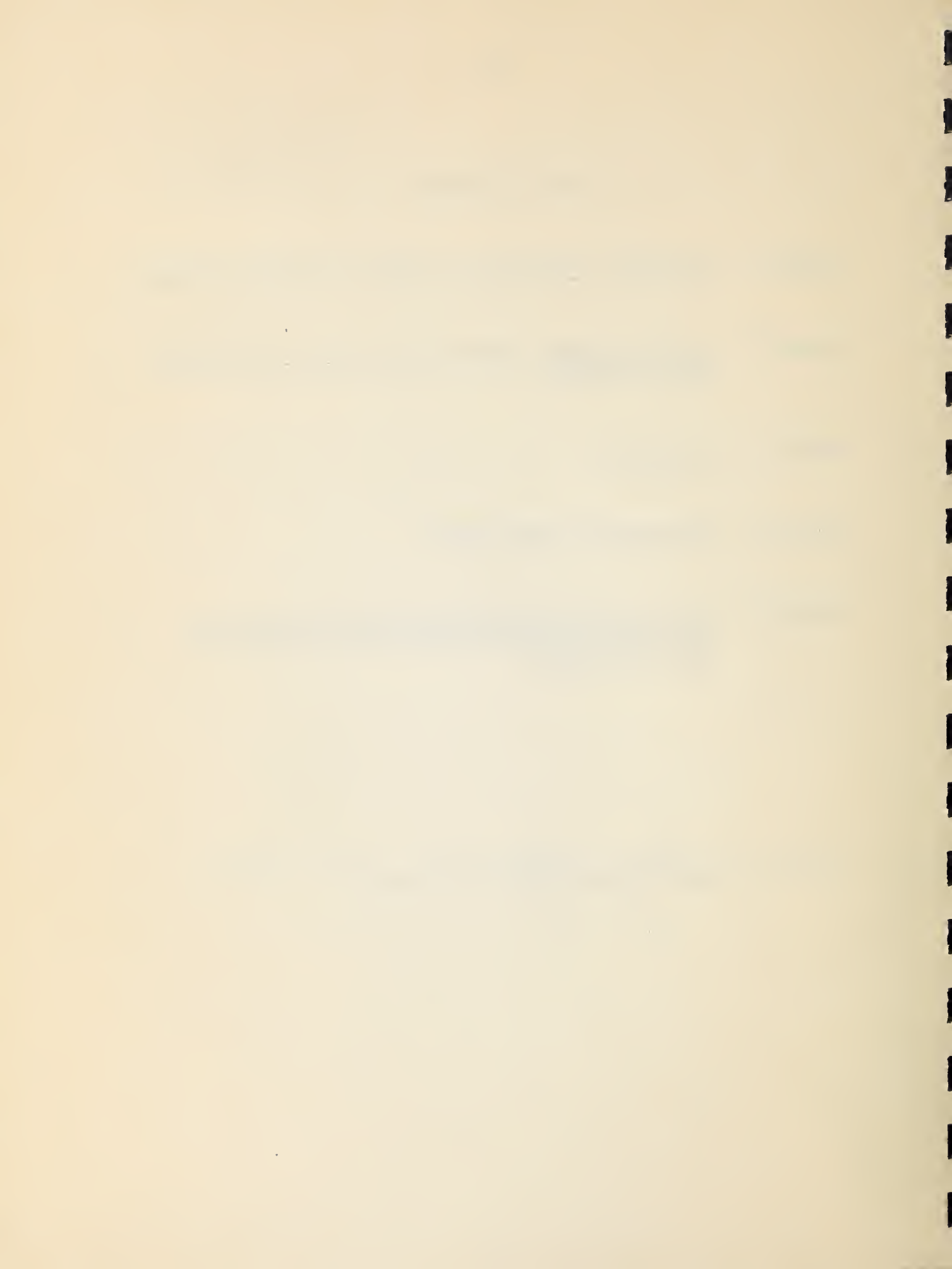
APPENDIX E - Letters of Response on Historical and Archeological Values from Massachusetts Historical Commission and State Archeologist

APPROVED BY

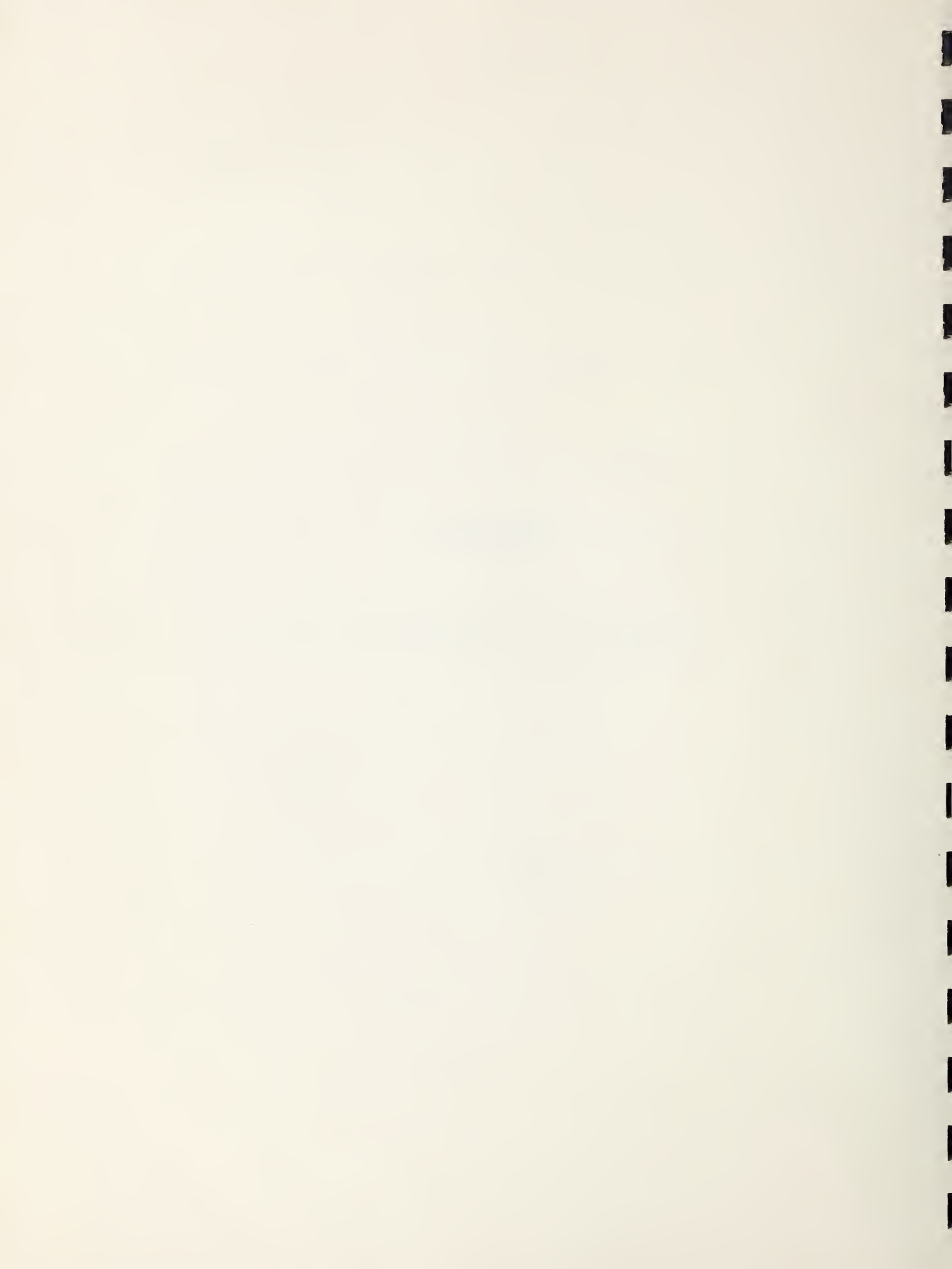

Benjamin Isgur, State Conservationist

Date

3/3/76



APPENDICES

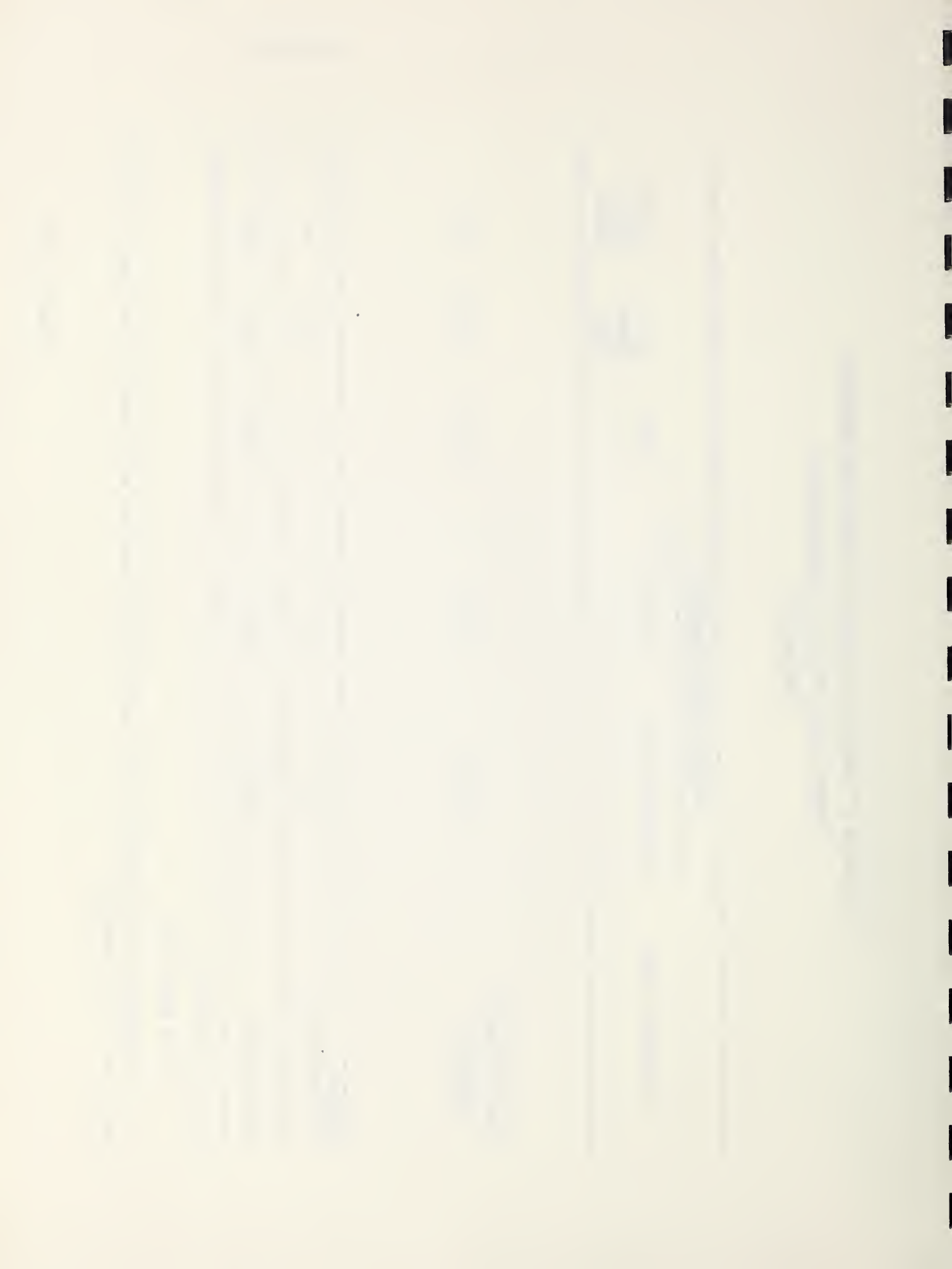


COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES
 Diamond Brook Watershed, Massachusetts
 (Dollars) ^{1/}

Evaluation Unit	AVERAGE ANNUAL BENEFITS			Total	Avg Annual Cost	Benefit Cost Ratio
	Damage Reduction	Secondary				
<u>All Structural Measures:</u>	80,730	6,630		87,360	43,980	2.0:1
Project Administration	--	--		--	7,370	--
GRAND TOTAL	80,730 ^{2/}	6,630		87,360	51,350	1.7:1

^{1/} Price base 1975

^{2/} In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$1,610 annually.





OFFICE OF THE DIRECTOR
DIVISION OF WATER RESOURCES

The Commonwealth of Massachusetts
Water Resources Commission
Leverett Saltonstall Building, Government Center
100 Cambridge Street, Boston 02202

July 14, 1975

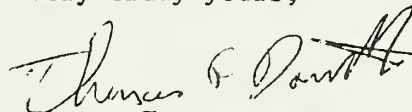
Dr. Benjamin Isgur
State Conservationist
Soil Conservation Service
29 Cottage Street
Amherst, Massachusetts 01002

Re: Basin 9, Neponset, PL 566
Diamond Brook
Environmental Impact Statement Federal

Dear Dr. Isgur:

We have reviewed the Draft Environmental Impact Statement for Diamond Brook Watershed and have no comments to make. We find it to adequately treats the watershed and is responsive to the proposed projects and watershed.

Very truly yours,


Thomas F. Doucette
Associate Civil Engineer

TFD/m

cc Philip Christensen, SCS, Amherst

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APPENDIX D

The Commonwealth of Massachusetts
Executive Office for Administration and Finance
Office of State Planning and Management

Frank T. Keefe
 Director

Leverett Saltonstall Building, Room 909
100 Cambridge Street, Boston 02202

AREA CODE
 727-5061

REQUEST FOR REVIEW OF ENVIRONMENTAL IMPACT REPORT
 MASSACHUSETTS STATE CLEARINGHOUSE (727-4154)

TO: Commissioner Joseph Brown
 Department of Natural Resources
 100 Cambridge Street - 19th Floor
 Boston, MA 02202

DATE: June 12, 1975

REPLY DUE: July 3, 1975

TITLE OF REPORT: Draft EIS, Diamond Brook Watershed

IMPACT AREA: Norfolk County

CLEARINGHOUSE IDENTIFIER: 75050506

JUL 22 1975

JUL 22 1975

The Massachusetts State Clearinghouse has received the above referenced Environmental Impact Report and is referring it to your agency for review and comment. Please focus your review on the technical adequacy of the report within your agency's jurisdiction and expertise. Any conflicts with your agency's programs should be noted. Please comment below, using additional sheets if necessary, and return your comments by the due date noted above.

REPORT

PROJECT

Impact report adequate

Project not in conflict with this agency's programs

Impact report not adequate (see comments)

Project is in conflict with this agency's programs (see comments)

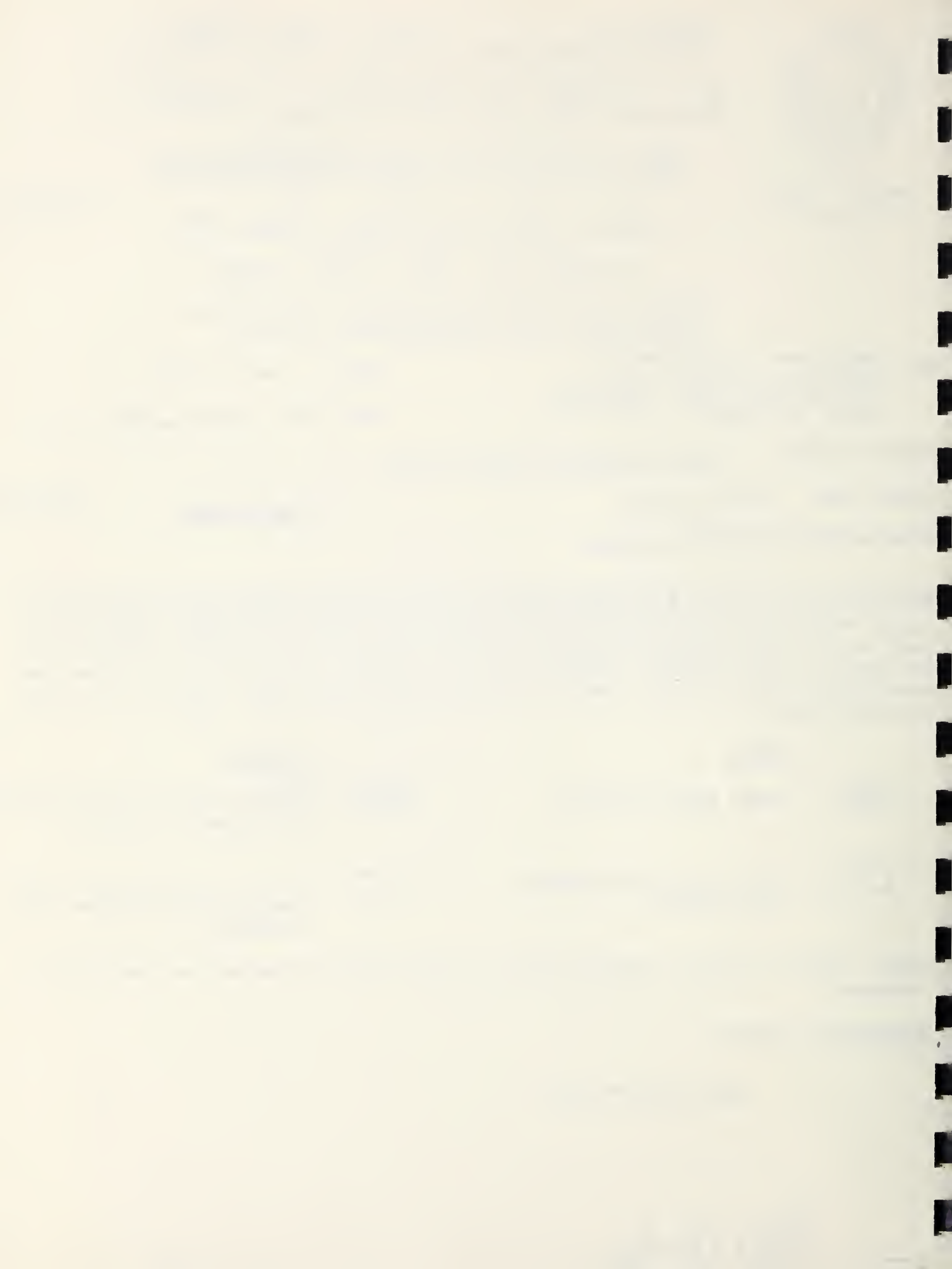
(NOTE: Please check the appropriate box in each column with respect to your agency's response.)

Explanatory comments:

(See Attached Sheet)

John C. ...

July 14 1975

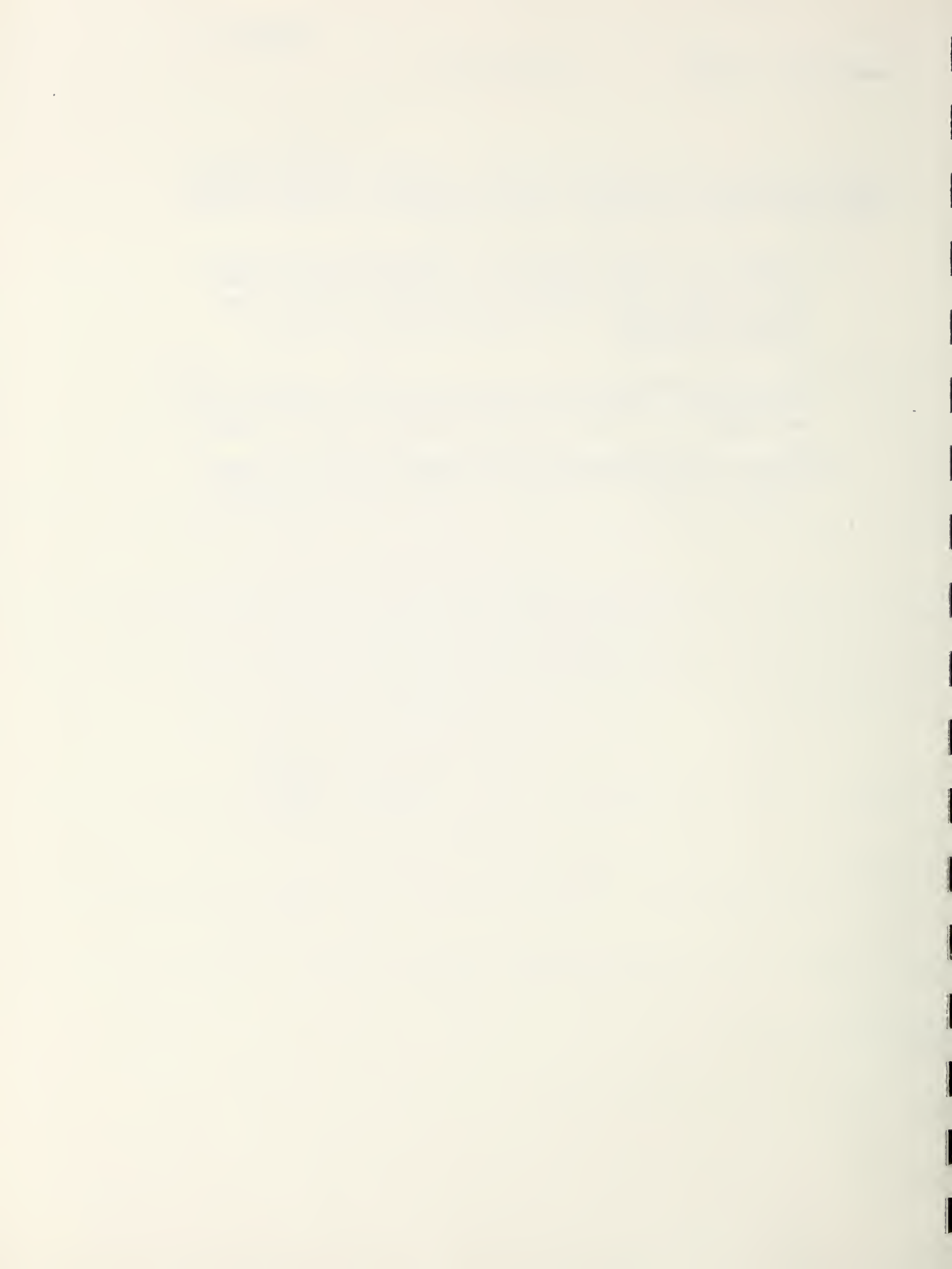


Identifier # 75050506

Diamond Brook

The above draft EIS in general adequately addresses the environmental impacts concerning the project, with the exception of several aspects that should receive some further consideration:

1. Although the report discusses the existing pollution of the streams due to septic leaching - no mention is made of how this may effect the condition of the water quality of the proposed impoundment - will vegetative growth become a reoccurring problem?
2. There is no mention of the present land use or aesthetic values in the area of the stream channelization - or indication, of any damage from letting the brook naturally flood its banks?
3. There is little discussion of the impacts of stream channelization of Diamond Brook upon the Neponset River, if any.





Metropolitan Area Planning Council
44 School Street Boston, Massachusetts 02108

Richard M. Doherty
Executive Director

(617) 523-2454

June 16, 1975

Dr. Benjamin Isgur
State Conservationist
29 Cottage Street
Amherst, Massachusetts 01002

Re: Review of an Environmental Impact Statement pertaining to
Diamond Brook Watershed (MAPC # EIS-75-30, Received May 14, 1975)

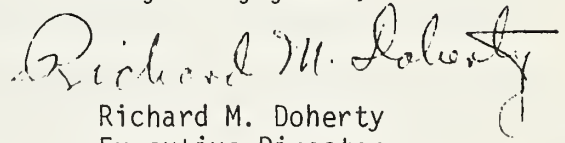
Dear Dr. Isgur:

In accordance with Section 5 of the Watershed Protection and Flood Prevention Act, the Metropolitan Area Planning Council, as metropolitan clearinghouse, has reviewed the above referenced environmental impact statement.

After careful review, the Council concludes that the document in question fulfills the requirements of the National Environmental Policy Act of 1969. Also, the Council wishes to express its support for the proposed project, and state that the project is consistent with all regional plans and policy related to the natural environment.

The comments of Mr. Robert Boyd, MAPC Representative from Walpole, are attached.

Very truly yours,


Richard M. Doherty
Executive Director

RMD/k1

CC: The Honorable Evelyn Murphy
Secretary of Environmental Affairs
Mr. Frank Keefe
Office of State Planning
Mr. Robert Boyd
MAPC Representative - Walpole

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This ensures transparency and allows for easy verification of the data.

In the second section, the author outlines the various methods used to collect and analyze the data. This includes both primary and secondary data collection techniques. The primary data was gathered through direct observation and interviews, while secondary data was obtained from existing reports and databases.

The third section details the statistical analysis performed on the collected data. This involves the use of descriptive statistics to summarize the data and inferential statistics to test hypotheses. The results of these analyses are presented in a clear and concise manner, highlighting the key findings of the study.

Finally, the document concludes with a discussion of the implications of the findings. It suggests that the results have significant implications for the field of study and provides recommendations for further research. The author also acknowledges the limitations of the study and offers suggestions for how these can be addressed in future work.

mapcMetropolitan Area Planning Council
44 School Street Boston, Massachusetts 02108Richard M. Doherty
Executive Director

(617) 523-2454

REQUEST FOR REVIEW COMMENTSTO: Robert B. Boyd, Jr.
MAPC representative, Walpole

Attached please find a description of the project referenced below. The Council requests that you review this proposal focusing on its compatibility with your community's plans, programs and objectives. We would appreciate your completing the form below and returning it to us. ATTN: METROPOLITAN CLEARINGHOUSE, by the due date.

COMMENTS DUE: EIS-75-30

MAPC PROJECT NUMBER: June 9, 1975

REVIEW COMMENTS:

- Proposal not applicable to this agency.
- Concur with proposal (Explain below).
- Need more information (Explain below).
- Cannot concur with proposal (Explain below).

EXPLANATORY COMMENTS:

I was one of the original petitioners for this project, more than 10 years ago. I am still in full accord with it.

Robert B. Boyd, Jr.

Signature

Title

6-3-75

Date

[The following text is extremely faint and illegible due to low contrast and blurring. It appears to be a list or a series of entries, possibly a table of contents or a list of items, but the specific content cannot be transcribed.]



The Commonwealth of Massachusetts

Office of the Secretary

Massachusetts Historical Commission

40 Beacon Street Boston, Massachusetts 02108

727-8470

Paul Guzzi

Secretary of the Commonwealth

May 22, 1975

Dr. Benjamin Isgur
State Conservationist
Soil Conservation Service
United States Department of Agriculture
29 Cottage Street
Amherst, Massachusetts 01002

Dear Dr. Isgur:

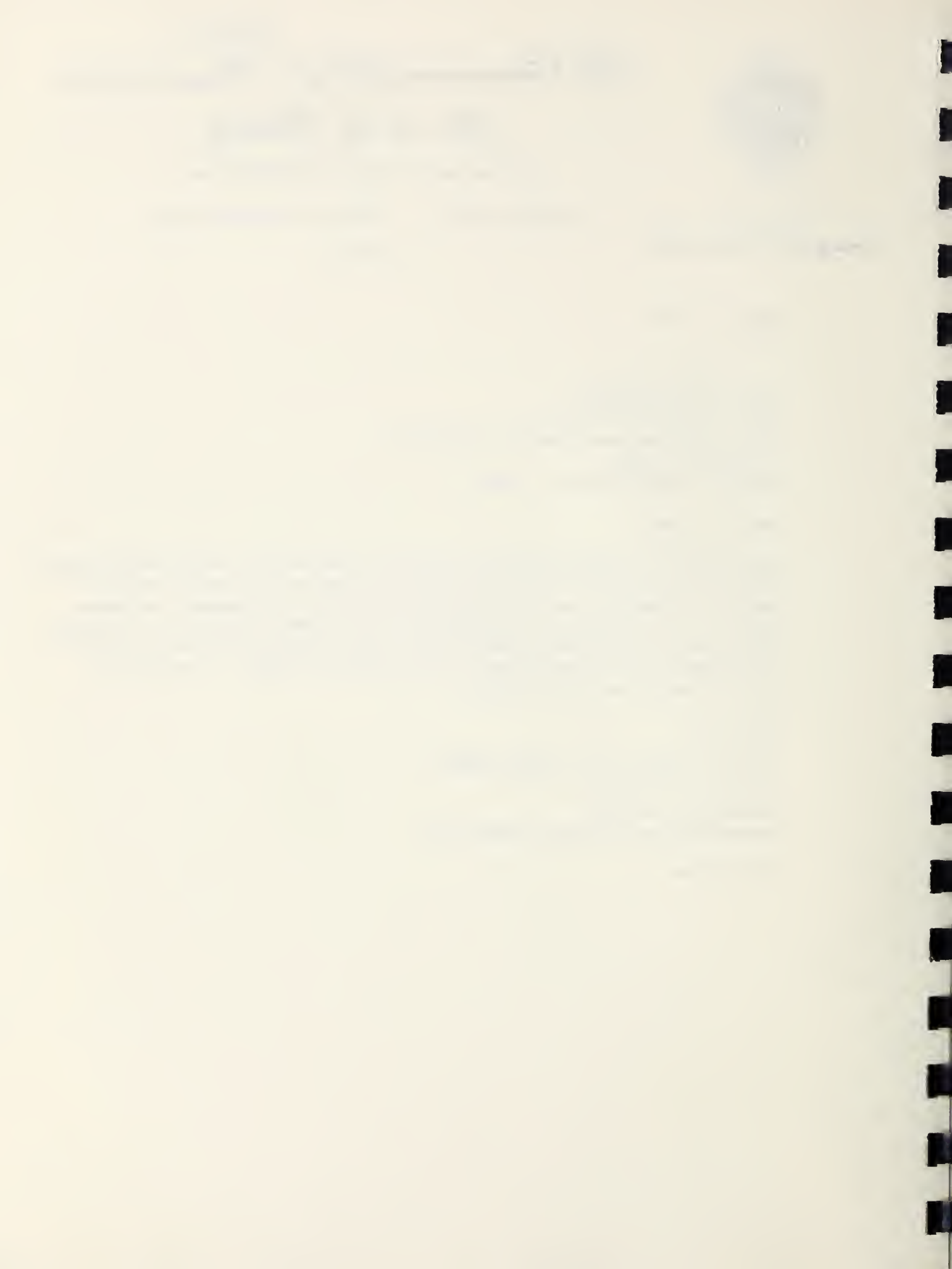
Thank you for sending copies of the work plan and the draft environmental impact statement for the Diamond-Traphole Brooks Watershed, Norfolk County, Massachusetts. The preliminary draft environmental statement had been reviewed by the Massachusetts Historical Commission in December 1972 with the conclusion that there were no properties of historical or archeological value listed in the inventory files at that time. This situation has not changed.

Sincerely,

Elizabeth R. Amadon

Elizabeth R. Amadon
Executive Director
Massachusetts Historical Commission

ERA:PLW:pw



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310



1 JUL 1975

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Control No.

06 - 0333819

Referred to: SC5

Date:

JUL 08 1975

B

Dear Mr. Long:

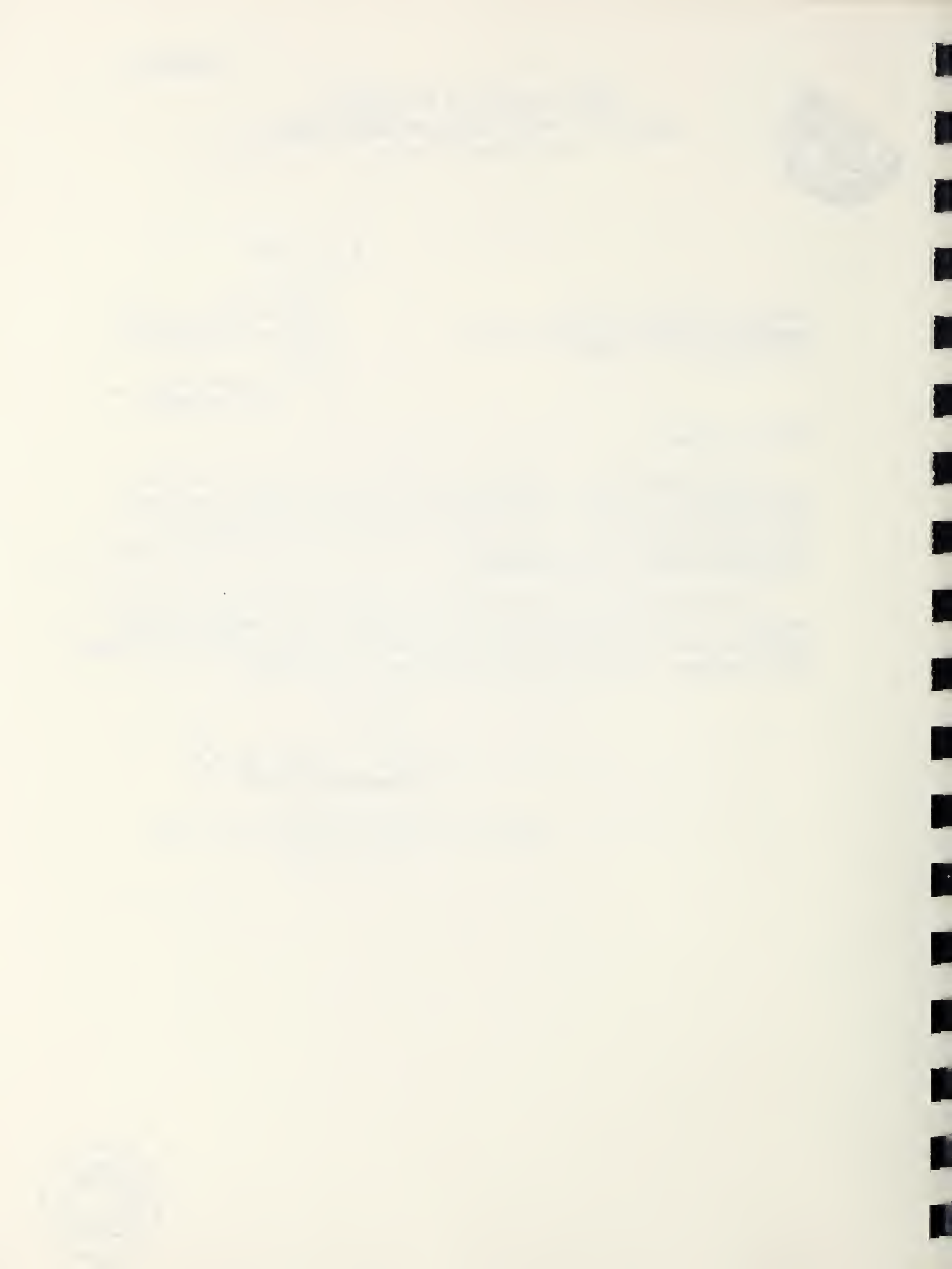
In compliance with provisions of Section 5 of Public Law 566, 83d Congress, the State Conservationist of Massachusetts, by letter of 12 May 1975, requested the views of the Chief of Engineers on the work plan and draft environmental statement for the Diamond Brook Watershed Project, Massachusetts.

We have reviewed the work plan and foresee no conflict with any project or current proposal of this Department. The draft environmental impact statement satisfies the requirements of Public Law 91-190, 91st Congress, insofar as this Department is concerned.

Sincerely,

Charles R. Ford
Deputy Assistant Secretary of the Army
(Civil Works)







DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
GOVERNMENT CENTER
BOSTON, MASSACHUSETTS 02203

OFFICE OF
THE REGIONAL DIRECTOR

June 30, 1975

Dr. Benjamin Isgur
State Conservationist
Soil Conservation Service
Department of Agriculture
29 Cottage Street
Amherst, Massachusetts 01002

Dear Dr. Isgur:

HEW's Regional Environmental Council has reviewed the draft Environmental Impact Statement for the Diamond Brook Watershed, Massachusetts.

On the basis of our review, we have determined that the impacts of the proposed action have been adequately addressed within the scope of this Department's responsibility.

Thank you for giving us the opportunity to review this draft statement.

Sincerely yours,

A handwritten signature in cursive script that reads "Donald Branum".

Donald Branum
Regional Environmental Officer



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20460

PEP ER-75/472

JUL 15 1975

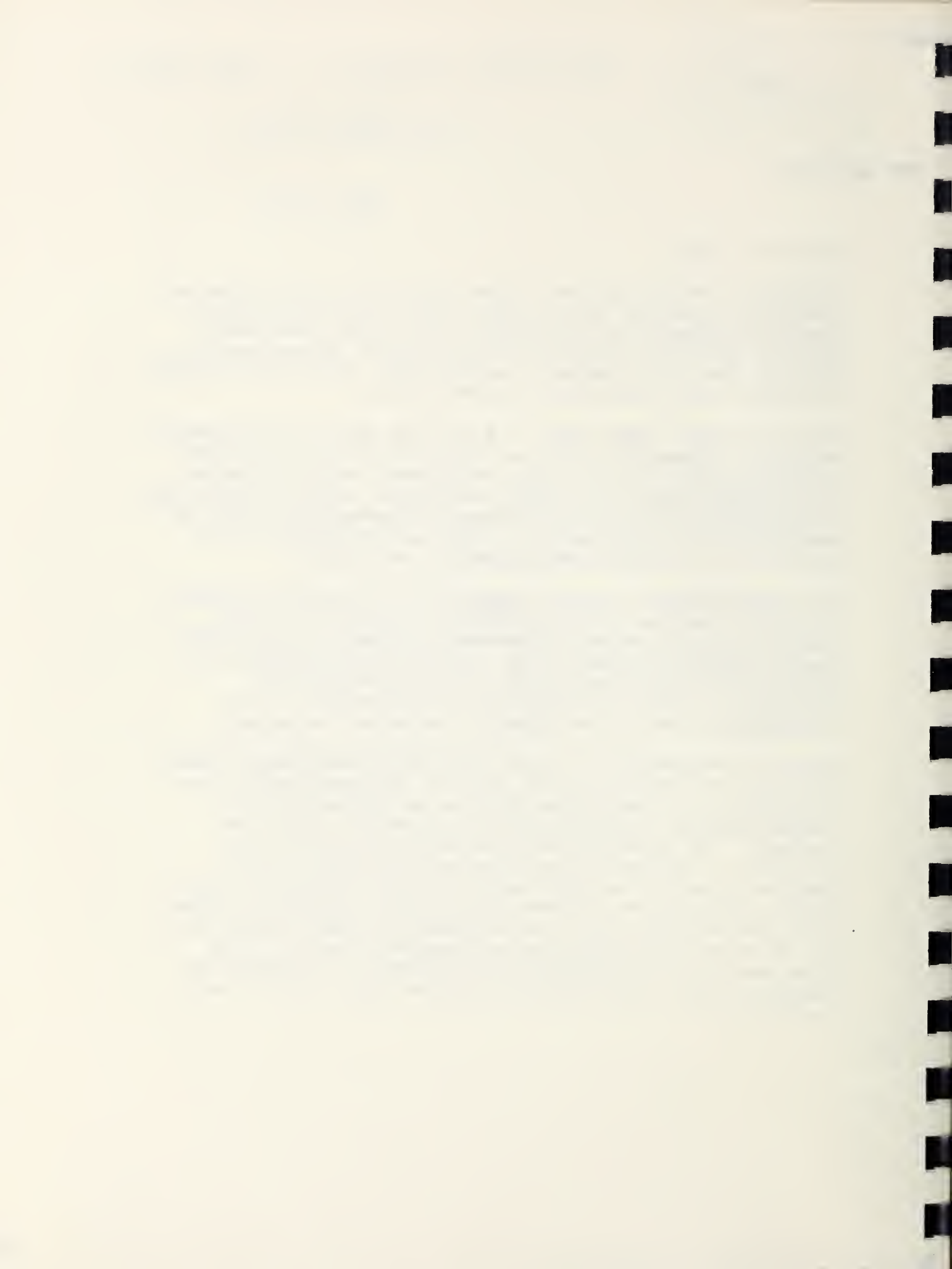
Dear Mr. Isgur:

Thank you for the letter of May 12, 1975, requesting our views and comments on the work plan and draft environmental statement for Protection and Flood Prevention, Diamond Brook Watershed, Norfolk County, Massachusetts. We find that the documents sufficiently evaluated mineral resources and recreation considerations.

While the work plan (page 36) and the draft environmental statement (pages 55, 74, and Appendix D) portray appropriate concern for cultural resources, both historical and archeological, the final statement should display the commentaries of the State Historic Preservation Officer and the State Archeologist, which are referred to on page 74 of the draft environmental statement.

The archeological report (Appendix D) clearly indicates the low potential of archeological values to be disturbed by this project. However, the archeologist did make recommendations (sheet 9 of 14) which should be presented in the final plan and final statement indicating special conditions in the project to be accomplished while the physical works are underway.

Page 5, paragraph 2, of the draft statement states that the fish and wildlife pool will be cleared during construction. In our review of the preliminary draft environmental statement dated January 18, 1973, we stated: "We have consulted with the Massachusetts Division of Fisheries and Game and we believe that maximum benefits to fish and wildlife, including waterfowl, would occur if trees and woody vegetation of the fish and wildlife pool are allowed to remain uncleared." We maintain that position and request that the work plan and final environmental statement be modified to indicate that the fish and wildlife pool will be left uncleared.



The statement should explain the reasons why hunting will not be allowed in the project area. These explanations should be included in the sections pertinent to pages 48 and 67 of the statement.

Although some consideration of impacts on ground-water resources is suggested by numerous scattered references to sanitation problems, the environmental statement should describe ground-water resources in a more systematic manner, should indicate whether and to what extent ground water is used for other than municipal supplies, and should indicate how significant the ground water from fractured crystalline rocks may be and what effect the project will have on these supplies. It should then address beneficial or adverse impacts of the proposed project on ground-water resources, including especially such subjects as the extent, if any, of waterlogging, effects of the project on the quality of ground water, and effects on the contribution of ground water to stream flow.

It is suggested that a note be added to Table 1 under the appropriate heading to indicate that eight or nine additional acres of wetland have not been accounted for, in the 58-acre area required for project structures, in addition to the four acres of water surface that are accounted for. Presumably, the eight acres of swamp to be lost as a result of the project are included in the 39 acres of forest land shown on the table (page 14).

We hope these comments and suggestions will be of assistance to you.

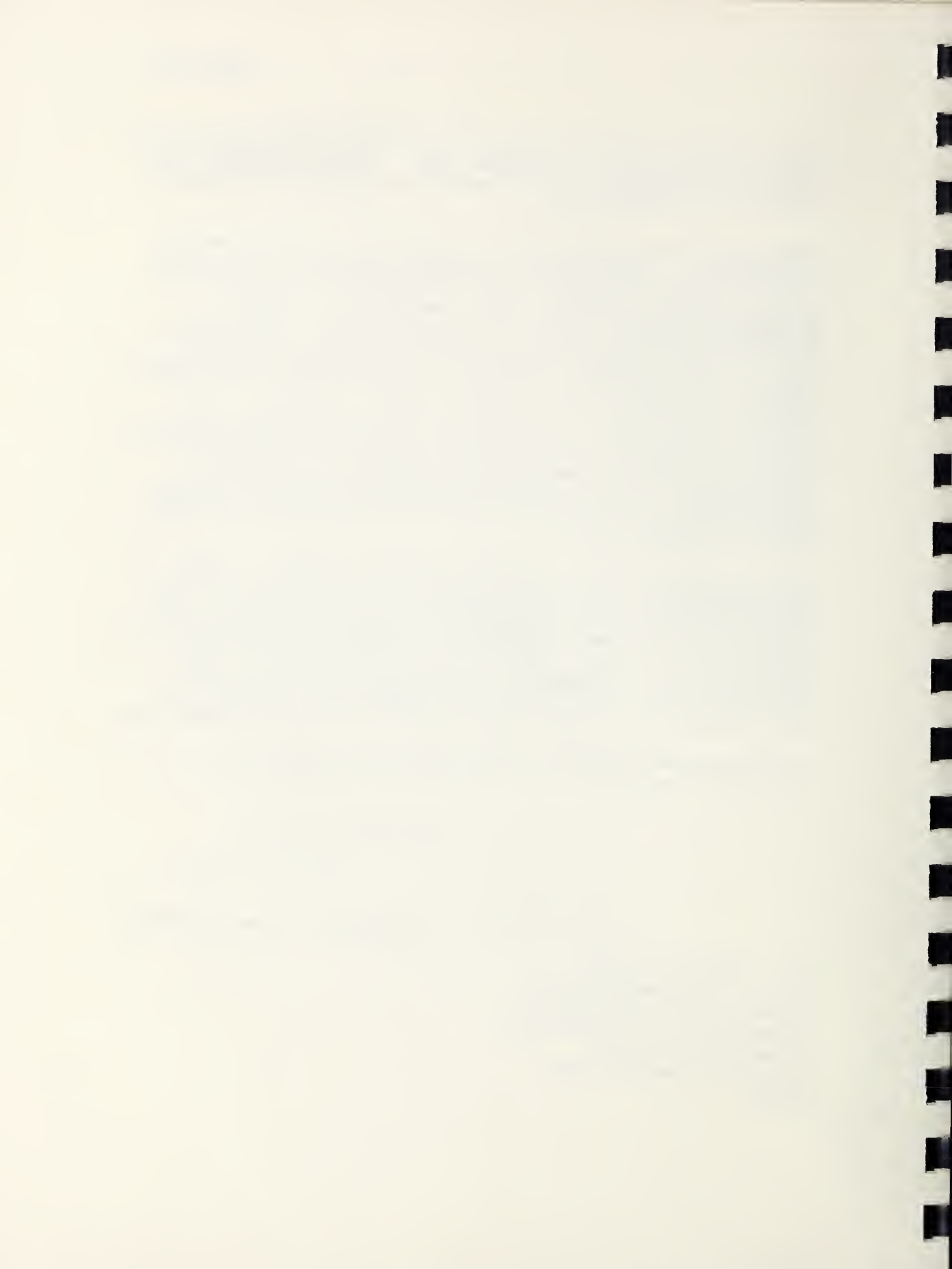
Sincerely yours,

(S) Stanley D. Doreaus

Deputy Assistant

Secretary of the Interior

Dr. Benjamin Isgur
State Conservationist
Soil Conservation Service
Department of Agriculture
29 Cottage Street
Amherst, Massachusetts
01002





DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

APPENDIX B

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

JUN 2 1975

Mr. Philip Christensen
Acting State Conservationist
Soil Conservation Service
29 Cottage Street
Amherst, Massachusetts 01002

Dear Mr. Christensen:

This is in response to your letter of 12 May 1975 addressed to Commandant, Coast Guard concerning a draft environmental impact statement for the Diamond Brook Watershed, Norfolk County, Massachusetts.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W. R. RIEDEL

Acting Deputy Chief, Office of Marine
Environment and Systems

By direction of the Commandant



The following information is provided for your reference:

1. The first section discusses the importance of maintaining accurate records.

2. The second section outlines the procedures for handling confidential information.

3. The third section details the requirements for data security and access control.

4. The fourth section describes the process for reporting and investigating security incidents.

5. The fifth section provides information on the roles and responsibilities of the security team.

6. The sixth section discusses the importance of regular security audits and assessments.

7. The seventh section outlines the process for updating security policies and procedures.

8. The eighth section provides information on the training and awareness programs for employees.

9. The ninth section discusses the importance of incident response planning and testing.

10. The tenth section provides information on the process for reviewing and improving the security program.



APPENDIX B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
Room 2203 - (617)-223-4635
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

July 9, 1975

Mr. Kenneth E. Grant, Administrator
U.S. Department of Agriculture
Soil Conservation Service
Washington, DC 20250

RE: D-SCS-B36005-MA

Dear Mr. Grant:

We have reviewed the Draft Environmental Impact Statement (EIS) on the Diamond Brook Watershed project, Norfolk County, MA. The draft appears to be a fairly complete presentation of the environmental impacts of the proposed project. We would, however, suggest the following addition to the final EIS:

Page 63 mentions that temporary increases in noise, air pollution by dust and exhaust emission will occur. Dust pollution resulting from construction is subject to regulation by the State Air Pollution Implementation Plan, Regulation No. 9 (Dust and Odor). The State Department of Environmental Affairs Division of Air Pollution should be able to explain what dust prevention methods are considered acceptable under this regulation.

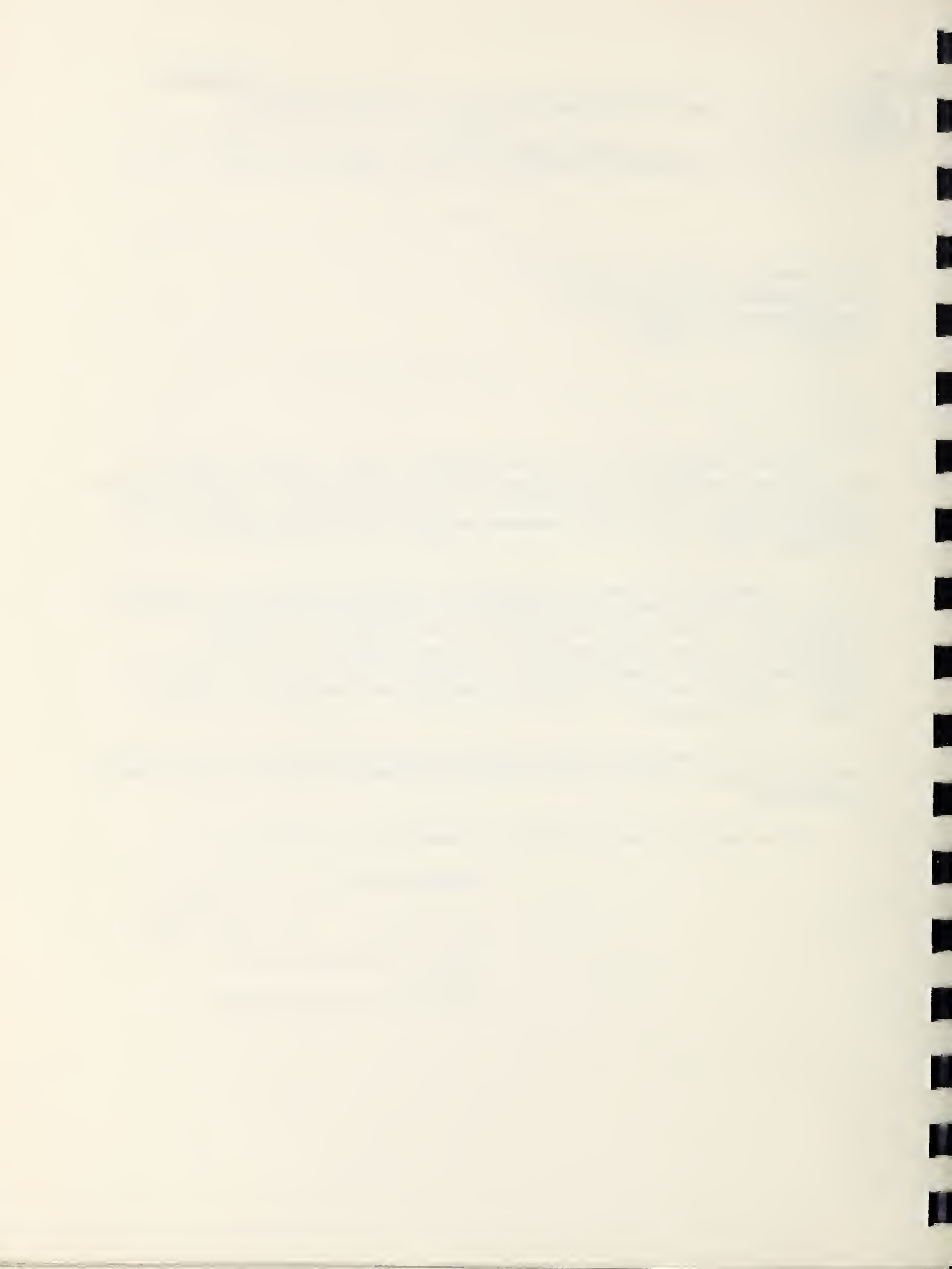
Due to the reasonable completeness of this draft, we have rated the project LO-1 in accordance with our national rating system, a copy of which is enclosed.

If we can be of any assistance, please give us a call.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Wallace E. Stickney".

Wallace E. Stickney, P.E.
Director
Environmental Impact Office



Environmental Impact of the Action

LO -- Lack of Objections

EPA has no objections to the proposed action as described in the draft environmental impact statement; or suggests only minor changes in the proposed action.

ER -- Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating federal agency to reassess these aspects.

EU -- Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1 -- Adequate

The draft environmental impact statement sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

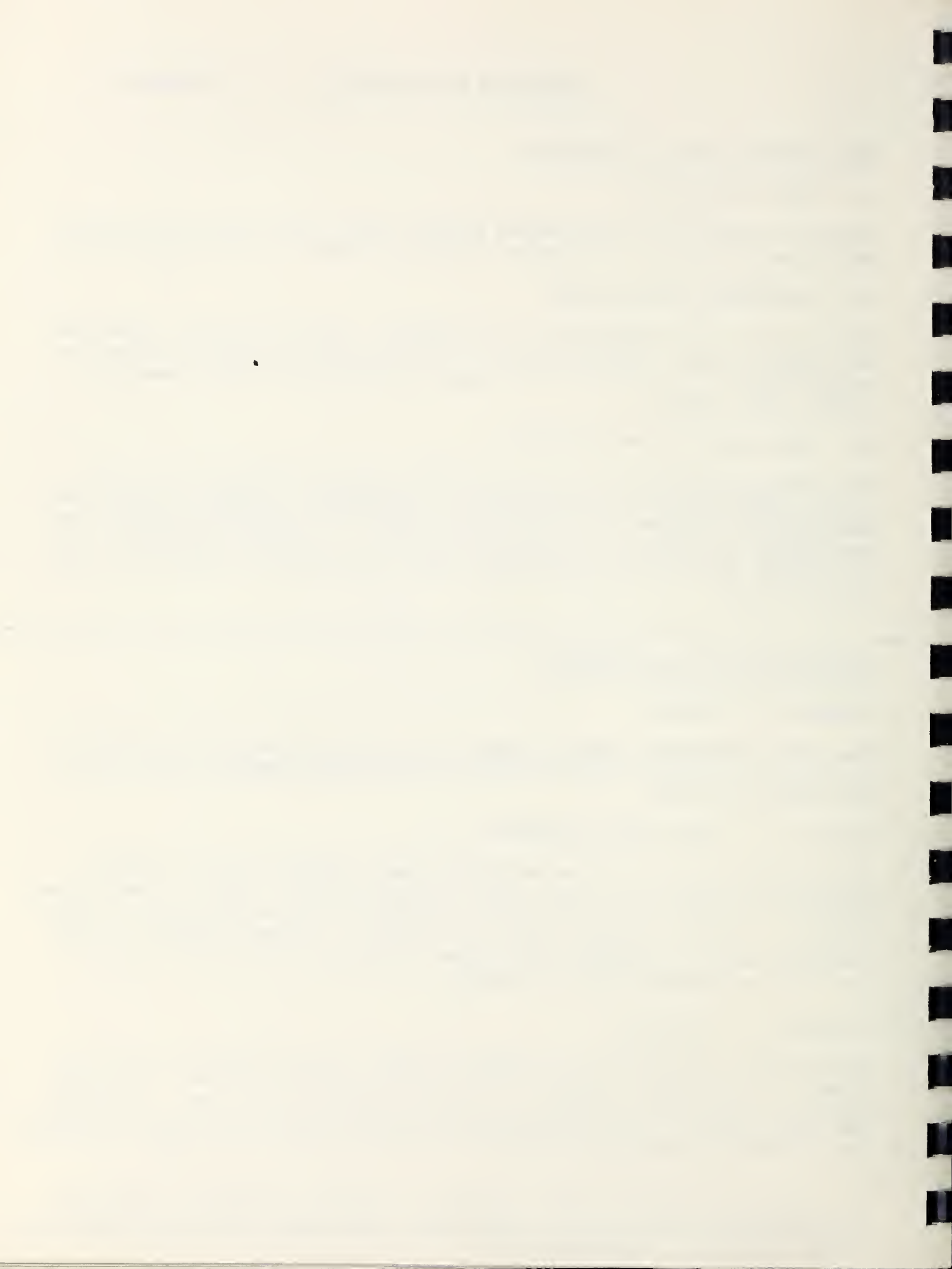
Category 2 -- Insufficient Information

EPA believes that the draft environmental impact statement does not contain sufficient information to assess fully, the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft environmental impact statement.

Category 3 -- Inadequate

EPA believes that the draft environmental impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft environmental impact statement is assigned a Category 3, no rating will be made of the project or action; since a basis does not generally exist on which to make such a determination.



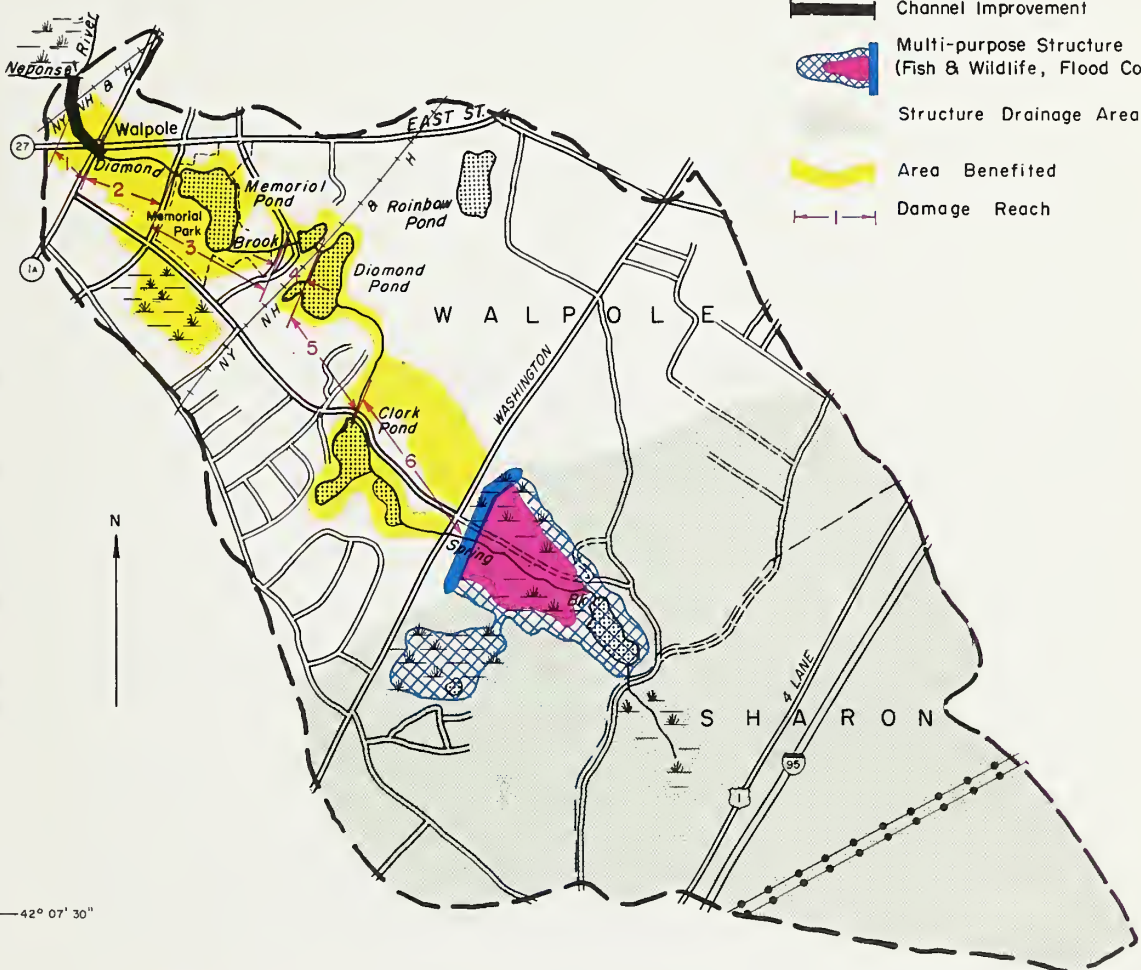


LOCATION MAP

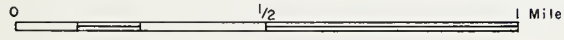
71° 15' 00"

LEGEND :

- Roads
- Railroad
- Streams
- Marsh
- Watershed Boundary
- Town Line
- Power-transmission Line
- Channel Improvement
- Multi-purpose Structure (Fish & Wildlife, Flood Control)
- Structure Drainage Area
- Area Benefited
- Damage Reach



42° 07' 30"



71° 15' 00"

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

APPENDIX C

Project Map
DIAMOND BROOK WATERSHED
NORFOLK COUNTY, MASSACHUSETTS



ARCHEOLOGICAL SURVEY REPORT

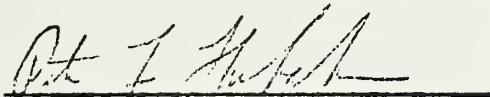
ALLEN SITE

DIAMOND-TRAPHOLE BROOKS WATERSHED

NORFOLK COUNTY

WALPOLE, MASSACHUSETTS

Prepared and Investigated by :



Peter F. Thorbahn
Department of Anthropology
University of Massachusetts/Amherst



Description

The Allen Site is located in Walpole, Massachusetts, approximately 6/10 of a mile south of the intersection of High Plain and Washington Streets. It is bounded on the north and east by Baker Street and Old Post Road, on the south by Walpole Country Club and on the west by Washington Street. It is roughly one square mile in area. The low point of the site is 177.3 feet above mean sea level at Spring Brook and the highest points are 202 feet in the low hills to the northeast and southwest. Most of the Allen Site is made up of the drainage basin of Spring Brook and this is surrounded on the north, east and south by low hills. Allens Pond is the only body of open water on the site, but it is not natural (see below). The water table is at the surface in all areas 184 feet or less in elevation, which is most of the drainage basin (see Plates 1 & 2 and Figure 1.).

The soils in the Allen Site can be divided into two general types. In the drainage basin the soils are primarily sediments and muck soils. The hills around the basin are characterized by a sand matrix with low clay concentrations above a base of glacial sands and gravels. A more detailed analysis is found in Klingelhofer and Mills' Geology Report (1971). The hill sides are too steep and their crests too narrow for prehistoric or historic farming. The lower area of the site is likewise unsuitable because of the high water table.

There are two major plant communities within the Allen Site. A Spruce-Maple Swamp complex is found in the drainage basin. The major woody species are Black Spruce, Red Maple, Pin Oak and Swamp Oak. Marsh grasses thorny shrubs are the principal ground cover (Plate 3). On the hills there is a Mixed Mesic Lowland community dominated by White Pine, Red Maple, Scarlet and Pin Oaks. There is little herbaceous ground cover, the forest floor being covered with duff and litter (Plate 4).

Avifauna in the site is abundant, and although only overwintering species were observed, this abundance is undoubtedly also the case in summer. The most frequently observed species were Chickadees, Nuthatches, Brown Creepers, Blue Jays, House Sparrows, Hairy and Downy Woodpeckers. The most common mammalian species would be Woodchucks, Chipmunks, Rabbits and Grey Squirrels in the hills and Muskrats. Spring Brook is too small to support a large permanent fish population, but before dams were constructed downstream, it is possible that Alewife or Herring may have spawned in Spring Brook. Other economically important animal species such as White Tailed Deer and Wild Turkey are not found in the area now, but also may have been present in the past. In sum, the Allen Site is less diverse and productive than it was in the past because of the high human population density in the vicinity, but in early historic or prehistoric times, it may not have been much more attractive for exploitation of natural resources.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It is essential to ensure that every entry is properly documented and verified. This process helps in identifying any discrepancies or errors early on, allowing for prompt correction and ensuring the integrity of the financial data.

Furthermore, the document emphasizes the need for transparency and accountability. All stakeholders should have access to the relevant information, and any changes or updates should be clearly communicated. This approach fosters trust and ensures that everyone is working with the most current and accurate data available.

In addition, the document highlights the significance of regular audits and reviews. These periodic checks are crucial for validating the accuracy of the records and identifying any potential areas of concern. By conducting thorough audits, organizations can gain valuable insights into their financial performance and make informed decisions based on reliable data.

Overall, the document serves as a comprehensive guide for managing financial records effectively. It provides clear instructions and best practices to help organizations maintain accurate, transparent, and reliable financial information throughout their operations.

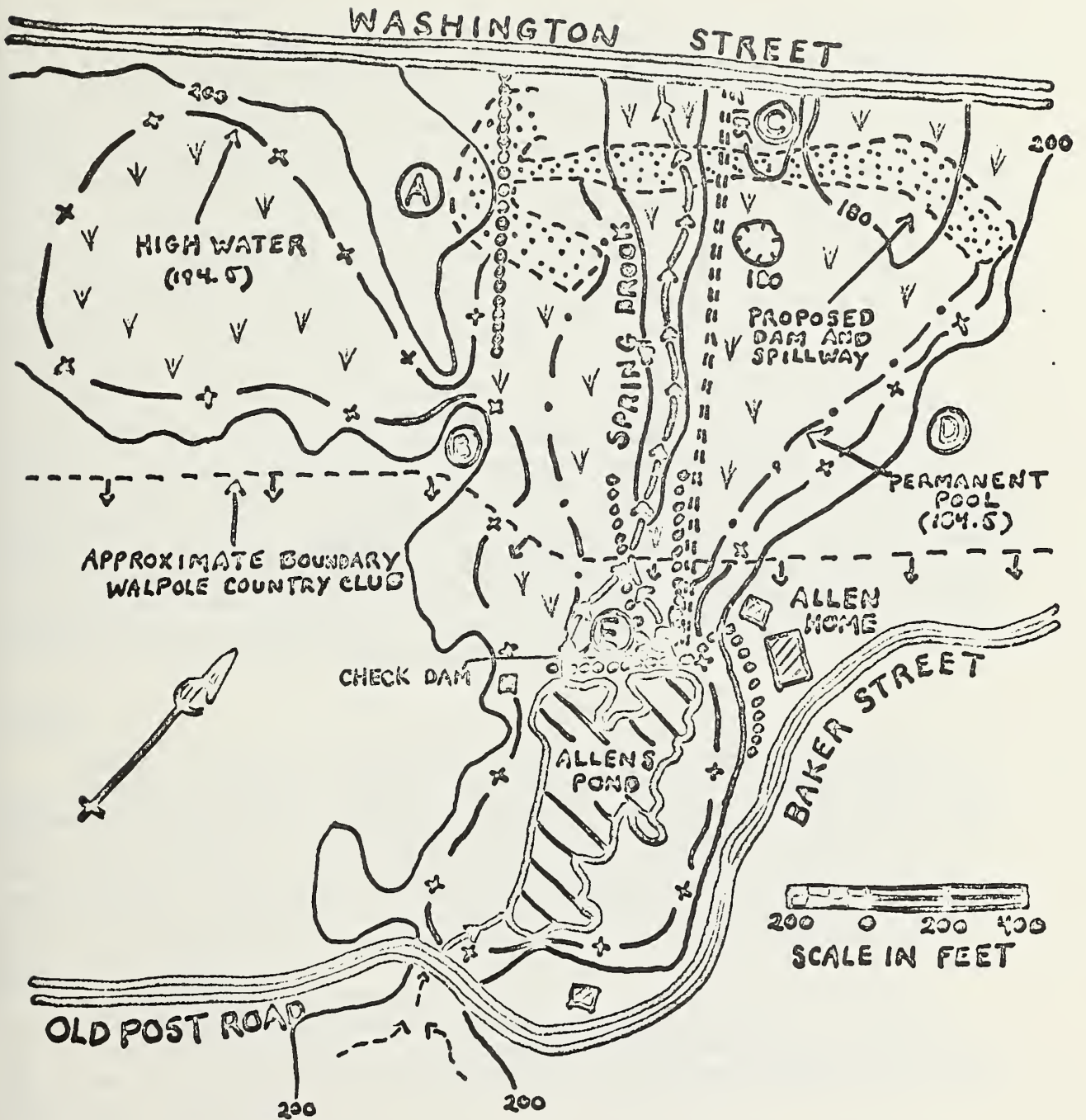
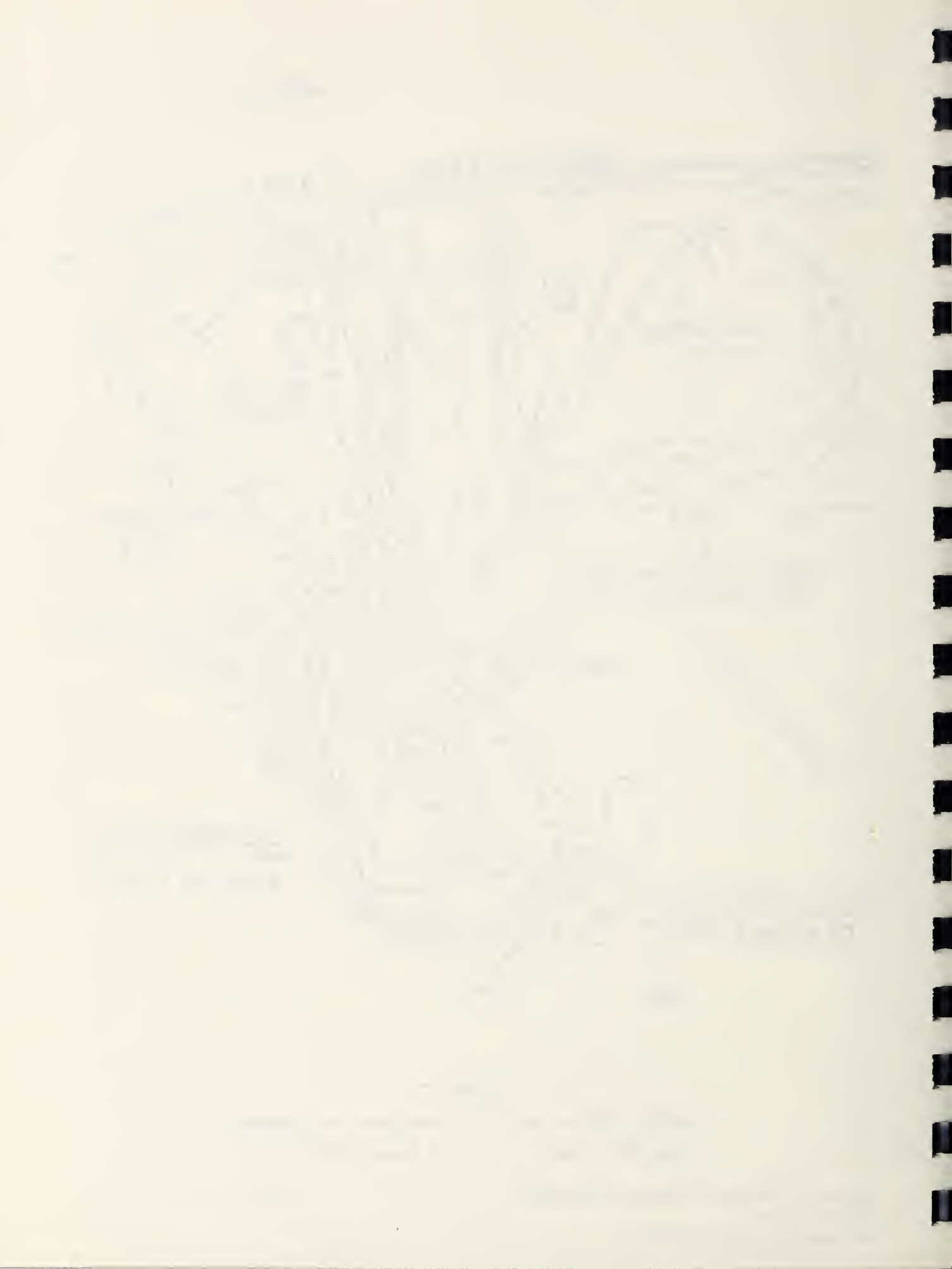


FIGURE 1

ALLEN SITE - Existing Features and Proposed
Dam, Spillway, Pool, and Design High Water



In terms of industrial or commercial potential, it has already been noted that the site is unsuitable for agriculture. The volume and flow of Spring Brook this far upstream was probably too low for milling operations without extensive water control technology. Since higher quality water power is available a short distance downstream and on the Neponset River nearby, it is unlikely that the site attracted industry based on water power in the historic period. Logging undoubtedly took place in the past, but this was largely limited to the hills since the wetlands would have discouraged commercial logging activity. The only commercially valuable mineral known in the site is bog iron, and more will be said about this later. Here again the site does not seem to possess a high potential for historical industry, just as its wild resources in the past probably did not hold any outstanding attraction.

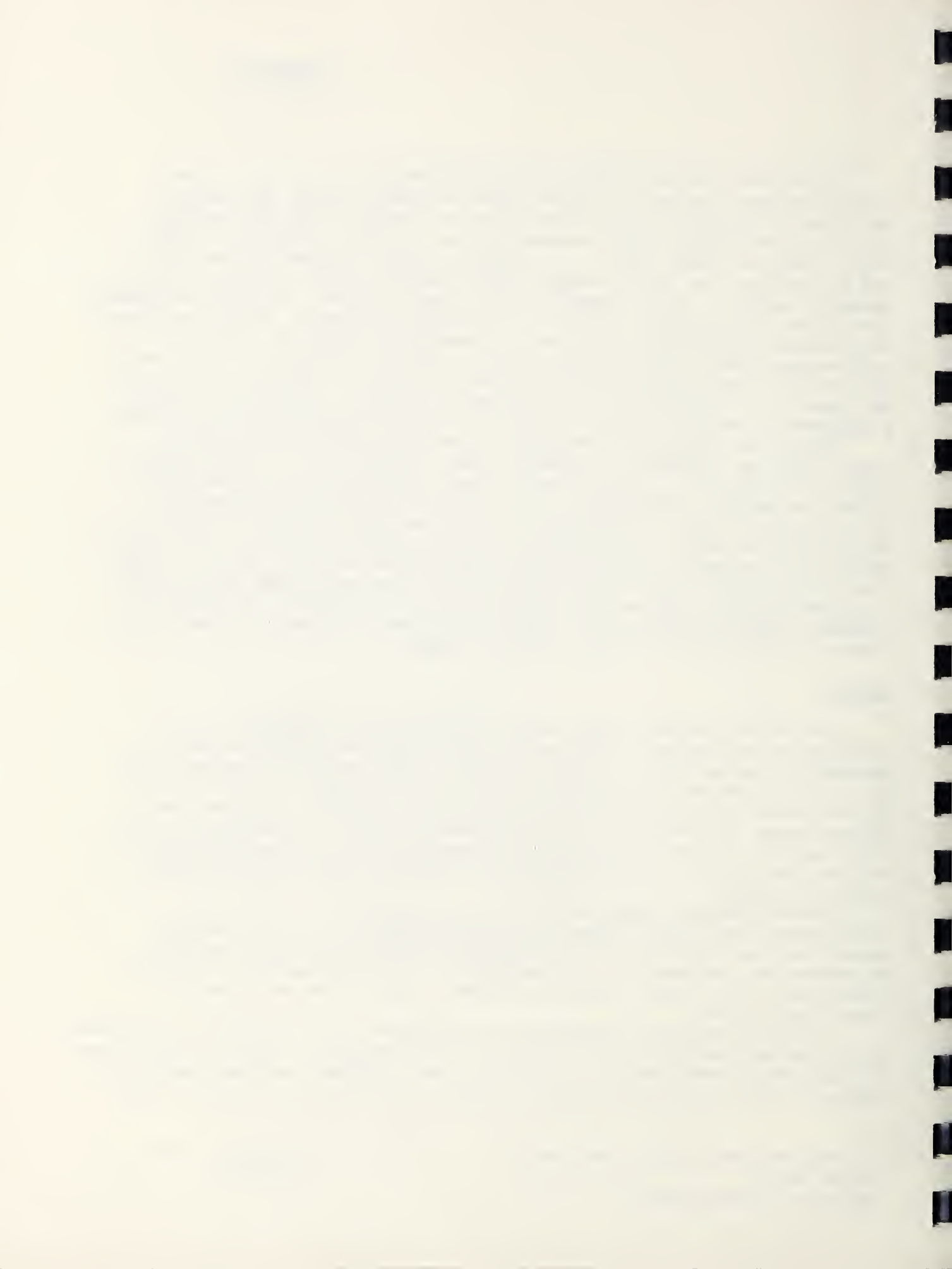
The major feature of the site is that it is highly disturbed. Nearly half of the area is presently under construction of fairways for Walpole Country Club. The section between Allens Pond and Washington Street is largely undeveloped, but it has been completely logged over in the recent past. I estimate in a rough way that from the size of standing trees that no individual tree is over 70 years old. Even Allens Pond is not natural. When the Allen family took over the property from the Fales in 1898, one of the first things done was to dam Spring Brook sometime near the turn of the century to create the pond for aesthetic purposes (Phillip Allen-pers. comm.). This has undoubtedly altered the course of Spring Brook within the site area.

Method

The archeological survey was conducted in three stages. First a documentary review was conducted at the library of the University of Massachusetts/Amherst. Also oral data was collected in interviews with Mr. Walter Vietz of the Walpole Historical Society, Mr. Phillip Allen, former owner of the site, and with Dr. Dena Dincauze, Department of Anthropology, University of Massachusetts/Amherst. The purpose of this stage was to outline the history and prehistory of the general area and to identify historic or prehistoric resources already identified within the site.

Next a walking survey was conducted of the entire Allen Site (with verbal permission from the Walpole Country Club). The walking survey had two objectives - to conduct a limited ecological survey to assess the potential for exploitation of wild and natural resources (discussed above) and to identify surface indications of historic or prehistoric sites.

Finally, subsurface sampling was conducted. This was done by augering, test pits and test trenches in areas A, B, C, and D of the site (see Figure 1). All these areas are in the hills to the northeast and southwest of Spring Brook, outside the boundary of the Country Club. Only the hills



APPENDIX D

were sampled because the swampy area is unsuitable for human habitation. In areas A, B and C, three 2' X 2' test pits were dug in each area. These were placed in a rough triangular pattern approximately 20 feet to a side on the level sections of the hills. One test trench was put in area C. No test pits were put in area D because this section of the site is on hill side and the slope would dictate against a habitation site. All areas were extensively tested with a soil auger to a depth of two feet in a uniform pattern with a minimum of ten feet between auger samples. The purpose of these activities was to obtain a characteristic soil development profile for the upland portion of the site, and to identify any subsurface indications of human activities such as soil anomalies or artifacts.

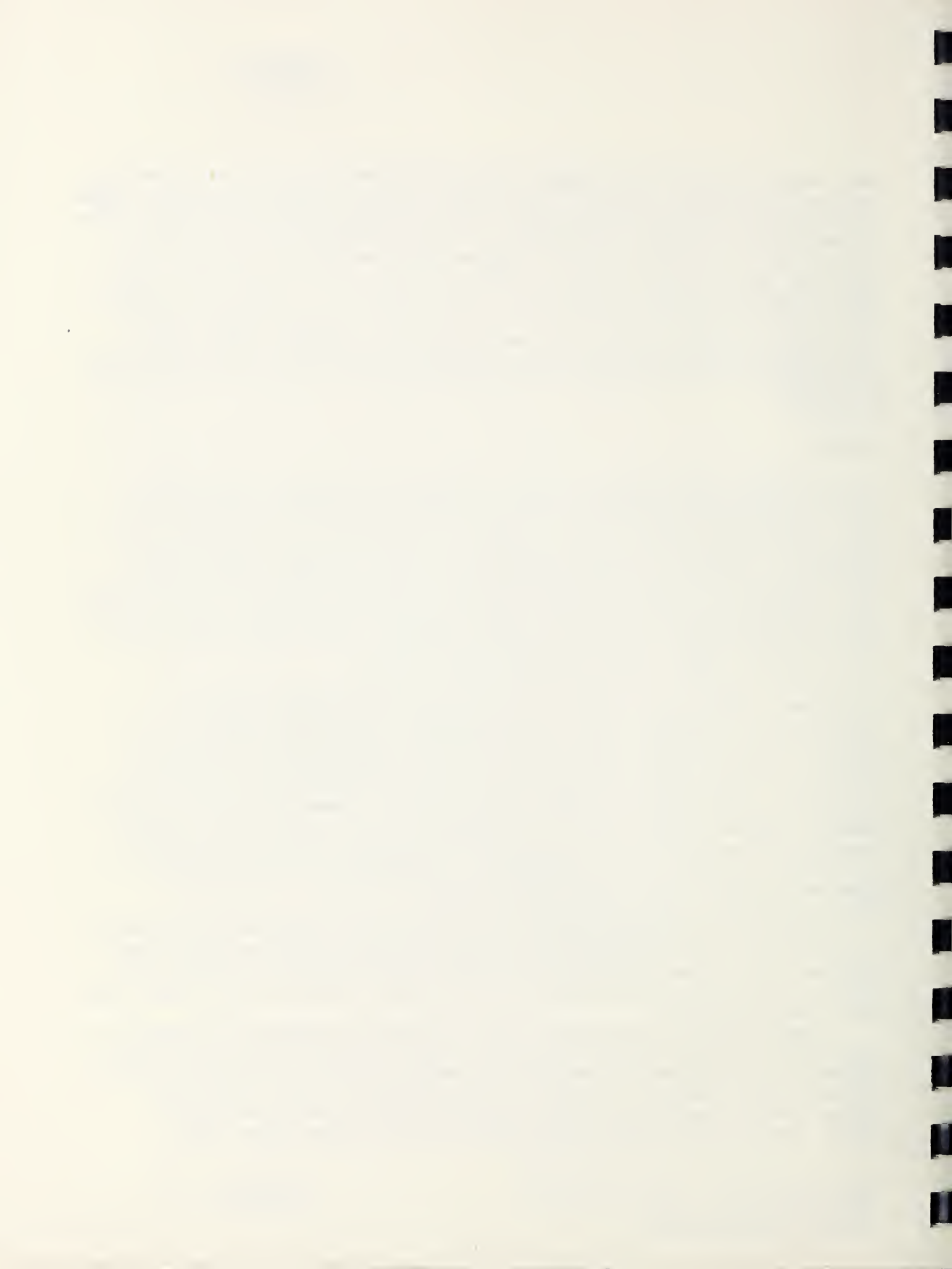
Results

In this inland region of southeastern Massachusetts, the most important area for prehistoric exploitation was probably the Neponset River drainage. Northeast of the Allen Site, a number of Archaic sites are found on elevation above or within the flood plain of the Upper Neponset. These were probably bases from which hunting, fishing and gathering activities were conducted on a seasonal basis. The region is less suitable for horticultural activity because it exhibits many of the same characteristics found in the Allen Site - high water tables in the lowlands and broken topography in the uplands. Few Woodland sites are known for the region (Dena Dincauze-pers. comm.).

Early colonial records indicate that besides the Neponset (or Ponkapoag) Indians who lived in the immediate vicinity, both the Wampanoag and Massachusetts Indians claimed territorial rights in the Walpole area. In fact, there was sufficient interest in the Upper Neponset that in a deed dated 1685, Josias, grandson of Chickatabut, assigned all his tribe's rights to the Town of Dedham with the unusual exception of 200 acres of land surrounding the present day Bird Pond in Walpole, which is about one mile northeast of the Allen Site. Josias' reasons were not stated, but perhaps he wanted to insure access to an unusually productive area for hunting and fishing. In addition, Old Post Road which bounds the site on the east was said to have been a principal indian trail (DeLue 1925:3-18).

Although the regional prehistory and history indicates a good deal of activity in the general area, I think it is possible to argue that because of the close proximity of high potential areas, the Allen Site held no great attraction because other nearby areas were relatively that much more attractive.

Spring Brook is mentioned in the industrial history of Walpole as early as the second half of the 17th century. Bog iron deposits were worked for forges located in the town center to the west. In the 1740's Ebenezer Fales built a saw mill on the stream, and the industry on Spring Brook expanded throughout the 19th century with the Diamond Cotton Factory, the Smith Machine Shop and the Allen Twine Mill.



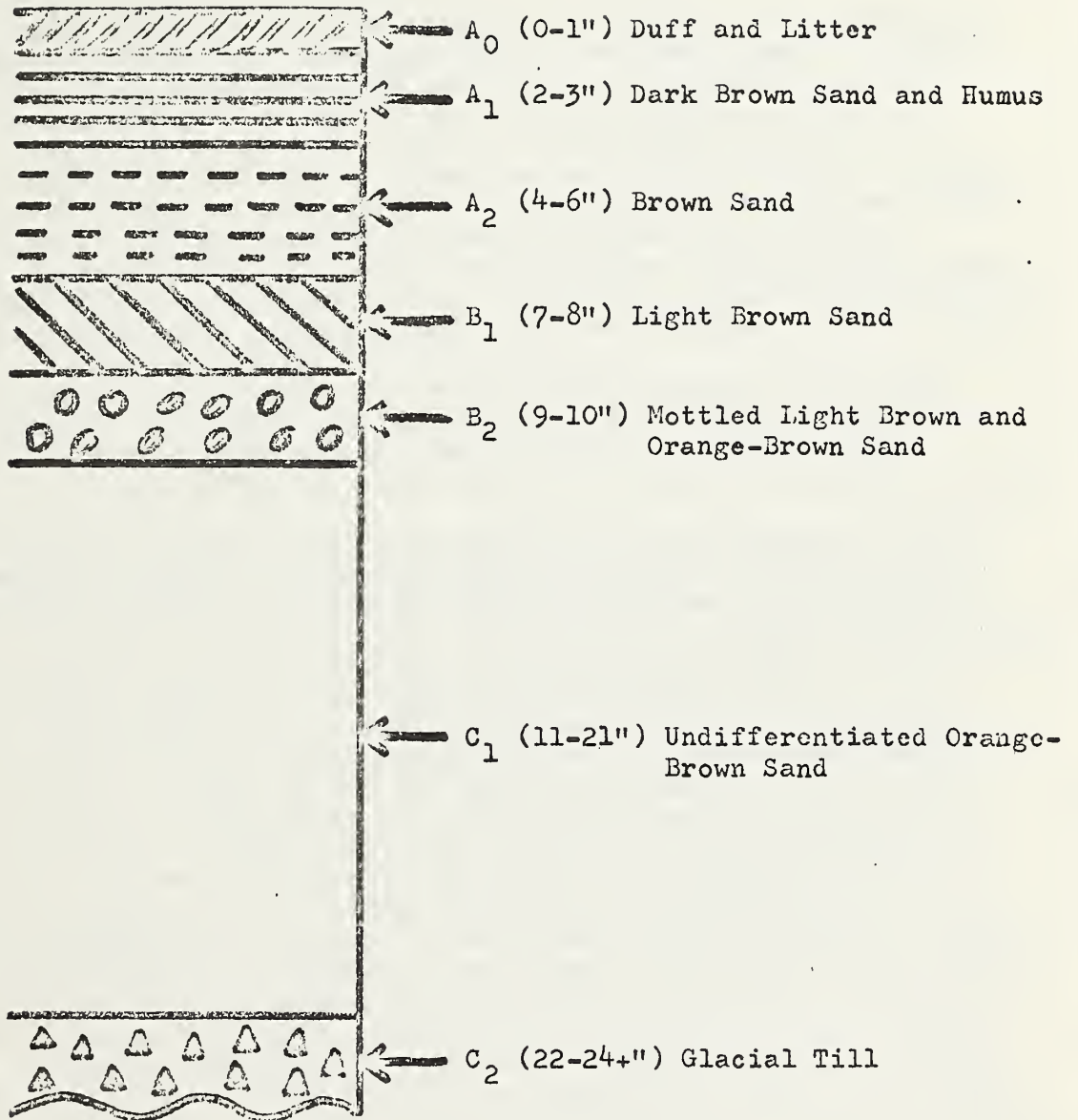


FIGURE 2. Typical Upland Soil Development Profile
(Taken from Area A - Elevation 200')



APPENDIX D

However, all these industries were closer to the center of Walpole, at least half a mile downstream of Washington Street (Ibid:241-43, 270-71). Most of the locations are confirmed for the 19th century by the Norfolk County Atlas of 1876.

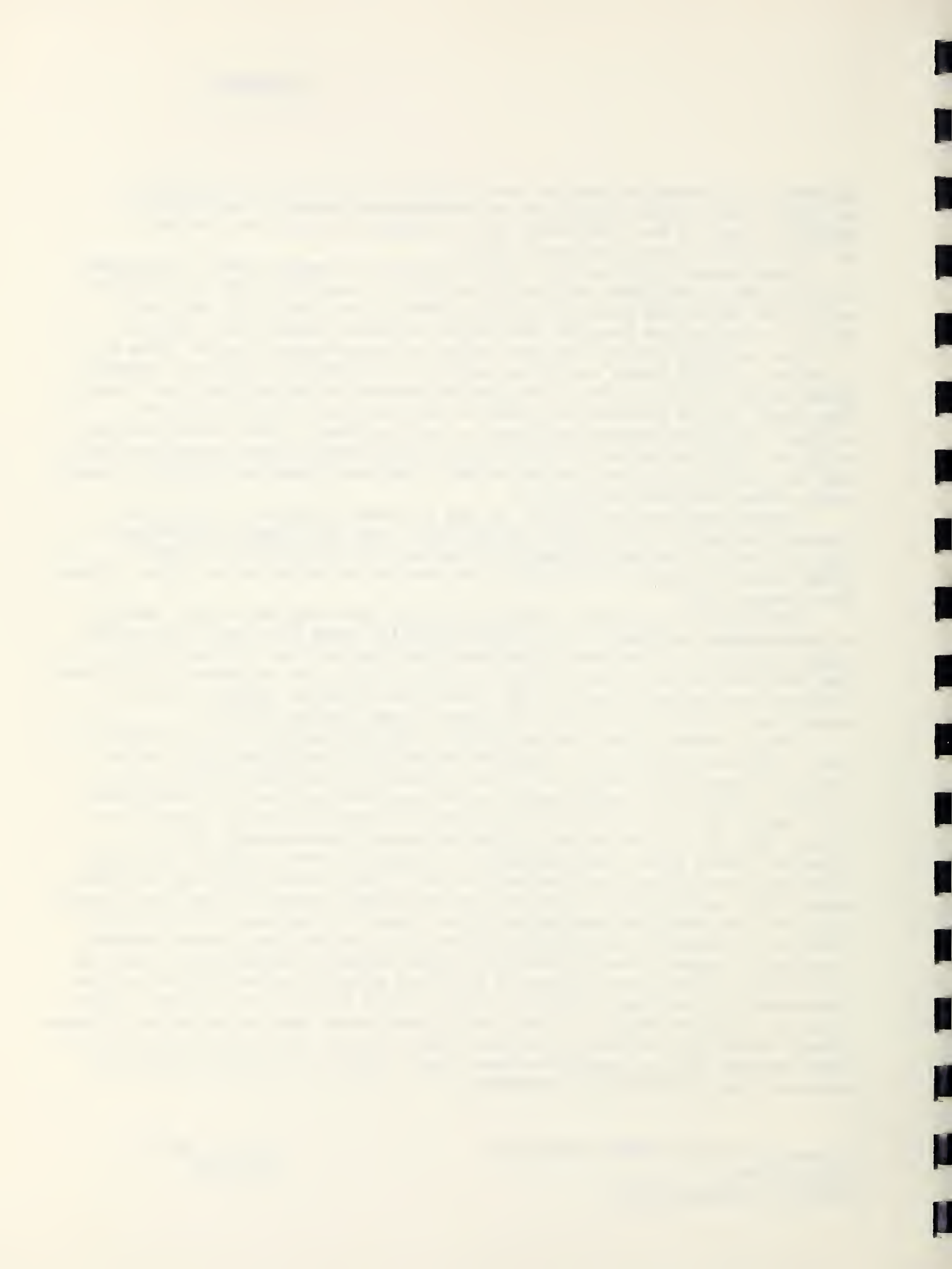
Once again it seems that the potential of nearby areas outweighed the resources available in the Allen Site. A bog iron mine is said to be behind the Allen home which was worked up to the Civil War, but this is outside the area of the survey (Phillip Allen-pers. comm.).

The walking survey produced only two archeological sites. Area E contains a field stone check dam across the northern outlet of Spring Brook below the Allen Pond Dam, and of course the Allen Pond Dam itself. The check dam is between two field stone walls which parallel the stream for approximately 400 feet to the northwest. This structure was built in 1915 for a water wheel at the check dam to generate electricity for the Allen house and the walls were for stabilization (Phillip Allen-pers. comm. and see Plate 5).

There are no sites listed in the National Register of Historic Places (National Park Service 1972,1974), and the Walpole Historical Society has no record of a site in the survey area (Walter Vietz-pers. comm.). Finally, Phillip Allen knew of no sites of any type within the survey area.

The soil development profile obtained from the subsurface survey is diagrammed in Figure 2. No sample profile from the test pits or the auger revealed a plow zone. This confirms the earlier statement that the area in the site was unsuitable for farming. No evidence for cultural activity was found in any of the test pits or auger samples with one exception - Test Trench 3C (see Figure 3 and Plates 6 & 7).

Test Trench 3C was put in after a smaller test pit had revealed a very high concentration of charcoal extending from immediately below the duff layer to a depth of 8". The trench was actually two 5' X 2' trenches joined at right angles on N-S and E-W axes and was excavated to a depth of 15", at which point sterile glacial gravels occur. The trench was in the center of a circular area approximately 35' in diameter where high concentrations of charcoal were found by augering. This area containing the charcoal is on a low rise projecting into the swamp from Washington Street and the northwest corner of the test trench was 140' due south of Washington Street and 97' due east of the dirt road which connects the Allen property with Washington Street (general location is area C - see figure 1). Three distinct levels were found in the trench. First was a layer of wood ash mixed with sand, then a layer dominated by charcoal with many large pieces intact and finally a thin lens of oxidized sand. The width of these levels was variable and in some places were intermingled. The excavated soil was screened through a 1/4" mesh screen, but no artifacts were found. Many of the large pieces of charcoal were sections of branches.



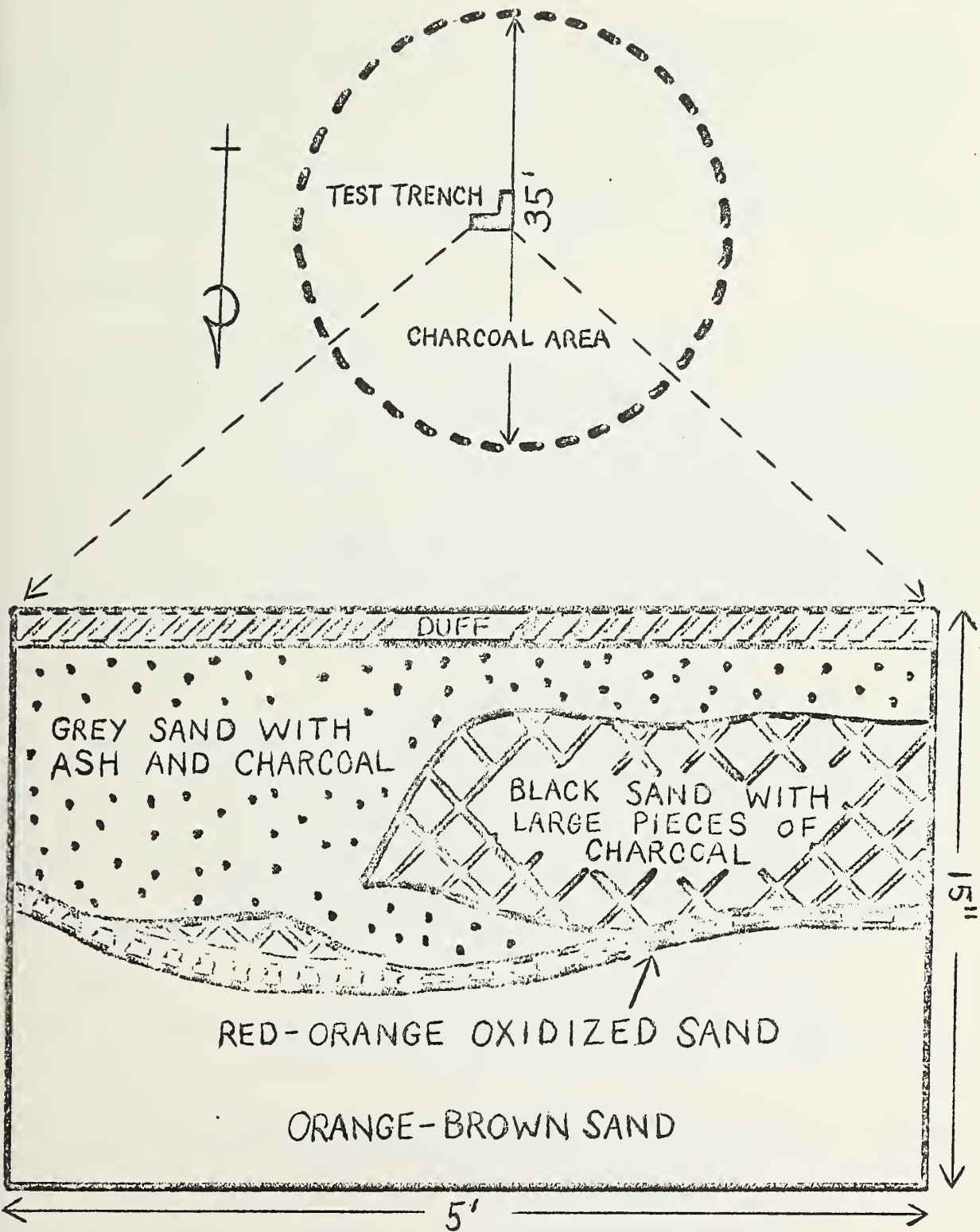
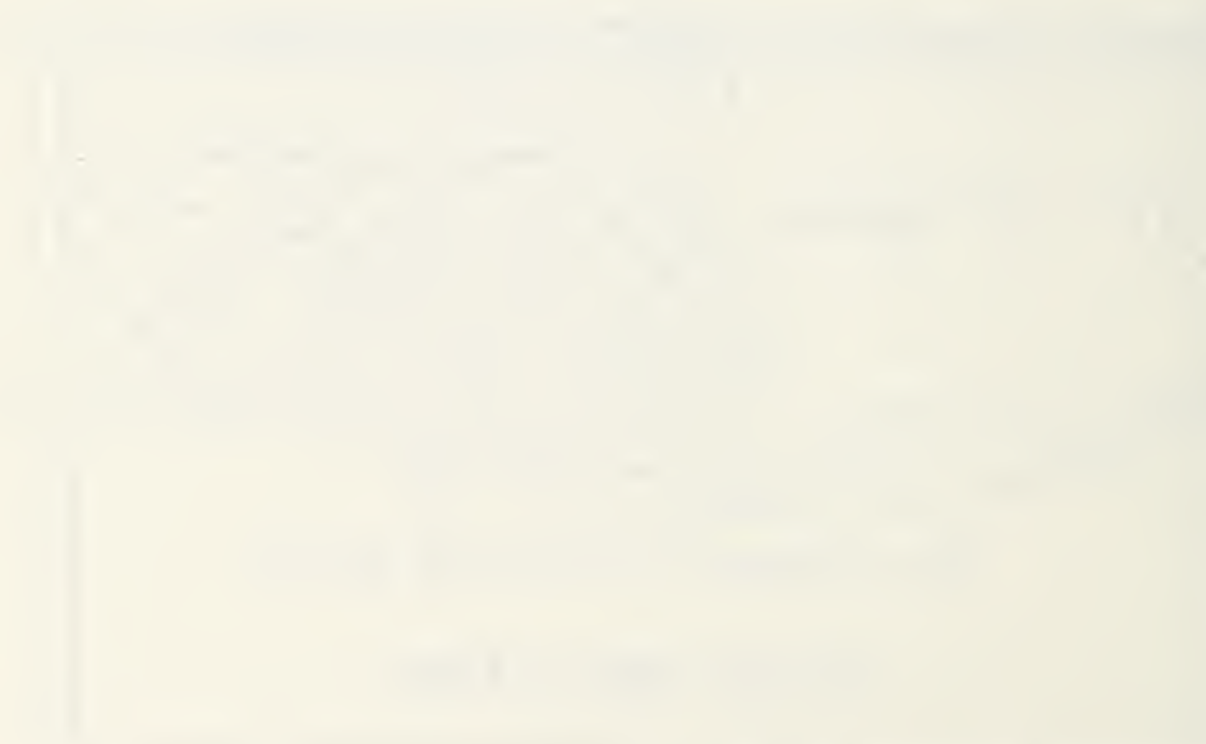


FIGURE 3. Charcoal Area and North Wall Profile of Test Trench 3C



The area is too large to have been a prehistoric hearth and the depth of the charcoal and its occurrence immediately below the surface make it unlikely that it could be a series of hearths. The absence of any artifacts make it doubtful that this could have been an historic or prehistoric structure which burned. All indications point to a shallow pit in which a large quantity of brush was burned. In fact, the DPW did this in several locations along Washington Street in the mid 1950's when the road was widened (Phillip Allen-pers. comm.), and I believe this is the most plausible explanation.

Estimation of Environmental Impact

At least half of the survey area has already been disturbed by the construction of the Walpole Country Club, but it is very doubtful that any significant historic or prehistoric sites were in this section since it was wetland prior to the creation of Allens Pond. My survey did not reveal any cultural resources of prehistoric or historic significance in the undisturbed section of the Allen Site. Since the major planned alteration will be the flooding of existing wetland, possible detrimental impact on this section is negligible. Removal of fill from borrow areas in the survey area may expose and disturb subsurface sites not located in this survey, however I believe there is a low probability of this taking place. In short, the impact of the Allen Site project on historic or prehistoric cultural resources is minimal.

Recommendations

It is my assessment that the Allen Site Project can proceed without any further archeological work being conducted because I believe that no significant historic or prehistoric resources exist within the Allen Site. However, on the basis of region history and prehistory, the existence of such resources cannot be totally ruled out. Therefore, I would recommend that the construction crew on this project be made aware of this possibility, especially when removing fill from borrow areas, and if any indication of a subsurface site is found, a professional archeologist should be consulted before work continues.

References

- DELUKE, W. (1925) The story of Walpole, Ambrose Press, Norwood Mass.
 KLINGELHOFER, K. & MILLS, D. (1971) Geology report, Allen Site, SCS, Amherst, Mass.
 NATIONAL PARK SERVICE (1972&1974 suppl.) National Register of historic places, Dept. of the Interior, Washington, D.C.
 NORFOLK COUNTY (1876) Norfolk County Atlas, Dedham, Mass.



The Commonwealth of Massachusetts APPENDIX E

Office of the Secretary

Massachusetts Historical Commission

John F. A. Davoren

Secretary of the Commonwealth

7-7-7-Street

40 Beacon Street

Boston, Mass. 02108

December 18, 1972

Dr. Benjamin Isgur
State Conservationist
Soil Conservation Service
United States Department of Agriculture
29 Cottage Street
Amherst, Massachusetts 01002

Dear Dr. Isgur:

Thank you for sending copies of the draft watershed work plan and the preliminary draft environmental statement for the Diamond-Traphole Brooks Watershed, Norfolk County, Massachusetts. I have reviewed these documents on behalf of the Massachusetts Historical Commission and wish to offer the following comments.

As stated on page 4 of the environmental statement, there are no properties of historical or archeological value listed in our present inventory that would be affected by installation of the structural measures of the project, nor are there any properties within the watershed listed in the National Register of Historic Places. The major question seems to be archeological, in light of the fact that there has been no archeological survey of the areas affected by the project. You are to be commended for the statement that "if evidence is found prior to, or during construction, that historical or archeological values exist that may be affected, the National Park Service and the Massachusetts Historical Commission will be notified. Construction would not begin or be continued until necessary actions have been taken." Despite these safeguards, I would suggest contacting the State Archeologist at this stage. He might have information unavailable to us or might be able to arrange to have someone look over the site. He is Dr. Maurice Robbins, Bronson Museum, 8 North Main Street, Attleboro, Massachusetts 02703.

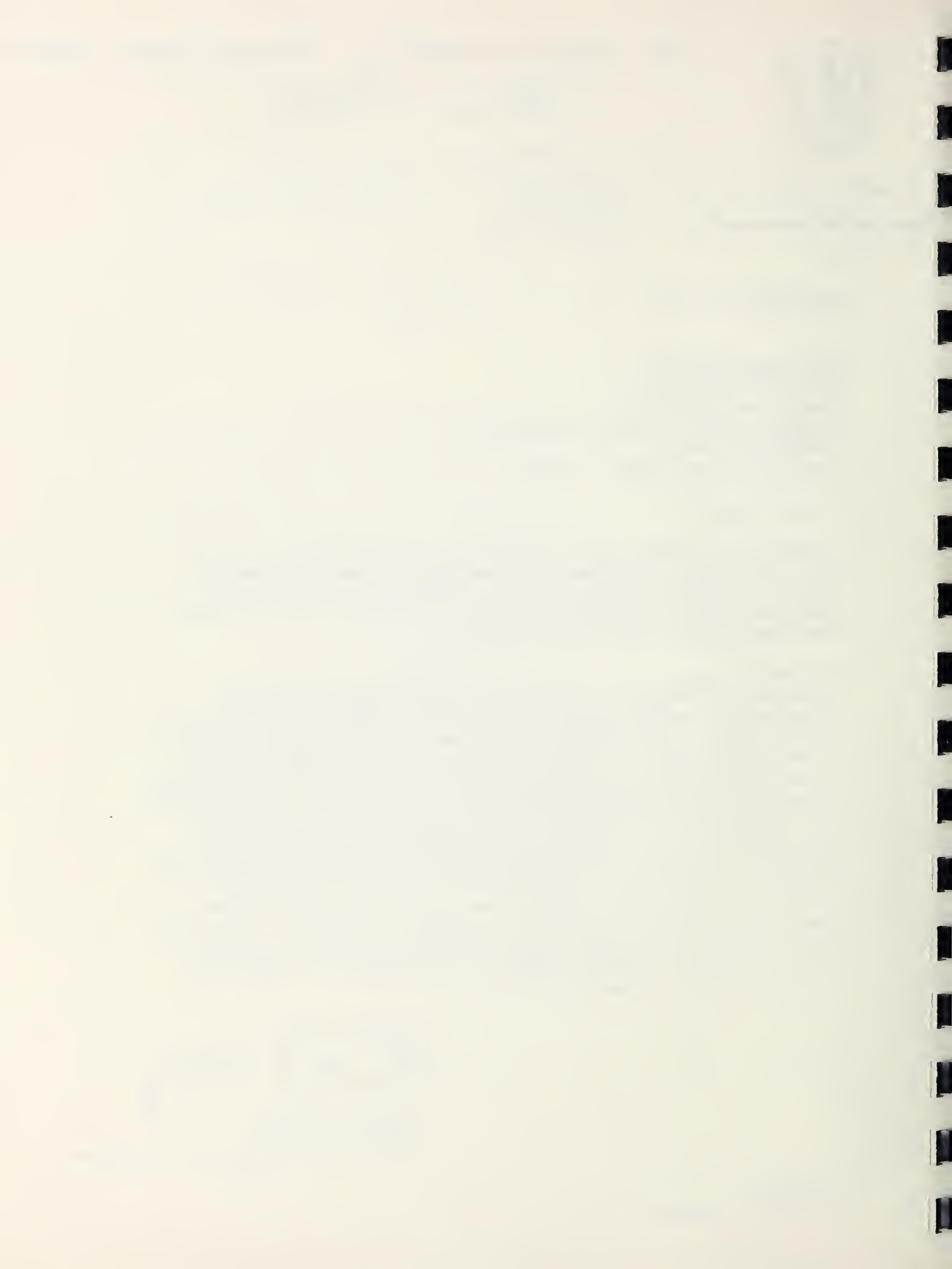
Sincerely yours,

Robert B. Rettig

Robert B. Rettig
Executive Director
Massachusetts Historical Commission

RBR/akc

cc: Dr. Robbins





The Commonwealth of Massachusetts

Office of the Secretary

State House, Boston 02133

John F. X. Lawson

Secretary of the Commonwealth

OFFICE OF THE STATE ARCHAEOLOGIST
BRONSON MUSEUM, 8 NO. MAIN ST.,
ATTLEBORO, MA. 02703

February 19, 1973

United States Department of Agriculture
Soils Conservation Service
20 Cottage Street
Amherst, Massachusetts

Att. Dr. Benjamin Isaac
State Conservationist

Dear Dr. Isaac :-

I have the material concerning the Diamond-Trenchole Brooks Watershed, Norfolk County, Massachusetts. I have compared the area with our survey maps and find no archaeological sites directly in the area affected.

However, we have alerted our field research man responsible for that area and he will resurvey the area as soon as surface conditions allow. If he should find evidence not as yet recorded I will transmit his report to you.

Thank you very much for providing us with the opportunity of investigating this proposed project.

Very truly yours

Maurice Robbins
State Archaeologist

MR/clr

