

RESOLUTION

RESOLUTION: TO ADOPT THE HISTORIC RESOURCE CHAPTER OF THE DOVER MASTER PLAN

WHEREAS: The Planning Board and Planning Department have written and completed in accordance with RSA 674:3, a Chapter of the Dover Master Plan entitled Historic Resources; and

WHEREAS: A concerted effort was undertaken to include participation by the general public; and

WHEREAS: A formal public hearing on said Chapter, in accordance with RSA 675:6, was held before the Planning Board on December 13, 1988 and January 10, 1989.

NOW THEREFORE, BE IT RESOLVED BY THE DOVER PLANNING BOARD THAT:

1. The Master Plan Chapter entitled Historic Resources be adopted and certified in accordance with RSA 674:4; and
2. The Planning Board Chairman is authorized to sign and label as "adopted" the final reproduced documents of said Chapter; and
3. The Planning Department is authorized to develop an abbreviated summary of the said Chapter.

January 24, 1989
Date of Planning Board Action

Harold Ruston
Planning Board Chairman

Motion to approve by: Atis Perry

Seconded by: Mike McInnell

Board members in favor: 7 present

Board members opposed: None

RESOLUTION

RESOLUTION: TO ADOPT THE OPEN SPACE/RECREATION AND NATURAL RESOURCES CHAPTER OF THE DOVER MASTER PLAN

WHEREAS: The Planning Board and the Planning Department have written and completed in accordance with RSA 674:3, the Open Space/Recreation and Natural Resources Chapter of the Dover Master Plan; and

WHEREAS: A concerted effort was undertaken to include participation by the general public; and

WHEREAS: A formal public hearing on said Chapter, in accordance with RSA 675:6, was held before the Planning Board on December 13, 1988.

NOW THEREFORE, BE IT RESOLVED BY THE DOVER PLANNING BOARD, THAT:

1. The Master Plan Chapter entitled Open Space/Recreation and Natural Resources is adopted and certified in accordance with RSA 674:4, and
2. The Planning Board Chairman is authorized to sign and label as "adopted" the final reproduced documents of said Chapter, and
3. The Planning Department is authorized to develop an abbreviated summary of the said Chapter.

December 20, 1988
Date of Planning Board Action

Harold Preston
Planning Board Chairman

Motion to approve by: Kevin Mone

Seconded by: Oits Perry

Board members in favor: All eight in attendance

Patricia Torr, absent

Board members opposed: None

TABLE OF CONTENTS

	PAGE
NATURAL RESOURCES/OPEN SPACE/RECREATION: GOALS AND OBJECTIVES	1
SECTION ONE: FORESTS, FISH AND WILDLIFE, AGRICULTURE	5
FOREST RESOURCES	7
Recommendations	11
FISH AND WILDLIFE RESOURCES	15
Estuarine (Coastal) Habitat	15
Inland and Freshwater Habitat	21
Summary	25
Recommendations	25
AGRICULTURAL RESOURCES	29
Recommendations	32
SECTION TWO: WATER RESOURCES	37
INTRODUCTION	39
SURFACE WATER AND WATERSHED ASSESSMENT	39
Bellamy River	39
Cochecho River	41
Salmon Falls/Piscataqua River	42
Johnson Creek	42
SURFACE WATER SUPPLIES	43
Existing Supplies	43
Potential Supplies	43
Construction of an Off-Stream Reservoir	43
Direct Withdrawal and Treatment	45
Development of a Regional Surface Water Supply	47
New Hampshire Legislature Classification of Surface Water Quality	47
GROUNDWATER RESOURCES	53
Stratified Drift Aquifers:	53
The Hoppers	53
The Barbadoes Pond Aquifer	54
The Pudding Hill Aquifer	54
The Willand Pond Aquifer	55
The Huckleberry Hill Aquifer	55
The Garrison Road Site	60
BEDROCK GEOLOGY	60
Potential Groundwater Supplies:	61
Sand and Gravel Favorable Zones	61
Bedrock Favorable Zones	62

THREATS TO WATER RESOURCES	65
Non-point Source Pollution	65
Point Pollution Sources	71
Underground Storage Tanks	72
Land Use and Groundwater Protection	72
EXISTING REGULATORY PROGRAMS AND ORDINANCES	75
Subdivision Regulations	75
Health Ordinance	76
Flood Management	76
Zoning Ordinance	77
Site Plan Review Regulations	78
Sewer Ordinance	78
Summary and Evaluation of Regulatory Programs	79
NON-REGULATORY PROGRAMS AND POLICIES	81
Regional Planning	81
Educational Programs	81
Coordination with Adjacent Communities	82
Household Hazardous Waste	83
Acquisition of Land and Easements	83
SECTION THREE: OPEN SPACE AND RECREATION	91
INVENTORY OF DOVER'S EXISTING OPEN SPACE	94
PRESERVING OPEN SPACE	97
OPEN SPACE PLAN	99
RECREATION STANDARDS	101
INVENTORY OF DOVER'S RECREATION FACILITIES	106
DOVER'S PARKS AND PLAYGROUNDS - INVENTORY AND NEEDS	112
Specific Recommendations for Existing Parks/Playgrounds and Additional Facilities	114
Additional Recommendations for New Recreation Facilities	119
SECTION FOUR: HISTORIC RESOURCES	123
INTRODUCTION	125
WINDSHIELD SURVEY	125
RESULTS: HISTORIC OVERVIEW AND SURVIVING BUILT HISTORIC RESOURCES	126
OBSERVATIONS AND RECOMMENDATIONS	131
Urban Core Residential Neighborhoods	132
Historic Agricultural Areas	133
Transportation	134
Historic Districts	135
APPENDIX	
UNDERGROUND STORAGE TANK INFORMATION FOR DOVER AS OF MAY 27, 1988	139
DOVER WELL AND BORING DATA	

LIST OF TABLES

SECTION ONE: FORESTS, FISH AND WILDLIFE, AGRICULTURE

Annual Timber Harvest for the City of Dover 1981-1987	8
Finfish Captured in Great Bay Estuary July, 1980 to October 1981	18
Bird Species Identified on the Salmon Falls, Cochecho and Bellamy Rivers, July 1980 through June, 1981	19
Fur Bearing Animals Trapped or Hunted in Dover 1980-1986	22
Operational Data, Cochecho Falls Fish Ladder 1976-1986	24
Dover's Commercial Farms	31
Farm Land in Use as of March 1988	35

SECTION TWO: WATER RESOURCES

Piscataqua River Drainage Basin	49
Damsites in the City of Dover 1988	51
Ice Contact Deposit Formations	59
Potential Non-Point Pollutant Sources in Dover and Adjacent Municipalities	69
NPDES Permits Issued in Dover as of 1988	71
Land Parcels Contained in the 400 Foot Municipal Well Radius	84

SECTION THREE: OPEN SPACE AND RECREATION

Open Space Inventory, Dover, N.H.-1988	94
Recommended New Hampshire Recreation Standards	104
Recreation Facilities Inventory, Dover, N.H.-1988	108
Comparison of Dover's Recreation Facilities to Statewide Standards	113

LIST OF MAPS AND FIGURES

SECTION ONE: FORESTS, FISH AND WILDLIFE, AGRICULTURE

Location of Certified Tree Farms, Dover, N.H.-1988	10
Location of Shellfish Concentrations in Great Bay Estuary 1980-1981	17
Important Fish and Wildlife Habitat, City of Dover 1988	20
Location of Commercial Farms, Dover, N.H.-1988	34

SECTION TWO: WATER RESOURCES

Piscataqua River and Coastal N.H. Basins Location Map	40
Proposed Jackson Brook Water Supply Reservoir and Treatment Facility	44
Dam Sites in the City of Dover 1988	50
Principal Aquifers and other Glacial Deposits - City of Dover	57
Ireland and Griffin Wells - 400 Foot Radius	86
Smith and Cummings Wells - 400 Foot Radius	87
Hughes Well - 400 Foot Radius	88
Calderwood and 8" Test Wells - 400 Foot Radius	89

SECTION FOUR: HISTORIC RESOURCES

Historic Resources - City of Dover 1988	125
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APPENDIX

Drainage Basin Map - Dover	Map Pocket
Contaminant Threats Analysis	Map Pocket
Hydrogeologic, Geophysical and Favorable Zone Map	Map Pocket
Open Space and Recreation	Map Pocket
Historic Resources - Urban Core - Dover	Map Pocket

NATURAL RESOURCE/OPEN SPACE/RECREATION
GOALS AND OBJECTIVES

GOAL #1

Better protect the environment and natural resources.

OBJECTIVES

- A. Protect Existing and Future Ground Water Supplies
- B. Protect Potential Surface Water Supply
- C. Prevent Soil Erosion
- D. Protect River Corridors
- E. Protect Wildlife Habitat
- F. Protect Wetlands
- G. Manage Forest Lands
- H. Better Regulate Mineral Extraction

GOAL #2

Provide sufficient recreation land and facilities to service the City's existing and projected population.

OBJECTIVES

- A. Identify appropriate amount of land and facilities needed to serve existing and project population.
- B. Identify type of recreational facilities needed.
- C. Develop a plan for achieving the appropriate type and level of recreation land and facilities.

GOAL #3

Preserve adequate open space to protect natural resources, maintain aesthetic quality and insure quality of life.

OBJECTIVES

- A. Identify amount and type of open space needed to provide for existing and projected population.
- B. Develop a plan for achieving amount and type of open space.

GOAL #4

Promote regional management of natural resources.

OBJECTIVES

Promote regional development of recreation facilities,
management of natural resources.

- A. Identify recreation facilities which would be best provided at a regional or multi-town level.
- B. Identify natural resources/open space areas which require regional protection.
- C. Work with appropriate regional, state and local agencies to achieve the desired natural resource, open space and recreation needs.

NATURAL RESOURCE/OPEN SPACE/RECREATION
WORK TASKS

1. Map groundwater protection zones.
2. Develop and adopt groundwater protection ordinance.
3. Map wetlands.
4. Develop and adopt wetland protection ordinance.
5. Create conservation/environmental officer's position to enforce environmental protection regulations.
6. Develop erosion control ordinance.
7. Define and identify the City's fish and wildlife habitats.
8. Educate property owners about the benefits of Natural Resource Protection and Management.
9. Identify suitable tracts of land to perform forest management.
10. Include land acquisition program in Capital Improvements Program.
11. Promote a high level of participation in appropriate grant funds (Land and Water Conservation Fund, Coastal Zone Management, Local Conservation Investment Program, etc.)
12. Develop subdivision regulations which address recreation and open space exactions.
13. Develop landscaping and tree cutting regulations.
14. Inventory existing recreation facilities and open space areas.
15. Pursue county-wide park and/or conservation easement on Strafford County land in Dover.
16. Purchase B & M right of way from Rt. 108 to Third Street yard.
17. Develop and adopt minimum recreation standards (subdivision and site review)

18. Project population and recreation needs to year 2020.
19. Develop a 5-year program of recreation facilities using capital outlay in the operating budget or Capital Improvement Program as applicable.
20. Identify and establish priority areas of open space for purchase or easement attachment.
21. Evaluate city-owned parcels of land for conservation/recreation potential.
22. Evaluate existing regulatory mechanisms in Dover for protecting natural resources.

Section One

**FORESTS
FISH AND WILDLIFE
AGRICULTURE**

FOREST RESOURCES

As Dover becomes more urbanized, greater and increasing pressures will be exerted to convert undeveloped areas of the City into a variety of man-made land uses. Forested land is one of the resources which is continually being transformed into the built-up land area of the City.

For many people forested land represents only the space between the built-up areas in which we spend most of our lives. However, in addition to its potential for passive recreation, forest land provides a host of environmental services among which are the following:

- stabilization of soil preventing erosion and retardation of water runoff;
- provides oxygen to the air and filters out dust;
- stabilizes the water table which protects watersheds and drinking water supplies;
- provides support and protection for numerous wildlife species;
- provides shade in summer and wind protection in winter;
- provides visual diversity, color and contrast to the landscape.

Forest resources are probably one of the more overlooked natural resources. In a population center the size of Dover, little attention is paid as the forested lands are cut back in an incremental fashion to make room for more housing or other non-residential uses. The loss of forested land is also less noticeable because Dover is surrounded by other municipalities which still have an abundance of forest land.

This type of incremental encroachment on the City's forest resources has taken its toll however. An inventory conducted by the University of New Hampshire indicates that in 1953 approximately 6,935 acres or 38% of Dover's land area was forested. By 1974, twenty-nine years later, this figure had decreased only 580 acres to 6,355 acres. In 1982, however, total forested acres in Dover had dropped to 4,230 acres (23%). This means that in the eight year period between 1974 and 1982, approximately 2,705 acres had been cut down or about 338 acres annually. This represents a loss of 30% of the City's 1953 forested acres. The period between 1982 and 1987 has probably been the most explosive growth period which the City has encountered. Therefore, it is likely that this trend towards the rapid loss of forest land is still continuing.

Dover's forests can be divided into three major categories: conifers, hardwoods and mixed. No major portions of this cover consists of virgin stands of trees which is a reflection of the important role that the lumber trade and produce played in Dover's economy from the time of it's founding up until the end of the eighteenth century.

Conifers in this region consist primarily of white pine, hemlock, red pine, spruce and pitch pine. The hardwoods are made up for the most part of red oak, red maple, beech, white birch, ash and white oak. The mixed stands, as the name implies, constitute a combination of the foregoing with a general predominance of red oak, red maple, white pine and hemlock. Throughout Dover and the region white pine is the predominant tree, followed by hemlock, red oak and red maple.

Due to the fact that Dover has very little mature forest land, there is not much opportunity for any large-scale commercial logging operations. However, Dover's forest land have generated some income for both the City and the property owner as evidenced by information compiled by the NH Division of Forests and Lands, Department of Resources and Economic Development.

The following table shows the amount of timber which was reported as being harvested between 1981 and 1987 within the City.

ANNUAL TIMBER HARVEST
FOR THE CITY OF DOVER
1981 - 1987

	<u>Fiscal Years*</u>				
	<u>1981-82</u>	<u>83-84</u>	<u>84-85</u>	<u>85-86</u>	<u>86-87</u>
Pine (B.F.)	196,969	112,881	63,765	74,517	100,120
Hemlock-Larch (B.F)	4,213	-	2,320	7,559	-
Hardwoods (B.F.)	-	-	8,930	295	-
Pallets/Ties (B.F.)	8,419	-	13,625	-	11,635
Spruce-Fir (Cords)	219	-	-	-	-
Pine (Cords)	67	-	-	-	62
Softwood (Cords)	109	30	-	-	-
Fuel Wood (Cords)	195	-	5	58	5
Chips (Cords)	-	349	94	970	187
Annual Timber Yield					
Tax Received By Dover	\$1,483	\$877	\$804	\$1,073	\$975

Source: Certification of Yield Taxes assessed as submitted to the Department of Revenue Administration.

B.F. - Board Feet (500 B.F. = 1 cord)

* Fiscal years run from April 1 - March 31. No data is available for FY 82-83.

State statute (RSA 79:10) requires all property owners to file a "Notice of Intent to Cut" with the City Assessor before commencing any cutting operation unless the wood is to be used for personal use. The City receives 10% of the assessed stumpage value. The annual harvest and tax yield is illustrated in the preceding table. A conservative estimate would be that this table represents only 50% of the cutting operations which occur annually within the City. This means we have a less accurate inventory of our forest resources and a loss of revenue for the City.

Although there are no large commercial logging operations in Dover, there are several small-scale loggers producing sawlogs, cordwood and chips. In addition, some private land owners have taken on a management role of their forest land as Certified Tree Farmers. This is a program established by the American Forestry Council which encourages private foresters interested in providing the timber industry with good quality raw materials. A certified tree farmer is a landowner with a minimum of ten acres who implements forestry practices such as weeding and thinning of young timber, wildlife enhancement, tree cropping, forest fire and erosion protection.

In Dover there are currently eight certified tree farmers with a total ownership of 512 acres. There is probably an equal amount of land which is being managed but not as part of the tree farm program. (e.g. Strafford County has 30 acres of managed forest land).

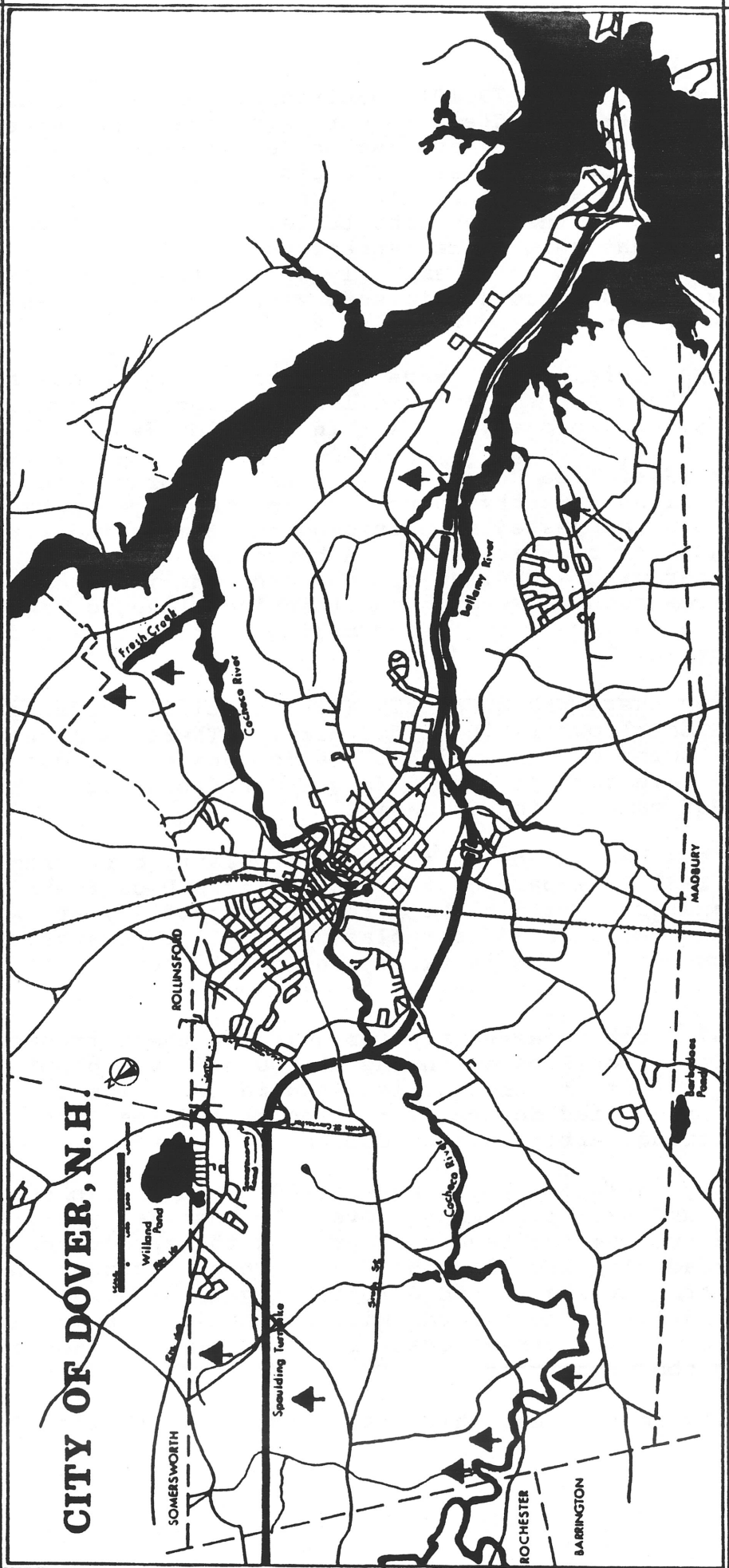
Dover has had an active street tree planting program since about 1980. As part of the Public Works Department's Tree Program, trees within the street rights-of-way are systematical planted or replaced. The City's arborist is responsible for the installation and maintenance of these trees.

In 1987 Dover received the top award in the Community Beautification Program in the 10,000 and over population category from the NH Arborist Association. The City has recently applied for certification as a "Tree City, USA" from the national Arbor Day Foundation.

The City installs approximately 100 trees a year between the spring and fall plantings. Over the past few years the focus of the program has been on improving the appearance of the main roads leading into the City. These include: Both ends of Central Avenue; Sixth Street; Silver; Washington and Portland Ave. The program will now begin to shift its focus to refurbishing street trees in residential neighborhoods within the urban core.

The City cemeteries, which represent one aspect of Dover's

LOCATION OF
CERTIFIED TREE FARMS
DOVER, NH - 1988



▲ CERTIFIED TREE FARM

SOURCE: STRAFFORD COUNTY FORESTER



NEW HAMPSHIRE
NATURAL HERITAGE
INVENTORY

Edie Hentey

1 February 1989

Debbi Burrington
185 Sixth Street
Dover, NH 03820

Dear Ms Burrington:

Thank you for consulting the New Hampshire Natural Heritage Inventory regarding the presence of rare plants, animals, and exemplary natural communities (referred to as "elements") in Dover and in particular, the Royals Cove area. We have no records of elements there. However, other areas do and enclosed is a list of elements known from within the boundaries of your town. The list consists of four columns: The state rank, the global rank, the scientific name, and the common name. We have provided an explanation of the ranking system used by the Heritage Inventory.

Also enclosed is a copy of a USGS topographic map with locations of elements indicated on it by dots. Where sufficient information is available, a grid represents the population area and potential habitat of the element. Natural Communities are also indicated by a grid.

Due to the sensitive nature of some elements, at this time the names on the list will not be directly matched up with the dots and grids. One dot may also represent the location for more than one element. This information will assist you in your initial resource inventory and prioritizing of land for protection.

When your town is ready to formally propose land for protection, more precise information will be provided on the elements found within the boundaries. This information will include the name and exact location of each element, ecological boundaries, and management recommendations. We will also advise you on the sensitivity of the data and the level of confidentiality recommended in the application process.

I urge you to telephone me with any questions you may have about this information. Since each element occurrence presents unique protection problems, more information may be necessary to enable you to identify your protection needs and decide on the appropriate boundaries.

Department of Resources and Economic Development
PO Box 856 CONCORD N.H. 03302-0856

603-271-3623

*Frank
Native
Conservancy*

Many of the elements on the enclosed list have not been reverified by the Natural Heritage Inventory. They are old records with generalized localities, collected from herbaria and museums, whose current status is uncertain. In such cases we will be unable to map this information for you with any precision.

This list can be useful to you. First, the elements may still exist in your town and could be relocated by conducting a biological inventory. Second, the occurrence of these elements gives a clue to what types of habitat exist in your town and provides a basis for planning such an inventory.

The New Hampshire Natural Heritage Inventory, an agency of the New Hampshire Department of Resources and Economic Development (DRED), collects and analyzes data on the status, location, and distribution of rare or declining native plants, animals, and natural communities in the state. Data is collected on over 100 animal species, 300 plant species, and 90 community types. 2400 records of occurrences of these elements are mapped and stored in a computerized database. The Heritage Inventory exchanges data with the Audubon society of NH, the NH Endangered Species Program, and the NH Fish and Game Department. This information is being provided to municipalities as part of the Trust for New Hampshire Lands local initiative project. Dover can play a key role in protecting the state's rare species and habitat. Your interest and efforts are very much appreciated.

Sincerely,



John E. Korpi
Ecologist
NH Natural Heritage
Inventory

SRANK	GRANK	SCIENTIFIC NAME	COMMON NAME	TOWN NAME
S1	G4	ADLUMIA FUNGOSA	CLIMBING FUMITORY	FARMINGTON
SH	G5	MELAMPYRUM LINEARE VAR LATIFOLIUM	COW-WHEAT	FARMINGTON
S1	G5	CAREX BULLATA	INFLATED SEDGE	ROCHESTER
S2	G5	ARABIS MISSOURIENSIS	MISSOURI ROCK-CRESS	ROCHESTER
S2	G4	ISOETES RIPARIA	RIVER BANK QUILLWORT(17)	ROCHESTER

S2	G4	ISOETES ENGELMANNII	ENGELMAN'S QUILLWORT(17)	DOVER (at bank)
S1	G5	LESPEDEZA PROCUMBENS	TRAILING BUSH-CLOVER	DOVER
<i>integrated</i> S2	G5	POTAMOGETON NODOSUS	KNOTTY PONDWEED (P. 92)	DOVER (at bank)
S2	G5	CONVOLVULUS SPITHAMAEUS	LOW BINDWEED	DOVER (at bank)

(Hotchkiss)

1st on Co.

Isotria medeoloides Small in habit P. 92 R.C

open space plan, are also part of the tree planting program. Trees are regularly planted as the use of the cemetery expands. The older section of Pine Hill Cemetery has very mature trees which require more maintenance such as fertilizing and cabling. However, the scenic and historic value of this area make it well worth the time and money invested. In 1984, a survey of Pine Hill identified 428 trees with sugar maple being the dominant species (284 trees). Spruce was the principal evergreen (60 trees).

The inventory conducted in 1984 identified every street tree and publicly-owned shade tree in Dover. A total of 2095 trees were noted; 1665 street trees and 430 trees in Pine Hill. Although that inventory has not been updated on a regular basis the total number of trees is currently estimated around 3200. It is the intent of the DPW to update this inventory to coincide with the coming-on-line of the City's computer mapping system.

RECOMMENDATIONS

1. Manage Forest Resources

The City needs to take a more protective role and set an example in protecting and managing its forest resources. There are several city-owned parcels which may be suitable for forest management practices. Among those parcels are:

- Long Hill Memorial Park - a 14 acre parcel located on Long Hill Road. Thickly wooded and primarily undeveloped site with the exception of a basketball and tennis courts. (Tax maps A and D Lots 10 and 10A respectively).
- Guppy Park - a 39 acre parcel located on Portland Avenue. Approximately half of the site is already being used for active recreation. (Tax Map 26 Lot 2).
- Map H Lot 63 - this 11 acre parcel is bordered by the Bellamy River and the Madbury town line. It is completely undeveloped and currently has no access.

These parcels should be reviewed with the State and County Foresters to discuss their management potential. A selective thinning of these parcels could generate a small amount of revenue for the City or at least cover the cost of a consulting forester to do the work. A well managed parcel will improve the health of the forest, make the area more productive for wildlife and provide access trails for public use.

However, the City's forest management activities should

not be limited to an isolated, individual parcel type approach. Moreover, it should be pursued from a city-wide perspective as a "system" of managed parcels interconnected with corridors or "greenways" of undeveloped land. These corridors will serve to link the larger managed forested areas together, which will facilitate the movement of wildlife and provide buffers between the developed portions of the City.

2. Designate a City Forest

In New Hampshire, municipalities are given the authority to establish by purchase, lease, grant, tax collector's deed, transfer, bequest or other devise, a city or town forest (RSA 31:110). The main purpose of such a forest shall be to encourage the proper management of timber, firewood and other natural resources through planting, timber stand improvement, thinning, harvesting, reforestation, and other multiple use programs consistent with the forest management program, and deed restrictions and any pertinent local ordinances or regulations. Furthermore, a city forest can provide an ideal laboratory for schools and civic organizations, and an area for general recreation use by town residents.

All of the city-owned parcels mentioned under recommendation #1 have potential to be a city forest. A review of and report on these parcels and any other potential sites should be conducted by the Conservation Commission.

If additional lands could be acquired along the Bellamy River between Mast Road and the river there would be the potential for some outstanding recreation and forest management opportunities.

This area plays an important role in recharging the aquifer of the Griffith and Ireland municipal wells. In addition, if a corridor along the river could be connected to the existing Bellamy Park it would create an extensive river front park for the City with approximately 1200 feet of frontage on the river.

3. Encourage private landowners to conserve the City's forest resources.

Every effort should be made to work with private landowners in managing their wood lots. Although property owners who are currently managing their wood lots probably have the land in "current use", this tax category may not exist forever. Therefore, the City should pursue the possibility of obtaining a conservation easement or purchasing the development rights from interested landowners. This would still reduce the tax

burden of the property owner while conserving the resource and maintaining open space for the City. There are currently funds available from the State through the Land Conservation Investment Program (LCIP) for this very purpose.

4. Better monitoring of logging activities within the City.

More regular compliance with RSA 79:10, "Notice of Intent to Cut", needs to be obtained from landowners who are logging on their property. The filing of this "notice" should be condition of approval for all subdivision, site plan and building permit application process. This will help in insure that a better inventory of forest resources are maintained and that the City receives the proper tax revenues.

One way to better enforce these regulations would be to contract with a forester on a part-time basis. This person would review all cutting operations in the City to make sure that accurate and complete information is being submitted. This has been done in other communities and the additional revenue collected more than offsets the cost of the forester's services.

5. Start a Forest Conservation Program

As indicated in this section Dover is apparently losing a substantial amount of its forested land to development every year. Action needs to be taken now to reverse, or at least, slow this trend before the effects of this cutting become severe.

A forest conservation program should be initiated by the City. This program should include at least the following methods of implementation.

- A. Landscaping regulations should be developed for inclusion into the subdivision and site plan review process. These regulations should minimize the amount trees cut during the construction process. They should also address the location of trees to be left on-site with regard to buffer and screening of abutting properties, as well as conformance and compatibility with the City's open space program objectives.

The City should work closely with the State and County Forester to develop these regulations. The State is currently looking at developing some comprehensive tree cutting regulations.

- B. The City should set an example for private landowners by participating in the Certified Tree Farm Program.

Once a city-owned parcel has been selected and some management practices initiated, the City should apply for membership in this program.

- C. The Planning Board should require street tree plantings for new subdivision on a more consistent basis. The Board has this authority under Section 155-36E of the Subdivision Regulations.
- D. Expand the City's tree planting program by revegetating the City-owned parcels which have been excavated or otherwise stripped of vegetation.

FISH AND WILDLIFE RESOURCES

The label of "city" tends to give Dover the connotation of being a predominantly urban environment. However, within Dover's 28 square miles there are many different types of habitat ranging from forest land and fields to wetlands, ponds and waterways. These habitat support a variety of animal species which represent an important resource to the residents of Dover. The following section provides an overview of Dover's fish and wildlife which are currently sharing the land and water with the rest of the City's residents.

ESTUARINE (COASTAL) HABITAT

Dover is very fortunate to have within its municipal boundaries an extensive amount of surface water resources. The Cochecho, Bellamy, Salmon Falls and Piscataqua Rivers comprise some 960 acres and provide the City with approximately 50 miles of river frontage. All four rivers belong to the larger Piscataqua River drainage basin which at Dover Point, receives discharge from the Great and Little Bay tidal basin before emptying into the Atlantic Ocean.

The Bellamy and Cochecho Rivers are tidal from the Bay to their respective dams in the City proper. As these saltwater (tidal) embayments mix with the inflow of freshwater from upland areas they create what is known as an "estuary". This ensuing mixture of salt and fresh water represents a continuously fluctuating hydrological environment to which many plants and animals have adapted. Estuaries are extremely valuable as: breeding and nursery areas for finfish and shellfish (and therefore vital to the fishing industry); as habitat for a variety of native and migratory birds; as nature's "sponge" during periods of coastal flooding; and as a filter for what flows from the river to the sea.

Great Bay is a classic example of an estuarine system and represents one of the finest remaining relatively unspoiled systems on the Atlantic coast. In September of 1987, it was incorporated into the National Estuarine Research Reserve program by the Federal Government. The purpose of this program is to designate a representative sample of relatively undisturbed estuaries around the country as places to promote research and education.

It follows then that the three tidal portions of the rivers which flow through Dover, including their major tributaries of Fresh Creek and Varney Brook would also exhibit the

ecologically diverse characteristics of this estuarine system. They are, in fact, an integral part of the estuary. Between 1980 and 1981 the New Hampshire Fish and Game Department conducted a year-long inventory of resources in the estuarine system. This inventory showed the diversity of fish and wildlife that depend of the estuary, as well as the commercial and recreational use of the area. For example:

- there is a commercial fishery for lobsters and rock crabs and recreational clamming and oystering;
- there were 52 different species of finfish identified. The species included resident, anadromous, catadromous, ocean migrants and fresh-water finfish; and
- during the year, over 90,000 birds representing 71 different species were identified.

In Dover specifically, there were some particularly noteworthy findings contained in the inventory. The following paragraphs provide more detail about the shellfish, finfish, birds and mammals which were identified within Dover's municipal boundaries.

Shellfish

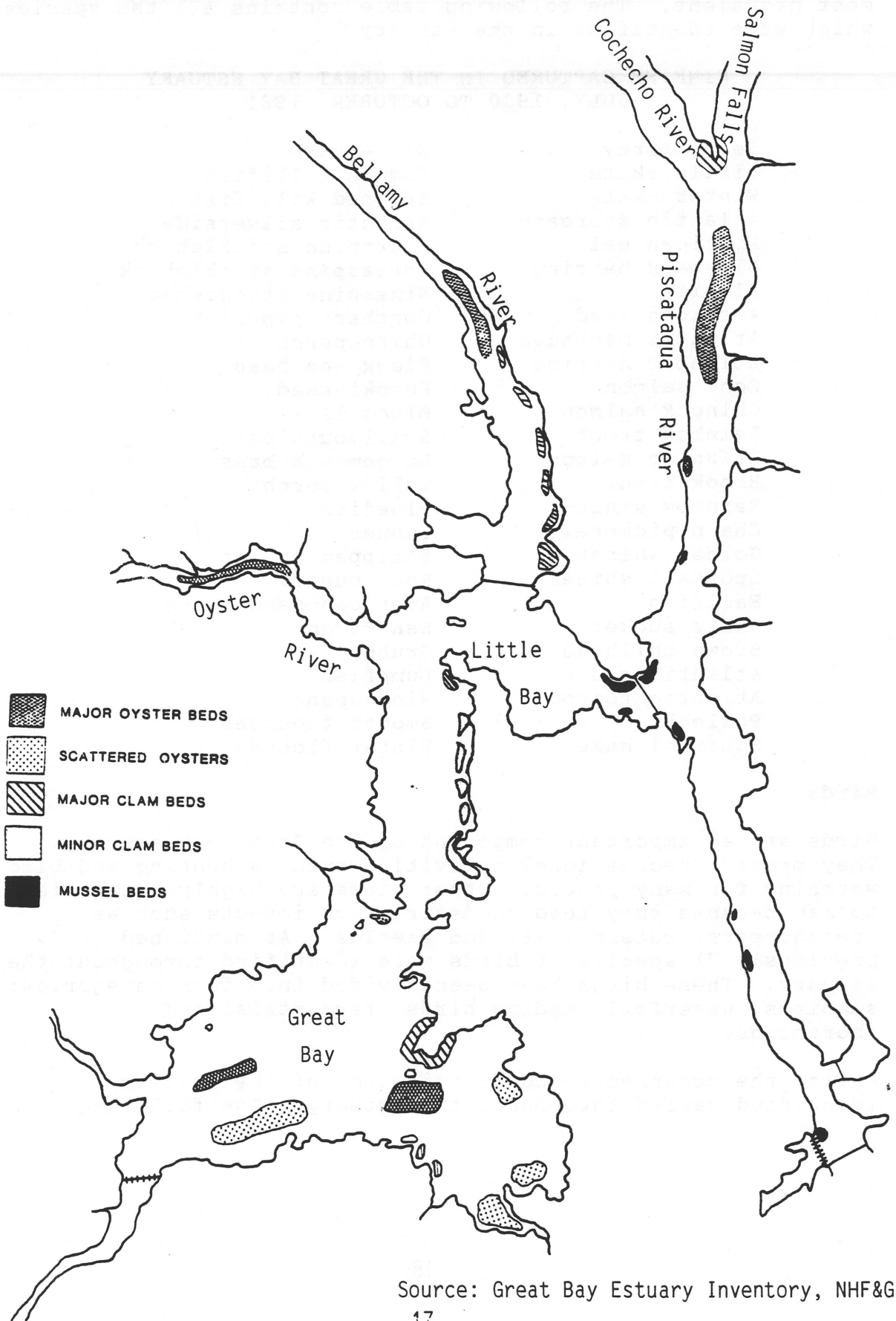
In the Bellamy River were found one of the few "major" oyster beds located in the estuary, as well as six locations of "minor" clam (soft-shell) beds. The Piscataqua River also contains one of the largest oyster beds in the estuary, as well as more evenly distributed populations of clams, blue mussels, lobsters, rock crabs, hermit crabs and horseshoe crabs. The Cochecho River, at its confluence with the Salmon Falls River, was one of the few locations of a major clam bed within the estuary.

Finfish

Within the estuary, sampling was also conducted at numerous locations in order to access finfish populations and distribution. There were four sampling locations in Dover: three on the Bellamy (including Royalls Cove), one on the Cochecho above Fresh Creek, and one on the Salmon Falls near the Rollinsford town line.

Almost all 52 species of finfish found in the estuary were identified at the sampling locations on Dover's rivers. However, some species were more prevalent at certain locations. On the Bellamy River: White perch, River herring, Silversides, Killifish, Winter flounder, Rainbow

Location of Shellfish Concentrations in
Great Bay Estuary 1980 - 81



Source: Great Bay Estuary Inventory, NHF&GD

smelt, Sticklebacks and Smooth flounder were found in higher numbers. On the Cochecho and Salmon Falls Rivers: Atlantic tomcod, Rainbow smelt, River herring, Common killifish, Smooth flounder and White perch were the species found to be most prevalent. The following table contains all the species which were identified in the estuary.

FINFISH CAPTURED IN THE GREAT BAY ESTUARY
JULY, 1980 TO OCTOBER, 1981

Sea lamprey	White hake
Little skate	Common killifish
Winter skate	Striped killifish
Atlantic sturgeon	Atlantic silverside
American eel	Fourspine stickleback
Blueback herring	Threespine stickleback
Alewife	Ninespine stickleback
American shad	Northern pipefish
Atlantic menhaden	White perch
Atlantic herring	Black sea bass
Coho salmon	Pumpkinseed
Chinook salmon	Bluegill
Rainbow trout	Smallmouth bass
Atlantic salmon	Largemouth bass
Brook trout	Yellow perch
Rainbow smelt	Bluefish
Chain pickerel	Cunner
Golden shiner	Stripped mullet
Spottail shiner	Rock gunnel
Fallfish	American sand lance
White sucker	Sea raven
Brown bullhead	Grubby
Atlantic cod	Lumpfish
Atlantic tomcod	Windowpane
Pollock	Smooth flounder
Squirrel hake	Winter flounder

Birds

Birds are an important component of the Great Bay estuary. They provide recreational activities such as hunting and bird watching for many people. Other birds are highly beneficial to man because they feed on destructive insects such as grasshoppers, caterpillars and beetles. As mentioned previously 71 species of birds were identified throughout the estuary. These birds have been divided into four categories: seabirds, waterfowl, wading birds, terrestrial and shorebirds.

Again, the occurrence and distribution of the species identified varied throughout the estuary. The following

table lists those birds which were sighted on the rivers in Dover.

**BIRD SPECIES IDENTIFIED ON THE SALMON FALLS,
COCHECHO AND BELLAMY RIVERS
JULY, 1980 THROUGH JUNE, 1981**

SEABIRDS

Great Black-Backed
Gull
Herring Gull
Ringed-Billed Gull
Double-Crested Cormorant

WADING BIRDS

Snowy Egret
Great Blue Heron
Green Heron
American Bittern

WATERFOWL

Canada Goose
Mallard
Black Duck
Blue-Winged Teal
Green-Winged Teal
Wood Duck
Greater Scaup
Bufflehead
Old Squaw
Common Scoter
Pied-Billed Grebe
Hooded Merganser
Horned Grebe

TERRESTRIALS & SHORE

Black-Bellied Plover
Spotted Sandpiper
Greater Yellowlegs
Lesser Yellowlegs
Least Sandpiper
Semipalmated Sandpiper
Belted Kingfisher
Crow
Red-Tailed Hawk
Osprey
Killdeer
Solitary Sandpiper
Tree Swallow
Red-Winged Blackbird

Mammals

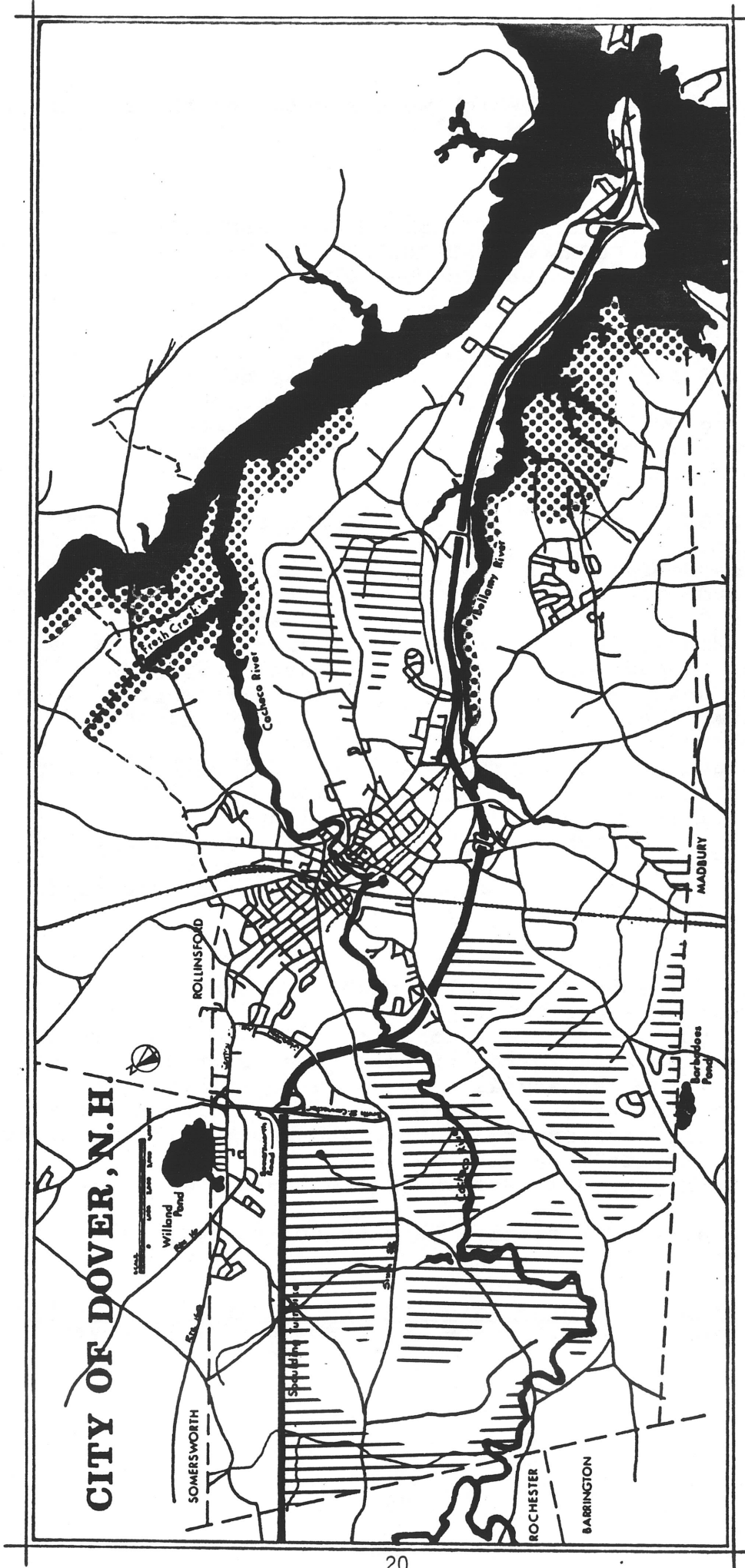
Marine and terrestrial mammals inhabit the Great Bay estuary and the land area surrounding the estuary. Harbor seals primarily, but also an occasional pilot whale and porpoise frequent the area in search of food. Terrestrial mammals also utilize the estuary as a food source. There are at least eight species of terrestrial mammals which are seen throughout the estuary area including: raccoon, red fox, gray squirrel, cottontail rabbit, whitetail deer, eastern chipmunk, woodchuck and muskrat.

The food Chain and Potential Threats to the Estuarine Environment

The preceding paragraphs have presented information on the various fish and wildlife species associated with Dover's

IMPORTANT FISH AND
WILDLIFE HABIT

CITY OF DOVER
1988



- Surface Water (Tidal and Fresh)
- Estuary And Contiguous Upland
- Prime Inland Areas

lowland esuary environment. Although these fauna have been presented in an individualistic fashion as part of an inventory, they are actually intricately related as part of a delicately balanced food chain.

Other components of the food chain which are usually given less attention but which play a very important role are the plants and microscopic animals which inhabit the estuary. These flora and fauna provide food for animals which are higher in the food chain, but are also very susceptible to changes in the environment.

For instance, the eelgrass and saltmarsh are major contributors to estuarine productivity. Both eelgrass and saltmarsh help to stabilize bottom sediments by its root system. The leaves support small fauna that are consumed by larger species. Fish move into these during high tide to feed or avoid predation. Crabs, oysters and crustaceans and molluscs are often found in abundance in the eelgrass and saltmarsh. Various species of birds will in turn feed on these animals during low tide.

However, due to the immobility or relatively slow movement of the plants and animals in these fisheries, they are very susceptible to environmental pollution.

The impact, for example, of an oil spill or other hydrocarbon contamination could substantially destroy plant life which could result in substantial destabilization of bottom sediments with resulting loss of habitat, increased turbidity and siltation problems.

As mentioned earlier, estuaries serve as a spawning and nursery area for many different species. Spawning adults, eggs and larva are particularly sensitive to changes in their environments. Spawning activity occurs at the same time for many species. This usually results in greater than normal concentrations of species in a spawning area. As a result, whole local populations can be vulnerable to a single adverse event.

INLAND AND FRESHWATER HABITAT

Upland from Dover's estuaries are the more developed portions of the City. These built-up areas, which range from urban to rural development densities, have a major affect on shaping the location, type and amount of available fish and wildlife habitat. The types of habitat in Dover vary greatly and include: timberstands of varying ages and mixtures of soft and hardwoods, wooded swamps, fields and meadows in varying stages of successional growth, freshwater marshes, bogs,

ponds and rivers. This diversity of habitats is critical for a variety of wildlife to survive in a given area. Different species often require different habitats for shelter, feeding, and breeding.

Terrestrial Habitat

The key to planning the management of all wildlife species is to know their habitat requirements and to provide them in a variety of combinations that meet the needs of as many species as possible. To this end, wildlife must be viewed as communities of species that respond over time to habitat changes.

It is essential to have as complete an inventory as possible of the wildlife species inhabiting a particular geographic area in order to develop appropriate management practices.

With the exception of the State's inventory of the Great Bay estuary, information about fish and wildlife species for the rest of Dover is limited. What information is available is primarily concerned with game species since the basic source of funds for wildlife management is derived from hunter's expenditures, purchase of licenses and tax on sporting arms and ammunition.

The following table contains data on species of fur-bearing animals which were trapped or hunted within Dover's city limits between 1980 and 1986.

FUR BEARING ANIMALS TRAPPED OR HUNTED IN DOVER* 1980 - 1986

	ANNUAL SEASON**					
	1980-81	81-82	82-83	83-84	84-85	85-86
Beaver	13	8	0	7	7	9
Otter	0	1	0	0	2	3
Muskrat	-	241	32	72	84	31
Raccoon	11	20	22	10	29	9
Deer	-	-	11	12	30	30
Red Fox	16	45	24	11	26	13
Gray Fox	5	6	6	3	5	0

*Based on annual reports made by hunters and trappers to the New Hampshire Fish and Game Department.

**The annual hunting and trapping seasons fall within the

time period of November to March.

While the preceding table doesn't identify total populations or densities of these animals, it may indicate their relative abundance. Other game and furbearing species which live in, or pass through Dover include: mink, otter, weasel, skunk, fisher, turkey, bobcat, coyote, as well as an occasional moose or bear.

Of course, there are numerous non-game species of birds, mammals, and reptiles which occur in the upland habitat areas. Many of these more common, but no less important species, are more adaptable to coexisting with humans. They generally require less land and can utilize alternative food sources. The larger species however, utilize more land areas that generally speaking, are in the outlying portions of the City and cross over into adjacent communities. This ability of wildlife to move in from less developed adjoining municipalities is an important reason why we continue to see them in Dover.

Aquatic Habitat

The primary freshwater habitats in Dover consist of the Cochecho and Bellamy riverine systems and their various tributaries, and Willand Pond which straddles the Dover/Somersworth City line. The Cochecho River is the larger of the two rivers with a mean annual flow estimated at 240 cubic feet per second. The water quality has been rather low in the past (Class C or D) due to the up-river discharge of sewage from Farmington and Rochester. However, both municipalities now have secondary sewage treatment plants and the Cochecho's water quality has been upgraded to Class B.

The Cochecho River habitat does support a reasonable fish population, primarily warm water species. The species which have been documented are listed below.

Lamprey Eel	Eastern Chain Pickerel
American Eel	Eastern Brook Trout
Common White Sucker	Fallfish
Pumpkinseed	Smallmouth Bass
Yellow Perch	Common Shiner
Brown Bullheads	

The river has been managed (stocked) for rainbow and brook trout by NH Fish and Game at its upper reaches in Farmington. There is also a naturally reproducing population of brown trout occurring in two of the Cochecho River's tributaries, the Ella and Mad Rivers.

Also present in the Cochecho are anadromous species of American shad, alewife and blueback herring. The Fish and Game Department has been stocking approximately 1500 alewife spawners since 1984 in Bow Lake on the Isinglass River which is a major tributary of the Cochecho. This management is to provide forage for Bow Lake resident fish populations but will also increase the Cochecho River spawning run of alewife.

In Dover, the Cochecho has also been stocked with American Shad. Fish and Game has stocked the river in the Watson Dam Project impoundment since 1978. Thus far apparently not many have returned to the Denil fishway located at the Cochecho Falls Dam. The following table illustrates the stocking and return rate figures for shad and alewives.

OPERATIONAL DATA, COCHECHO FALLS FISH LADDER			
YEAR	#SHAD IN LADDER	# ADULT SHAD RELEASED ALIVE	# ALEWIVES IN LADDER
1976	NA	0	9,500*
1977	NA	0	29,500*
1978	4	0	1,925
1979	2	0	586
1980	0	212	7,713
1981	0	183	6,559
1982	1	120	4,129
1983	3	135	968
1984	0	241	477
1985	1	90	974
1986	1	205	2,612

NOTE: NA = Figures not available but probably less than 8.
*Estimated, probably not reliable.

SOURCE: New Hampshire Fish and Game Department

Fish and Game is also beginning a five year plan to restore an Atlantic Salmon run in the Cochecho by stocking eggs in the Isinglass River. The agency is also anticipating completion of a management plan for the river by 1989-90.

The Bellamy River begins at Swains Lake in Barrington and flows through Madbury before reaching Dover. This more moderate size river, which has a 1987 water quality of Class A, is also managed by Fish and Game for both rainbow trout and brook trout. Below the dam which impounds the Bellamy Reservoir other species are evident including largemouth bass, American eels, fallfish and white suckers. Above the dam additional species which have been identified include eastern chain pickerel, brown bullheads, yellow perch,

pumpkinseeds and goldenshiners.

Willand Pond which straddles the Dover/Somersworth border, is also Class A water quality. It is approximately 73 acres with a maximum reported depth of 23 feet. Fish species inhabiting the pond include white perch, largemouth bass, eastern chain pickerel and golden shiners.

SUMMARY

Despite the rapid growth which Dover has experienced over this decade there is still a reasonable amount of habitat left to support viable fish and wildlife populations. Unfortunately, when wildlife habitat is confronted with encroaching human development it's usually habitat preservation which has the lower priority.

The presence of wildlife in an area has many virtues, some of which cannot be quantified; such as the personal pleasure and gratification which a person feels from seeing wildlife in its natural environment. Or the educational value derived from observing wildlife in order to gain a better understanding of the ecological system of which we are all a part.

Other benefits of fish and wildlife provide can be quantified to some extent. Each year hunters, fishermen, hikers and birdwatchers seek out the wildlife in Dover for its recreational value. Aside from providing these recreational opportunities, the revenues derived from the sale of equipment, arms, and licenses, and related amenities such as food, lodging and supplies, represent an important contribution to the local economy.

Another important aspect of wildlife management is that the conservation or preservation of habitat areas is easily integrated with the goals of open space protection, recreation planning and the conservation of other natural resources. For instance, those areas identified as important open space usually have value for wildlife as well. Passive recreation areas can provide wildlife habitats. Good forest management enhances an area for wildlife while agricultural cultivation can provide supplemental food for various species.

RECOMMENDATIONS

1. Preserve and manage those areas of Dover which are best suited for fish and wildlife habitat.
 - (a) Unquestionably, the portions of the Great Bay estuary located in Dover provide some of the most

important fish and wildlife habitat within the state. The City should place top priority on preserving in its natural condition as much land as possible along the tidal areas of the Bellamy, Cochecho and Salmon Falls/Piscataqua Rivers. A minimum 250 foot protective corridor along these rivers, and around tidal marsh areas will provide an essential minimum buffer zone. Wider buffer zones will be encouraged whenever possible.

- b) The second areas of priority for preservation should be the freshwater systems of the Cochecho and the Bellamy Rivers. These riverine habitats are important areas for inland wildlife and their protection will help maintain the quality of the estuary downriver will be maintained. Once again a 250 foot protective corridor is necessary.

2. Identify wildlife habitat areas of additional importance throughout the City.

Although it may be desirable it is probably not feasible to set aside a number of very large tracts of land (i.e. 300 + acres in size) around the City for wildlife preservation. Therefore, a more selective approach to habitat preservation should be undertaken. A process should be initiated to identify parcels of varying size which include various types of habitat that are dispersed throughout the City. A system of "corridors" which connect these habitat areas should also be identified. These corridors would facilitate movement of wildlife throughout the built-up areas of the City. The Planning Department and Conservation Commission should solicit assistance from wildlife experts at the University of New Hampshire, Cooperative Extension, NH Fish & Game Department, and the NH Department of Resources and Economic development (DRED) in undertaking this project. If funds are available private consultants could also be used.

3. Use cluster development techniques to attract wildlife in the City.

Cluster development allows the grouping of structures on a site in order to provide larger areas of open space. These open space areas will naturally attract various types of wildlife depending on the size and type of open space which is set aside.

Dover currently has a cluster ordinance (Alternative Design Subdivisions) although it has not received a lot

of use. Consideration should be required during the subdivision approval process to locating open space in a manner that is most beneficial to wildlife. Consideration should be given to placing permanent conservation easements on these open space areas.

One method could be to situate the open space on the site so that it abuts another area of open space on an adjacent parcel. Or create a corridor of open space to facilitate wildlife movement through the site, particularly along waterways such as streams or brooks. These areas should be protected by a conservation easement and deed restriction placed on them by the Planning Board as a condition for subdivision approval.

AGRICULTURAL RESOURCES

Dover's rapid growth of the recent past has created mounting pressure to convert the City's supply of farmland into a variety of man-made non-agricultural uses. The amount of land best suited for agriculture continues to shrink as the demand for more urbanized land uses increase.

The depletion of farmland resources has not been an issue of great concern in the past. Little attention has been paid as the City's supply of land suitable for agriculture dwindles year after year. Much of the City's land best suited for agriculture is not in current use and is simply open land. However, this open land which has been cleared, drained and is relatively flat is also well suited for development as well as agriculture.

This view of open land has impacted the City's farmland resources however. The Dover Planning Department has recently completed an inventory of farmland based on soil suitability developed by the USDA Soil Conservation Service. The inventory indicates that in 1980 approximately 4,680 acres, or 30% of Dover's land area (15,368 acres) was considered important farmland and was available for farming. By a recent count this supply has dropped to 3,967 acres or 26% of Dover's land area. This means that in the eight year period between 1980 and 1988, approximately 713 acres of important farmland soils have been removed or covered over to make room for other land uses. This represents an 15% loss in land suitable for agriculture over an eight year period. In the past eight years the City has experienced its most explosive growth ever. If the trend towards the loss of farmland continues, the City could lose over 1,000 additional acres of land suitable for agriculture by the year 2000.

The Soil Conservation Service Land Capability Classification System was used as the basis for developing these agricultural land quality groups. This system groups soils into eight capability classes primarily on the basis of capability to produce common cultivated crops without deterioration to the soil resource. The risks of soil damage or limitations in use become progressively greater from class I to class VIII. The relationships between agricultural land quality groups and land capability classes are outlined in the following table.

AGRICULTURAL LAND QUALITY GROUPS

GROUP	LAND CAPABILITY CLASSES
Prime Farmland	I and II
Farmland of Additional Statewide Importance	III
Fair to Unsuted for Agriculture	IV - VIII

Source: U.S. Department of Agriculture Handbook No 210.

Prime Farmland consists of soils that have few, if any, limitations to restrict the choice of agricultural crops. Conservation practices needed to conserve or manage these soils are easily applied. Additional farmland of statewide importance consists of soils that have more limitations for agricultural use than the prime farmland. The choices of agricultural crops are more restrictive, especially on wet soils. Conservation practices are usually more difficult to apply and maintain. These soils are illustrated on the Important Farmlands Map of Dover on file in the Planning Office

For Dover, prime farmland consists of several soil classes with moderate slopes: Ondowa fine sandy loam, Podunk fine sandy loam, Buxton silty loam 0-3% slopes, Charlton fine sandy loam 3-8% slopes, Elmwood fine sandy loam 0-3% slopes, and Windsor loamy fine sand 0-8% slopes. Dover's farmland of additional statewide importance consists of several soil classes with more significant slopes: Buxton silty loam 3-8% slopes, Charlton fine sandy loam 8-15% slopes, Suffield silty loam 8-15% slopes, and Windsor loamy fine sand 8-15% slopes.

The Planning Department's farmland inventory shows that in 1988 the City has approximately 1,684 acres of prime farmland and 2,283 acres of farmland of additional statewide importance still available for cultivation. This compares to the 1980 figure of 1,984 acres of prime farmland and 2,695 acres of farmland of additional statewide importance. This represents a 15% loss of land for both categories since 1980.

The majority of the city's farmland is used for pasture and hay. The principle crops grown in Dover are hay, tree fruits, vegetables, and small fruits (strawberries and blueberries). The major feed animals produced are beef animals.

Due to the nature of the economy, farming as an occupation has declined significantly over the last few decades. There

are only 16 commercial farming operations in Dover, totaling approximately 866 acres. Commercial farming is defined as any farm selling over \$1,000 of product per year. The following table gives the locations of Dover's commercial farms and the items they produce.

DOVER'S COMMERCIAL FARMS*

<u>Location</u>	<u>Map-Lot</u>	<u>Product</u>	<u>Acres</u>
Dover Point	K-19	tree fruit small fruit flowers	84
Garrison Road	I-IN	hay	24
Back Road	M-100, 100A	hay, strawberries	70
Littleworth Rd.	G-28, 29B	hay	80
Littleworth Rd.	G-2	hay	97
Littleworth Rd.	H-31	hay, some beef	60
Dover Point Rd.	M-52	vegetables	65
Mast Road	J-19	hay, horses	50
Henry Law Ave.	K-1	beef, hay	35
Atlantic Ave.	N-13	dairy	45
Bayview Road	J-22	beef, hay	80
Mast Road	I-5	nursery, berries	3
Rte. 108	H-1, H-1A	nursery	3
County Farm Cross Road	B-11	hay	35
County Farm Cross Road	B-11B	hay	3
County Farm Cross Road	B-17	hay, horses	30

total acres 866

* Over \$1,000 of product sold per year

Source: Cooperative Extension Agent, Strafford County.

Despite the decline in farming as an occupation, Dover offers ample opportunities for agricultural, horticultural, and

floricultural operations under its zoning and land use regulations. There is also opportunity for the retail sale of agricultural or farm products.

The R-40, R-20, RM-20 and RM-12 Zones (approximately 72% of the City's land area) allow for agricultural, horticultural, and floricultural land uses by right. Additionally, the R-40 Zone allows by right the retail sale of agricultural or farm products so long as such products are raised on the same site. The R-20 and RM-20 Zones allow the retail sale of agricultural or farm products raised on site by Special Exception. Finally, the B-1, B-2, and B-3 Zones allow for the retail sale of agricultural or farm products as the principle use of a site.

While the City still has a healthy amount of land suitable for agriculture much of it is being lost to development. Efforts should be made to protect this valuable resource. Farmland provides many benefits to a community among which are the following:

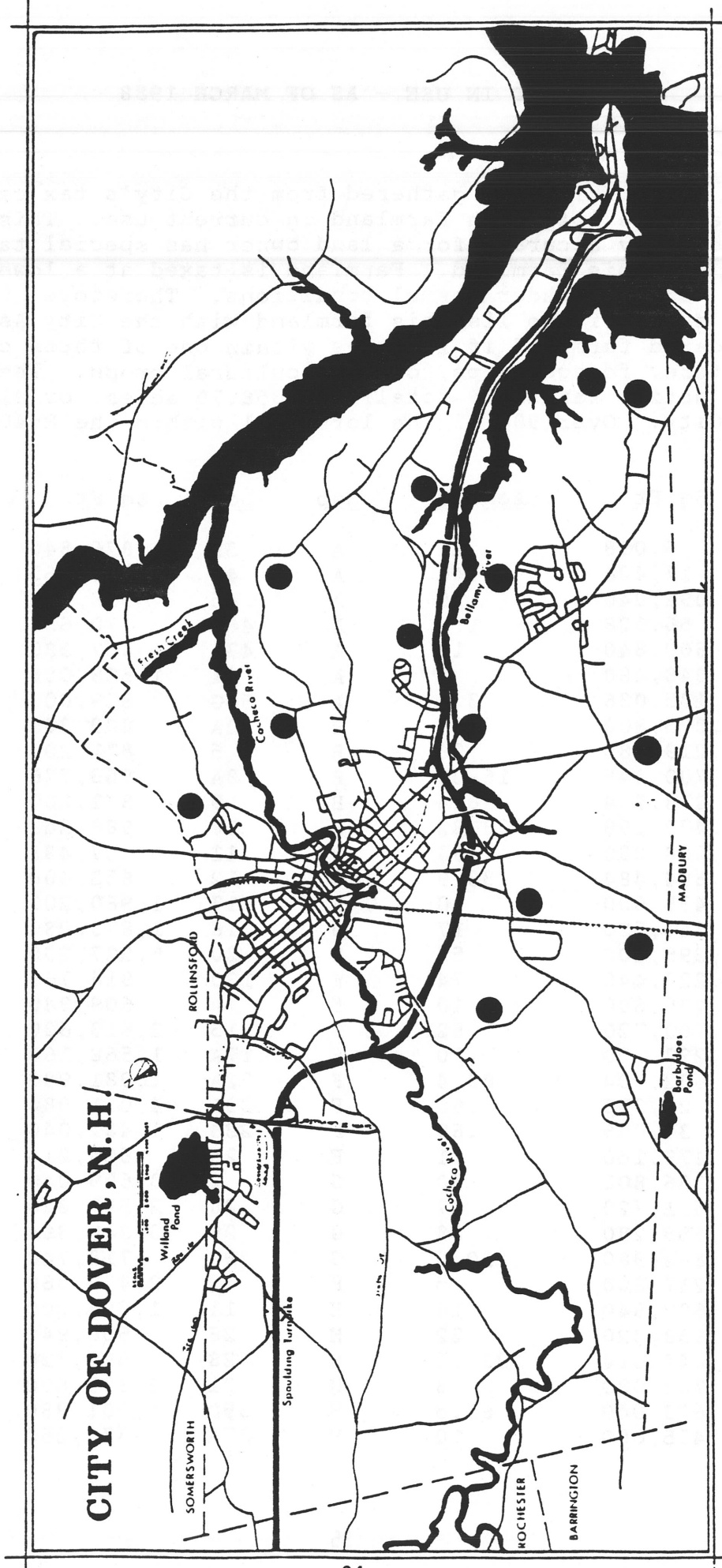
- provides economic diversity
- provides visual diversity, color and contrast to the landscape
- provides fresh produce grown locally
- provides open space in contrast to the city's urbanization
- maintains the fertility of the land
- provides long term food alternatives
- undeveloped land does not require municipal services, thus not increasing taxes

RECOMMENDATIONS

1. Make use of state and federal conservation programs and available state and federal funds for preserving agricultural land.
The city should make use of the funds available from the State through the Land Conservation Investment Program (LCIP). These funds can be used to purchase development rights to farmland while allowing the farming operation to continue.
2. Preserve farmland through open space dedication.
Encourage developers to set aside land suitable for agriculture as part of their development proposals. This could be best achieved through cluster development regulations with a conservation easement attached to the agricultural land.
3. The City should integrate agricultural land in its open space plan.
Agriculture has been an important part of Dover's history and continues to play a role in the City's economic base.

It also represents an important component of open space throughout the City and should continue to do so. It is recommended that at least 1600 acres of the Dover's farmland be permanently preserved. This represents about 10% of the City's land area. Particular emphasis should be placed on preserving those areas designated as prime farmland soils.

LOCATION OF
COMMERCIAL FARMS
DOVER, NH - 1988



● COMMERCIAL FARMS
SOURCE: 1988 PLANNING DEPARTMENT FARMLAND INVENTORY

FARM LAND IN USE - AS OF MARCH 1988

The following information was gathered from the City's tax cards. It is a list of all the lots with farmland in current use. This list should be reasonably accurate for a land owner has special tax incentives to list his farmland. Farmland is taxed at a lower rate than the land would be under normal conditions. Therefore, it is to the landowner's benefit to list his farmland with the City Assessor. Land is considered farmland if it falls within one of three categories: permanent pasture, forage crops, or horticultural crops. These are 142 classified as active farmland, totaling 4,358.75 acres, or almost one third of the City. Over 90% of the lots fall within the R-40 zone.

Map	Lot	Sq Ft	Acreage	Map	Lot	Sq Ft	Acreage
3	4	6,098	.14	A	39	3,876,840	89
4	35	17,424	.40	A	44	569,765	13.08
34	20	392,040	9	A	45	918,245	21.08
34	20A	56,628	1.3	A	46A	70,657	1.62
34	20B	609,840	14	A	47A	457,380	10.5
34	21	348,480	8	A	51	1,528,085	35.08
35	59A	135,036	3.1	A	53G	859,003	19.72
A	19	2,395,800	55	B	2A	809,345	18.58
A	23	1,219,680	28	B	5	871,200	20
A	24	700,445	16.08	B	8A	853,776	19.6
A	24B	278,784	6.4	B	9	871,200	20
A	26	1,473,199	33.82	B	10	688,248	15.8
A	27	4,268,880	98	B	11	6,307,488	144.8
A	29A	1,694,484	38.9	B	12	653,400	15
A	30	435,600	10	B	17	1,960,200	45
A	35A	740,520	17	B	18	1,873,080	43
A	37	2,395,800	55	B	20	5,227,200	120
B	21	3,223,440	74	F	120	914,760	21
C	2	435,600	10	F	14	609,840	14
C	3+3D	2,700,720	62	F	15	2,613,600	60
C	4	5,227,200	120	F	17A	1,568,160	36
C	14	3,632,904	83.4	F	22A	1,981,980	45.5
C	21A	28,750	.66	F	23A	4,051,080	93
C	41	30,056	.69	F	23B	1,481,040	34
C	43	479,160	11	F	25	624,215	14.33
C	45	1,306,800	30	G	2	3,659,040	84
C	46	1,611,720	37	G	28	2,591,820	59.5
C	47	1,655,280	38	G	29	3,240,864	74.4
C	48	892,980	20.5	G	29B	718,740	16.5
D	11A	217,800	5	H	4	2,439,360	56
D	12	609,840	14	H	11	1,089,000	25
D	14	958,320	22	H	26	500,940	11.5
D	16	1,444,014	33.15	H	28	522,720	12
D	16B	784,080	18	H	31	2,395,800	55
D	17	2,678,940	61.5	H	35D	1,001,880	23
D	17C	435,600	10	H	37A	370,260	8.5

Map	Lot	Sq Ft	Acreage	Map	Lot	Sq Ft	Acreage
E	27	2,169,288	49.8	H	40C	496,584	11.4
E	27D	446,490	10.25	H	55	784,040	18
E	30+31	653,400	15	H	60	653,400	15
E	32	1,127,333	25.88	I	28	130,680	3
E	35	609,840	14	I	52	827,640	19
E	38	2,962,080	68	I	67	261,360	6
E	47	1,480,040	34	I	94C	2,047,320	47
E	49	479,160	11	J	2	1,306,800	30
E	50	217,800	5	J	3A	522,720	12
E	67	653,400	15	J	7	849,420	19.5
E	69	65,340	1.5	J	8	261,360	6
F	2	2,683,296	61.6	J	12	914,716	21
F	3D	457,380	10.5	J	22	3,397,680	78
F	8	627,264	14.4	J	23B	1,306,800	30
F	9	1,742,400	40	J	25	827,640	19
K	1	3,397,680	78	N	8	3,746,160	86
K	6	2,787,840	64	N	8A	2,744,280	63
L	1	370,260	8.5	N	15	1,742,400	40
L	14M	1,218,373	27.97	N	18	958,320	22
L	40	679,536	15.6	N	20	1,350,360	31
L	45	696,960	16				
L	50	526,640	12.09				
L	89I	522,720	12				
L	98	479,160	11				
L	99	91,476	2.1				
L	101	17,860	.41				
M	1	217,800	5				
M	2	1,306,800	30				
M	3	1,777,248	40.8				
M	5	678,665	15.58				
M	52	3,615,480	83				
M	53A	1,350,360	31				
M	54	1,176,120	27				
M	76	1,328,580	30.5				
M	83	2,744,280	63				
M	92A	740,520	17				
M	92B	740,520	17				
M	96	544,500	12.5				
M	96A	827,640	19				
M	98	348,480	8				
M	100	2,940,300	67.5				
M	102	1,960,200	45				
M	104	609,840	14				
N	1	1,524,600	35				
N	2	3,397,680	78				
N	2A	618,552	14.2				
N	3	1,176,120	27				
N	5	827,640	19				
N	6	829,382	19.04				

Section Two

WATER RESOURCES

RESOLUTION

RESOLUTION: TO ADOPT THE HISTORIC RESOURCE CHAPTER OF THE DOVER MASTER PLAN

WHEREAS: The Planning Board and Planning Department have written and completed in accordance with RSA 674:3, a Chapter of the Dover Master Plan entitled Historic Resources; and

WHEREAS: A concerted effort was undertaken to include participation by the general public; and

WHEREAS: A formal public hearing on said Chapter, in accordance with RSA 675:6, was held before the Planning Board on December 13, 1988 and January 10, 1989.

NOW THEREFORE, BE IT RESOLVED BY THE DOVER PLANNING BOARD THAT:

1. The Master Plan Chapter entitled Historic Resources be adopted and certified in accordance with RSA 674:4; and
2. The Planning Board Chairman is authorized to sign and label as "adopted" the final reproduced documents of said Chapter; and
3. The Planning Department is authorized to develop an abbreviated summary of the said Chapter.

January 24, 1989
Date of Planning Board Action

Harold Ruston
Planning Board Chairman

Motion to approve by: Otis Perry

Seconded by: Melice McAnnell

Board members in favor: 7 present

Board members opposed: None

RESOLUTION

RESOLUTION: TO ADOPT THE OPEN SPACE/RECREATION AND NATURAL RESOURCES CHAPTER OF THE DOVER MASTER PLAN

WHEREAS: The Planning Board and the Planning Department have written and completed in accordance with RSA 674:3, the Open Space/Recreation and Natural Resources Chapter of the Dover Master Plan; and

WHEREAS: A concerted effort was undertaken to include participation by the general public; and

WHEREAS: A formal public hearing on said Chapter, in accordance with RSA 675:6, was held before the Planning Board on December 13, 1988.

NOW THEREFORE, BE IT RESOLVED BY THE DOVER PLANNING BOARD, THAT:

1. The Master Plan Chapter entitled Open Space/Recreation and Natural Resources is adopted and certified in accordance with RSA 674:4, and
2. The Planning Board Chairman is authorized to sign and label as "adopted" the final reproduced documents of said Chapter, and
3. The Planning Department is authorized to develop an abbreviated summary of the said Chapter.

December 20, 1988
Date of Planning Board Action

Harold Preston
Planning Board Chairman

Motion to approve by: Kevin Mone

Seconded by: Oits Perry

Board members in favor: All eight in attendance

Patricia Torr, absent

Board members opposed: None

TABLE OF CONTENTS

	PAGE
NATURAL RESOURCES/OPEN SPACE/RECREATION: GOALS AND OBJECTIVES	1
SECTION ONE: FORESTS, FISH AND WILDLIFE, AGRICULTURE	5
FOREST RESOURCES	7
Recommendations	11
FISH AND WILDLIFE RESOURCES	15
Estuarine (Coastal) Habitat	15
Inland and Freshwater Habitat	21
Summary	25
Recommendations	25
AGRICULTURAL RESOURCES	29
Recommendations	32
SECTION TWO: WATER RESOURCES	37
INTRODUCTION	39
SURFACE WATER AND WATERSHED ASSESSMENT	39
Bellamy River	39
Cochecho River	41
Salmon Falls/Piscataqua River	42
Johnson Creek	42
SURFACE WATER SUPPLIES	43
Existing Supplies	43
Potential Supplies	43
Construction of an Off-Stream Reservoir	43
Direct Withdrawal and Treatment	45
Development of a Regional Surface Water Supply	47
New Hampshire Legislature Classification of Surface Water Quality	47
GROUNDWATER RESOURCES	53
Stratified Drift Aquifers:	53
The Hoppers	53
The Barbadoes Pond Aquifer	54
The Pudding Hill Aquifer	54
The Willand Pond Aquifer	55
The Huckleberry Hill Aquifer	55
The Garrison Road Site	60
BEDROCK GEOLOGY	60
Potential Groundwater Supplies:	61
Sand and Gravel Favorable Zones	61
Bedrock Favorable Zones	62

THREATS TO WATER RESOURCES	65
Non-point Source Pollution	65
Point Pollution Sources	71
Underground Storage Tanks	72
Land Use and Groundwater Protection	72
EXISTING REGULATORY PROGRAMS AND ORDINANCES	75
Subdivision Regulations	75
Health Ordinance	76
Flood Management	76
Zoning Ordinance	77
Site Plan Review Regulations	78
Sewer Ordinance	78
Summary and Evaluation of Regulatory Programs	79
NON-REGULATORY PROGRAMS AND POLICIES	81
Regional Planning	81
Educational Programs	81
Coordination with Adjacent Communities	82
Household Hazardous Waste	83
Acquisition of Land and Easements	83
SECTION THREE: OPEN SPACE AND RECREATION	91
INVENTORY OF DOVER'S EXISTING OPEN SPACE	94
PRESERVING OPEN SPACE	97
OPEN SPACE PLAN	99
RECREATION STANDARDS	101
INVENTORY OF DOVER'S RECREATION FACILITIES	106
DOVER'S PARKS AND PLAYGROUNDS - INVENTORY AND NEEDS	112
Specific Recommendations for Existing Parks/Playgrounds and Additional Facilities	114
Additional Recommendations for New Recreation Facilities	119
SECTION FOUR: HISTORIC RESOURCES	123
INTRODUCTION	125
WINDSHIELD SURVEY	125
RESULTS: HISTORIC OVERVIEW AND SURVIVING BUILT HISTORIC RESOURCES	126
OBSERVATIONS AND RECOMMENDATIONS	131
Urban Core Residential Neighborhoods	132
Historic Agricultural Areas	133
Transportation	134
Historic Districts	135
APPENDIX	
UNDERGROUND STORAGE TANK INFORMATION FOR DOVER AS OF MAY 27, 1988	139
DOVER WELL AND BORING DATA	

LIST OF TABLES

SECTION ONE: FORESTS, FISH AND WILDLIFE, AGRICULTURE

Annual Timber Harvest for the City of Dover 1981-1987	8
Finfish Captured in Great Bay Estuary July, 1980 to October 1981	18
Bird Species Identified on the Salmon Falls, Cochecho and Bellamy Rivers, July 1980 through June, 1981	19
Fur Bearing Animals Trapped or Hunted in Dover 1980-1986	22
Operational Data, Cochecho Falls Fish Ladder 1976-1986	24
Dover's Commercial Farms	31
Farm Land in Use as of March 1988	35

SECTION TWO: WATER RESOURCES

Piscataqua River Drainage Basin	49
Damsites in the City of Dover 1988	51
Ice Contact Deposit Formations	59
Potential Non-Point Pollutant Sources in Dover and Adjacent Municipalities	69
NPDES Permits Issued in Dover as of 1988	71
Land Parcels Contained in the 400 Foot Municipal Well Radius	84

SECTION THREE: OPEN SPACE AND RECREATION

Open Space Inventory, Dover, N.H.-1988	94
Recommended New Hampshire Recreation Standards	104
Recreation Facilities Inventory, Dover, N.H.-1988	108
Comparison of Dover's Recreation Facilities to Statewide Standards	113

LIST OF MAPS AND FIGURES

SECTION ONE: FORESTS, FISH AND WILDLIFE, AGRICULTURE

Location of Certified Tree Farms, Dover, N.H.-1988	10
Location of Shellfish Concentrations in Great Bay Estuary 1980-1981	17
Important Fish and Wildlife Habitat, City of Dover 1988	20
Location of Commercial Farms, Dover, N.H.-1988	34

SECTION TWO: WATER RESOURCES

Piscataqua River and Coastal N.H. Basins Location Map	40
Proposed Jackson Brook Water Supply Reservoir and Treatment Facility	44
Dam Sites in the City of Dover 1988	50
Principal Aquifers and other Glacial Deposits - City of Dover	57
Ireland and Griffin Wells - 400 Foot Radius	86
Smith and Cummings Wells - 400 Foot Radius	87
Hughes Well - 400 Foot Radius	88
Calderwood and 8" Test Wells - 400 Foot Radius	89

SECTION FOUR: HISTORIC RESOURCES

Historic Resources - City of Dover 1988	125
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APPENDIX

Drainage Basin Map - Dover	Map Pocket
Contaminant Threats Analysis	Map Pocket
Hydrogeologic, Geophysical and Favorable Zone Map	Map Pocket
Open Space and Recreation	Map Pocket
Historic Resources - Urban Core - Dover	Map Pocket

**NATURAL RESOURCE/OPEN SPACE/RECREATION
GOALS AND OBJECTIVES**

GOAL #1

Better protect the environment and natural resources.

OBJECTIVES

- A. Protect Existing and Future Ground Water Supplies
- B. Protect Potential Surface Water Supply
- C. Prevent Soil Erosion
- D. Protect River Corridors
- E. Protect Wildlife Habitat
- F. Protect Wetlands
- G. Manage Forest Lands
- H. Better Regulate Mineral Extraction

GOAL #2

Provide sufficient recreation land and facilities to service the City's existing and projected population.

OBJECTIVES

- A. Identify appropriate amount of land and facilities needed to serve existing and project population.
- B. Identify type of recreational facilities needed.
- C. Develop a plan for achieving the appropriate type and level of recreation land and facilities.

GOAL #3

Preserve adequate open space to protect natural resources, maintain aesthetic quality and insure quality of life.

OBJECTIVES

- A. Identify amount and type of open space needed to provide for existing and projected population.
- B. Develop a plan for achieving amount and type of open space.

GOAL #4

Promote regional management of natural resources.

OBJECTIVES

Promote regional development of recreation facilities,
management of natural resources.

- A. Identify recreation facilities which would be best provided at a regional or multi-town level.
- B. Identify natural resources/open space areas which require regional protection.
- C. Work with appropriate regional, state and local agencies to achieve the desired natural resource, open space and recreation needs.

NATURAL RESOURCE/OPEN SPACE/RECREATION
WORK TASKS

1. Map groundwater protection zones.
2. Develop and adopt groundwater protection ordinance.
3. Map wetlands.
4. Develop and adopt wetland protection ordinance.
5. Create conservation/environmental officer's position to enforce environmental protection regulations.
6. Develop erosion control ordinance.
7. Define and identify the City's fish and wildlife habitats.
8. Educate property owners about the benefits of Natural Resource Protection and Management.
9. Identify suitable tracts of land to perform forest management.
10. Include land acquisition program in Capital Improvements Program.
11. Promote a high level of participation in appropriate grant funds (Land and Water Conservation Fund, Coastal Zone Management, Local Conservation Investment Program, etc.)
12. Develop subdivision regulations which address recreation and open space exactions.
13. Develop landscaping and tree cutting regulations.
14. Inventory existing recreation facilities and open space areas.
15. Pursue county-wide park and/or conservation easement on Strafford County land in Dover.
16. Purchase B & M right of way from Rt. 108 to Third Street yard.
17. Develop and adopt minimum recreation standards (subdivision and site review)

18. Project population and recreation needs to year 2020.
19. Develop a 5-year program of recreation facilities using capital outlay in the operating budget or Capital Improvement Program as applicable.
20. Identify and establish priority areas of open space for purchase or easement attachment.
21. Evaluate city-owned parcels of land for conservation/recreation potential.
22. Evaluate existing regulatory mechanisms in Dover for protecting natural resources.

Section One

**FORESTS
FISH AND WILDLIFE
AGRICULTURE**

FOREST RESOURCES

As Dover becomes more urbanized, greater and increasing pressures will be exerted to convert undeveloped areas of the City into a variety of man-made land uses. Forested land is one of the resources which is continually being transformed into the built-up land area of the City.

For many people forested land represents only the space between the built-up areas in which we spend most of our lives. However, in addition to its potential for passive recreation, forest land provides a host of environmental services among which are the following:

- stabilization of soil preventing erosion and retardation of water runoff;
- provides oxygen to the air and filters out dust;
- stabilizes the water table which protects watersheds and drinking water supplies;
- provides support and protection for numerous wildlife species;
- provides shade in summer and wind protection in winter;
- provides visual diversity, color and contrast to the landscape.

Forest resources are probably one of the more overlooked natural resources. In a population center the size of Dover, little attention is paid as the forested lands are cut back in an incremental fashion to make room for more housing or other non-residential uses. The loss of forested land is also less noticeable because Dover is surrounded by other municipalities which still have an abundance of forest land.

This type of incremental encroachment on the City's forest resources has taken its toll however. An inventory conducted by the University of New Hampshire indicates that in 1953 approximately 6,935 acres or 38% of Dover's land area was forested. By 1974, twenty-nine years later, this figure had decreased only 580 acres to 6,355 acres. In 1982, however, total forested acres in Dover had dropped to 4,230 acres (23%). This means that in the eight year period between 1974 and 1982, approximately 2,705 acres had been cut down or about 338 acres annually. This represents a loss of 30% of the City's 1953 forested acres. The period between 1982 and 1987 has probably been the most explosive growth period which the City has encountered. Therefore, it is likely that this trend towards the rapid loss of forest land is still continuing.

Dover's forests can be divided into three major categories: conifers, hardwoods and mixed. No major portions of this cover consists of virgin stands of trees which is a reflection of the important role that the lumber trade and produce played in Dover's economy from the time of it's founding up until the end of the eighteenth century.

Conifers in this region consist primarily of white pine, hemlock, red pine, spruce and pitch pine. The hardwoods are made up for the most part of red oak, red maple, beech, white birch, ash and white oak. The mixed stands, as the name implies, constitute a combination of the foregoing with a general predominance of red oak, red maple, white pine and hemlock. Throughout Dover and the region white pine is the predominant tree, followed by hemlock, red oak and red maple.

Due to the fact that Dover has very little mature forest land, there is not much opportunity for any large-scale commercial logging operations. However, Dover's forest land have generated some income for both the City and the property owner as evidenced by information compiled by the NH Division of Forests and Lands, Department of Resources and Economic Development.

The following table shows the amount of timber which was reported as being harvested between 1981 and 1987 within the City.

ANNUAL TIMBER HARVEST
FOR THE CITY OF DOVER
1981 - 1987

	<u>Fiscal Years*</u>				
	<u>1981-82</u>	<u>83-84</u>	<u>84-85</u>	<u>85-86</u>	<u>86-87</u>
Pine (B.F.)	196,969	112,881	63,765	74,517	100,120
Hemlock-Larch (B.F)	4,213	-	2,320	7,559	-
Hardwoods (B.F.)	-	-	8,930	295	-
Pallets/Ties (B.F.)	8,419	-	13,625	-	11,635
Spruce-Fir (Cords)	219	-	-	-	-
Pine (Cords)	67	-	-	-	62
Softwood (Cords)	109	30	-	-	-
Fuel Wood (Cords)	195	-	5	58	5
Chips (Cords)	-	349	94	970	187
 Annual Timber Yield Tax Received By Dover	 \$1,483	 \$877	 \$804	 \$1,073	 \$975

Source: Certification of Yield Taxes assessed as submitted to the Department of Revenue Administration.

B.F. - Board Feet (500 B.F. = 1 cord)

* Fiscal years run from April 1 - March 31. No data is available for FY 82-83.

State statute (RSA 79:10) requires all property owners to file a "Notice of Intent to Cut" with the City Assessor before commencing any cutting operation unless the wood is to be used for personal use. The City receives 10% of the assessed stumpage value. The annual harvest and tax yield is illustrated in the preceding table. A conservative estimate would be that this table represents only 50% of the cutting operations which occur annually within the City. This means we have a less accurate inventory of our forest resources and a loss of revenue for the City.

Although there are no large commercial logging operations in Dover, there are several small-scale loggers producing sawlogs, cordwood and chips. In addition, some private land owners have taken on a management role of their forest land as Certified Tree Farmers. This is a program established by the American Forestry Council which encourages private foresters interested in providing the timber industry with good quality raw materials. A certified tree farmer is a landowner with a minimum of ten acres who implements forestry practices such as weeding and thinning of young timber, wildlife enhancement, tree cropping, forest fire and erosion protection.

In Dover there are currently eight certified tree farmers with a total ownership of 512 acres. There is probably an equal amount of land which is being managed but not as part of the tree farm program. (e.g. Strafford County has 30 acres of managed forest land).

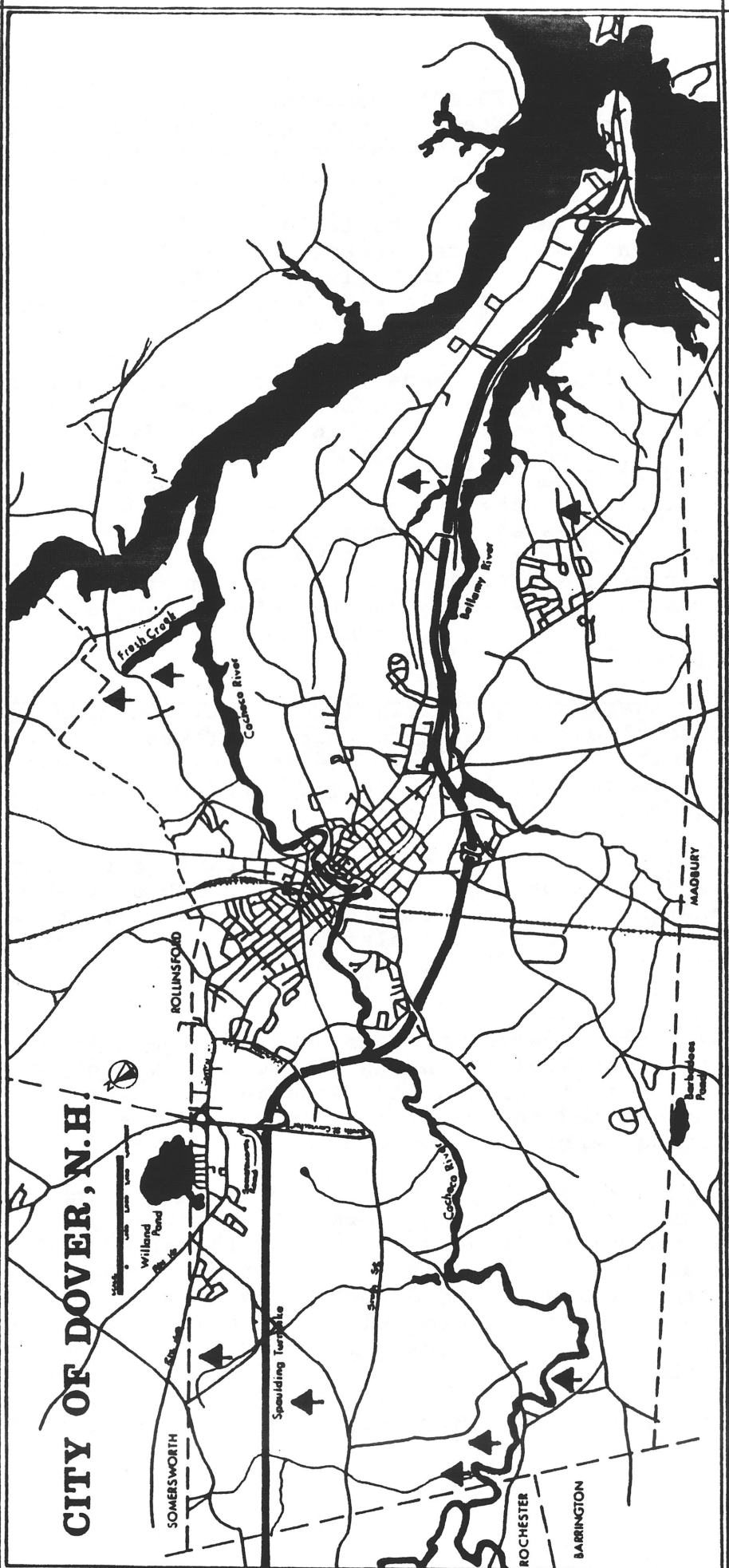
Dover has had an active street tree planting program since about 1980. As part of the Public Works Department's Tree Program, trees within the street rights-of-way are systematical planted or replaced. The City's arborist is responsible for the installation and maintenance of these trees.

In 1987 Dover received the top award in the Community Beautification Program in the 10,000 and over population category from the NH Arborist Association. The City has recently applied for certification as a "Tree City, USA" from the national Arbor Day Foundation.

The City installs approximately 100 trees a year between the spring and fall plantings. Over the past few years the focus of the program has been on improving the appearance of the main roads leading into the City. These include: Both ends of Central Avenue; Sixth Street; Silver; Washington and Portland Ave. The program will now begin to shift its focus to refurbishing street trees in residential neighborhoods within the urban core.

The City cemeteries, which represent one aspect of Dover's

LOCATION OF
CERTIFIED TREE FARMS
DOVER, NH - 1988



▲ CERTIFIED TREE FARM

SOURCE: STRAFFORD COUNTY FORESTER



NEW HAMPSHIRE
NATURAL HERITAGE
INVENTORY

Edie Hentey

1 February 1989

Debbi Burrington
185 Sixth Street
Dover, NH 03820

Dear Ms Burrington:

Thank you for consulting the New Hampshire Natural Heritage Inventory regarding the presence of rare plants, animals, and exemplary natural communities (referred to as "elements") in Dover and in particular, the Royals Cove area. We have no records of elements there. However, other areas do and enclosed is a list of elements known from within the boundaries of your town. The list consists of four columns: The state rank, the global rank, the scientific name, and the common name. We have provided an explanation of the ranking system used by the Heritage Inventory.

Also enclosed is a copy of a USGS topographic map with locations of elements indicated on it by dots. Where sufficient information is available, a grid represents the population area and potential habitat of the element. Natural Communities are also indicated by a grid.

Due to the sensitive nature of some elements, at this time the names on the list will not be directly matched up with the dots and grids. One dot may also represent the location for more than one element. This information will assist you in your initial resource inventory and prioritizing of land for protection.

When your town is ready to formally propose land for protection, more precise information will be provided on the elements found within the boundaries. This information will include the name and exact location of each element, ecological boundaries, and management recommendations. We will also advise you on the sensitivity of the data and the level of confidentiality recommended in the application process.

I urge you to telephone me with any questions you may have about this information. Since each element occurrence presents unique protection problems, more information may be necessary to enable you to identify your protection needs and decide on the appropriate boundaries.

Department of Resources and Economic Development
PO Box 856 CONCORD N.H. 03302-0856

603-271-3623

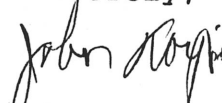
*Frank
Native
Conservancy*

Many of the elements on the enclosed list have not been reverified by the Natural Heritage Inventory. They are old records with generalized localities, collected from herbaria and museums, whose current status is uncertain. In such cases we will be unable to map this information for you with any precision.

This list can be useful to you. First, the elements may still exist in your town and could be relocated by conducting a biological inventory. Second, the occurrence of these elements gives a clue to what types of habitat exist in your town and provides a basis for planning such an inventory.

The New Hampshire Natural Heritage Inventory, an agency of the New Hampshire Department of Resources and Economic Development (DRED), collects and analyzes data on the status, location, and distribution of rare or declining native plants, animals, and natural communities in the state. Data is collected on over 100 animal species, 300 plant species, and 90 community types. 2400 records of occurrences of these elements are mapped and stored in a computerized database. The Heritage Inventory exchanges data with the Audubon society of NH, the NH Endangered Species Program, and the NH Fish and Game Department. This information is being provided to municipalities as part of the Trust for New Hampshire Lands local initiative project. Dover can play a key role in protecting the state's rare species and habitat. Your interest and efforts are very much appreciated.

Sincerely,



John E. Korpi
Ecologist
NH Natural Heritage
Inventory

SRANK	GRANK	SCIENTIFIC NAME	COMMON NAME	TOWN NAME
S1	G4	ADLUMIA FUNGOSA	CLIMBING FUMITORY	FARMINGTON
SH	G5	MELAMPYRUM LINEARE VAR LATIFOLIUM	COW-WHEAT	FARMINGTON
S1	G5	CAREX BULLATA	INFLATED SEDGE	ROCHESTER
S2	G5	ARABIS MISSOURIENSIS	MISSOURI ROCK-CRESS	ROCHESTER
S2	G4	ISOETES RIPARIA	RIVER BANK QUILLWORT(17)	ROCHESTER

S2	G4	ISOETES ENGELMANNII	ENGELMAN'S QUILLWORT(17)	DOVER (P. 92) at bank
S1	G5	LESPEDEZA PROCUMBENS	TRAILING BUSH-CLOVER	DOVER
indented S2	G5	POTAMOGETON NODOSUS	KNOTTY PONDWEED (P. 92)	DOVER James White
S2	G5	CONVOLVULUS SPITHAMAEUS	LOW BINDWEED	DOVER (Hutchinson)

1st on Co.

Isotria medeoloides

Small in field P. 92 R.C.

open space plan, are also part of the tree planting program. Trees are regularly planted as the use of the cemetery expands. The older section of Pine Hill Cemetery has very mature trees which require more maintenance such as fertilizing and cabling. However, the scenic and historic value of this area make it well worth the time and money invested. In 1984, a survey of Pine Hill identified 428 trees with sugar maple being the dominant species (284 trees). Spruce was the principal evergreen (60 trees).

The inventory conducted in 1984 identified every street tree and publicly-owned shade tree in Dover. A total of 2095 trees were noted; 1665 street trees and 430 trees in Pine Hill. Although that inventory has not been updated on a regular basis the total number of trees is currently estimated around 3200. It is the intent of the DPW to update this inventory to coincide with the coming-on-line of the City's computer mapping system.

RECOMMENDATIONS

1. Manage Forest Resources

The City needs to take a more protective role and set an example in protecting and managing its forest resources. There are several city-owned parcels which may be suitable for forest management practices. Among those parcels are:

- Long Hill Memorial Park - a 14 acre parcel located on Long Hill Road. Thickly wooded and primarily undeveloped site with the exception of a basketball and tennis courts. (Tax maps A and D Lots 10 and 10A respectively).
- Guppy Park - a 39 acre parcel located on Portland Avenue. Approximately half of the site is already being used for active recreation. (Tax Map 26 Lot 2).
- Map H Lot 63 - this 11 acre parcel is bordered by the Bellamy River and the Madbury town line. It is completely undeveloped and currently has no access.

These parcels should be reviewed with the State and County Foresters to discuss their management potential. A selective thinning of these parcels could generate a small amount of revenue for the City or at least cover the cost of a consulting forester to do the work. A well managed parcel will improve the health of the forest, make the area more productive for wildlife and provide access trails for public use.

However, the City's forest management activities should

not be limited to an isolated, individual parcel type approach. Moreover, it should be pursued from a city-wide perspective as a "system" of managed parcels interconnected with corridors or "greenways" of undeveloped land. These corridors will serve to link the larger managed forested areas together, which will facilitate the movement of wildlife and provide buffers between the developed portions of the City.

2. Designate a City Forest

In New Hampshire, municipalities are given the authority to establish by purchase, lease, grant, tax collector's deed, transfer, bequest or other devise, a city or town forest (RSA 31:110). The main purpose of such a forest shall be to encourage the proper management of timber, firewood and other natural resources through planting, timber stand improvement, thinning, harvesting, reforestation, and other multiple use programs consistent with the forest management program, and deed restrictions and any pertinent local ordinances or regulations. Furthermore, a city forest can provide an ideal laboratory for schools and civic organizations, and an area for general recreation use by town residents.

All of the city-owned parcels mentioned under recommendation #1 have potential to be a city forest. A review of and report on these parcels and any other potential sites should be conducted by the Conservation Commission.

If additional lands could be acquired along the Bellamy River between Mast Road and the river there would be the potential for some outstanding recreation and forest management opportunities.

This area plays an important role in recharging the aquifer of the Griffith and Ireland municipal wells. In addition, if a corridor along the river could be connected to the existing Bellamy Park it would create an extensive river front park for the City with approximately 1200 feet of frontage on the river.

3. Encourage private landowners to conserve the City's forest resources.

Every effort should be made to work with private landowners in managing their wood lots. Although property owners who are currently managing their wood lots probably have the land in "current use", this tax category may not exist forever. Therefore, the City should pursue the possibility of obtaining a conservation easement or purchasing the development rights from interested landowners. This would still reduce the tax

burden of the property owner while conserving the resource and maintaining open space for the City. There are currently funds available from the State through the Land Conservation Investment Program (LCIP) for this very purpose.

4. Better monitoring of logging activities within the City.

More regular compliance with RSA 79:10, "Notice of Intent to Cut", needs to be obtained from landowners who are logging on their property. The filing of this "notice" should be condition of approval for all subdivision, site plan and building permit application process. This will help in insure that a better inventory of forest resources are maintained and that the City receives the proper tax revenues.

One way to better enforce these regulations would be to contract with a forester on a part-time basis. This person would review all cutting operations in the City to make sure that accurate and complete information is being submitted. This has been done in other communities and the additional revenue collected more than offsets the cost of the forester's services.

5. Start a Forest Conservation Program

As indicated in this section Dover is apparently losing a substantial amount of its forested land to development every year. Action needs to be taken now to reverse, or at least, slow this trend before the effects of this cutting become severe.

A forest conservation program should be initiated by the City. This program should include at least the following methods of implementation.

- A. Landscaping regulations should be developed for inclusion into the subdivision and site plan review process. These regulations should minimize the amount trees cut during the construction process. They should also address the location of trees to be left on-site with regard to buffer and screening of abutting properties, as well as conformance and compatibility with the City's open space program objectives.

The City should work closely with the State and County Forester to develop these regulations. The State is currently looking at developing some comprehensive tree cutting regulations.

- B. The City should set an example for private landowners by participating in the Certified Tree Farm Program.

Once a city-owned parcel has been selected and some management practices initiated, the City should apply for membership in this program.

- C. The Planning Board should require street tree plantings for new subdivision on a more consistent basis. The Board has this authority under Section 155-36E of the Subdivision Regulations.
- D. Expand the City's tree planting program by revegetating the City-owned parcels which have been excavated or otherwise stripped of vegetation.

FISH AND WILDLIFE RESOURCES

The label of "city" tends to give Dover the connotation of being a predominantly urban environment. However, within Dover's 28 square miles there are many different types of habitat ranging from forest land and fields to wetlands, ponds and waterways. These habitat support a variety of animal species which represent an important resource to the residents of Dover. The following section provides an overview of Dover's fish and wildlife which are currently sharing the land and water with the rest of the City's residents.

ESTUARINE (COASTAL) HABITAT

Dover is very fortunate to have within its municipal boundaries an extensive amount of surface water resources. The Cochecho, Bellamy, Salmon Falls and Piscataqua Rivers comprise some 960 acres and provide the City with approximately 50 miles of river frontage. All four rivers belong to the larger Piscataqua River drainage basin which at Dover Point, receives discharge from the Great and Little Bay tidal basin before emptying into the Atlantic Ocean.

The Bellamy and Cochecho Rivers are tidal from the Bay to their respective dams in the City proper. As these saltwater (tidal) embayments mix with the inflow of freshwater from upland areas they create what is known as an "estuary". This ensuing mixture of salt and fresh water represents a continuously fluctuating hydrological environment to which many plants and animals have adapted. Estuaries are extremely valuable as: breeding and nursery areas for finfish and shellfish (and therefore vital to the fishing industry); as habitat for a variety of native and migratory birds; as nature's "sponge" during periods of coastal flooding; and as a filter for what flows from the river to the sea.

Great Bay is a classic example of an estuarine system and represents one of the finest remaining relatively unspoiled systems on the Atlantic coast. In September of 1987, it was incorporated into the National Estuarine Research Reserve program by the Federal Government. The purpose of this program is to designate a representative sample of relatively undisturbed estuaries around the country as places to promote research and education.

It follows then that the three tidal portions of the rivers which flow through Dover, including their major tributaries of Fresh Creek and Varney Brook would also exhibit the

ecologically diverse characteristics of this estuarine system. They are, in fact, an integral part of the estuary. Between 1980 and 1981 the New Hampshire Fish and Game Department conducted a year-long inventory of resources in the estuarine system. This inventory showed the diversity of fish and wildlife that depend of the estuary, as well as the commercial and recreational use of the area. For example:

- there is a commercial fishery for lobsters and rock crabs and recreational clamming and oystering;
- there were 52 different species of finfish identified. The species included resident, anadromous, catadromous, ocean migrants and fresh-water finfish; and
- during the year, over 90,000 birds representing 71 different species were identified.

In Dover specifically, there were some particularly noteworthy findings contained in the inventory. The following paragraphs provide more detail about the shellfish, finfish, birds and mammals which were identified within Dover's municipal boundaries.

Shellfish

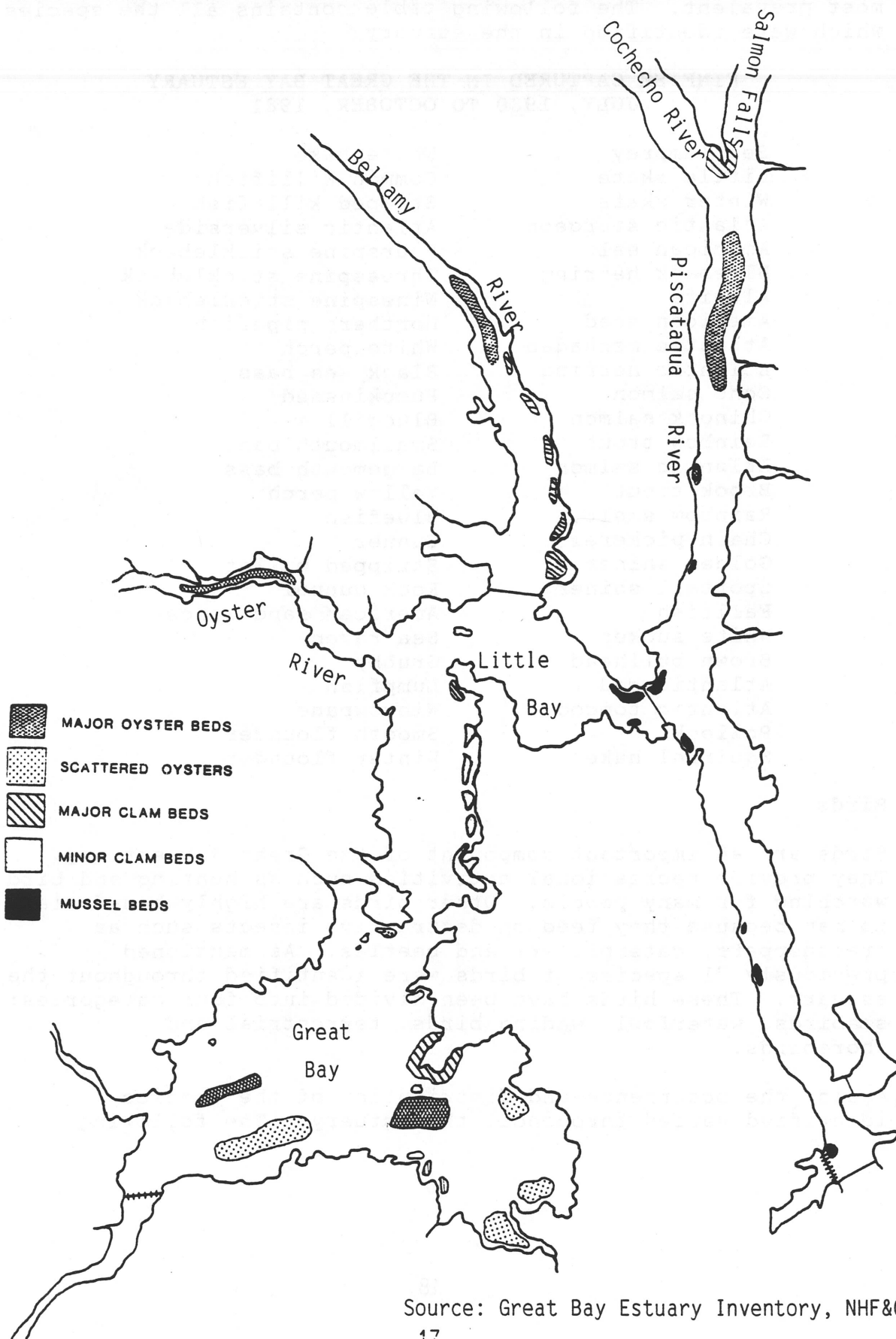
In the Bellamy River were found one of the few "major" oyster beds located in the estuary, as well as six locations of "minor" clam (soft-shell) beds. The Piscataqua River also contains one of the largest oyster beds in the estuary, as well as more evenly distributed populations of clams, blue mussels, lobsters, rock crabs, hermit crabs and horseshoe crabs. The Cochecho River, at its confluence with the Salmon Falls River, was one of the few locations of a major clam bed within the estuary.

Finfish

Within the estuary, sampling was also conducted at numerous locations in order to access finfish populations and distribution. There were four sampling locations in Dover: three on the Bellamy (including Royalls Cove), one on the Cochecho above Fresh Creek, and one on the Salmon Falls near the Rollinsford town line.

Almost all 52 species of finfish found in the estuary were identified at the sampling locations on Dover's rivers. However, some species were more prevalent at certain locations. On the Bellamy River: White perch, River herring, Silversides, Killifish, Winter flounder, Rainbow

Location of Shellfish Concentrations in
Great Bay Estuary 1980 - 81



Source: Great Bay Estuary Inventory, NHF&GD

smelt, Sticklebacks and Smooth flounder were found in higher numbers. On the Cochecho and Salmon Falls Rivers: Atlantic tomcod, Rainbow smelt, River herring, Common killifish, Smooth flounder and White perch were the species found to be most prevalent. The following table contains all the species which were identified in the estuary.

FINFISH CAPTURED IN THE GREAT BAY ESTUARY
JULY, 1980 TO OCTOBER, 1981

Sea lamprey	White hake
Little skate	Common killifish
Winter skate	Striped killifish
Atlantic sturgeon	Atlantic silverside
American eel	Fourspine stickleback
Blueback herring	Threespine stickleback
Alewife	Ninespine stickleback
American shad	Northern pipefish
Atlantic menhaden	White perch
Atlantic herring	Black sea bass
Coho salmon	Pumpkinseed
Chinook salmon	Bluegill
Rainbow trout	Smallmouth bass
Atlantic salmon	Largemouth bass
Brook trout	Yellow perch
Rainbow smelt	Bluefish
Chain pickerel	Cunner
Golden shiner	Stripped mullet
Spottail shiner	Rock gunnel
Fallfish	American sand lance
White sucker	Sea raven
Brown bullhead	Grubby
Atlantic cod	Lumpfish
Atlantic tomcod	Windowpane
Pollock	Smooth flounder
Squirrel hake	Winter flounder

Birds

Birds are an important component of the Great Bay estuary. They provide recreational activities such as hunting and bird watching for many people. Other birds are highly beneficial to man because they feed on destructive insects such as grasshoppers, caterpillars and beetles. As mentioned previously 71 species of birds were identified throughout the estuary. These birds have been divided into four categories: seabirds, waterfowl, wading birds, terrestrial and shorebirds.

Again, the occurrence and distribution of the species identified varied throughout the estuary. The following

table lists those birds which were sighted on the rivers in Dover.

**BIRD SPECIES IDENTIFIED ON THE SALMON FALLS,
COCHECHO AND BELLAMY RIVERS
JULY, 1980 THROUGH JUNE, 1981**

SEABIRDS

Great Black-Backed
Gull
Herring Gull
Ringed-Billed Gull
Double-Crested Cormorant

WADING BIRDS

Snowy Egret
Great Blue Heron
Green Heron
American Bittern

WATERFOWL

Canada Goose
Mallard
Black Duck
Blue-Winged Teal
Green-Winged Teal
Wood Duck
Greater Scaup
Bufflehead
Old Squaw
Common Scoter
Pied-Billed Grebe
Hooded Merganser
Horned Grebe

TERRESSTRIALS & SHORE

Black-Bellied Plover
Spotted Sandpiper
Greater Yellowlegs
Lesser Yellowlegs
Least Sandpiper
Semipalmated Sandpiper
Belted Kingfisher
Crow
Red-Tailed Hawk
Osprey
Killdeer
Solitary Sandpiper
Tree Swallow
Red-Winged Blackbird

Mammals

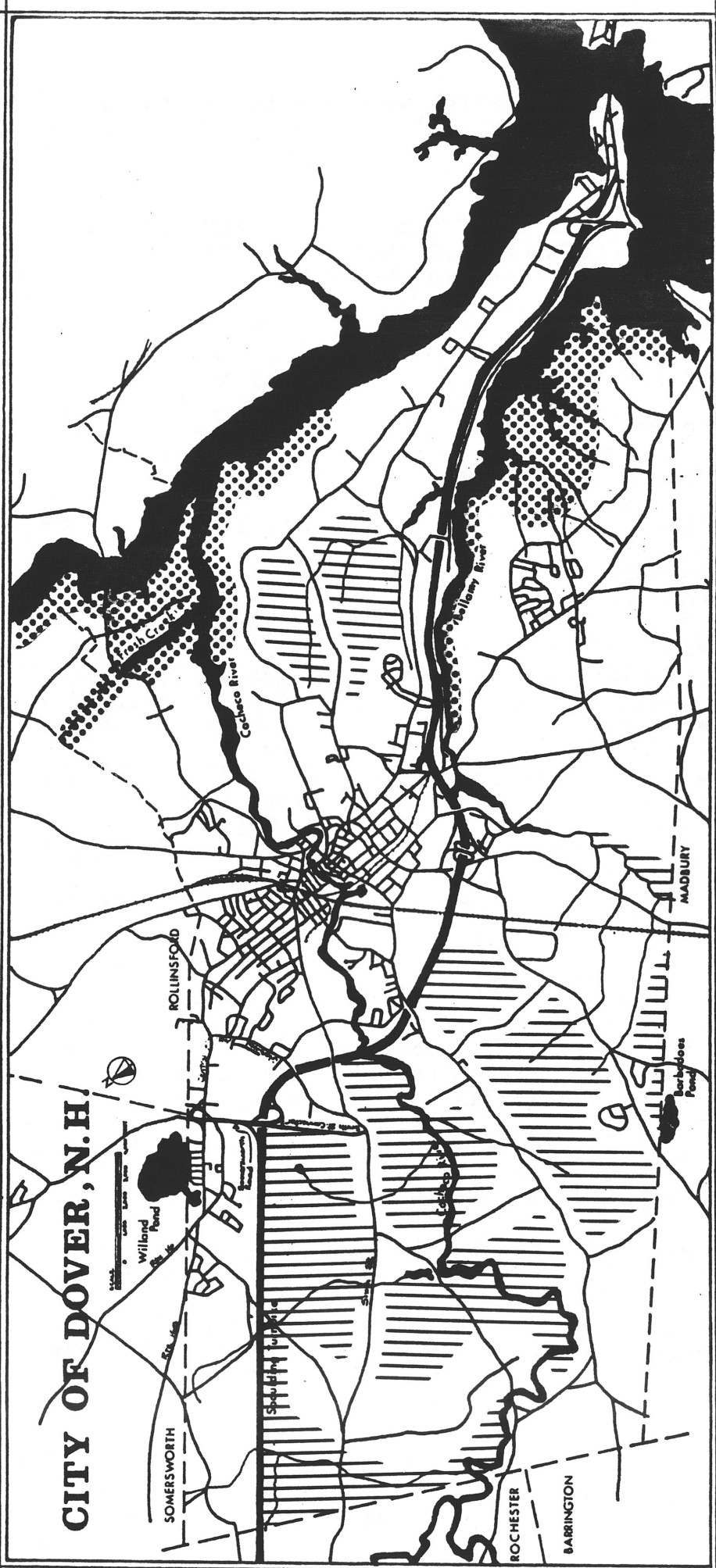
Marine and terrestrial mammals inhabit the Great Bay estuary and the land area surrounding the estuary. Harbor seals primarily, but also an occasional pilot whale and porpoise frequent the area in search of food. Terrestrial mammals also utilize the estuary as a food source. There are at least eight species of terrestrial mammals which are seen throughout the estuary area including: raccoon, red fox, gray squirrel, cottontail rabbit, whitetail deer, eastern chipmunk, woodchuck and muskrat.

The food Chain and Potential Threats to the Estuarine Environment

The preceding paragraphs have presented information on the various fish and wildlife species associated with Dover's

IMPORTANT FISH AND
WILDLIFE HABIT

CITY OF DOVER
1988



- Surface Water (Tidal and Fresh)
- Estuary And Contiguous Upland
- Prime Inland Areas

lowland esuary environment. Although these fauna have been presented in an individualistic fashion as part of an inventory, they are actually intricately related as part of a delicately balanced food chain.

Other components of the food chain which are usually given less attention but which play a very important role are the plants and microscopic animals which inhabit the estuary. These flora and fauna provide food for animals which are higher in the food chain, but are also very susceptible to changes in the environment.

For instance, the eelgrass and saltmarsh are major contributors to estuarine productivity. Both eelgrass and saltmarsh help to stabilize bottom sediments by its root system. The leaves support small fauna that are consumed by larger species. Fish move into these during high tide to feed or avoid predation. Crabs, oysters and crustaceans and molluscs are often found in abundance in the eelgrass and saltmarsh. Various species of birds will in turn feed on these animals during low tide.

However, due to the immobility or relatively slow movement of the plants and animals in these fisheries, they are very susceptible to environmental pollution.

The impact, for example, of an oil spill or other hydrocarbon contamination could substantially destroy plant life which could result in substantial destabilization of bottom sediments with resulting loss of habitat, increased turbidity and siltation problems.

As mentioned earlier, estuaries serve as a spawning and nursery area for many different species. Spawning adults, eggs and larva are particularly sensitive to changes in their environments. Spawning activity occurs at the same time for many species. This usually results in greater than normal concentrations of species in a spawning area. As a result, whole local populations can be vulnerable to a single adverse event.

INLAND AND FRESHWATER HABITAT

Upland from Dover's estuaries are the more developed portions of the City. These built-up areas, which range from urban to rural development densities, have a major affect on shaping the location, type and amount of available fish and wildlife habitat. The types of habitat in Dover vary greatly and include: timberstands of varying ages and mixtures of soft and hardwoods, wooded swamps, fields and meadows in varying stages of successional growth, freshwater marshes, bogs,

ponds and rivers. This diversity of habitats is critical for a variety of wildlife to survive in a given area. Different species often require different habitats for shelter, feeding, and breeding.

Terrestrial Habitat

The key to planning the management of all wildlife species is to know their habitat requirements and to provide them in a variety of combinations that meet the needs of as many species as possible. To this end, wildlife must be viewed as communities of species that respond over time to habitat changes.

It is essential to have as complete an inventory as possible of the wildlife species inhabiting a particular geographic area in order to develop appropriate management practices.

With the exception of the State's inventory of the Great Bay estuary, information about fish and wildlife species for the rest of Dover is limited. What information is available is primarily concerned with game species since the basic source of funds for wildlife management is derived from hunter's expenditures, purchase of licenses and tax on sporting arms and ammunition.

The following table contains data on species of fur-bearing animals which were trapped or hunted within Dover's city limits between 1980 and 1986.

**FUR BEARING ANIMALS
TRAPPED OR HUNTED IN DOVER*
1980 - 1986**

	ANNUAL SEASON**					
	1980-81	81-82	82-83	83-84	84-85	85-86
Beaver	13	8	0	7	7	9
Otter	0	1	0	0	2	3
Muskrat	-	241	32	72	84	31
Raccoon	11	20	22	10	29	9
Deer	-	-	11	12	30	30
Red Fox	16	45	24	11	26	13
Gray Fox	5	6	6	3	5	0

*Based on annual reports made by hunters and trappers to the New Hampshire Fish and Game Department.

**The annual hunting and trapping seasons fall within the

time period of November to March.

While the preceding table doesn't identify total populations or densities of these animals, it may indicate their relative abundance. Other game and furbearing species which live in, or pass through Dover include: mink, otter, weasel, skunk, fisher, turkey, bobcat, coyote, as well as an occasional moose or bear.

Of course, there are numerous non-game species of birds, mammals, and reptiles which occur in the upland habitat areas. Many of these more common, but no less important species, are more adaptable to coexisting with humans. They generally require less land and can utilize alternative food sources. The larger species however, utilize more land areas that generally speaking, are in the outlying portions of the City and cross over into adjacent communities. This ability of wildlife to move in from less developed adjoining municipalities is an important reason why we continue to see them in Dover.

Aquatic Habitat

The primary freshwater habitats in Dover consist of the Cochecho and Bellamy riverine systems and their various tributaries, and Willand Pond which straddles the Dover/Somersworth City line. The Cochecho River is the larger of the two rivers with a mean annual flow estimated at 240 cubic feet per second. The water quality has been rather low in the past (Class C or D) due to the up-river discharge of sewage from Farmington and Rochester. However, both municipalities now have secondary sewage treatment plants and the Cochecho's water quality has been upgraded to Class B.

The Cochecho River habitat does support a reasonable fish population, primarily warm water species. The species which have been documented are listed below.

Lamprey Eel	Eastern Chain Pickerel
American Eel	Eastern Brook Trout
Common White Sucker	Fallfish
Pumpkinseed	Smallmouth Bass
Yellow Perch	Common Shiner
Brown Bullheads	

The river has been managed (stocked) for rainbow and brook trout by NH Fish and Game at its upper reaches in Farmington. There is also a naturally reproducing population of brown trout occurring in two of the Cochecho River's tributaries, the Ella and Mad Rivers.

Also present in the Cochecho are anadromous species of American shad, alewife and blueback herring. The Fish and Game Department has been stocking approximately 1500 alewife spawners since 1984 in Bow Lake on the Isinglass River which is a major tributary of the Cochecho. This management is to provide forage for Bow Lake resident fish populations but will also increase the Cochecho River spawning run of alewife.

In Dover, the Cochecho has also been stocked with American Shad. Fish and Game has stocked the river in the Watson Dam Project impoundment since 1978. Thus far apparently not many have returned to the Denil fishway located at the Cochecho Falls Dam. The following table illustrates the stocking and return rate figures for shad and alewives.

OPERATIONAL DATA, COCHECHO FALLS FISH LADDER			
YEAR	#SHAD IN LADDER	# ADULT SHAD RELEASED ALIVE	# ALEWIVES IN LADDER
1976	NA	0	9,500*
1977	NA	0	29,500*
1978	4	0	1,925
1979	2	0	586
1980	0	212	7,713
1981	0	183	6,559
1982	1	120	4,129
1983	3	135	968
1984	0	241	477
1985	1	90	974
1986	1	205	2,612

NOTE: NA = Figures not available but probably less than 8.
*Estimated, probably not reliable.

SOURCE: New Hampshire Fish and Game Department

Fish and Game is also beginning a five year plan to restore an Atlantic Salmon run in the Cochecho by stocking eggs in the Isinglass River. The agency is also anticipating completion of a management plan for the river by 1989-90.

The Bellamy River begins at Swains Lake in Barrington and flows through Madbury before reaching Dover. This more moderate size river, which has a 1987 water quality of Class A, is also managed by Fish and Game for both rainbow trout and brook trout. Below the dam which impounds the Bellamy Reservoir other species are evident. including largemouth bass, American eels, fallfish and white suckers. Above the dam additional species which have been identified include eastern chain pickerel, brown bullheads, yellow perch,

pumpkinseeds and goldenshiners.

Willand Pond which straddles the Dover/Somersworth border, is also Class A water quality. It is approximately 73 acres with a maximum reported depth of 23 feet. Fish species inhabiting the pond include white perch, largemouth bass, eastern chain pickerel and golden shiners.

SUMMARY

Despite the rapid growth which Dover has experienced over this decade there is still a reasonable amount of habitat left to support viable fish and wildlife populations. Unfortunately, when wildlife habitat is confronted with encroaching human development it's usually habitat preservation which has the lower priority.

The presence of wildlife in an area has many virtues, some of which cannot be quantified; such as the personal pleasure and gratification which a person feels from seeing wildlife in its natural environment. Or the educational value derived from observing wildlife in order to gain a better understanding of the ecological system of which we are all a part.

Other benefits of fish and wildlife provide can be quantified to some extent. Each year hunters, fishermen, hikers and birdwatchers seek out the wildlife in Dover for its recreational value. Aside from providing these recreational opportunities, the revenues derived from the sale of equipment, arms, and licenses, and related amenities such as food, lodging and supplies, represent an important contribution to the local economy.

Another important aspect of wildlife management is that the conservation or preservation of habitat areas is easily integrated with the goals of open space protection, recreation planning and the conservation of other natural resources. For instance, those areas identified as important open space usually have value for wildlife as well. Passive recreation areas can provide wildlife habitats. Good forest management enhances an area for wildlife while agricultural cultivation can provide supplemental food for various species.

RECOMMENDATIONS

1. Preserve and manage those areas of Dover which are best suited for fish and wildlife habitat.
 - (a) Unquestionably, the portions of the Great Bay estuary located in Dover provide some of the most

important fish and wildlife habitat within the state. The City should place top priority on preserving in its natural condition as much land as possible along the tidal areas of the Bellamy, Cochecho and Salmon Falls/Piscataqua Rivers. A minimum 250 foot protective corridor along these rivers, and around tidal marsh areas will provide an essential minimum buffer zone. Wider buffer zones will be encouraged whenever possible.

- b) The second areas of priority for preservation should be the freshwater systems of the Cochecho and the Bellamy Rivers. These riverine habitats are important areas for inland wildlife and their protection will help maintain the quality of the estuary downriver will be maintained. Once again a 250 foot protective corridor is necessary.

2. Identify wildlife habitat areas of additional importance throughout the City.

Although it may be desirable it is probably not feasible to set aside a number of very large tracts of land (i.e. 300 + acres in size) around the City for wildlife preservation. Therefore, a more selective approach to habitat preservation should be undertaken. A process should be initiated to identify parcels of varying size which include various types of habitat that are dispersed throughout the City. A system of "corridors" which connect these habitat areas should also be identified. These corridors would facilitate movement of wildlife throughout the built-up areas of the City. The Planning Department and Conservation Commission should solicit assistance from wildlife experts at the University of New Hampshire, Cooperative Extension, NH Fish & Game Department, and the NH Department of Resources and Economic evelopment (DRED) in undertaking this project. If funds are available private consultants could also be used.

3. Use cluster development techniques to attract wildlife in the City.

Cluster development allows the grouping of structures on a site in order to provide larger areas of open space. These open space areas will naturally attract various types of wildlife depending on the size and type of open space which is set aside.

Dover currently has a cluster ordinance (Alternative Design Subdivisions) although it has not received a lot

of use. Consideration should be required during the subdivision approval process to locating open space in a manner that is most beneficial to wildlife. Consideration should be given to placing permanent conservation easements on these open space areas.

One method could be to situate the open space on the site so that it abuts another area of open space on an adjacent parcel. Or create a corridor of open space to facilitate wildlife movement through the site, particularly along waterways such as streams or brooks. These areas should be protected by a conservation easement and deed restriction placed on them by the Planning Board as a condition for subdivision approval.

AGRICULTURAL RESOURCES

Dover's rapid growth of the recent past has created mounting pressure to convert the City's supply of farmland into a variety of man-made non-agricultural uses. The amount of land best suited for agriculture continues to shrink as the demand for more urbanized land uses increase.

The depletion of farmland resources has not been an issue of great concern in the past. Little attention has been paid as the City's supply of land suitable for agriculture dwindles year after year. Much of the City's land best suited for agriculture is not in current use and is simply open land. However, this open land which has been cleared, drained and is relatively flat is also well suited for development as well as agriculture.

This view of open land has impacted the City's farmland resources however. The Dover Planning Department has recently completed an inventory of farmland based on soil suitability developed by the USDA Soil Conservation Service. The inventory indicates that in 1980 approximately 4,680 acres, or 30% of Dover's land area (15,368 acres) was considered important farmland and was available for farming. By a recent count this supply has dropped to 3,967 acres or 26% of Dover's land area. This means that in the eight year period between 1980 and 1988, approximately 713 acres of important farmland soils have been removed or covered over to make room for other land uses. This represents an 15% loss in land suitable for agriculture over an eight year period. In the past eight years the City has experienced its most explosive growth ever. If the trend towards the loss of farmland continues, the City could lose over 1,000 additional acres of land suitable for agriculture by the year 2000.

The Soil Conservation Service Land Capability Classification System was used as the basis for developing these agricultural land quality groups. This system groups soils into eight capability classes primarily on the basis of capability to produce common cultivated crops without deterioration to the soil resource. The risks of soil damage or limitations in use become progressively greater from class I to class VIII. The relationships between agricultural land quality groups and land capability classes are outlined in the following table.

AGRICULTURAL LAND QUALITY GROUPS

GROUP	LAND CAPABILITY CLASSES
Prime Farmland	I and II
Farmland of Additional Statewide Importance	III
Fair to Unsited for Agriculture	IV - VIII

Source: U.S. Department of Agriculture Handbook No 210.

Prime Farmland consists of soils that have few, if any, limitations to restrict the choice of agricultural crops. Conservation practices needed to conserve or manage these soils are easily applied. Additional farmland of statewide importance consists of soils that have more limitations for agricultural use than the prime farmland. The choices of agricultural crops are more restrictive, especially on wet soils. Conservation practices are usually more difficult to apply and maintain. These soils are illustrated on the Important Farmlands Map of Dover on file in the Planning Office

For Dover, prime farmland consists of several soil classes with moderate slopes: Ondowa fine sandy loam, Podunk fine sandy loam, Buxton silty loam 0-3% slopes, Charlton fine sandy loam 3-8% slopes, Elmwood fine sandy loam 0-3% slopes, and Windsor loamy fine sand 0-8% slopes. Dover's farmland of additional statewide importance consists of several soil classes with more significant slopes: Buxton silty loam 3-8% slopes, Charlton fine sandy loam 8-15% slopes, Suffield silty loam 8-15% slopes, and Windsor loamy fine sand 8-15% slopes.

The Planning Department's farmland inventory shows that in 1988 the City has approximately 1,684 acres of prime farmland and 2,283 acres of farmland of additional statewide importance still available for cultivation. This compares to the 1980 figure of 1,984 acres of prime farmland and 2,695 acres of farmland of additional statewide importance. This represents a 15% loss of land for both categories since 1980.

The majority of the city's farmland is used for pasture and hay. The principle crops grown in Dover are hay, tree fruits, vegetables, and small fruits (strawberries and blueberries). The major feed animals produced are beef animals.

Due to the nature of the economy, farming as an occupation has declined significantly over the last few decades. There

are only 16 commercial farming operations in Dover, totaling approximately 866 acres. Commercial farming is defined as any farm selling over \$1,000 of product per year. The following table gives the locations of Dover's commercial farms and the items they produce.

DOVER'S COMMERCIAL FARMS*

<u>Location</u>	<u>Map-Lot</u>	<u>Product</u>	<u>Acres</u>
Dover Point	K-19	tree fruit small fruit flowers	84
Garrison Road	I-IN	hay	24
Back Road	M-100, 100A	hay, strawberries	70
Littleworth Rd.	G-28, 29B	hay	80
Littleworth Rd.	G-2	hay	97
Littleworth Rd.	H-31	hay, some beef	60
Dover Point Rd.	M-52	vegetables	65
Mast Road	J-19	hay, horses	50
Henry Law Ave.	K-1	beef, hay	35
Atlantic Ave.	N-13	dairy	45
Bayview Road	J-22	beef, hay	80
Mast Road	I-5	nursery, berries	3
Rte. 108	H-1, H-1A	nursery	3
County Farm Cross Road	B-11	hay	35
County Farm Cross Road	B-11B	hay	3
County Farm Cross Road	B-17	hay, horses	30

total acres 866

* Over \$1,000 of product sold per year

Source: Cooperative Extension Agent, Strafford County.

Despite the decline in farming as an occupation, Dover offers ample opportunities for agricultural, horticultural, and

floricultural operations under its zoning and land use regulations. There is also opportunity for the retail sale of agricultural or farm products.

The R-40, R-20, RM-20 and RM-12 Zones (approximately 72% of the City's land area) allow for agricultural, horticultural, and floricultural land uses by right. Additionally, the R-40 Zone allows by right the retail sale of agricultural or farm products so long as such products are raised on the same site. The R-20 and RM-20 Zones allow the retail sale of agricultural or farm products raised on site by Special Exception. Finally, the B-1, B-2, and B-3 Zones allow for the retail sale of agricultural or farm products as the principle use of a site.

While the City still has a healthy amount of land suitable for agriculture much of it is being lost to development. Efforts should be made to protect this valuable resource. Farmland provides many benefits to a community among which are the following:

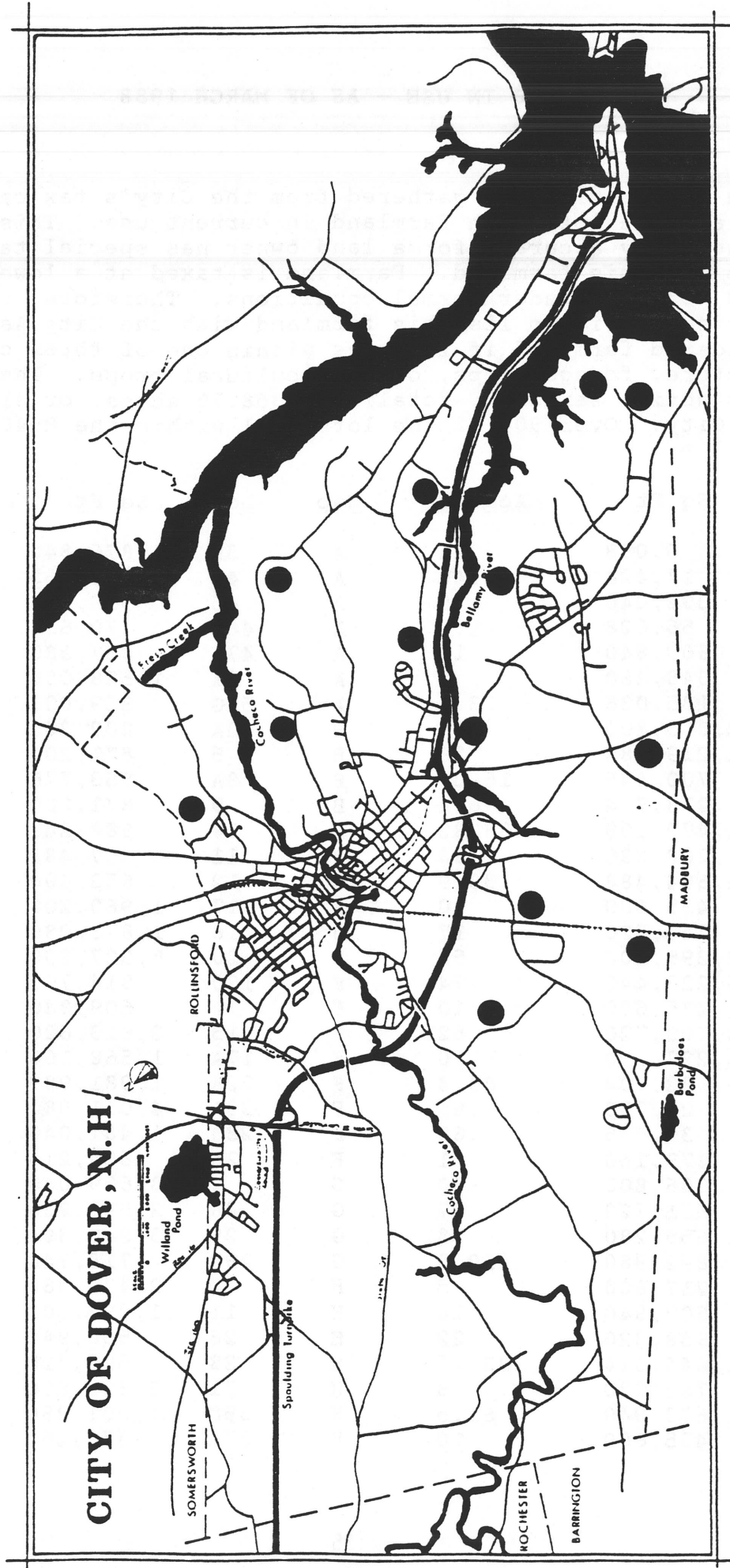
- provides economic diversity
- provides visual diversity, color and contrast to the landscape
- provides fresh produce grown locally
- provides open space in contrast to the city's urbanization
- maintains the fertility of the land
- provides long term food alternatives
- undeveloped land does not require municipal services, thus not increasing taxes

RECOMMENDATIONS

1. Make use of state and federal conservation programs and available state and federal funds for preserving agricultural land.
The city should make use of the funds available from the State through the Land Conservation Investment Program (LCIP). These funds can be used to purchase development rights to farmland while allowing the farming operation to continue.
2. Preserve farmland through open space dedication.
Encourage developers to set aside land suitable for agriculture as part of their development proposals. This could be best achieved through cluster development regulations with a conservation easement attached to the agricultural land.
3. The City should integrate agricultural land in its open space plan.
Agriculture has been an important part of Dover's history and continues to play a role in the City's economic base.

It also represents an important component of open space throughout the City and should continue to do so. It is recommended that at least 1600 acres of the Dover's farmland be permanently preserved. This represents about 10% of the City's land area. Particular emphasis should be placed on preserving those areas designated as prime farmland soils.

LOCATION OF
COMMERCIAL FARMS
DOVER, NH - 1988



● COMMERCIAL FARMS
SOURCE: 1988 PLANNING DEPARTMENT FARMLAND INVENTORY

FARM LAND IN USE - AS OF MARCH 1988

The following information was gathered from the City's tax cards. It is a list of all the lots with farmland in current use. This list should be reasonably accurate for a land owner has special tax incentives to list his farmland. Farmland is taxed at a lower rate than the land would be under normal conditions. Therefore, it is to the landowner's benefit to list his farmland with the City Assessor. Land is considered farmland if it falls within one of three categories: permanent pasture, forage crops, or horticultural crops. These are 142 classified as active farmland, totaling 4,358.75 acres, or almost one third of the City. Over 90% of the lots fall within the R-40 zone.

Map	Lot	Sq Ft	Acreage	Map	Lot	Sq Ft	Acreage
3	4	6,098	.14	A	39	3,876,840	89
4	35	17,424	.40	A	44	569,765	13.08
34	20	392,040	9	A	45	918,245	21.08
34	20A	56,628	1.3	A	46A	70,657	1.62
34	20B	609,840	14	A	47A	457,380	10.5
34	21	348,480	8	A	51	1,528,085	35.08
35	59A	135,036	3.1	A	53G	859,003	19.72
A	19	2,395,800	55	B	2A	809,345	18.58
A	23	1,219,680	28	B	5	871,200	20
A	24	700,445	16.08	B	8A	853,776	19.6
A	24B	278,784	6.4	B	9	871,200	20
A	26	1,473,199	33.82	B	10	688,248	15.8
A	27	4,268,880	98	B	11	6,307,488	144.8
A	29A	1,694,484	38.9	B	12	653,400	15
A	30	435,600	10	B	17	1,960,200	45
A	35A	740,520	17	B	18	1,873,080	43
A	37	2,395,800	55	B	20	5,227,200	120
B	21	3,223,440	74	F	120	914,760	21
C	2	435,600	10	F	14	609,840	14
C	3+3D	2,700,720	62	F	15	2,613,600	60
C	4	5,227,200	120	F	17A	1,568,160	36
C	14	3,632,904	83.4	F	22A	1,981,980	45.5
C	21A	28,750	.66	F	23A	4,051,080	93
C	41	30,056	.69	F	23B	1,481,040	34
C	43	479,160	11	F	25	624,215	14.33
C	45	1,306,800	30	G	2	3,659,040	84
C	46	1,611,720	37	G	28	2,591,820	59.5
C	47	1,655,280	38	G	29	3,240,864	74.4
C	48	892,980	20.5	G	29B	718,740	16.5
D	11A	217,800	5	H	4	2,439,360	56
D	12	609,840	14	H	11	1,089,000	25
D	14	958,320	22	H	26	500,940	11.5
D	16	1,444,014	33.15	H	28	522,720	12
D	16B	784,080	18	H	31	2,395,800	55
D	17	2,678,940	61.5	H	35D	1,001,880	23
D	17C	435,600	10	H	37A	370,260	8.5

Map	Lot	Sq Ft	Acreage	Map	Lot	Sq Ft	Acreage
E	27	2,169,288	49.8	H	40C	496,584	11.4
E	27D	446,490	10.25	H	55	784,040	18
E	30+31	653,400	15	H	60	653,400	15
E	32	1,127,333	25.88	I	28	130,680	3
E	35	609,840	14	I	52	827,640	19
E	38	2,962,080	68	I	67	261,360	6
E	47	1,480,040	34	I	94C	2,047,320	47
E	49	479,160	11	J	2	1,306,800	30
E	50	217,800	5	J	3A	522,720	12
E	67	653,400	15	J	7	849,420	19.5
E	69	65,340	1.5	J	8	261,360	6
F	2	2,683,296	61.6	J	12	914,716	21
F	3D	457,380	10.5	J	22	3,397,680	78
F	8	627,264	14.4	J	23B	1,306,800	30
F	9	1,742,400	40	J	25	827,640	19
K	1	3,397,680	78	N	8	3,746,160	86
K	6	2,787,840	64	N	8A	2,744,280	63
L	1	370,260	8.5	N	15	1,742,400	40
L	14M	1,218,373	27.97	N	18	958,320	22
L	40	679,536	15.6	N	20	1,350,360	31
L	45	696,960	16				
L	50	526,640	12.09				
L	89I	522,720	12				
L	98	479,160	11				
L	99	91,476	2.1				
L	101	17,860	.41				
M	1	217,800	5				
M	2	1,306,800	30				
M	3	1,777,248	40.8				
M	5	678,665	15.58				
M	52	3,615,480	83				
M	53A	1,350,360	31				
M	54	1,176,120	27				
M	76	1,328,580	30.5				
M	83	2,744,280	63				
M	92A	740,520	17				
M	92B	740,520	17				
M	96	544,500	12.5				
M	96A	827,640	19				
M	98	348,480	8				
M	100	2,940,300	67.5				
M	102	1,960,200	45				
M	104	609,840	14				
N	1	1,524,600	35				
N	2	3,397,680	78				
N	2A	618,552	14.2				
N	3	1,176,120	27				
N	5	827,640	19				
N	6	829,382	19.04				

Section Two

WATER RESOURCES

WATER RESOURCES

Introduction

Almost all of southeastern New Hampshire, including Dover and the surrounding area, is encompassed by the large Piscataqua River Basin. There are more than 17,000 acres of the Piscataqua Drainage Basin in the City of Dover, which includes more than 4000 acres of wetland soils.

Dover has three main tributaries which feed the Basin, the Bellamy River, the Cochecho River and Salmon Falls River. At the confluence with the Cochecho, the Salmon Falls becomes the Piscataqua River, which flows south from Dover to the Atlantic Ocean. Drainage and subdrainage basins for these rivers are depicted on the Drainage Basin Map in the appendix.

These three rivers flow more than 21 miles through the City and have been an important factor in Dover's history and development. In the 1600's Dover served as a major port of trade; today the rivers remain a vital part of the City's environmental and commercial assets.

Maintaining clean, functional waterways and aquifers is beneficial to the community for health, safety, recreation, conservation and education purposes, as well as in meeting the needs of commerce. Therefore, it is important that the City's master plan address existing water conditions and make provisions for future use.

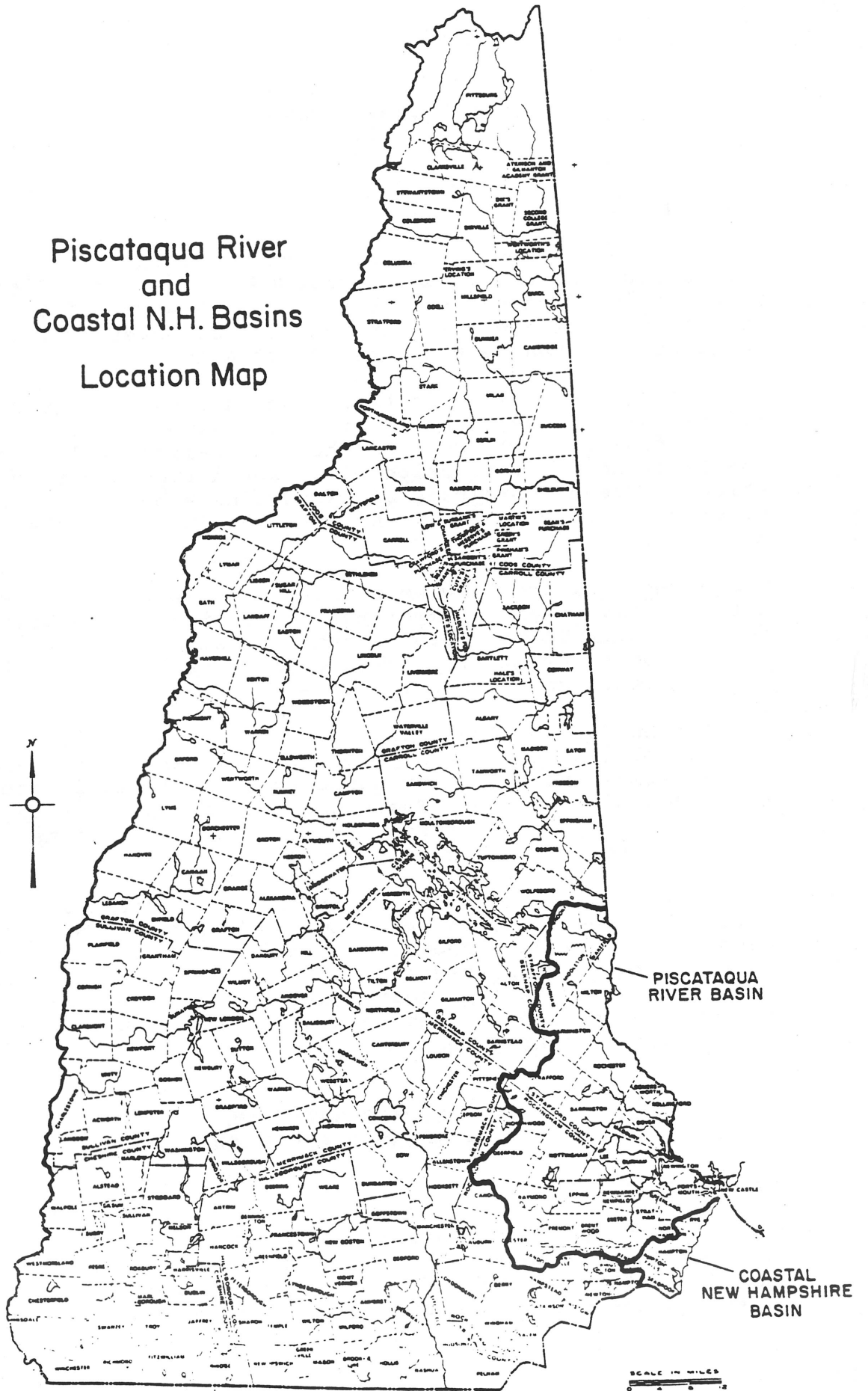
The section will provide a great deal of information to City officials, residents and businesses about Dover's water resources. The data and maps contained herein represent the most accurate, comprehensive and scientifically reliable information available. Additional or more up-to-date information should be used to aid in the planning process as it becomes available.

SURFACE WATER AND WATERSHED ASSESSMENT

The Bellamy River

The Bellamy River originates at Swains Lake in Barrington, New Hampshire, and flows in a southeasterly direction through the Bellamy Reservoir, then easterly through Dover. In Dover there is one dam on the Bellamy, below which the river is

Piscataqua River and Coastal N.H. Basins Location Map



tidal. Above the dam, the elevation ranges from 20 feet to 80 feet above mean sea level (MSL) at the Madbury town line.

Through its 5.8 mile flow in Dover, the Bellamy drains more than 6000 acres of watershed land, including more than 1400 acres of poorly drained soil and more than 300 acres of very poorly drained soil as shown in Table A.

There are eight second order tributary streams in the Bellamy River Basin within the City. Although there is usually at least some flow in each, others may run dry during long periods without rain.

Five hundred twenty five acres of the Bellamy River Basin lie within the 100-Year floodplain boundaries as depicted on the Water Resources Map. These boundaries have been located based on the flood insurance rate maps (FIRM) of the U.S. Department of Housing and Urban Development.

The Bellamy River has a 1988 New Hampshire legislative classification of "A," indicating that the water is of the highest quality. Water from this river is certainly suitable for recreation and bathing, but is clean enough to use as a drinking water source as well. Presently, the City can withdraw up to 720,000 (GPD) from the Bellamy and is artificially recharging the Ireland and Griffin Wells with this water.

The Cochecho River

The Cochecho River flows 34 miles from its point of origin in New Durham to its confluence with the Salmon Falls River. Its length in Dover is approximately seven miles. There are two dams on the Cochecho in Dover, one at Watson Road, the other at Pacific Mills on Central Avenue. The elevation of the river at the Rochester city line is approximately 120 feet above MSL. The Watson Road dam site is 100 feet above MSL at which point the river begins descending down to an elevation of 40 feet at the Pacific Mills dam. Below the second dam, the Cochecho becomes tidal.

The Cochecho has thirteen second order streams which supplement its flow for its seven mile length in Dover. Four of these are minor, unnamed tributaries which may dry up periodically. The others, however, are the major feeds from smaller drainage basins within the Cochecho River Basin, and are likely to go dry only during periods of prolonged drought.

The watershed area of the Cochecho Basin in Dover is approximately 8700 acres. This includes nearly 1600 acres of

poorly drained soil and more than 225 acres of very poorly drained soil. Over 600 acres of the Cochecho Basin lie in the 100-Year floodplain boundaries.

This river received a legislative classification "B" rating. A "B" rating indicates that the Cochecho is suitable for bathing and recreation. Since it is not of the highest quality, though, the water should be treated before being used as a drinking water source.

The Salmon Falls/Piscataqua River

The third major tributary which flows through Dover as part of the overall Piscataqua River Basin is the Salmon Falls/Piscataqua River. At its confluence with the Cochecho River, the Salmon Falls becomes the Piscataqua River. This river channel forms the 5.3 mile boundary between Dover, NH and Maine, and is tidal along its entire length in Dover.

Only two tributaries are found in this basin, which drains nearly 850 acres of Dover land. Of this area, more than 110 acres are poorly drained land, and more than 65 acres are very poorly drained. In addition, 91 acres lie in the 100-Year floodplain boundary.

Like the Cochecho, the Salmon Falls/Piscataqua River is a Class B river under the legislative system. Once again, this means that the water is appropriately used for bathing and recreation. The Piscataqua is saline for its' entire length in Dover and therefore not suitable as a drinking water supply.

Johnson Creek

Johnson Creek is a small drainage basin which flows into the nearby Oyster River. The Oyster River Basin is not considered a tributary in the City of Dover because only the Johnson Creek subbasin is located in Dover. The majority of the Oyster River Basin is found in Madbury and Durham.

The Johnson Creek drains slightly over 925 acres of Dover land. Of this, nearly 220 acres are poorly drained, and fewer than 15 acres are very poorly drained. The subbasin includes approximately 22 acres of floodplain land, as well. As with most of Dover's surface waters, Johnson Creek has a legislative class "B" rating.

SURFACE WATER SUPPLIES

Existing Supplies

Dover is currently using surface water to supplement its groundwater drinking supplies. As previously stated, water is presently being withdrawn from the Bellamy River and discharged into a receiving basin to recharge the Griffin and Ireland wells. The City received approval in 1983 from the N.H. Water Supply & Pollution Control Division to withdraw up to 720,000 (GPD) from the river.

In 1988 the City received further State approval to withdraw up to 2,880,000 (GPD) from the Isinglass River. This water will be withdrawn from the river just above its confluence with the Cochecho River in the City of Rochester. This water will be used to artificially recharge the Calderwood and the "8-inch" wells located in the northwest corner of the City. This area is also referred to as "the hoppers".

The third source of surface water is Willand Pond. This 73 acre pond is located primarily in Somersworth with a small extension into Dover. The pond is considered to be a "reserve" supply of drinking water for Dover although no water is presently being withdrawn from it.

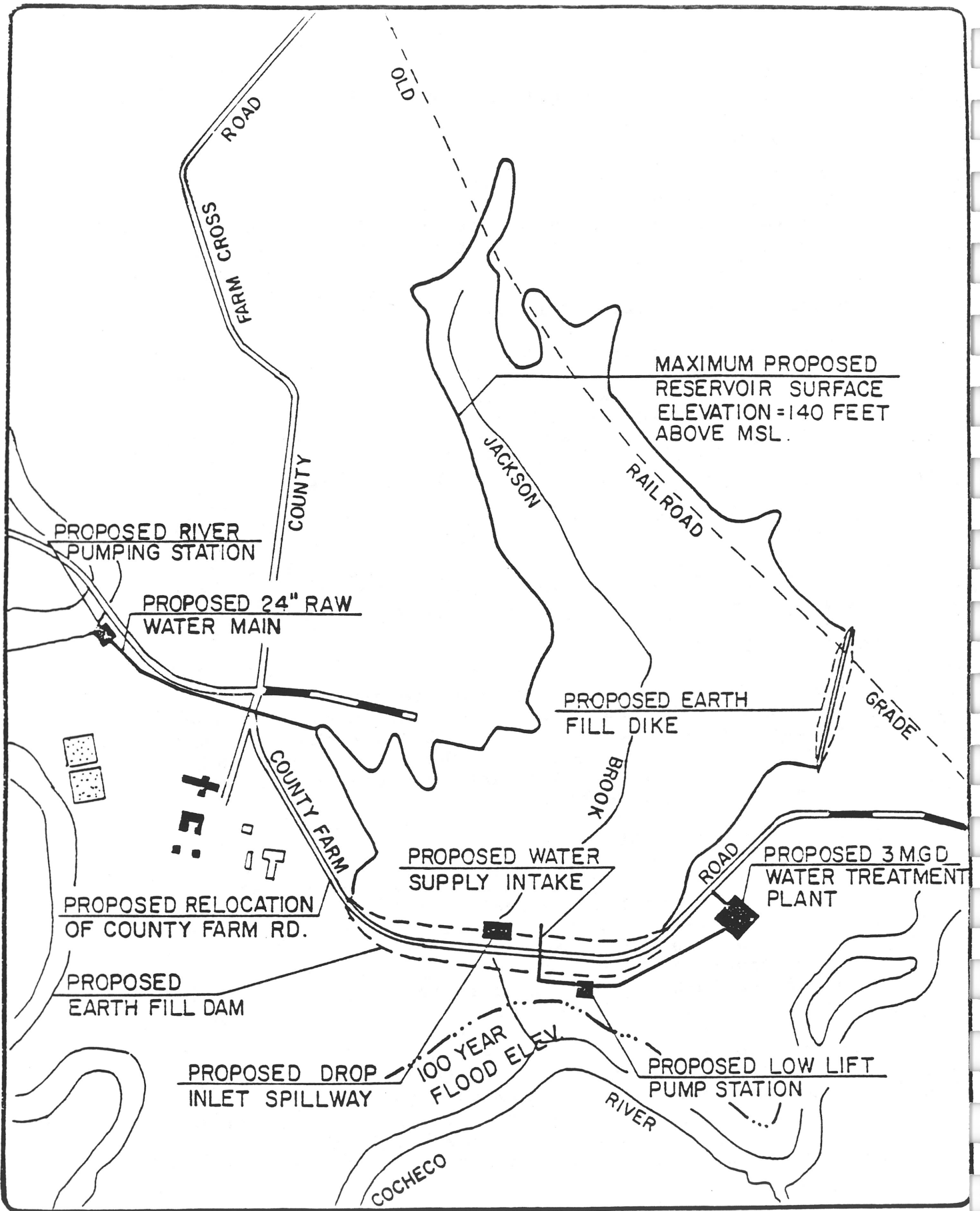
Potential Supplies

Several options for additional surface water supplies have been considered by the City. They include an off-stream reservoir for the Cochecho River, direct withdrawal and treatment from the Cochecho, and the use of a regional surface water supply. The following paragraphs explain each of these options in detail.

Construction of an Off-Stream Reservoir

Off-stream reservoirs, unlike traditional on-stream reservoirs, are constructed away from the main water supply source in a location where reservoir construction costs can be minimized. An off-stream reservoir located near the Cochecho River may be filled during periods of high river flow and should have sufficient storage capacity to maintain water supply drafts during times when river flows are low.

In their report on water sources for the City of Dover, BCI examined the possibility of establishing off-stream reservoirs in the stream valleys of Reyners Brook, Indian Brook, Horn Brook, Blackwater Brook and Jackson Brook. With the exception of Jackson Brook, all other sites were found to have too much development or insufficient storage



CITY OF DOVER, NEW HAMPSHIRE PROPOSED JACKSON BROOK WATER SUPPLY RESERVOIR AND TREATMENT FACILITY			SCALE: 1" = 700'	
			DEC. 1987	FIGURE 1

capacity.

The Jackson Brook area (see figure 1) is relatively flat and reservoir construction here will require a significant amount of earthwork. However, construction costs should be less than other sites because it has not been developed and land acquisition costs should be lower. The Jackson Brook site has potential capacity to store 400 million gallons of water.

Operation of an off-stream reservoir in Dover will involve skimming water from the Cochecho River during periods of high flow. Pumping should not occur when River flows are too low. The actual low river flow water supply withdrawal limit below which no water can be withdrawn from the river will depend upon several factors.

1. Waste Assimilation Flow - Sufficient flow must remain within the river so that treated waste streams can be properly diluted and biologically degraded, to maintain stream water dissolved oxygen levels.
2. Reservoir Nutrient Loading - Pumping from the Cochecho River must occur during times when flows are high and river water nutrient concentrations are most dilute. Pumping during periods of low river flow may result in reservoir water quality degradation and algal blooms.
3. Aquatic base flow - A minimum flow must be maintained to provide adequate protection and habitat for river wildlife.

Taking these factors into consideration, and using a low flow withdrawal from the Cochecho of 40 cubic feet per second, BCI has estimated that a safe yield from the reservoir would range from 2 to 2.4 million gallons per day.

Direct Withdrawal and Treatment

Direct withdrawal from the Cochecho River for water supply will be possible only when river flows are high. Direct withdrawal from the Cochecho River will be possible approximately 75% of the time, based on estimates of aquatic base flow. Well production could be decreased during this time, when river flows are high, to allow for natural replenishment of aquifer storage. The other 25% of the time, when river flows are low, the lack of treatment plant finished water production can be compensated for by additional production from the City's groundwater sources.

Operation of a direct withdrawal and treatment system will

result in decreased use of groundwater supplies when river flows are high, insuring that aquifer storage will be at a maximum prior to any prolonged dry period. Essentially this will have the same effect on municipal groundwater supply capacity as does artificial recharge.

Direct water supply withdrawal can be used in conjunction with artificial groundwater recharge. Aquifers located near relatively clean surface water supplies can be artificially recharged while other aquifers, not located near an adequate surface water supply, could be rested while the Cochecho River water supply is in use to maximize storage in those aquifers. These rested aquifers could then be pumped at increased rates when river flows are low and direct withdrawal and treatment at the Cochecho River facility is not possible.

The feasibility of operating this system will depend on available aquifer storage volumes and on natural aquifer recharge and discharge rates as they relate to aquifer storage levels. In other words if resting aquifers within the City would not significantly increase their total water storage volumes and their drought condition safe yields then operation of a direct withdrawal and treatment facility will not significantly increase the City's water production capabilities during dry periods.

Sizing of the direct withdrawal treatment system will depend upon the same aquifer storage parameters discussed previously. System sizing will be based on the increased drought condition aquifer safe yields that will be expected from resting of aquifers during periods of high river flows.

The treatment system may be designed to run at a constant flow rate with fluctuations in demand being met by varying well pumping rates. This should result in a simple treatment plant design that minimizes construction and operational costs.

The main advantage of this system is that no surface water reservoir will be required, but Cochecho River water can be used, indirectly, to increase the total capacity of Dover's water supply sources, as well as to increase drought condition aquifer yields. More information will be needed to determine whether this type of aquifer yield augmentation is technically feasible. Costs for implementation of this system must be compared with net increased water yields in order to determine the economic feasibility of the project.

Development of a Regional Surface Water Supply

Another option available to the City is to develop reservoir site outside the Dover City limits. This could be done in cooperation with other cities and towns in the area resulting in development of a regional water supply system. One possibility is to negotiate and enter into an agreement with the City of Portsmouth to increase the safe yield of the Bellamy Reservoir in exchange for shared use of reservoir yields.

Increasing the Bellamy Reservoir safe yield would most likely involve pumping water into the reservoir from the Isinglass River during wet periods to compensate for increased reservoir drafts during dry periods. In this way, reservoir safe yield could be increased with increasing reservoir storage capacity.

This option is the most technically feasible surface water supply development option available to the City but it may not be politically possible. A regional planning approach must be taken in determining the feasibility of this option so that the interests of all the communities involved may be considered.

New Hampshire Legislative Classification of Surface Water Quality

State regulations establish four classes or grades of surface waters for purposes of classification. Class A waters are of the highest quality and are potentially acceptable for water supply uses after disinfection. They contain no more than 50 coliform bacteria per 100 millimeters. There is no discharge of sewage or wastes into Class A waters. In Dover, Willand Pond and the Bellamy River Basin are Class A waters.

Class B waters are also high quality, with no objectionable physical characteristics. These waters differ from Class A waters by permitting somewhat more coliform bacteria (200 per 100 ml). Also, sewage and waste disposal may be permitted, but only if the water is treated to maintain the high quality physical, chemical and bacteriological characteristics and if the disposal and discharge are not inimical to the fish life. This water is considered acceptable for bathing and other recreational activities, and may be suitable for use as water supplies following adequate treatment. The Cochecho River Basin is a Class B waterway.

Class C waters are free from slick, odors, turbidity, and surface-floating solids of unreasonable kind. They must be free from matter and chemicals inimical to fish. Discharge

of sewage, waste or cooling water may occur but may not interfere with the uses assigned to this class. The Class C waters are generally acceptable for recreational boating, fishing, or for industrial water supply uses.

The lowest classification, Class D, is free from slick, sludge deposits, odors and surface-floating materials of unreasonable kind, duration, or quantity, taking into account the necessities of the industries involved. Waters in this class may experience certain temperature increases due to the discharge of treated waste or sewage. These waters must be aesthetically acceptable, and may be used for certain industrial purposes, power and navigation. As of 1987, no waterways in Dover were classified as C or D.

TABLE A

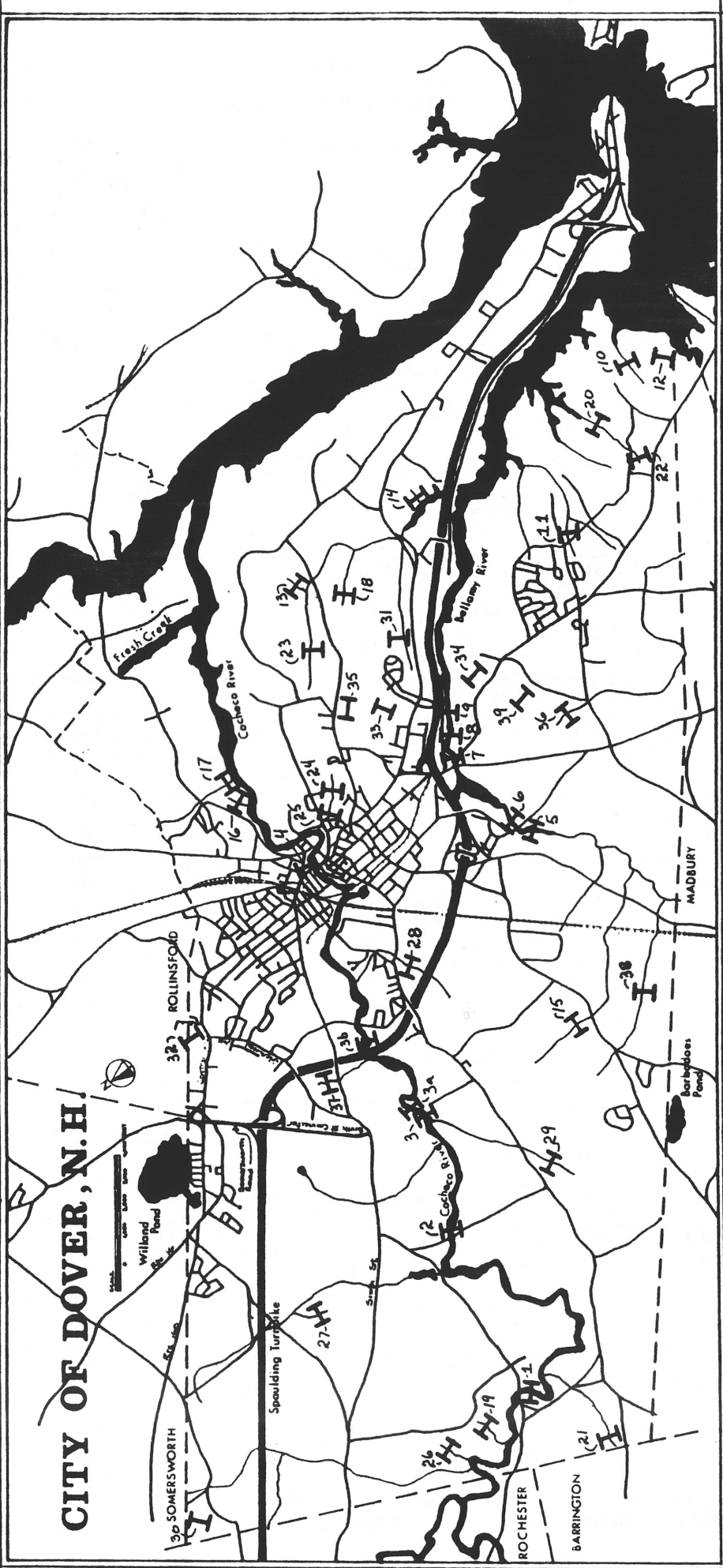
PISCATAQUA RIVER DRAINAGE BASIN

Major River Basin	Legis Class	Watershed	Tributaries	Acres of Watershed area Total/in City	Poorly Drain Soil (Acres)	Very Poorly Drain Soil (Acres)	Acres in 100 yr. Floodplain	
COCHECHO	B	LCSB #1	U. Trib	377.75/377.75	0	0	13.2	
		LCSB #2	U. Trib	189.85/189.85	19.0	0	12.3	
		LCSB #3			852.1/852.1	95.2	6.4	43.3
		MCSB #1	U. Trib		1227/1227	152.0	23.2	83.6
		UCSB #1			177.5/177.5	15.2	1.3	10.0
		MCSB #2	Berry Brook		1412.95/1412.95	35.2	5.5	45.4
		UCSB #2	U. Trib		-/901.5	320.1	17.4	87.5
		Blackwater	Blackwater Clark		4042.6/1064.85	323.3	14.9	127.2
		Emerson	Emerson		239.2/121.7	14.5	0	1.9
		Fresh Creek	Fresh Creek		4091.1/95.55	39.3	3.2	21.6
		Horn	Horn Brook		217.65/217.65	51.6	7.8	1.3
		Indian	Indian Brook		526.3/536.3	169.9	0	10.0
		Jackson	Jackson Brook		715.2/715.2	147.3	131.4	92.3
Reyners	Reyners Brook		1363.15/1075.4	219.9	14.5	78.1		
TOTAL				15432.3/8965.3	1587.3	224.3	617.7	
BELLAMY	A		Kelly Brook	22400/1781.05	771.2	79.7	183.7	
			Knox Marsh Br					
		BSB #1			1426.9/1426.9	244.9	37.3	103.7
		BSB #2	U. Trib		311.25/311.25	101.7	0	12.6
		BSB #3	U. Trib U. Trib U. Trib U. Trib		2017.5/1677.7	263.0	168.4	206.6
		BSB #4						
	Varney	Varney		1172.7/1172.7	154.8	26.8	19.0	
TOTAL				27328.35/6369.6	1535.6	312.2	525.6	
SALMON FALLS/ PISCATAQUA	B	PSB #1		563.1/563.1	107.5	14.5	41.0	
		PSB #2	Garvey Brook		207.6/207.6	3.9	51	49.7
		Tates	Tates Brook		1903.1/73.6	0	0	0
TOTAL				2673.8/844.3	111.4	65.5	90.7	
JOHNSON CR.	B		Johnson Cr.	1040.35/926.7	219.9	14.5	21.9	
TOTAL FOR CITY				-/17105.9	3454.2	616.5	1255.9	

LCSB = Lower Cochecho Sub-basin
MCSB = Middle Cochecho Sub-basin

UCSB = Upper Cochecho Sub-basin
BSB = Bellamy Sub-basin

DAM SITES IN THE
CITY OF DOVER
1988



H - Dam Site Location

8 - WRD Dam Number

SOURCE: NH Water Resources Division

DAMSITES IN THE
CITY OF DOVER
1988

WRD DAM No.	NAME	RIVER	STATUS	OWNER
67.01	Cochecho River I	Cochecho	Ruins	Pacific Mills
02	Watson - Waldron Dam	Cochecho	Active	NHWRD
03	Cochecho River III	Cochecho	Ruins	NHWRD
03a	Pikes Mill	Cochecho	Ruins	NHWRD
03b	Whittier Falls	Cochecho	Ruins	NHWRD
04	Cochecho River	Cochecho	Active	City of Dover
05	Bellamy River I	Bellamy	Ruins	City of Dover
06	Bellamy River II	Bellamy	Ruins	City of Dover
07	Sawyers Mill Dam	Bellamy	Active	D.J. Marini Co.
08	Bellamy River IV	Bellamy	Active	D.J. Marini Co.
09	Bellamy River V	Bellamy	-0-	Frank Holmwood
67.10	Fire Pond	Natural Swale	-0-	Elizabeth Huggins Trust
11	Farm Pond	Natural Swale	-0-	Thelma Jeralds
12	Farm Pond	Natural Swale	-0-	Donald Schultze
13	Farm Pond	Trib. Canney Brook	Active	Andre Ayer
14	Farm Pond	Natural Swale	-0-	Hugh Tuttle
15	Fire Pond	Natural Swale	-0-	A.C. Tuttle
16	Recreation Pond	Natural Swale	-0-	Robert Sylvester
17	Irrigation Pond	Natural Swale	Not built	Cochecho C.C.
18	Water Supply Pond	Trib. Canney Brook	-0-	Mr. Williams
19	Farm Pond	Trib Cochecho River	-0-	Arthur Smith
67.20	Farm Pond	Natural Swale	Active	Ernest Boulandger
21	Water Supply Pond	Natural Swale	Active	Strafford County Farm
22	Fire Pond	Natural Swale	Active	Charles White
23	Wildlife Pond	Natural Swale	Active	Lawrence Sullivan
24	Scenic Pond	Criket Brook	-0-	Arthur Davis
25	Scenic Pond	Drew Brook	Active	Arthur Davis
26	Farm Pond	Natural Swale	-0-	William Cusack
27	Wildlife Pond	Natural Swale	-0-	Robert Scott
28	Farm Pond	Natural Swale	Active	James Nadeau
29	Fire Pond	Trib. Mellego Brook	-0-	Robert McMaster
30	Farm Pond	Trib. Blackwater Brook	-0-	Warden Frazer
67.31	-0-	Natural Swale	-0-	Elliot Rose Co.
32	Hanneford Bros. Dam	Natural Swale	-0-	Hanneford Bros. Co.
33	Detention Pond	-0-	-0-	Philip Crosier
34	Gateway Detention Pond	Natural Swale	-0-	Gateway Assoc.
35	Paoline Develop. Pond	-0-	-0-	Paoline Deveop. Trust
36	Dunn's Bridge Det. Pond	-0-	-0-	Milletee & Assoc.
37	Glenwood Detention Pond	-0-	-0-	Robbins Auto Parts
38	Detention Pond	-0-	Exempt	Robbins Auto Parts
39	Brown Farm Det. Pond	-0-	-0-	Land-Buy Unlimited

SCURCE: New Hampshire Water Resources
Division - 1988

-0- Means data not yet entered or not available

GROUNDWATER RESOURCES

The landscape of southeastern New Hampshire is primarily the result of the glacier that moved across this area 10,000 years ago leaving in its wake deposits of sand, gravel, mud, and till (unsorted rock particles). Along with the region's geologic formations (mappable units of rock or rock fragments), these deposits, also referred to as unconsolidated units or deposits, are the key to assessing the region's groundwater availability.

Groundwater location can be estimated by examining the characteristics of the various glacial deposits and geologic formations. Potential water yield of an aquifer is related to the material in which the water is found, with the best groundwater sources found in deposits of high permeability and specific yield. The highest yielding aquifers occur in unconsolidated surficial material (glacial) such as ice-contact deposits, outwash and shore deposits and bedrock that is highly fractured. Stratified ice-contact deposits are the best potential aquifers in this region. However, only 15% or less of the state has stratified ice-contact deposits and the average thickness of these deposits is only 30 to 40 feet. This limited number of potential high yield aquifer areas will necessitate long-range planning for the future use of this resource.

The city of Dover currently draws its water from six wells located within the city boundaries, and one well in the neighboring town of Madbury. Each of these wells is located in a high water-yielding ice contact deposit.

There are seven major ice-contact deposits which lie either partially or wholly within the City boundaries which were mapped by Bradley in 1964.1. They are: The Hoppers; the Barbadoes Pond aquifer; the Pudding Hill aquifer; the Willand Pond aquifer; the Huckleberry Hill aquifer; the Garrison Road site; and an unnamed deposit which is now largely covered by dense development in Dover's urban core. The following information presents descriptions and characteristics for each of these aquifers.

STRATIFIED DRIFT AQUIFERS

The Hoppers

This ice-contact deposit which begins in the eastern corner of Barrington, was designated by the Army Corps of Engineers² and by the U.S. Geological Survey, as a high yield aquifer area. This geologic formation is comprised of several steep-walled kettle holes which are shaped like grain or coal hoppers and give the area its name. The "Hoppers" area is underlain with coarse-grained sand and gravel ice-contact

deposits which extend easterly into Rochester and Dover. In it are located two of Dover's wells, the Calderwood and "8-inch" wells.

The deposits are 0.80 square miles in area and are as much as 60 to 80 feet thick in places. The saturated thickness may be as much as 65 feet. These deposits can yield large quantities of water to wells. Both the Isinglass and Cocheco Rivers may recharge the aquifer area. Layers of sand and silt indicate that infiltration is 1.6 gallons per day per square foot (gpd/sq.ft.) of river bed, and they appear to be hydraulically connected to the aquifer in those places where marine deposits allow recharge from the river. The estimated safe sustained yield is 0.72 mgd for this area based on pumping information from the two existing wells.

The Barbadoes Pond Aquifer

The Barbadoes Pond area is underlain by very fine sand and gravel sized particles in an ice-contact deposit. This is a very large reservoir for groundwater with deposits from 102 to 190 feet thick. The saturated thicknesses range from 85 to 130 feet. The aquifer area is 0.92 square miles and has a SSY of .43 mgd as derived from the Hughes well pump data. However, this well can only be pumped for an approximate eight month period without inducing excess amounts of iron into the water. Barbadoes Pond occupies a kettle hole depression. Wells located near the pond may direct some flow, causing the pond to recharge the aquifer. The reservoir at the Bellamy River north of Barbadoes Pond diverts most of the water into the river.

Recharge potential is extremely high. Tremendous amounts of rainfall penetrate the ice-contact areas. BCI estimates recharge between 300 and 350 million gallons per year for the Barbadoes Pond/Bellamy areas. Additionally, some of the region contains an active gravel pit, allowing for collection and ponding of runoff which could provide an even greater infiltration of precipitation. Recent geophysical analysis of the area by BCI confirmed earlier reports of a bedrock valley. This bedrock valley may be filled with permeable sand and gravel overlain by marine clays, forming a confined aquifer. Furthermore, it is possible that the valley is part of a very large structure that interconnects a number of the sand and gravel ice-contact deposits of this region (the Hoppers, Barbadoes Pond and Pudding Hill).

The Pudding Hill Aquifer

The Pudding Hill ice-contact deposit is two miles long, three quarters of a mile wide, and rises 90 feet above the surrounding region. The area is composed chiefly of sand and gravel, although along the edges the sand and gravel grade with marine sediments. The fine grain sediments prevent

recharge from the Bellamy River; however, an ice-contact deposit south of Pudding Hill may be hydraulically connected to it. In addition, several large sand & gravel sits enhance precipitation recharge because of a lack of vegetation on their walls.

The Army Corps, estimated the deposit to be approximately 0.86 square miles in area with a thickness of over 100 feet observed in the pits in the area. Dover presently has two municipal wells in this deposit; the Griffin and Ireland wells. The SSY for the aquifer with these wells is 1.58 mgd; however iron and maganese is also a problem in this area.

The Willand Pond Aquifer

The Willand Pond Aquifer is a large kame plain which underlies much of Somersworth and extends into Dover and Rollinsford in the vicinity of the Weeks traffic circle. Somersworth has a well field in the northern end of the deposit near the Salmon Falls River. The saturated thickness in that area is 50 feet or more. Dover has two wells (Smith and Cummings) at the southern end of the deposit where the saturated thickness was estimated by Bradley to be as much as 75 feet. These SSY for these wells is estimated at 0.72 mgd; however the existence of benzene in the area limits pumping to a six month time period.

Willand Pond itself is defined as a kettle hole. The water in the pond is hydraulically interconnected with the groundwater and therefore may supplement the groundwater reservoir. However, BCI's further investigation of this aquifer indicates that a groundwater divide exists in the area of the Weeks traffic circle which limits water in the deposit from reaching the City's wells. Despite this fact, recharge to the permeable sands and gravels in the secondary groundwater protection zone alone (shown on the groundwater protection zones map) is estimated by BCI to be between 849 and 990 million gallons per year.

Up until 1980 Willand Pond was used to supplement the city's water supply. However, due to the existence of metals in the pond bottom water is no longer withdrawn. Willand Pond is presently considered a backup water supply for Dover although the infrastructure has been removed from the pond.

The Huckleberry Hill Aquifer

This linear, north-trending body of ice-contact deposits occupies a strip of land between the Piscataqua and Bellamy rivers. The sand and gravel deposits range from 40-60 feet deep, are approximately 0.8 sq. mi. in surface area and are buried beneath marine deposits on the east and west edges. Bradley indicated that a large saturated thickness was unlikely in this deposit and the danger of saltwater

Salmon Falls River
Watershed

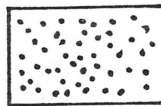
Cochecho River
Watershed

Isinglass River
Watershed

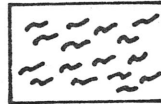
CALDERWOOD
8 INCH WELL

THE HOPPER
AQUIFER

HUCKLEBERRY HILL
AQUIFER



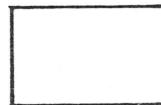
ICE CONTACT DEPOSIT



OUTWASH & SHORE DEP.



TILL



MARINE DEPOSIT



CITY WELL



DOVER CITY BOUNDARY



WATERSHED BOUNDARY

SOURCE: E. BRADLEY

MAP OF THE CITY OF DOVER
SHOWING THE PRINCIPAL
AQUIFERS AND OTHER
GLACIAL DEPOSITS

ICE CONTACT DEPOSIT FORMATIONS

AQUIFER PARAMETER	Willand Pond	Pudding hill	Barbadoes Pond	The Hoppers	Huckleberry Hill(a)	Notes
Area of Surficial Ice-Contact Deposits, sq.mi. (acres)	7.73 s.m. (4950 A)	0.80 s.m. (510A)	0.92 s.m. (590A)	0.78 s.m. (500A)	0.80 s.m. (510A)	(1)
Average saturated thickness, feet.	37 ft.	36 ft.	85 ft.	54 ft.	39 ft.	(2)
Estimated Available Storage, million gallons (mg), (acre ft)	6000 mg (18,300 A-ft)	600 mg (1830 A-ft.)	960 mg (2950 A-ft.)	570 mg (1750 A-ft)	650 mg (2000 A-ft.)	(3)
Estimated Annual Average Precipitation, Recharge (in mg), or 21 inches of rainfall.	28000 mg	290 mg	340 mg	290 mg	290 mg	(4)
Estimated Yield from Precipitation Recharge, mgd (gpm)	7.7 mgd (5400 gpm)	0.8 mgd (560 gpm)	0.9 mgd (625 gpm)	0.8 mgd (560 gpm)	0.8 mgd (560 gpm)	(5)
Surface Water Drainage Basin in which Aquifer is situated:	Salmon Falls River	Bellamy River & Johnson Creek	Bellamy River	Isinglass/Cocheo & Bellamy Rivers	Tidal Estuaries	--
Percent of Aquifer Area in Dover	About 20%	100%	About 20%	About 30%	100%	--

NOTES:

- (1) Area of ice-contact deposits shown on U.S.G.S. Water Supply Paper 1695 (1964), Plate 2.
 - (2) Estimated by averaging saturated thicknesses of granular deposits at Dover wells and at wells reported in U.S.G.S. publications.
 - (3) Estimated from data listed in lines 1 and 2, taking into account porosity of materials and stored water extractable by well pumping.
 - (4) Estimated at one-half the average rainfall, in inches per year.
 - (5) Estimated by pumping wells at a constant rate, 365 days per year.
- (a) The Huckleberry Hill aquifer is largely artesian, and subject to salt water intrusion if pumped heavily for an extended period of time.

SOURCE: This table was reproduced from the "Report to the Board of Water Commissioners, City of Dover New Hampshire, on New Water Supply Sources and Improvements, November 1979 - Camp Dresser & McKee Inc."

intrusion exists if intensive development of groundwater supplies from these deposits is undertaken. The Army Corps delineated only a small area (0.23 sq. miles) of this sand and gravel deposit as an aquifer with a SSY of 0.16 mgd.

At one time the City did have a well (Cote Well) in this area which served as an emergency water supply. However, in 1977 the well was capped and abandoned.

The Garrison Road Site

Extensive USGS mapping (Bradley, Cotton) leave unclear whether the Garrison Road deposit is connected to others in the area, such as Pudding Hill to the northwest, but BCI has conservatively modelled the area as a separate ice-contact deposit. Subsurface information is sketchy, but the deposit probably is between 70 and 100 feet thick. The sand and gravel contacts at depth to either bedrock or glacial till. In this model, recharge derives exclusively from direct precipitation. With an area of 221 acres and an assumed recharge rate of 18 to 21 inches per year, between 108 and 126 million gallons per year will infiltrate into the area. This area does have substantial housing developments but contamination concerns are minimized since the region is served by City sewer.

BEDROCK GEOLOGY

Southeastern New Hampshire is underlain by metamorphosed sedimentary and volcanic rocks (bedrock), which is divided into formations based on rock types and geologic age. The formations occur in beds of varying width and trend northeasterly. Folding and faulting of the bedrock has occurred and has created joint and fracture patterns.

Joints, faults and contacts between the bedrock units tend to be low-lying features on the earth's surface because they are broken down by fracturing and weathering. Water will seek these features out because they are low-lying. Different characteristics of the bedrock formations will create variable amounts and patterns of jointing and faulting. Groundwater collects in these joints and faults and can be extracted for both private and municipal use. Surface water will often reveal the locations of these faults, joints and contacts between bedrock units.

The bedrock in Dover also trends in a north, northeasterly direction and consists broadly of two groups. The older of these consist of ancient sediments and some volcanics; these have been deformed and recrystallized. This group of metamorphic rocks include the Kittery, Eliot, Berwick and Littleton formations. The younger rocks are the minority in Dover; they are igneous ancient sediments. Two varieties, Exeter Diorite and Quartz Monzonite, are evidenced in Dover.

The northerly part of the City is almost entirely composed of the Berwick Formation, although the extreme northern edge, at the Rochester city line, is where Quartz Monzonite is found. The central and southern end of the City is composed by a nearly symmetrical pattern of the Eliot and Kittery Formations followed by Exeter Diorite, then the Kittery and Eliot formations again.

Little information is presently available regarding the magnitude of bedrock aquifers in Dover. Domestic wells have been placed successfully into bedrock in Dover but the yield of these wells (less than 100 gpm) would be inadequate for a municipal water supply.

BCI has conducted as part of its 1987 report, fracture trace analysis via remote sensing. This analysis identified zones of fracturing and faulting which produce linear expressions on aerial photos. Locating and determining the extent and strength of these lineaments is an important step in targeting zones of bedrock that are highly transmissive to water. Further analysis of this data including structural mapping and reconnaissance geophysics resulted in producing a list of "favorable zones." These zones are considered of such geologic and hydrologic quality to warrant continued exploration. These zones are described in the next section.

POTENTIAL GROUNDWATER SUPPLIES

Based on BCI's exploration process, eleven "favorable zones" were selected for further exploration. Four of the selected areas are sand and gravel aquifers. They are: the Bellamy Site; the Barbadoes Site; the Tates Brook Site; and the Garrison Road Site. The remaining seven "favorable zones" delineate bedrock aquifers. They are: Johnson Creek; Blackwater Brook; Reyners Brook; Fresh Creek; Drew Road; Horn Brook and Varney Brook. All eleven areas are depicted on both the Groundwater Protection Map and the Hydrogeologic, Geophysical and Favorable Zone Maps which are an appendix to this report.

Sand and Gravel Favorable Zones

Bellamy and Barbadoes Sites - Both of these areas presently contain municipal wells. The Bellamy site has the Griffin and Ireland wells and the Barbadoes Site has the Hughes well. BCI's exploration indicates the likelihood of a bedrock valley in this area which may interconnect a number of sand and gravel ice-contact deposits of this region. Due to the high permeability of these deposits recharge is extremely high, therefore these two sites could represent a major water producing zone for the City.

Sanitary concerns in these areas include: Madbury Metals salvage operation; the City's industrial parks on Littleworth and Knox Marsh Roads; and several operating gravel pits. These pits are concern not only for there present use of mining but also for the long-term reuse of the areas once the overburden has been removed above the water table.

An additional environmental concern in this area is Barbadoes Pond. In the past, prolonged pumping of the Hughes well has lowered the water level in the pond. Presumably, an additional well in this area will have a similar effect.

Tates Brook Site - Tates Brook is located in Somersworth in the Willand Pond aquifer. As discussed in a prior section, the Willand Pond area is a very large ice-contact deposit capable of supplying large amounts of water to numerous wells.

The Tates Brook area was chosen with the possibility of placing both surficial (sand and gravel) and bedrock wells. A "hybrid well" could be installed which is screened in the permeable sand and gravel deposits and has an open borehole in the bedrock taking advantage of both types of aquifers.

One possible sanitary threat in this Somersworth's old landfill off Blackwater Road. This site is currently on the EPA Superfund list although the extent of contamination has not yet been determined. In addition, the fact that this well site would be located outside of Dover's municipal boundaries means that the City would have no regulatory authority over potentially hazardous, adjacent land uses.

The Garrison Road Site - As discussed in a prior section, subsurface information about this deposit is sketchy. A test well sunk for the City in 1950 from the bottom of a gravel pit encountered bedrock at 89 ft. MSL and was a dry hole. However, the high permeability and recharge rate of this area warrant additional test wells to either confirm a water supply or eliminate it with finality.

Bedrock Favorable Zones

Johnson Creek - Several hydrogeologic features combine to make this site an excellent prospect despite the fact that the site falls partially outside the city limits of Dover. Sanitary concerns are minimal, and nearby wells show anomalously high yields. The area is mantled with marine deposits of silts and clays, but a deep, narrow bedrock valley may hold more permeable deposits beneath. The local subdrainage area is moderate (almost two square miles), although the fracture zone probably connects to subdrainages to the north. Recharge over this zone is estimated to be between 320 and 430 million gallons per year. Finally, this

appears to be an area of structural intersection with two distinct sets of lineaments coming together, one trending north and the other northeast. The combination should prove highly favorable for groundwater development.

Blackwater Brook - Located at the northern edge of Dover, the Blackwater Brook site shows excellent structural agreement between the remote sensing lineaments and bedrock fracture fabric. The regional gravity surveys suggest great depth to bedrock, in the order of 75 to 125 feet below the ground surface. The overburden in the subbasin is predominantly sandy till and the upper (sandy) member of the marine deposits that blanket much of the region. With such a large subbasin (6 sq. mi.), recharge should be adequate for a high yield bedrock well. Recharge calculated within the watershed area is between 380 and 520 million gallons per year. Sanitary concerns are minimal since the site is upgradient of the Spaulding Turnpike.

Reyners Brook - The Reyners Brook lineaments show up on all imagery platforms analyzed and closely follow foliation patterns in the Berwick Formation bedrock. The subdrainage is moderate (lightly more than 2 sq. mi.), but the basin is quite flat, and a substantial bedrock fracture system could tap water stored in the Willand Pond gravels to the northeast. Recharge within the watershed area ranges from 340 to 450 million gallons per year. Sanitary concerns include the Spaulding Turnpike, with the potential for salt contamination and hazardous waste spills from traffic accidents.

Fresh Creek - This zone has northerly trending lineament that correlates moderately well with the local fracture fabric data. The watershed area is rather large, yet it is likely that only a small percentage (25% or less) of water will be available for withdrawal at this favorable zone. The total watershed is capable of supplying 1100 to 1400 million gallons per year; however, structural considerations and potential for salt water encroachment make this site less favorable than the sites previously discussed.

Drew Road - This area lies to the east of the Johnson Creek zone, but does not possess the same bedrock valley characteristics that make Johnson Creek so attractive. The structural agreement with the lineament data is good, and existing well data (all domestic wells) indicate potential with several anomalously high yield wells in the area. Recharge calculations range from 50 to 80 million gallons per year. The only sanitary concerns are domestic housing with septic systems.

Horn Brook - The Horn Brook lineament trends approximately at right angles to the general direction of regional foliation in the bedrock. The cross-strike orientation has been shown

in other regions (South and North Berwick, Maine) to be highly transmissive to water. The underlying bedrock is the Berwick Formation in which BCI has located and drilled several high yield wells along that trend. Although the subdrainage is small (less than 1 sq. mi.), a well located in a significant fracture could draw some recharge from water in the Cochecho River as well as from the large sandy marine deposits to the northwest. Recharge was estimated between 100 and 140 million gallons per year, not including any induced infiltration from the Cochecho River. Several nearby domestic wells show anomalously good yields. No sanitary concerns exist in the area.

Varney Brook - This zone has a northerly trending lineation oriented approximately perpendicular to regional foliation. This orientation correlates moderately well with the local fracture fabric data especially on a north-northeast trend. No geophysical surveys were conducted at Varney Brook. Several high yield wells exist near the site which further enhances its attractiveness. The recharge potential for this area ranges from 150 to 300 million gallons per year. Sanitary concern for this site consists primarily of the potential for salt water intrusion from nearby estuaries.

THREATS TO WATER RESOURCES

Threats to water resources come from a variety of activities. Water pollution is separated into two categories - point source pollution and non-point source pollution. A point source of pollution is defined in Section 502(14) of the Federal Clean Water Act (FCWA) as "any discernable, confined to a discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigation agriculture.

Non-point source pollution may originate naturally from the weathering minerals, the erosion of unaltered lands and forests or from man-induced and artificial sources. Man-induced non-point source pollution such as fertilizer and pesticide applications, erosion from agricultural land, and transportation and erosion in urban developments are common in this area. In general, surface waters are more vulnerable to pollution from point and non-point sources because runoff is often unfiltered and polluted overland flow runs directly into surface waters. Groundwater is more protected from pollution, particularly non-point sources because the above layers of rock and soil filter out most of the potential contaminants. The following is a summary of some of the more common types of non-point sources of pollution found in the City of Dover.

Infiltration of Polluted Surface Water. Many aquifers in close proximity to streams and rivers are sustained by infiltration of surface water. Sand and gravel aquifers can usually filter migrating water effectively, particularly if these materials contain some organic matter. Filtration is less likely to occur if the water flows through very porous material and pollutants such as chloride, nitrate, and many organic compounds that are highly mobile, move freely with the water.

Land Disposal of Solid and Liquid Waste Material. The disposal of waste materials such as manure, sludges, garbage and industrial wastes is a major cause of groundwater pollution. If the waste materials contain soluble products, they could potentially infiltrate the land and potentially reach the groundwater.

Stock Piles. The stockpiling of de-icing salts (sodium and calcium chloride) is a common practice in New Hampshire and the rest of the northeast. If the storage areas are exposed to the land surface or the weather, they are one of the prime threats to surface and groundwater quality. De-icing salts are used for highway snow and ice control.

Dumps. "Sanitary landfills" or dumps can have serious negative impacts on groundwater. As rain-water flows downward through the trash, leachate collects at the bottom and may infiltrate the underlying soils. Infiltrating leachate may have a high mineral content which is not completely filtered before it reaches the groundwater. Once the leachate has reached the water table it will flow with the groundwater gradient or toward a well.

Sludge. This is a significant waste problem that is growing rapidly. Sludge is generated from a number of different industrial processes as well as water treatment and waste water treatment plants. Water treatment plant sludge may be lime-rich. Sludge from municipal and industrial wastes may have a number of soluble compounds. Others are insoluble such as heavy metals and may be removed and concentrated by plants.

Animal Feedlots. Animal feedlots produce a very high volume and concentration of pollutants yet cover a relatively small area. They can have an impact on surface and groundwater alike. The quality and quantity of feedlot runoff depends on the soil mixture, permeability, number of animals and the rainfall intensity. The wastes from feedlots are highly concentrated with nutrients such as nitrates and phosphorous.

Fertilizers and Pesticides. The use of fertilizers and pesticides is increasing in New Hampshire as it is throughout the country. Many of these substances are highly toxic, and in many cases, quite mobile in the subsurface. A number of compounds become quickly attached to fine-grained sediments, such as organic matter and clay and silt particles. A portion of these chemical and nutrient-laden sediments are removed by erosion and surface runoff. However, in heavily fertilized areas, the infiltration of nitrate, a decomposition product of ammonia fertilizer, enters the groundwater. The consumption of nitrate-rich water from fertilizers and feedlots can lead to serious disease, particularly in young children. The N.H. Division of Pesticide Control of the Department of Agriculture regulates commercial and private application of pesticides in the state. Commercial application of

pesticides requires a one year permit and/or licenses and the review process requires evidence of the applicant's competency and ability to use pesticides, proposed operations, proof of financial responsibility and a fee.

Accidental Spills of Hazardous Materials. Large volumes of toxic materials are transported by trucks, rail, and aircraft and are stored in above ground storage tanks. Accidental spills during transport or in storage is not uncommon. When spills do occur they are typically rinsed with water, which may carry the toxics to nearby streams. In other situations, dikes are made to control overland spreading of toxics. However, these dikes are made to control overland spreading of toxics. However, these dikes can increase the rate of infiltration and underlying groundwater is directly threatened.

Holding Ponds and Lagoons. Another major source of groundwater pollution are holding ponds and lagoons. Most are shallow excavations, ranging in size from a few feet to a few acres. Industrial chemicals, agricultural wastes, and municipal sewage are often held there. Some holding ponds are considered to be liquid-tight but the majority are not.

Drainage Wells and Canals. Field tiles and drainage wells are often used in heavy-clay, flat lying land that is poorly drained and contains a number of marshes. Drainage wells are often connected to aquifers. If the ponds are polluted then the aquifer may become contaminated as well.

Waste Disposal or Accidental Spills in Excavations. When clay, granite, sand and gravel are removed during excavations the groundwater table often ends up much closer to the surface. This increases the possibility for groundwater contamination because the overburden which once filtered contaminants is no longer there. Excavation operations generally have gasoline and oil on-site for the machinery involved in processing the materials. Just a small amount of these petroleum based products can contaminate a large amount of groundwater.

In addition, abandoned excavation sites often become illegal dumping areas for construction materials and other solid waste. Both the use of toxic materials and the dumping of waste represent very substantial threats to groundwater quality.

Septic Tanks, Cesspools and Privies. The effluent from these on-site waste disposal systems can pose great threat to groundwater. Septic tanks are only a temporary means of waste disposal and it is only a matter of time before the waste assimilation capacity of

the soil becomes depleted or exhausted. In all septic tank installations, there is a gradual reduction in the soils permeability. This results from the clogging of soil pores by biological materials and dispersion of soil aggregated by microorganisms. Individually, septic systems are of little significance. However, in densely populated areas they may present a problem.

Potential Non-point Pollutant Sources in Dover

Dover is a municipality which has for many years permitted a wide variety of land uses within its borders. It follows then that there is a greater opportunity to have land uses which represent a potential threat to water quality within the City. The following list represents those land uses in Dover which represent potential non-point sources of pollution. The list also contains potential sources of pollution in neighboring municipalities which are in close proximity of several of Dover's wells. The list is based on the NH Water Supply and Pollution Control Division's (WSPCD) most recent inventory of potential pollution sources which has been updated through 1987 through additional field investigations.

The "site #" on this list refers to the Contaminant Threats Analysis Map prepared by BCI Geonetics which is contained in the appendix. In addition, a detailed "Sanitary Survey Form" has been prepared for each potential pollutant source which are contained in Volume III of the BCI report.

POTENTIAL NON-POINT POLLUTANT

SOURCES IN DOVER AND ADJACENT MUNICIPALITIES

<u>SITE #</u>	<u>NAME/OWNER</u>	<u>LOCATION</u>	<u>DESCRIPTION</u>
1	Rochester Sewage Treatment Plant	Pickering Road	WWTP
2	Proposed Landfill (Barrington)	Tolend Road	Landfill
3	Midway Asphalt Plant #5	Rochester Neck Road	Industry
4	Brox Paving Materials	Rochester Neck Road	Sand & Gravel
5	Pumpkin Hollow Mobile Park	Rochester Neck Road	Housing Development
6	Dover Landfill	Tolend Road	Dump/Landfill
7	Strafford County Home	County Farm Road	Surface Impoundment Petro Chemical Storage
8	Strafford County Home	Watson/Cnty Farm Rd.	Sludge Disposal
9	Gasses Sunoco	Old Rochester/Dover	Gas Station
10	NH Dept. Transportation	Week Traffic Circle	Highway shed
11	Old Colony Fuel Stop	Week Traffic Circle	Gas Station
12	Sunoco	Central Avenue	Gas Station
13	BP Gas	Central Avenue	Gas Station
14	Crosby Road Industrial Park		Industrial Park
15	Industrial Park	Industrial Park Road	Industrial Park
16		Portland Ave/Rte 4	Dump
17	Industrial Park	Progress Drive	Industrial Park
18	Moore Business Machines	Locust Avenue	Industry
19	Citgo & Sunoco	Stark Avenue/108	Gas Station
20		Middle Road	Agriculture
21	Brickyard Estates	Dover Neck/Back Rd	Housing Development
22	Bill Dube Auto	Dover Point road	Auto Sales
23	Chadwick's Nursery	Mast Road	Greenhouse Nursery
24	Dover Sand & Gravel	Mast Road	Sand & Gravel Concrete Products
25	Madbury Metals	Pudding Hill Road	Metal Salvage
26	Madbury Landfill	Pudding Hill	Landfill
27	Jensen's Farmwood Village	Durham Rd/Spruce Ln	Trailer Park
28	Seaborne Hospital	Garrison Road	Hospital
29	NH Highway Department	Dover Pt/Spld Tpk	Highway shed
30	Tuttles Red Barn	Dover Pt/Spld Tpk	Agriculture
31	Calcutta Landfill	Dover Neck Road	Landfill
32	St Thomas Aquinas H.S.	Dover Point Road	Fuel Storage
33	The Landing	Huckleberry Hill	Housing Development
34	Elliott & Williams Roses	Dover Point Road	Greenhouses
35	David Dupont Exxon	Silver Street	Gas Station
36	Texaco Gas	Silver Street	Gas Station
37	Karkos Gulf Gas	Silver/Stark Avenue	Gas Station
38	Mobile Gas	Silver/Court Street	Gas Station
39	Getty Gas	Central Avenue	Gas Station
40	City Dover Maintenance	Upper Narrows	Gas/Salt Storage Dump Sewage Treatment plant

41	Bayhead/Clarostat	Washington/Main	Industry
42	Public Service Co. NH Substation	Cochecho Street	Electric Industry
43	Cochecho Country Club	Gulf Road	Agricultural Concerns
44	National Guard Armory		
45	Lord & Keenan Inc.	Oak Street	Petrochemical Storage
46	Harris Graphics	Broadway	Industry
47	D.F. Richard, Inc.	Broadway	Petrochemical Storage
48	Franklin Electroplating	Central Avenue	Industry
49	Robbin's Auto Parts	Ham/Park Street	Warehouse
50	Prosper & Shenvenueu & Son, Inc.	Maple Street	Industry
51	Wentworth Douglas Hospital	Central Avenue	Hospital
52		Central Avenue	Shopping Mall
53	Tibero Auto Body	Central Avenue	Gas
54	Cleary Cleaners	Central Avenue	Dry Cleaners
55	Citgo	Rte 9 Somersworth	Gas Station
56	Tri City Plaza	Rte 9 Somersworth	Shopping Mall
57	NE Telephone Co.	Rte 9 Somersworth	Fuel Storage
58	Getty Gas	Rte 9 Somersworth	Gas Station
59	Spee-Dee Oil Change/Lube	Rte 9 Somersworth	Auto Service Station
60	Getty Gas	Central Ave, Dover	Gas Station
61	Cleary Cleaners	Stark Avenue	Dry Cleaners
62	City Dover	Spruce/Garrison	Old Dump
63	Texaco Gas	Littleworth Road	Gas Station
64	City Dover	Dover Point	Proposed WWTP
65	Electric Company	Cochecho Street	Coal/Gasification Plant
66	Old Colony #6927	Central Avenue	Gas Station
67	Bill's Texaco	Central Avenue	Gas Station
68	Byrne's Chevrolet	5 Dover Point Road	Auto Dealer Auto Body
69	Colony Auto Co & Body works	Central Avenue	Shop
70	B&M Corp (Dover Carpenter Shop)	Grove Street	Gasoline Storage
71	B&M Corp (Dover Fuel Facility)	Off Oak Street	Diesel Fuel Storage
72	Hanscom's Truck Stop	72 Littleworth Road	Petrochemical Storage
73	General Electric Co. (Building T)	Off Littleworth Road	Petrochemical Storage
74	Dover High School		Petrochemical Storage
75	Ben's Marina	Dover Point Road	Gasoline Storage
76	Central Avenue Moving Center	622 Central Avenue	Petrochemical Storage
77	A. Lipson, Inc.	69 fifth Street	Petrochemical Storage
78	Lord & Keenan, Inc.	63 Fourth Street	Petrochemical Storage
79	William's Cadillac Olds, Inc.	38 Dover Point Road	Auto Dealer
80	Woodman Park School	Woodman Park	Petrochemical Storage

Point Pollutant Sources

Point sources of water pollution are usually distinguished between surface water and groundwater pollutants. Point Sources of surface water pollution are identified by National Pollutant Discharge Elimination System (NPDES) permits which are administered jointly by the U.S. Environmental Protection Agency and the NHWSPD. this system serves as the basic mechanism for enforcing the effluent and water quality standards applicable to direct discharges. All point source discharges are required to have an NPDES permit.

In Dover, NPDES permits have been issued as of 1988 to the following:

PERMIT NO.	NAME	TYPE OF DISCHARGE	RECEIVING WATERS
NH0000060	Clarostat Mnftg	Industrial	Cocheco River
NH0000078	Davidson Rubber	Industrial	Un-named Tributary To Bellamy River
NH0021661	Eastern Air Devices	Industrial	Un-named Tributary To Bellamy River
NH0021784	Elliott Rose Co.	Industrial	Varney Brook
NHG250139	Harris Graphics	Industrial	Cocheco River
NH0100064	Treatment Plant	Municipal	Cocheco River
NH0101176	Lowell Ave WTP	Municipal	Berry Brook
NH0100641	Strafford County Rest Home	Municipal	Cocheco River

The discharge or disposal of any substance, including sewage and waste into groundwater requires a permit from NHWSPCD. In accordance with WS 410, any industrial, municipal and privately-owned waste or sewage facility and agricultural operators where groundwater degradation is likely to occur; and any other facility which may significantly and adversely affect groundwater quality requires a groundwater permit.

Presently, the Dover Water Department is the only permit holder within the City. Two permits are held (permit #830801D and 870202D) for artificially recharging four of the City's wells as described in the surface waters section of this plan. There is however, a gravel washing operation in fairly close proximity to the City's Griffin and Ireland wells. Although this operation is not required to have a permit from the State, it is withdrawing approximately 60,000 to 80,000 gpd for about eight months of the year from the

Bellamy River and discharging into the ground as part of its washing operation.

UNDERGROUND STORAGE TANKS

The use of underground storage tanks was originally mandated for the storage of some hazardous materials such as gasoline and oil because they reduced the danger of fire and explosion. These tanks are dangerous however, because if they leak, potential contaminants are closer to the underlying groundwater and below the biologically active soil layer where attenuation of the contaminants might take place. Furthermore, leakage from such tanks may go unnoticed for long periods because it cannot be seen.

The majority of tanks in use today consist of older, single-walled steel construction which may corrode and leak over time. Fittings and pipes may also break in areas of unstable soil. However, proper construction and installation can minimize the risk of leakage into groundwater from underground storage tanks. Methods such as using double-walled or fiberglass tanks, or tanks within concrete vaults are beginning to receive more widespread use.

In September of 1985, the State of New Hampshire WSPCD adopted rules for the "Control of Nonresidential Underground Storage and Handling of Oil and Petroleum Liquids" (WS 411). These regulations apply to all existing (existing before effective date of rules) facilities where the capacity of any one tank is 1100 gallons or more; and for new or substantially modified facilities where the cumulative volume of all tanks is 1100 gallons or more. The rules mandate a testing schedule for all existing tanks and a replacement schedule for all existing tanks which are older than 25 years. The rules also specify the types of new tanks which may be installed and acceptable methods of installation. These include: using fiberglass or fiberglass reinforced plastic tanks; steel tanks with fiberglass reinforced plastic; or steel tanks with a cathodic protection system. In addition, a secondary containment structure such as a vault or impervious lever must be placed around the tank.

All new and existing underground tank facilities which are regulated by the State must be registered with WSPCD. As of May 1988 there were 172 underground storage tanks registered with the State. A list of these tanks is contained in the appendix of this section.

Land Use and Groundwater Protection

A detailed description of existing and probable future land use for Dover is contained in the Land Use Chapter of the master plan. However, a brief description of those land uses which may effect the groundwater quality or quantity of the

city's municipal water supplies shall be provided here.

A number of potential threats to water quality have previously been identified as point and non-point pollution sources. The Smith and Cummings wells situated near the Weeks Traffic Circle are adjacent to substantial amount of commercial development on Central Avenue in Dover and High Street in Somersworth. There are, within a one mile radius of these wells, five gas stations, two autobody shops, and a salt storage shed. In fact, the Cummings well has shown levels of benzene contamination from a leaking underground storage tank. Installation of an air stripper will be required to purify the water in this well.

There is additional commercial development adjacent to the well sites but the majority of the abutting land use is devoted to medium density (one unit per 12,000 sq. ft.) single-family development. However, the majority of this area is serviced by municipal sewer so the primary concerns are the creation of additional impermeable ground cover and the use and storage of hazardous or toxic materials.

The Griffin and Ireland wells are situated between Mast Road and the Bellamy River near the Madbury town line. The Griffin well is actually located in Madbury. There are a number of potential threats to groundwater quality in this area.

The sand and gravel deposit in which the wells are located is currently being mined for those materials. This means that the water table is closer to the surface and therefore is more susceptible to contamination. The heavy equipment used at these excavation sites require petroleum products (diesel fuel and oil) to operate which are a threat to water quality.

Within the same sand and gravel deposit, but located in the town of Madbury, is a metal salvage operation called Madbury Metals. As part of this salvage operation chemicals such as lead, cadmium, benzene and oil can leach into the ground and the groundwater.

On the opposite side of the Bellamy River from these wells are Dover's industrial parks. There are numerous businesses operating at these parks which generate, store and transport hazardous and toxic materials. These chemicals represent a potential threat to groundwater, as well as surface water since three small brooks run through the industrial parks and empty into the Bellamy River.

The proposed industrial rezoning on the north side of Littleworth Road along Columbus Avenue also has the potential to affect groundwater and surface water quality. Toxic chemicals, impermeable surfaces and runoff need to be regulated in areas designated as groundwater protection zones

which overlay the proposed industrial districts.

The Hughes well located near Barbadoes Pond off Old Stage Road is also in close enough proximity to the Crosby Road Industrial Park to consider those industrial land uses a potential threat to groundwater quality. Adjacent to Barbadoes Pond in Madbury is a major sand and gravel extraction operation which represents a potential threat. In addition, residential development in this area is on private septic systems with a 40,000 square foot minimum lot size.

The two remaining City wells are the Calderwood and "8-inch" wells located in "the hoppers" in the northwest of Dover. A short distance from these wells is the Tolend road landfill. This landfill site is no longer used by the City, but is on the EPA superfund list and currently undergoing remedial investigation.

On the opposite side of the Cochecho River from the wells is the Strafford County Complex. This complex has an active sewage treatment lagoon system and several underground storage tanks.

Located to the north of the wells in Rochester are two sand and gravel operations. One is an operating asphalt plant which produces asphalt on site using petroleum based products. The other operates a stone crushing and washing plant at the site.

EXISTING REGULATORY PROGRAMS
AND ORDINANCES

There are a number of regulatory mechanisms that a municipality is authorized to enact under State Statute which have the potential to impact water quality or quantity. They include:

1. Subdivision Regulations;
2. Health Ordinances;
3. Zoning Ordinances;
4. Site Plan Review Regulations; and the
5. Sewer Ordinance

Dover presently has adopted as part of the Code of the City of Dover, all of these types of regulations and ordinances in some form or another. This section of the plan will review and analyze the extent to which these regulatory mechanisms address water resource protection.

Subdivision Regulations - Dover first adopted a land use code in 1951. These were subsequently revised to reflect the provisions of the 1955 New Hampshire RSA 36 which enabled municipalities to adopt subdivision regulations. The most recent major update of the regulations was made in August 1986. Those are the regulations which will be reviewed here.

1. Wastewater Disposal. Much of Dover is serviced by municipal sewer. However, where sewer is not available the subdivision regulations require the installation of an on-site wastewater (septic) system (Section 155-42). This system must be designed in accordance with NHWSPCD specifications and must be approved and inspected by the City and State. The regulations also indicate that "in no case will the discharge of pollutants into surface waters or wetlands be permitted...".

Community leach (septic) systems servicing more than two septic tanks are also permitted as part of cluster (alternative design) subdivisions (Section 155-22). These systems must also be installed in accordance with WSPCD specifications. Additional requirements by the City include that all leach fields be on a separate lot which contains extra leaching capacity to be at least 50% of the design size required by the State. This secondary capacity can be used in alternation with the primary leaching area or in lieu of the primary leaching area in case of system failure.

Alternative design subdivisions must be service by the municipal water system. This eliminates the possibility of on-site well contamination.

2. Drainage and Flood Storage. The subdivision regulations

require that drainage facilities be installed to accommodate all pre-development and post-development surface water runoff. Said drainage facility must be of sufficient size to accommodate potential runoff from the entire upstream drainage area. Downstream drainage facilities outside the subdivision boundaries must also be evaluated so that runoff incident to the development will not overload said facilities. Design storm frequency requirements for drainage facilities are as follows:

- a) Major streams, rivers, bridges, culverts: fifty-year storm or flood of record.
- b) Minor brook culverts: fifteen-year storm
- c) Storm sewers: ten-year storm

Additional information must be provided to verify that utilities placed in a flood hazard area are installed in a manner to minimize flood damage and new or substantially altered structures must be flood-proofed or elevated above the base flood level. Also, any permits required under Section 404 of the Federal Water Pollution Act of 1972 regarding construction in and around surface waters must be obtained prior to final subdivision approval.

3. Erosion and Sediment Control. There presently are no provisions in the subdivision regulations specifying erosion and sediment control procedures. Therefore, the City must rely on RSA 149:8-a for erosion control measures. This statute, administered by NHWSPCD requires a permit be obtained for any project which "significantly alters the characteristics of the terrain" (i.e. disturbing more than 100,000 square feet of contiguous area).

Health Ordinance - Chapter 116 of the Code of the City of Dover is entitled "Public Health". The provisions of this ordinance regulate among other items the location and maintenance of vaults, privies and cesspools for the disposal of human waste and other wastewater.

The ordinance requires only a 2 foot setback from any adjoining lot line for any one of these disposal systems. However, none of these systems may be constructed within 100 feet of any public sewer or within the "compact" part of the City. All vaults and cesspools must be watertight and no abandoned well may be used.

Flood Management - As a participant in the regular phase of the National Flood Insurance Program Dover must comply with

federal regulations concerning development in flood hazard areas. Chapter 113 of the Code of the City of Dover is entitled "Flood Hazard Control" and addresses these provisions fully. The general provisions of the ordinance requires floodproofing or elevation of structures and anchoring of mobile homes in flood hazard areas. Further, no new construction is permitted in the federally designated flood hazard areas unless it can be demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base (100 year) flood more than one foot at any point within the community.

Zoning Ordinance - Chapter 170 of the Code of the City of Dover is entitled "Zoning". There are a number of subsections to this chapter which address water resources including the Conservation District; Well Site Protection District; Interim Growth Management District IV - Aquifer Recharge Areas; and Extraction Industries. All of these zoning districts are "overriding districts" which means they are superimposed over all other zoning districts within the City. Each of these subsections, as they existed in July, 1988 are described below.

Conservation District - The Conservation District Ordinance is designed to protect both surface water and groundwater within the City. It requires a setback for all construction activities of 100 feet from the high water mark of major rivers, freshwater or tidal, and 50 feet from any other freshwater body (e.g. any stream, brook, swamp or marsh). The ordinance also restricts development on very poorly drained soils, as well as city-owned parcels of land which contain a municipal well.

However, the ordinance is fairly permissive since a Special Exception can be obtained from the Zoning Board of Adjustment for constructing a boat dock or any other structure in the Conservation District. All that's required in order to obtain the Special Exception is an erosion and sedimentation control plan and any necessary State and Federal permits.

Well Site Protection District - The purpose of this ordinance is to protect the quality and quantity of Dover's water supply by regulating development in recharge areas of municipal wells. The ordinance regulates land uses and maximum lot coverage within a 1,000 foot radius around a city well. There is also a more restrictive 400 foot radius within the 1000 foot radius. This 400 feet is intended to protect against bacterial contamination as prescribed by NHWSPCD's Code of Administrative Rules (WS 309.04).

Interim Growth Management District IV - Aquifer Recharge Areas - This ordinance, adopted for a one year time period pursuant to RSA 674:23, was also intended to regulate

development in recharge areas of municipal wells. However, this ordinance expanded on the Well Site Protection ordinance by delineating the recharge areas as the entire sand and gravel deposits in which the wells are located. This ordinance actually expired on June 24, 1988 but has not yet been removed from the books.

Extraction Industries - This section of the Zoning Ordinance addresses the extraction of any subsurface materials; this normally involves sand, gravel and loam. The City's regulations are essentially identical to the State RSA 155-E entitled "Local Regulation Excavations". The regulations require a permit from the Planning Board for all extraction operations with a few exceptions. In addition, a restoration plan must be submitted which shows final grades and a revegetation plan suitable to prevent erosion. Specific provision which address water protection include prohibiting projects where:

- The excavation would substantially damage a known aquifer, so designated by USGS; and
- When excavation is planned beneath or adjacent to inland surface waters where a permit is required from State agencies; but the Planning Board can approve the application if the State permits are obtained.

Site Plan Review Regulations - Chapter 149 of the Code of the City of Dover is entitled "Site Review Ordinance". These regulations, adopted pursuant to RSA 674:43, are similar in scope to the Subdivision Regulations, except that they address changes of use, multi-family (5 or more units) development and non-residential development. The Site Review Ordinance addresses drainage and flood hazard areas in the same manner as the Subdivision Regulations described previously. No other specific provisions are made regarding water resource protection except for required compliance with the Dover Sewer Ordinance.

Sewer Ordinance - Chapter 147 of the Code of the City of Dover is entitled "Sewers". This Ordinance, which is administered by the Dover Sewer Commission, regulates connections to the municipal sewer system and the installation of private wastewater (septic) systems.

1. **Private Wastewater Disposal Systems** - In addition to complying with NHWSPCD installation regulations the following requirements are imposed by the City. No permit shall be issued for a septic system if the building lot area is less than 20,000 square feet with a public water supply or 30,000 square feet without a public water supply. These septic systems are also addressed under the Dover Plumbing Code with an

inspection required by the Health Officer.

2. **Municipal Sewer System** - Any piece of property within 100 feet of a municipal sewer is required to hook-in to the system. Discharge of waste into the system which could harm either the sewers, or treatment plant or have an adverse effect on the receiving stream (Cochecho/Piscataqua Rivers) is not permitted. There is a specific list of prohibited substances which address the heat, chemical composition, amount of solids, PH levels and BOD (Biological Oxygen Demand) of the discharged wastewater. In some cases, pretreatment of industrial wastes may be required.

SUMMARY AND EVALUATION OF REGULATORY PROGRAMS

The preceding paragraphs illustrate that Dover has already taken steps to protect the quality of its' groundwater and surface water. As is often the case, more can be done to improve the existing regulations in light of new types of development within the City and new available technology. The following section will make recommendations for strengthening existing regulations and the need for adoption of additional ones.

Erosion and Sediment Control - There is a gap in the City's subdivision and site plan review regulations concerning erosion and sediment control. Soil erosion is the loss of soil by the action of water, ice, gravity or wind. It has been a particular problem in Dover on construction sites which are stripped of all their vegetation for long periods of time.

It is recommended that standards be developed to address erosion and sediment control. Since this is an issue for both subdivision and site plan review, a single zoning ordinance should be adopted which would apply to both regulations, as well as applications for building permits.

Groundwater Protection - Previously described where two ordinances adopted by the City designed to protect groundwater. However, the interim ordinance expired in June 1988 and the Well Site Protection Ordinance does not protect enough of the aquifers surface area. Therefore, it is recommended that the "Groundwater Protection District" Ordinance prepared as part of this master planning process be adopted.

The ordinance regulates areas referred to as the "180 day radius" and the "1000 day contaminant travel time" around the municipal wells. These protection areas are described in more detail in the BCI report and represents the best technical information currently available to the City

regarding groundwater protection. The ordinance also regulates potential well sites described earlier in this plan, which warrant further exploration.

Wetland Management and Protection - The City "Conservation District" ordinance presently regulates development on very poorly drained soil only. This has permitted encroachment into potentially important wetlands which may be only poorly drained soil types. Furthermore, while the State Wetlands Board also regulates development in wetlands, their limited staffing creates gaps in the consistent protection of Dover's wetlands. Therefore, it is recommended that the "Wetland Protection District" ordinance, also prepared in conjunction with this master plan, be adopted. The ordinance uses vegetation and soils as wetland indicators. There is also a wetland evaluation process in the ordinance which permits development on wetlands which have a lower value when compared to other wetlands based on certain criteria.

Septic Systems - Although Dover does address the installation of on-site septic systems in several of its ordinances (Sewers, Plumbing, Health, Subdivision), the City primarily relies on the State for inspections and enforcement. The City Engineering Department does do an in-house review of septic system designs but the Health Officer is not presently doing on-site inspections.

It is recommended that all of Dover's ordinances addressing septic systems be reviewed to make them consistent with one another. Again, due to limited State staffing consistent review of all test sites and percolation tests may not be occurring. Therefore, it is advisable for the City to be conducting its own inspections to insure proper installation and adequate groundwater protection.

Extraction Regulations - Dover's regulations presently mirror the State statutes concerning extraction permits. These regulations provide a reasonable degree of protection for groundwater but improvements can be made. One area for improvement would be to require a more detailed reclamation plan which would provide a timetable of work and the type of vegetal material to be used. A second point would be to specify the maximum depth of excavation permitted above the water table. This will maintain some of the overburden which will help to protect groundwater quality. Finally, since these sand and gravel deposits cross municipal boundaries consideration should be given to making Dover's extraction regulations compatible with adjacent communities.

Underground Storage Tanks - As described in a previous section the State NHWSPCD has developed comprehensive regulations to address the installation of underground tanks over 1100 gallons in size for the storage of petroleum based products. While this is a big step forward in protecting

groundwater, a small leaking tank can do just as much damage as a large tank in terms of contamination to a water supply. Therefore, it is recommended that additional regulations be developed to control underground tanks for storing petroleum based products which are less than 1100 gallons. These regulations should be similar to the State's but revised in a fashion making them not prohibitive to a residential property owner. Regulations of this type would probably work best as part of the Site Plan Review Regulations and as a requirement for a building permit. These regulations will also enable the City to develop an inventory of underground tanks throughout Dover which would be a very valuable tool.

Flood Management - Although Dover's "Flood Hazard Control" ordinance adequately addresses development in flood hazard areas the detail of mapping in certain parts of the City is inadequate. Presently, the ordinance regulates the amount of development permitted in Flood Zones "A1-30" and "AE" on the Flood Insurance Rate Maps (FIRM's). However, no restrictions are placed on the amount of development which can occur in Flood Zone "A" which represents the majority of Dover's flood zone areas (See Section 113-12).

It is recommended that one of the two following actions be taken. Either reclassify the existing "A" zones to an A1-A30 zone through more detailed mapping or regulate the existing "A" zones in the same manner that zones A1-A30 are presently regulated.

Additional Staffing - Dover presently has, and is proposing several more, environmentally oriented ordinances. Current staffing levels and areas of expertise would create a deficiency in administering all these ordinances. This would require the City to rely more heavily on private consultants and other public agencies for technical assistance. Therefore, it is recommended that at least one additional staff position be created for someone with a specific background in soils and environmental conservation. This person would be part of the Planning and Building Inspection Department capable of reviewing and evaluating development proposals as they pertain to the City's ordinances.

NON-REGULATORY PROGRAMS AND POLICIES

In conjunction with the regulatory programs and ordinances described above there are also a number of non-regulatory methods which can be employed to protect water resources. Examples of these methods are discussed in the following section and how Dover can best use these methods.

Regional Planning - The importance of regional planning as it relates to water resources cannot be overemphasized. Since both groundwater and surface water do not respect municipal

boundaries a regional perspective must be used regarding these resources.

Dover has been a member of the Strafford Regional Planning Commission (SRPC) for a number of years. The City should continue active participation in the SRPC helping to shape its policies and work program in a manner which prescribes responsible water resources management at the regional level.

Educational Programs - The need for education concerning water resource protection and other environmental issues is very necessary. Enforcing one hundred percent compliance with regulations throughout the City is not possible from a cost perspective. Therefore, if property owners are better informed as to why a regulation or ordinance exists, voluntary compliance and more respect for the resource is likely to occur.

The Dover Conservation Commission has, and intends to continue, playing an active role in environmental education. Their work plan for the 1988-89 fiscal year includes:

1. Identify and development committees to accomplish goals
 - A. Education
 - B. Land acquisition/protection
 - C. Technical (to address best use, etc.)
 - D. Land management/monitoring

2. Develop materials such as "Before You Dredge & Fill" to assist in education and enforcement of current ordinances
 - A. Identify pressing issues
 - B. Develop sources of funding
 - C. Write/produce materials
 - D. Develop distribution plan

3. Promote and develop natural resources within the City
 - A. Develop public educational programs
 - B. Develop a City forest
 - C. Develop a public access to major waterways

Another method of public education would be the placing of signs along roadways indicating when someone is entering a groundwater protection zone of a public water supply. This would continually remind residents, motorists and truck drivers that they are in a sensitive area and should conduct their activities accordingly.

Finally, an educational effort should be focused on existing sources of potential contamination in groundwater zones. For instance, all companies within Dover's industrial park should be alerted that they are in a protection zone and all potentially hazardous materials must be handled with extreme

care. This could be done in all groundwater protection zones throughout the City on a regular basis.

Coordination with adjacent Communities - Since the aquifers in which Dover has municipal wells are largely located outside of the City, coordinating the protection of these aquifers with neighboring communities must be done. The municipalities of Madbury, Barrington, Rochester and Somersworth have been supplied with Dover's current groundwater protection information by the Planning Department. The ideal situation would be for Dover to enter into an inter-municipal agreement or a memorandum of understanding with each community addressing a mutual desire to protect these and other natural resources. Since Dover has no authority to enforce its regulations beyond its borders this must be a cooperative effort of all the communities.

Household Hazardous Waste - One very large potential threat to groundwater is the disposal of every day household products in landfills. Items such as paint cans, drain cleaner, fertilizers and a very long list of other products used in the home can leach into the groundwater causing contamination.

In 1985 and 1987, Dover participated in the first two regional household hazardous waste disposal programs in the state. Sponsored by the regional planning commission, a one day collection at the public works garage permitted households from around the region to dispose of their hazardous materials. These were then removed by a licensed hauler to a licensed disposal facility.

Both collections were very successful. In 1987, of the 267 cars delivering waste to the site, 152 were from Dover. In October of 1988, SRPC will again sponsor a collection day for the region in Dover. The City should continue to support SRPC's efforts in this area in future years.

Acquisition of Land and Easements - One of the best ways to protect Dover's water supplies is to purchase the land which overlies the aquifer. While purchasing the entire aquifer recharge area for each well would be cost prohibitive there are other measures which can be taken.

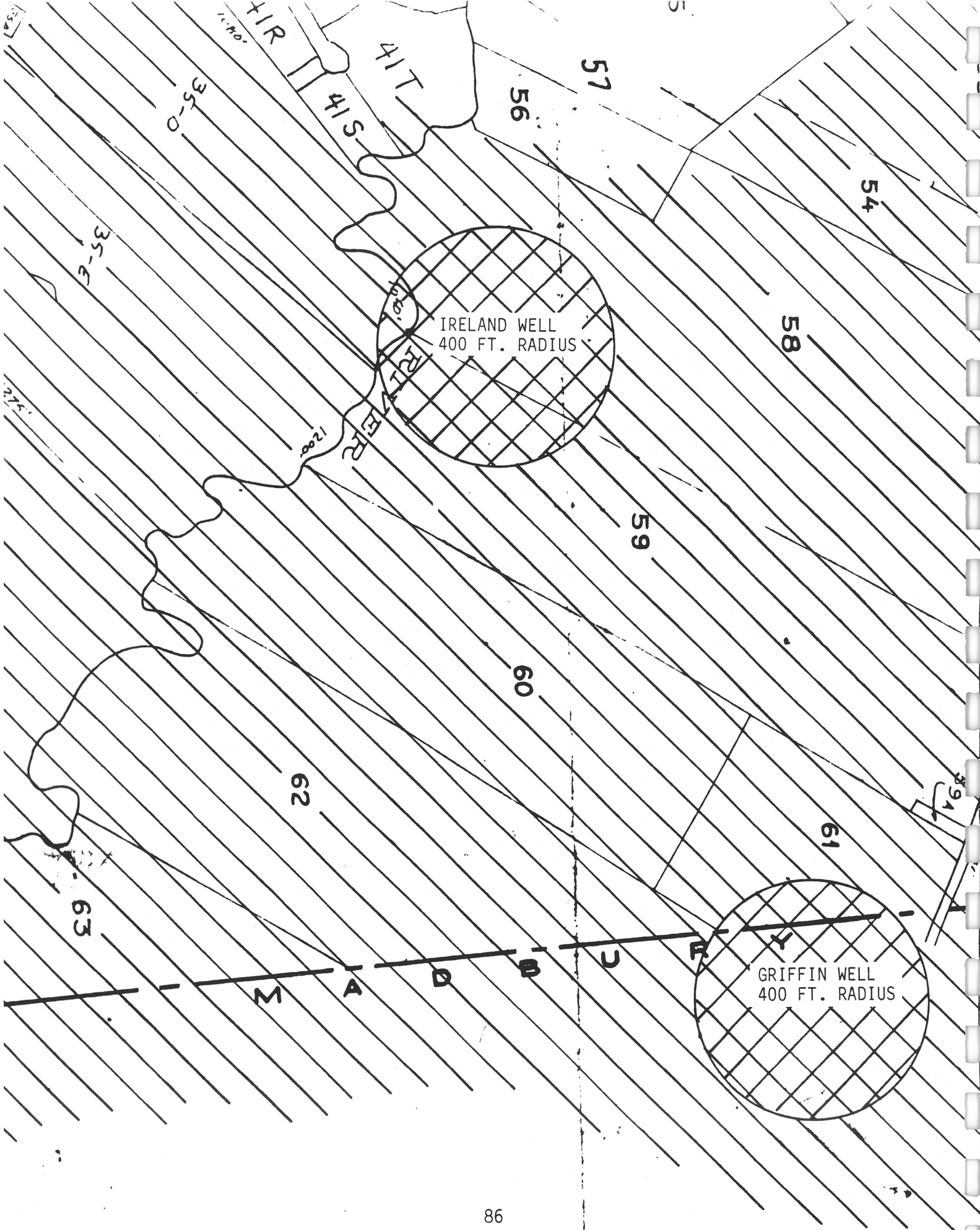
At a minimum, the City should own all the land within a 400 foot radius around its wells to protect against bacterial contamination. The table which follows identifies that tax map parcels which fall either partially or entirely within the 400 foot radius.

A second recommendation is to purchase the areas of the aquifers which have been mined for sand and gravel. Once the overburden (sand & gravel) has been removed from these areas the groundwater is much more susceptible to contamination.

WELL (MAP/LOT)	PARCELS WITHIN 400' (MAP/LOT)	PARCEL OWNER	PARCEL'S TOTAL SIZE (ACRES)	AMOUNT WITHIN 400' (ACRES)	ASSESSED VALUATION (\$)	BUILDINGS AND COMMENTS
H-58 Ireland Well	H-59	Timothy Pybus 90 Main St. Andover, MA 01819	28	2.92	L-68,000 B-41,200 T-109,200	Sand and Gravel Pits: Buildings are easily moved. Cost is for land only
	H-35D	Cabral Group 400 Amherst St. Nashua, NH 03063	24	1.16	L-27,400 B- 3,600 T-31,000	Yes, but not in corner of land in question
D-1 Smith and Cummings	D-2	James Tamposi Nashua, NH 03063	40		L-24,000	None. Currently in litigation over Growth Management Ordinance
C-8 Calderwood Well	C-7	City of Dover	20	1.39	L-20,000	City owned property near Brox's pits
C-12 8 - Inch Test Well	Barrington Map 15, Lot 58,58A	Town of Barrington		1.39		
	58	Dana Beiden P.O. Box 1521 Rochester, NH 03867	7		5,400	Open Land
	58A	Owner Unknown *If no one claims the land in 5 years, the Town gets the land	3.5		2,750	Open Land

WELL (MAP/LOT)	PARCELS WITHIN 400' (MAP/LOT)	PARCEL OWNER	PARCEL'S TOTAL SIZE (ACRES)	AMOUNT WITHIN 400' (ACRES)	ASSESSED VALUATION (\$)	BUILDINGS AND COMMENTS
F-42 Hughes	F-41	Veronica Nicole 25 Old Stage Road Dover, NH 03820	1.15	1.15 (all)	L-11.700 B-33.800 T-45.500	Yes--home City must buy entire Hughes lot, plus house. Price est. is conservative
	F-41A	Jeffrey & Sara LaPointe 27 Old Stage Road Dover, NH 03820	1	1	L-12,000 B-54,600 T-66,600	Home. City must buy land and house. Cost est. may be conservative
	G-38	Robert & Christine Seaver 16 Old Stage Road Dover, NH 03820	.33	.33	L-6800 L-34,000 T-40,800	Home. City must buy Land and house. Cost est. may be conservative.
	G-38A	Christine Seaver 16 Old Stage Road Dover, NH 03820	.31	.31	L-1200	None
	G-42	Robert and Louis Anagnos Tolend Road Dover, NH 03820	.86	.23	L-11,000 B-15,200 T-26,200	Already a non-conforming lot size
		Town of Madbury John Iafolia	90 acres	2.3	147.500	Open Land

*Based on .40 multiplier, estimated by the City Assessor.



SWORTH

ROLLINSFORD

SOMERSWORTH ROAD

CENTRAL AVENUE

ROAD

SPAULDING TURK

38

30-15

39

42

22

2

SMITH AND CUMMINGS WELLS
400 FT. RADIUS

CEMETERY

4A

4B

4C

4D

5,215

9,286

5,260

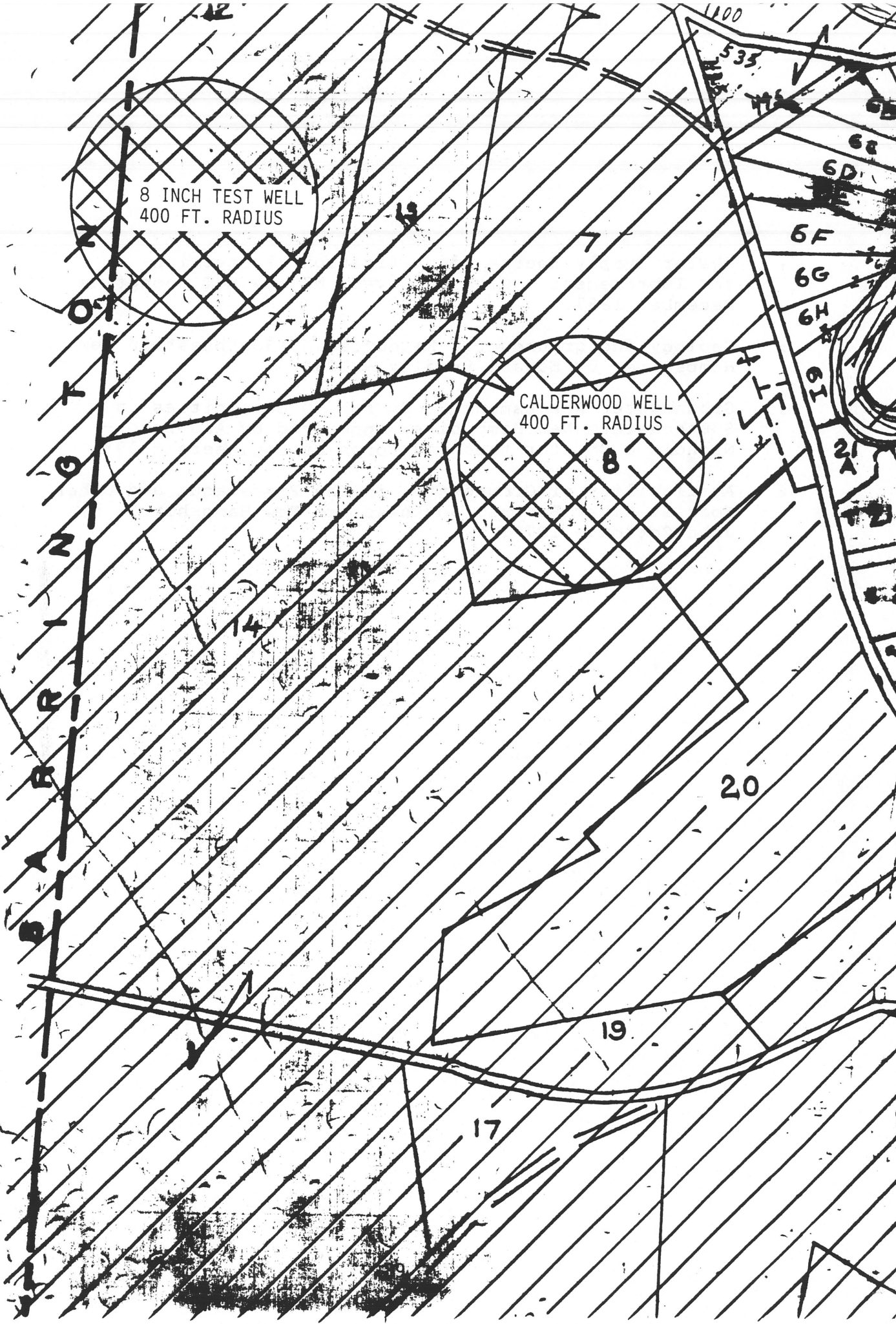
5,113

1,403





HUGHES WELL
400 FT. RADIUS



8 INCH TEST WELL
400 FT. RADIUS

CALDERWOOD WELL
400 FT. RADIUS

BEARRING

1:100

535

6F

6G

6H

19

21

7

14

19

17

20

1. "Water Supply Source Identification, Protection and Improvement - City of Dover, NH by BCI Geonetics, December 1987.
2. Geology and groundwater Resources of Southeastern New Hampshire, by Edward Bradley - 1964
3. Groundwater Assessment Study for 50 Communities in Southeastern New Hampshire - prepared by Anderson - Nichols & Co. for the Army Corps of Engineers - 1980.
4. Availability of Groundwater in The Piscataqua and Other Coastal River Basins, Southeastern New Hampshire - by John Cotton - 1977.

Section Three

OPEN SPACE AND RECREATION

OPEN SPACE AND RECREATION

The term "open space" represents different images to different people. It can range from a small neighborhood tot lot of a few hundred square feet to a National Wilderness Area of thousands of acres. Certainly there are many categories which lie in between. But perhaps open space is best defined as it was in the 1973 report "Open Space in Dover, N.H." in terms of the five functions it performs. These include:

1. Provision of recreation areas;
2. Protection of natural resources;
3. Preservation of distinctive architectural, historical, geological and botanical sites;
4. The creation of breathing spaces in densely settled areas; and
5. The shaping of urban growth and the preservation of natural beauty near urban and suburban development.

One misconception about open space is that it is wasted land. Nothing could be further from the truth. Studies have been completed indicating that open space maintained around developed areas, particularly residential, can actually enhance that development and increase its market value. Other empirical studies conducted on open space have looked at the comparative cost of land to the community in its natural and developed states. They illustrate that in many cases the cost to the municipality for the services it provides to a residential development (i.e. schools, fire, police, trash removal) exceed the increase in tax revenues generated by that development. Therefore, it may be more profitable to a municipality or at least less costly, to have a tract of land left in its natural state.

The other aspect of open space is how it contributes to "quality of life". The quality of life in Dover is generally what causes people to move to and stay in this community. It is based on peoples perceptions about the City as well as the "real" characteristics which compose Dover. Part of Dover's character is its rivers, its trees, its farmland and its wetlands. All of which represent its open space. Therefore, if Dover's quality of life is to be preserved it must be done so at least partially by preserving its open space.

**INVENTORY OF DOVER'S
EXISTING OPEN SPACE**

The first step in developing a plan for open space preservation is to determine what presently exists in Dover. Certainly, as one drives or walks around the City there still appears to be a good amount of undeveloped woodland, some farmland, wetland areas and surface water. So while a substantial amount of the land in Dover still remains in its natural state the large majority of it is privately owned. Therefore its status could change at any time from open space to residential, industrial, or some other form of development.

For that reason, only lands which are permanently protected or have a relatively high degree of protection have been included in the inventory. Recreation areas are considered part of the open space inventory but are listed separately later in this chapter.

**OPEN SPACE INVENTORY
DOVER, NH - 1988**

<u>REF. NO.</u>	<u>NAME OF FACILITY OR PARCEL</u>	<u>SIZE (ACRES)</u>	<u>DESCRIPTION OF ACTIVITIES</u>	<u>OTHER COMMENTS</u>
R2	BELLAMY RIVER SANCTUARY	40	<ol style="list-style-type: none"> 1. Bird Watching/Sightseeing 2. Cross-Country Skiing 3. Walking 4. Nature Education 5. Frontage on Bellamy River 	Operated by Audobon Society- Permanently Protected
	ELIZABETH HUGGINS TRUST	80	Privately Owned and Protected Farm	Located adjacent to the Audobon Preserve at the West Side of Bellamy River
R8	N.H. FISH AND GAME PARCEL	17.8	<ol style="list-style-type: none"> 1. Birdwatching/Sightseeing 2. Nature Study 3. Frontage on Bellamy River 	State-Owned Land
R7	STRAFFORD COUNTY LAND	228	<ol style="list-style-type: none"> 1. Agriculture 2. Forest Management 3. Garden Plots 4. Nature Walks 5. Cross-Country Skiing 6. Frontage on Cochecho River 	County-Owned Land And Buildings Large Amount of Open Space Degree of Protection Is Uncertain

P24	CONSERVATION LAND	23	1. Open Space Along Cochecho River- Steep Sloped	Permanently Protected Land Donated to Dover Conservation Commission
R5	MUNICIPAL WELL PROPERTY (Smith & Cummings Wells- Map D Lot 1)	47	1. Municipal Well 2. Pump House 3. Heath Bog 4. No Bottom Pond	City-Owned This Parcel Has A Relatively High Degree Of Protection As Long As the City Wells are Functioning
P27	CONSERVATION LAND	15	1. Open Space near Reyners Brook	Permanently Protected Development Rights
P22	MUNICIPAL WELL PROPERTIES AND ADJACENT PARCELS CALDERWOOD & 8 INCH WELLS (Map C Lots 7, 8, 12, 19, 20, 22)	109	1. Municipal wells 2. Sand & Gravel Excavation 3. Heath Bog	City-Owned Parcels This Open Space Has a Relatively High Degree Of Permanent Protection As Long As The City Wells are Functioning
P20	MUNICIPAL WELL PROPERTY (IRELAND WELL Map H Lot 58)	54	1. Municipal Well 2. Pump House 3. Sand Excavation	City-Owned Parcel This Open Space has a Relatively High Degree of Permanent Protection as Long s the City Well is Functioning
P21	MUNICIPAL WELL PROPERTY (GRIFFIN WELL Map H Lot 63)	11	1. Municipal Well 2. Pump House 3. Sand Excavation	City-Owned Parcel This Open Space has a Relatively High Degree of Permanent Protection as Long as The City Well is Functioning
P23	MUNICIPAL WELL PROPERTY (Hughes Well Map F Lot 42)	10	1. Municipal Well	City-Owned Parcels This Open Space Has a Relatively High Degree of Protection as Long as The City Well is Functioning
P18	PINE HILL CEMETERY	42		City-Owned Cemetery Provides Permanently Protected Open Space
P19	PINE HILL CEMETERY	35	1. Walking/Jogging	Permanently Protected Open Space

P26	CEMETERY	18		Permanently Protected Open Space
P20	CEMETERY	9		Permanently Protected Open Space
P25	CEMETERY	11		Permanently Protected Open Space
P28	CONSERVATION LAND	7.9	1. Open Space along Canney Brook - wetland	Permanently Protected Land Donated to Dover Conservation Commission

The list of parcels above, in conjunction with the City's recreation facilities, listed later in this chapter, represents Dover's inventory of "open space areas". Some of it is privately owned but the majority of it is in some sort of public ownership. The total land area of the parcels listed above is approximately 279 acres. This figure combined with the City-owned recreation areas acreage of 735 acres gives a total open space figure of approximately 974 acres. This figure however must be reduced somewhat to allow for buildings located on some of these sites such as schools, recreation buildings and the County buildings. Subtracting an estimated 40 acres for buildings and pavement from that figure reduces it to 934 acres.

Another caveat concerning this figure concerns the Strafford County land. Although its beautiful fields and rolling hills are now used primarily for agriculture and forestry it could be converted to residential development by a vote of the County delegation. This could reduce Dover's open space inventory by another 200 acres or so.

Not only is the quantity of Dover's open space important but its quality as well. Although the City-owned parcels which contain the municipal wells are included in the inventory (some 231 acres) they are considered lower quality (at least from a visual perspective) open space. The majority of Dover's wells are located in excavated gravel pits which while they are open and undeveloped to allow water infiltration, they are unattractive and generally off limits to the public.

Cemeteries have been included in the open space inventory which may seem unusual given that cemeteries are developed to some extent. However, cemeteries do provide an open visual break from buildings on the adjacent parcels. Cemeteries also have a "green character" to them which qualifies them as a unique type of open space. This is very true in Dover where the Public Works Dept. has an active tree planting and landscaping program which has created some very attractive cemeteries throughout the City.

PRESERVING OPEN SPACE

How much and what types of open space should be preserved in Dover? Although this question is asked as part of every open space plan the answer to how much? is very subjective and often very arbitrary. Rather than attempt to address how much land should be preserved as open space this plan

will address the types of areas which should be preserved with quality and purpose of use as the basis.

Of course recreation land is an important component of this open space plan but is addressed later in this chapter. This section will briefly describe areas which should be preserved as open space from a conservation standpoint.

Surface Water - Water is the "life blood" of our existence. Dover's rivers are important for drinking water, for recreation, for fire protection, for transportation, for wildlife and to a limited degree they also degrade human waste materials naturally. Coastal (saline) waters are very productive in terms of food and wildlife.

Floodplains - are those areas adjacent to streams, rivers, and the ocean that are subject to the effects of flooding. They represent a hazard to man's occupation. They also perform services such as: storing floodwaters; they are normally productive agriculturally; if left undeveloped they are an important habitat for wildlife; and in combination with adjacent surface waters provide a scenic landscape.

Wetlands - also store excess water during heavy storms. They also present negative values for human occupation since the soils have poor load-bearing capacity for urban structures. All types of wetlands contain intrinsic value as ecological units, for scientific study, scenic beauty and passive recreation.

Aquifers and Aquifer Recharge Areas - are generally sand and gravel materials which contain enough water to serve as groundwater for municipal or individual water supplies.

The surface areas over these aquifers (recharge areas) must be kept free from pollution and too much impervious covering which would prevent replenishment of the water supply.

Agricultural Land - is of course important for the production of food for humans and animals. Prime agricultural soil as defined by the USDA as the most productive type of soil available is particularly important. The existence of productive farms in Dover makes the community somewhat more self-sufficient and preserves some of its history as well.

Historic Sites - should also be part of an open space plan. The locations of first settlement, important battle sites, burial grounds, scenic roads etc. should all be preserved as a reminder for posterity.

OPEN SPACE PLAN

What then, given all this information, should Dover's plan be for protecting areas of open space? To a large degree the open space plan has already been presented. In the preceding natural resources chapters on forests, agriculture, fish and wildlife, and water, many recommendations were made as to how and where these resources should be conserved and/or preserved. Likewise, recommendations are also made in the following section on recreation for preserving land needed for that purpose. Together these recommendations comprise a plan which if followed through on will preserve many important areas of the City as permanently protected open space.

To repeat those recommendations again would be redundant. Instead, some general guidelines and overall goals for the open space plan will be suggested here which support and compliment those prior recommendations.

Make River Protection a Priority

Dover's rivers (Cochecho, Bellamy and Piscataqua/Salmon Falls) are natural focal points for an open space plan. The actual surface area of the water is in itself an open space threading through the City's developing land area. The river corridors (the water and adjacent land area) offer great potential for downtown beautification projects and preservation of larger more rural areas.

Since the rivers flow through several towns they provide an opportunity to address open space preservation at an inter-municipal level. Preserving our river corridors will help to protect drinking water supplies as well as important wildlife habitat.

River corridor preservation and conservation should be the top priority of the open space plan. Particular emphasis should be focused on the tidal (estuarine) portions of the rivers.

Open Space Should Be Accessible

When considering new areas for open space preservation emphasis should be placed on making them accessible to the general public. If physical or pedestrian access is not possible these areas should be at least visually accessible to the passerby.

This idea of accessibility is particularly important as it relates to surface waters. Protecting the City's rivers and ponds would have less meaning if they are inaccessible to the public. Therefore, emphasis should be placed on providing public access points (e.g. boat launches, hiking

trails, and picnic areas) along the City's waterways.

Open Space Should Address Multiple Purposes

Wherever possible open space preservation should address multiple needs. For instance, land obtained for a future recreation facility by the City would also add to the open space inventory. Similarly, land obtained for aquifer protection could also serve to protect floodplains, river corridors and wildlife habitat in certain parts of the City. This type of multi-purpose approach will help to conserve limited financial resources as well as natural resources.

Encourage Urban Open Space Preservation

It's often easier to focus open space preservation efforts in rural as opposed urban areas because of the relative ease in obtaining land. However, maintaining open space is equally important to preserving urban open space. Dover has a good record for providing small scale park and beautification activities in the urban core and should continue to make this a City policy. It's the quality not quantity of urban open space which matters most.

Create Open Space Corridors

Very often recreation and open space planning takes the form of isolated "pockets of green space" amidst the surrounding built up areas. In order to try and avoid that scenario in Dover it is recommended that a "greenbelt" or corridor system be identified which links these isolated areas together throughout the City. This greenbelt not only links areas together but also in of itself provides "space" between surrounding neighborhoods.

It probably won't be possible to connect a greenbelt which traverses the entire City. Therefore, smaller "loops" and even disconnected segments must be devised. Likewise, this greenbelt will have to follow many different types of paths, such as: rivers and streams; railroad tracks; power lines; and designated scenic roads.

Ultimately, this greenbelt (possibly the Garrison City Greenbelt) would provide extensive trails for hikers and skiers, facilitate the movement of wildlife throughout the City and provide buffers between developed areas. Some possible routes for this greenbelt are illustrated on the recreation map in the appendix.

Establish Funding Mechanisms for Open Space Preservation

It would be ideal if property owners in Dover were to

support the open space plan by donating their property or its' development rights to the city. Unfortunately, due to the ever-increasing value of land in Dover this becomes very unlikely given the potential profits which can be made. Therefore, both public and private funding sources must be available to move quickly towards acquiring a desirable parcel of open space when it comes on the market.

1. A capital reserve fund (CRF) for open space and recreation should be established in the City's capital improvements program (CIP). This CRF would receive an annual contribution (\$75,000 recommended) from city revenues. These funds could be used on their own or to match other public or private monies (i.e. grants) for the purpose of preserving open space and providing recreation land.
2. Establish a private land trust in the City of Dover. This non-profit organization formed under Internal Revenue Service guidelines would be able to preserve open space in Dover through acquisition, purchase of development rights or donation. Funding sources would be mainly private monies and various grants. This method of preserving open space is receiving much more widespread use and success across the State

RECREATION STANDARDS

In order to provide a sufficient amount of recreation opportunities for Dover residents a set of appropriate development standards must first be established. These standards are usually expressed on a per capita basis, or in this case, the amount of facilities provided per 1000 members of the population. Standards can also be expressed in terms of the typical site design requirements for a specific recreation facility. For example, the amount of land and type of equipment required for a neighborhood park as opposed to a community park.

Due to the emphasis which has been placed on recreation in this country over the years there has been quite a proliferation of standards produced. These standards however, should not be transferred from one community to another without considering the specific needs of each. These standards are intended to be a guide or a goal for recreation planning, therefore, they are expressed as a range of numbers. However, standards can seldom, if ever, be applied completely or without modification because a typical or ideal situation is seldom found. Therefore, these standards relative to areas and facilities should be

reviewed and appraised from time to time and modified whenever changing conditions warrant their revision.

Description of Facility - Types

Different types of recreation facilities are necessary in order to adequately carry out the activities of the community's recreation program. The different types of areas which are set forth below represent a variety of facilities which can be used to implement Dover's programs of athletics, recreation and physical education. The description of the facilities are a recommended standard for the City to use when upgrading existing parks or when developing new ones.

The Playlot - Is a very small area (less than one acre) which serves a portion of a neighborhood. It is a facility planned for vigorous, imaginative, outdoor play of pre-school children. It is within walking distance of the homes it serves providing facilities and equipment not available in crowded neighborhoods. A playlot might contain swings, a slide, sandbox, open "free play" area, climbing maze, playhouse or play sculpture, landscaping and a shelter with benches for adults.

A playlot is commonly included in a larger neighborhood or community park. In Dover, individual playlots are most appropriate within the densely developed urban core and its immediately adjacent area.

Neighborhood Playground - Primarily for children ages 5 to 14 and for family groups, but usually includes an area for pre-school children. The facility should be one to five acres in size and service an area of 1/4 to 1/2 mile radius. In the more rural portions of the City this service area can be expanded.

The neighborhood playground typically contains: an apparatus area; open lawn space; field for softball and other games and a hard-surfaced multiple-use area for court games. The area for use by smaller children would include the equipment described under The Playlot. The playground should also include off-street parking, toilets, maintenance equipment storage and perimeter buffer landscaping.

Community Park/School - The Community Park/School is an ideal facility which combines both education and recreation facilities on one site. It serves several neighborhoods within a 1/2 mile to a mile radius. The size of the facility will vary depending on the type of school, but a minimum of twelve to twenty acres should be provided.

The facilities of the community/park school should provide

a greater variety of activities and a larger quantity of concurrent activities than the neighborhood playground, but the facilities are basically the same. For instance, a neighborhood playground might have a little league or a softball field, a community park/school would have both. Other facilities would be similarly expanded depending on the specific needs of the area they serve.

The community/park school should be centrally located to the neighborhoods it is to serve and should provide a park-like environment in addition to the playground facilities. Although this facility will be within walking distance for a number of residents many will be accessing it by automobile so adequate parking should be available.

City-Wide Recreation Park - A large area serving all neighborhoods in the City. It provides major recreation facilities not usually duplicate in other parks, such as a swimming beach, boating areas, hiking trails and a city common or green. The city-wide park may also provide a beautiful natural setting that invites enjoyment of other special recreation interests. These parks may contain streams, woodlands, meadows or other unique natural features. A minimum size for such a facility is 50 acres.

Regional Recreation Areas - These types of facilities serve more than one town. They are usually relatively large land areas with natural surroundings and spaciousness emphasized more than equipment and facilities. Interpretive programs to promote understanding and enjoyment of the geologic, historic, biologic and other park features are often provided. There are no specific standards for such parks. They are usually state or federally owned.

Quantitative Standards for Recreation Facilities - As described previously, one method for assessing the adequacy of recreation facilities is to quantify them on a per capita basis. This method is based on the theory that the recreation needs of people living in a particular geographic area tend to follow a general pattern.

The standards presented here are recommended for New Hampshire communities by the Office of State Planning. They are based on an analysis of existing standards from other agencies and surveys of recreation leaders around the state. They tend to reflect generally well Dover's existing recreation program as well as the City's future recreation needs.

RECOMMENDED NEW HAMPSHIRE
RECREATION STANDARDS *

<u>Facility</u>	<u>Standard**</u>
Ballfields (number)	.6 to 1.0
Tennis Courts (number)	.5 to 1.5
Hard Court games (court)	1 to 4.0
Playgrounds (number)	.2 to 2.0
Playgrounds (acres)	1.3 to 3.5
Parks (acres)	1 to 20
Picnic areas (acres)	.2 to 5
Campgrounds (acres)	1.5 to 3.5
Campsites (number)	5 to 15
Boating Areas (acres)	23 to 95
Sailing Areas (acres)	8 to 15
Beaches (acres)	.1 to 1.5
Outdoor Swimming Pools	.07 to .4
Indoor Swimming Pools	.05 to .2
Outdoor Ice Areas	.2 to 1.0
Outdoor Ice Areas (square feet)	2,000 to 7,000
Indoor Ice Areas (number)	.02 to .5
Gymnasiums (number)	.2 to 1.0
18 Hole Golf Courses	.02 to .03
Downhill Ski Areas (acres)	.1 to .5

* Taken from "Recreation Planning, A Guide for New Hampshire Towns" by L.M. Kornfield, L.A., 1981.

** Facilities provided per 1000 people

As discussed previously these standards must be refined to suit the specific recreation requirements of Dover residents. To help identify these requirements several questions regarding recreation were included on the master plan public opinion survey which was distributed to residents of Dover in September of 1987. The survey was distributed to approximately 11,000 households and received a 13% rate of response.

When residents were asked to "Please list the recreational activities participated in regularly by members of your household", the following responses were given:

<u>ACTIVITY</u>	<u>RESPONSES</u>	<u>%TOTAL</u>
1. Swimming	186	20.3
2. Walking	124	13.5
3. Tennis	51	5.6
4. Bicycling	45	4.9

5.	Golf	44	4.8
6.	Basketball	43	4.7
7.	Baseball/Softball	43	4.7
8.	Running	33	3.6
9.	Parks/Playgrounds	29	3.2
10.	Cross-Country Skiing	24	2.6
11.	Aerobics/Exercise	22	2.4
12.	Hiking	21	2.3
13.	Downhill Skiing	21	2.3
14.	Boating/Canoeing	21	2.3
15.	Arts Festival/Concerts	21	2.3
16.	Bowling	20	2.2
17.	Ice Skating/Hockey	20	2.2
18.	Soccer	17	1.9
19.	Fishing	16	1.7
20.	Hunting/Shooting	10	1.1

NOTE: There were 29 other activities specified with less than 10 responses each.

Clearly swimming was the number one activity favored by Dover residents who responded to the survey. Walking was the second most popular by a large margin followed by tennis. Then closely grouped together are bicycling, golf, basketball and baseball/softball.

Presumably, the head-of-household would have filled out the survey. However, this person was asked to indicate the recreation activities of the entire household. The broad range of activities given as responses indicates that this occurred. Also significant in the responses is that they reflect year-round (summer and winter) recreational activities which means they are more indicative of the overall recreation trends for the City.

Respondents were then asked to further indicate "What recreation activities would you participate in if additional or better facilities were available?" The responses were as follows:

<u>ACTIVITY</u>	<u>RESPONSES</u>	<u>%TOTAL</u>	
1.	Swimming	66	11.0
2.	Tennis	55	9.2
3.	Walking	49	8.2
4.	Bicycling	46	7.7
5.	Cross-Country Skiing	31	5.2
6.	Ice Skating/Hockey	31	5.2
7.	Parks/Playgrounds	30	5.0
8.	Downhill Skiing	23	3.8
9.	Boating/Canoeing	22	3.7
10.	Basketball	21	3.5
11.	Arts Festival/Concerts	21	3.5
12.	Raquetball	19	3.2

13. Aerobics/Exercise	19	3.2
14. Running	18	3.0
15. Golf	17	2.8
16. Hiking	14	2.3
17. Picnicing	10	1.7

NOTE: There were 35 other activities specified with less than 10 responses for each.

Again, swimming was the top favored activity. Tennis and walking reversed places and bicycling remained in the number four position. The most notable changes were in the winter-oriented activities. Cross-country skiing moved up from the number 10 to the number 5 activity. Ice skating/hockey moved from number 17 to number 6 and downhill skiing from 13 to 8. Apparently, Dover residents would like to have more access to winter-oriented sports than is currently provided. Other notable changes were that boating/canoeing moved up from 14 to 9 while raquetball and picnicing now appear on the list of activities but did not for the first question.

INVENTORY OF DOVER'S RECREATION FACILITIES

Dover has a very diverse system of parks, playgrounds and recreational facilities. There are presently some 17 facilities comprising Dover's recreation system ranging from playlots and sitting parks to multi-use city-wide facilities to natural environmental areas. These facilities are operated and maintained to varying degrees by both the Recreation Department and School Department. Dover's recreation areas include:

City-Wide Parks

Bellamy Park
Guppy Park
Henry Law Park
Maglaras Park
Garrison Hill

Community Park/School

Dover High School
Garrison Elementary School
Woodman Park School
Horne Street School

Neighborhood Playgrounds

Morningside Park
Hancock Street Park
Park Street Park
Long Hill Memorial Park
Applevale Park
Mount Pleasant Park

Playlot/Sitting Park

Amanda Howard Park
Riverside Parks
Fish Ladder Park

Other Facilities

Hilton State Park
Willand Pond
St. Thomas High School
Beckwith Little League Field
Southside Little League Field
Cochecho Country Club

As part of this master plan an inventory of the equipment and activities available at Dover's recreation facilities was compiled. This information is contained in the following tables entitled "Recreation Facilities Inventory, Dover, N.H." Although some of the facilities are privately owned they have been included to give a more complete inventory. The reference number for each facility pertains to the Recreation Map in the appendix of this plan.

RECREATION FACILITIES INVENTORY
DOVER, NH - 1988

REF. NO.	NAME OF FACILITY	SIZE (ACRES)	EQUIPMENT OR ACTIVITIES	OTHER COMMENTS
P3	BELLAMY PARK	33	<ol style="list-style-type: none"> 1. X-Country Skiing 2. Walking/Jogging 3. Fishing 4. Picnicking 5. Swing Set 6. Access to Bellamy River 7. Bird Watching/Sightseeing 8. Summer Day Camp 	City-Wide Use Park
P9	GUPPY PARK	39	<ol style="list-style-type: none"> 1. Outdoor Swimming Pool (50 meter) 2. Indoor Ice Arena 3. Softball Field 4. Tennis Court 5. Natural Wooded Area 6. Open Lawn Area 7. Volleyball Court 8. Playground Equipment 9. Pavillion (w/picnic tables & grills) 	Neighborhood & City-Wide Use
P11	HENRY LAW PARK & BUTTERFIELD GYM	6	<ol style="list-style-type: none"> 1. Indoor Pool (25 yard) & Sauna 2. Gymnasium 3. Weight Room & Hydra-Fitness Room 4. Nautilus 5. Shuffle Board 6. Tot Lot and Pool (swing set & slide) 7. Band Shell 8. Open Lawn Area 9. Frontage on Cochecho River 	Neighborhood & City Wide Use
P8	MAGLARAS PARK	29	<ol style="list-style-type: none"> 1. Baseball Field (2) 2. Multi-Use Field (under construction) 3. Bubbler 	City-Wide Use
P7	GARRISON HILL	55	<ol style="list-style-type: none"> 1. Picnicking 2. Sightseeing 3. Sledding 4. Garrison Hill Tower (Historic Structure) 	City-Wide Use This Site Once Supported 2 downhill ski slopes. Site now on National Register of Historic Places
S1	DOVER HIGH SCHOOL	23	<ol style="list-style-type: none"> 1. Tennis Courts (4) 2. Baseball Field (Regulation) 3. Softball Field 4. Field Hockey Field 5. Football Field (lighted) 6. Track 7. Multi-Use Field 8. Gymnasium 9. Frontage on Bellamy River 	School Dept. and City-Wide Use

S3	GARRISON ELEMENTARY SCHOOL	22	<ol style="list-style-type: none"> 1. Tennis Courts (4) 2. Slide (2) 3. Climbing Bars (4 sets) 4. Basketball Courts (2) 5. Multi-Use Fields (3) 6. Swings 	School Dept. and Neighborhood Use
S7	WOODMAN PARK SCHOOL	10	<ol style="list-style-type: none"> 1. Baseball Field 2. Soccer Field 3. Track 4. Basketball Courts (2) 5. Tennis Courts (4) 6. Playground Equipment 7. Bubblers 	School Dept. and Neighborhood Use
S4	HORNE STREET SCHOOL	13.2	<ol style="list-style-type: none"> 1. Basketball Court 2. Tennis Courts (2) 3. Multi-Use Field 4. Swings (12) 5. Playground Equipment 6. Bubbler 	School Dept. and Neighborhood Use
P14	MORNINGSIDE PARK	1.6	<ol style="list-style-type: none"> 1. Swing Set 2. Slide 3. Climbing Bars 4. Tether Ball 5. Large Field for Informal Play 6. Shelter W/Picnic Tables 7. Bubbler 	Neighborhood Park Serving the Morningside Drive Area
P10	HANCOCK PARK	0.6	<ol style="list-style-type: none"> 1. Basketball Court 2. Playground Equipment 3. Open Lawn Area 4. Bubbler 	Neighborhood Use Park
P16	PARK STREET PARK	1	<ol style="list-style-type: none"> 1. Basketball Court 2. Playground Equipment 3. Sitting Areas 4. Grass Play Field 5. Volleyball Court 6. Bubbler 	Neighborhood Use Park
P12	LONG HILL MEMORIAL PARK	12	<ol style="list-style-type: none"> 1. Tennis Courts (2) 2. Basketball Court 3. Picnicking 4. Nature Walks 	Neighborhood Use Park
P2	APPLEVALE PARK	2.2	<ol style="list-style-type: none"> 1. Basketball Court 2. Open Play Area 3. Swing Set and Climbing Bars 4. Bubbler 	Neighborhood Park Serving Applevale Road Area

P15	MT. PLEASANT PLAYGROUND		<ol style="list-style-type: none"> 1. Small Open Play Area 2. Climbing Bars 	Neighborhood Use Located on Cemetery Land
P1	AMANDA HOWARD PARK	0.5	<ol style="list-style-type: none"> 1. Playground Equipment 2. Natural Area 	Playlot
P17	RIVERSIDE PARKS		<ol style="list-style-type: none"> 1. Park Benches 2. Sightseeing 3. Walking/Jogging Trail 	Small Sitting Park and Walking Paths in Downtown Business District
P5	FISH LADDER PARK	2300 S.F.	<ol style="list-style-type: none"> 1. View of Cochecho River Waterfall 2. Sitting Benches 3. Fish Ladder 	Small Sitting Park in Downtown Business District
R9	HILTON PARK	10	<ol style="list-style-type: none"> 1. Boat Launch (Deep Water) 2. Picnicking/Bar-B-Q Facilities 	State-Owned Facility City Wide and Regional Use
R6	WILLAND POND AREA	25	<ol style="list-style-type: none"> 1. Nature Walks 2. Picnicking 3. Boat Access 	City-Owned Parcels Located Primarily in Somersworth
R10	ST. THOMAS H.S.	30	<ol style="list-style-type: none"> 1. Baseball Field 2. Softball Field 	Privately Owned School
R1	BECKWITH LITTLE LEAGUE	3	<ol style="list-style-type: none"> 1. Little League Field 	Privately Owned Facility on City Land
R11	SOUTHSIDE LITTLE LEAGUE	2	<ol style="list-style-type: none"> 1. Little League Field 	Privately Owned and Operated Facility
R3	COCHECHO COUNTRY CLUB		<ol style="list-style-type: none"> 1. 18 Hole Golf Course 2. Club House 3. Outdoor Swimming Pool 	Privately-Owned Facility (Members Only)

Regional Recreation Areas

This report is concerned primarily with municipal recreation facilities. However, there are numerous regional recreation areas within an easy drive of Dover. While the existence of these regional facilities do provide additional resources for Dover's residents they do not lessen the need for City parks and playgrounds as they provide a different level of recreation.

The Lakes Region, the White Mountains and the Seacoast area are all valuable assets to the quality of life in Dover. The regional recreation facilities closest to Dover are briefly described below:

Blue Job Mountain State Forest - is a heavily wooded, 174 acre tract of land on the Farmington/Strafford town line. The activities include hiking, hunting, cross-country skiing and picnicking. Also, excellent views are available from the fire tower on the mountain's 1356 foot summit.

Odiorne Point State Park - is located on the Seacoast in the town of Rye. This 137 acre scenic area provides picnicking, bicycling and walking trails, a boat launch and a visitors center explaining the natural and historic importance of the area. Also located in Rye south of Odiorne State Park are the state parks of Wallis Sands, Sawyers and Jenness Beaches. All three provide public beaches for swimming.

Bellamy Reservoir - a 258 acre man-made lake is located primarily in Madbury and partially in Dover. Although its primary purpose is a water supply for the Portsmouth area, it also provides a passive natural area for canoeing, fishing, hunting and picnicking.

University of New Hampshire - is part of the state university system located in Durham. UNH has many recreation facilities open to the public including: an ice arena; football field; baseball fields; tennis and basketball courts; running track; gymnasium; as well as numerous social and entertainment functions. Also part of the university land is the area known as College Woods. This 205 acre natural area is densely wooded and contains trails for hiking and skiing, picnicking and opportunities for environmental education.

Pawtuckaway State Park - this 5,000 acre tract of land represents about 20% of the town of Nottingham. It is an extensively used multi-use facility which provides:

an extensively used multi-use facility which provides: camping; playground areas; picnicking; cross-country skiing and a small mountain range for climbing. In addition, Pawtuckaway Lake provides opportunity for swimming, boating, fishing and ice skating.

This is by no means intended to be an exhaustive list of regional recreation areas. It does however give an indication of the diversity of recreation facilities easily accessible to Dover's residents beyond the City's municipal borders. A comprehensive list of recreation facilities throughout the state is contained in the publication "Inventory of Outdoor Recreation Facilities in New Hampshire, 1981" compiled by the office of State Planning.

DOVER'S PARKS AND PLAYGROUNDS INVENTORY AND NEEDS

In the preceding sections recreation development standards were identified for various types of parks and playground facilities. An inventory of Dover's existing parks and recreation facilities was also presented in that section.

The next step then is to compare Dover's existing recreation facilities to these standards in order to identify the deficiencies and adequacies in the City's recreation program based on current and projected population figures. Since the recreation standards are expressed as a range of numbers it is recommended that Dover attempt to meet the midpoint of the range as a goal for certain facilities in providing the desired recreation opportunities for residents of the city. The midpoint is desirable for the more popular recreation facilities and it also provides a margin of safety to avoid dropping below the minimum threshold level.

Table A then compares Dover's recreation facilities to the suggested statewide standards. The population estimate for 1987 and the projections used in the table are taken from the housing chapter of the master plan.

**COMPARISON OF DOVER'S RECREATION
FACILITIES TO STATEWIDE STANDARDS**

FACILITY	STANDARD*	NO. IN DOVER	1987 STANDARD	1995 STANDARD	2000 STANDARD
Ballfields (number)	.6 to 1.0	19	.72	(.58)	(.52)
Tennis Courts (number)	.5 to 1.5	22**	.83	.68	.60
Hard Court Games (number)	1.0 to 4.0	9	(.34)	(.28)	(.25)
Playgrounds (number)	.2 to 2.0	16**	.60	.49	.44
Parks (acres)	1 to 20	119	4.5	3.7	3.3
Picnic Areas (acres)	.2 to 5	42	1.6	1.3	1.2
Capngrounds (acres)	.5 to 3.5	0	(0)	(0)	(0)
Boating Areas (acres)	23 to 95				
Sailing Areas (acres)	8 to 15				
Beaches (acres)	.1 to 1.5	0	(0)	(0)	(0)
Outdoor Swimming Pools (number)	.07 to .4	1	(.04)	(.03)	(.03)
Indoor Swimming Pools (number)	.05 to .2	1	(.04)	(.03)	(.03)
Outdoor Ice Areas (number)	.2 to 1.0	0	(0)	(0)	(0)
Indoor Ice Areas (number)	.02 to .5	1	.04	.03	.03
Gymnasiums (number)	.2 to 1.0	3	(.11)	(.09)	(.08)
18 Hole Golf Courses (number)	.02 to .03	1	.04	.03	.03
Downhill Ski Areas (number)	.1 to .5	0	(0)	(0)	(0)

DOVER'S POPULATION	26,500	32,400	36,500
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ADDITIONAL RECREATION FACILITIES RECOMMENDED

- Public Boat Launches
- Designated Bicycle Lanes
- Cross-Country Ski Trails
- Walking/Jogging Trails

* Standards are based on facilities provided per 1000 people.
 ** Includes private condominium facilities
 () Indicates a shortage of facilities occurring in that year

As illustrated in table A Dover does not presently meet the minimum threshold limit for providing a number of the recreation facilities listed. In fact there is an existing shortage of facilities in every category except tennis courts, playground, picnic areas, acres of park land and indoor ice areas. In all of the listed recreation facilities Dover falls below the midpoint of the range as of 1987.

Another important aspect of this inventory is that it includes school recreation facilities as well as municipal facilities. The School Departments' facilities are not open to the public on a regular basis. Therefore, the amount of facilities listed in Table A are somewhat inflated in terms of what is truly available for citywide recreational use.

In order to bring the City's recreation facilities in line with the recommended standards the following additions should be made:

FACILITY	NUMBER NEEDED TO MEET MINIMUM	
	1987	1995
Ballfield (number)	1	5
Tennis Courts (number)	9*	0
Hard Court Games (number)	16	0
Playgrounds (number)	18*	0
Parks (acres)	146*	0
Picnic Areas (acres)	27*	0
Campgrounds	N/R	N/R
Boating Areas	N/R	N/R
Sailing Areas	N/R	N/R
Beaches (Acres)	2.7	3.2
Outdoor Swimming Pools (number)	0.8	N/R
Indoor Swimming Pools (number)	0.3	1.6
Outdoor Ice Areas (number)	5	N/R
Indoor Ice Areas (number)	0	0
Gymnasiums (number)	2.3	N/R
18 Hole Golf Courses (number)	N/R	N/R
Downhill Ski Areas (number)	N/R	N/R

N/R - Not Recommended

* - These figures represent the midpoint of the range and are recommended to be met by the year 1995.

Specific Recommendations for Existing Parks/Playgrounds and Additional Facilities

Bellamy Park - 33 acres - City-wide Park

This park is one of Dover's "natural setting" parks located on Bellamy Road across from the Dover High School. The Bellamy River meanders through the woodlands and grassy

open spaces providing a very pleasant setting. The structure on the site is used as a headquarters for youth programs in the summer and a warming hut for cross-country skiers in the winter.

Almost half of the parks acreage has been taken over by the high school for use as playing fields. In addition, there has been serious encroachment on the parks boundaries by the multi-family housing constructed on Route 155.

Recommendations

1. Acquire the 28 acre vacant parcel (tax assessor's lot H-18) along Route 155 to be added to the parks acreage. This additional land will help to maintain a buffer between the park and its encircling development which greatly impacts on the character of a natural setting area of this type.
2. Renovate the park building to make it useful for functions, day care facilities, weekend camping trips and warming hut operation.
3. Rebuild footbridge railings and access walkways to the bridge. Remove remaining dam ruins from river.
4. Implement erosion control techniques in the area of the old swimming beach. Erosion is causing filling-in of the stream channel.
5. Construct an outdoor ice skating rink. This would compliment the cross-country ski trails and warming hut providing a winter recreation facility for Dover residents.

Guppy Park - 39 acres - City-Wide Park

This is one of Dover's primary park/playground facilities. Located near the Rollinsford town line on Portland Avenue Guppy Park contains approximately 25 acres of woodland, an indoor ice and tennis arena, an outdoor pool, lighted softball field and family recreation area.

Recommendations

1. Construct two full-length basketball courts near the softball field.
2. Create trail system and implement forest management practices in woodland area. (See recommendations in Forest Resources chapter.)
3. Investigate the feasibility and cost of enclosing the outdoor pool. This makes sense given that: swimming

was the most popular activity listed in the public opinion survey, the Henry Law Park pool receives an excessive amount of use, and the outdoor swimming season in New Hampshire is only a few months long. In designing the facility a modular style would be preferable allowing open-air swimming and sunbathing in the summer season.

Henry Law Park - 6 acres - City-Wide Park

Located in the central business district, Henry Law Park is one of Dover's oldest and most intensively used recreation facilities. With approximately 1,200 feet of frontage on the Cochecho River, the park also contains the Butterfield Gym and indoor pool, a tot lot and wading pool and an outdoor amphitheater for entertainment.

Recommendations

1. Install handicap access to the gym and pool facilities. Install gunite liner in swimming pool.
2. Create an additional 10-15 parking spaces on-site. Restripe parking lot.
3. Remove old foundation of the outdoor wading pool.
4. The proximity of this facility to the river calls for its enhancement as a "natural setting" park. The fence along the river should be replaced and the existing vegetation selectively thinned to allow views of the Cochecho. Several tree-lined walkways with sitting benches and picnic tables should be laid out on the grassy area between the pool and River Street creating a "greenbelt" along the river. A central focal point, such as a fountain or sculpture, placed along these walkways would create a "city common" type area.
5. When the city's sewage treatment plant and Public Works Barn are removed (1991) from River Street, this "greenbelt" described above should be extended along the Cochecho up to Maglaras Park. Ten to fifteen additional acres should be added to the park at that time. This would be done in conjunction with the multi-use redevelopment plan for city parcel recommended in the Land Use Chapter. This redevelopment plan should contain a public boat launch.
6. Construct an addition to the Butterfield Gym and pool complex containing squash, racquetball and handball courts.
7. Provide additional physical fitness equipment at the Butterfield Gym.

Maglaras Park - 29 acres - City-wide Park

Situated near Henry Law Park, Maglaras Park has frontage on Henry Law Avenue and the Cochecho River. It presently contains two minor league baseball fields with a multi-use playing field under construction. The privately owned South Side little league field is directly adjacent to this park. Maglaras Park has the potential to be one of Dover's outstanding recreational facilities for organized sporting events.

Recommendations

1. Complete multi-use field (loam & seed).
2. Construct parking lot with landscaping for the playing fields.
3. Install bleachers and restroom facilities for the playing fields.
4. Construct four tennis courts and two basketball courts in the park.
5. Develop fitness trail loop and riverside footpaths along the linkage to Henry Law Park.

Garrison Hill - 55 acres - City-wide Park

Located on the Rollinsford town line near Wentworth Douglass Hospital, Garrison Hill's 300 foot summit provides some of the most long distance scenic views in the City. The skiing area and apparatus that once existed have been largely removed. The Garrison Hill Committee is raising funds to rebuild the historic tower structure.

Recommendations

1. Continue the work begun by the Committee and Recreation Dept. to regrade and improve the top of the hill for picnicking and special events.
2. Develop a landscaping and parking plan for hilltop area.
3. Develop and implement an erosion control plan for the badly eroded upper ski slope area.
4. The lower portion of the ski slope, located in Rollinsford, should be improved for sledding, tobogganing and beginning skiers.

Dover High School - 23 acres - Community Park/School

Recommendations

1. Reinstall two full-length outdoor basketball courts.
2. Extend Bellamy Park cross-country ski trails behind the school along the Bellamy River as part of the city-wide "greenbelt".

Garrison Elementary School - 22 acres - Community Park/School

Recommendations

1. Resurface and repair existing basketball courts.
2. Renovate existing tennis courts.
3. Improve trails through wooded area for hiking and cross-country skiing as part of the city-wide "greenbelt".

Woodman Park School - 17 acres - Community Park/School

1. Repair and resurface running track. Install permanent edging around track.

Horne Street School - 13 acres - Community Park/School

Recommendations

1. Resurface tennis courts and replace fence.
2. Install more tot lot equipment.
3. Reconstruct basketball courts.
4. Create landscaped picnic area with benches and tables on grassy slope between tennis courts and parking area.

Morningside Park - 1.6 acres - Neighborhood Playground

Recommendations

1. Construct basketball court.
2. Provide additional playlot equipment.
3. Install backstop on multi-use field.
4. Construct storage facility for summer playground program equipment.

Hancock Park - 0.6 acres - Neighborhood Playground

Recommendations

1. Reseal basketball court surface.
2. Provide more tot lot equipment and park benches.
3. Install vehicle barriers at park entrance on Hancock Street.

Park Street Park - 1 acre - Neighborhood Playground

Recommendations

1. Provide more tot lot equipment.
2. Provide a shelter with picnic tables.
3. Divide different activity areas with tree plantings and other landscaping.

Long Hill Memorial Park - 12 acres - Neighborhood Playground

Recommendations

1. Add playground and tot lot equipment.
2. Provide picnic tables in wooded area.
3. Create trail system and implement forest management practices in woodland area. (See recommendations in Forest Resources chapter.)

Applevale Park - 2.2 acres - Neighborhood Playground

1. Provide a shelter with picnic tables.

Additional Recommendations for New Recreation Facilities

In addition to the recommendations previously made for existing parks, playgrounds and schools, the following new facilities are also recommended. Specific sites have not been selected for the playgrounds or park/school facilities to allow flexibility in the planning process. However, general locations and "service areas" have been identified on the recreation map in the appendix. Furthermore, if the sites selected for the park/school facilities coincide with any of the proposed playground locations then it may not be necessary to construct that particular playground.

Playgrounds

1. Whittier - Washington Area Playground
2. Back Road - Henry Law Avenue Area Playground
3. Back Road - Middle Road Area Playground
4. Middle Road - Tuttle Lane Area Playground
5. Mast Road Area Playground
6. Watson Road - Tolend Road Area Playground
7. Long Hill Road - Sixth Street Area Playground
8. County Farm Area Playground

Community Park/School

The School Department and Planning Department have identified the need for two new elementary schools in the City. One facility is needed immediately in the Henry Law Avenue/Back Road Area to address the existing overcrowded conditions in the school system. The second facility will be needed around 1995 to service the northern part of the City in the upper Sixth Street area.

Both schools should have as part of the facility a park/playground as described in the section on recreation standards. However, once a site has been selected for each school, the School and Recreation Departments should work closely to develop a master plan which will ensure that the recreation facilities meet the needs of all concerns.

Other Recreation Needs

Public Access to Waterways - although Dover has over 1,400 acres of surface water which is considered part of the public domain much of it is inaccessible due to private land holdings. A major goal of the City should be to more public access points to its rivers for boating, fishing and general enjoyment.

1. Complete proposed canoe launch to Bellamy River on Mill Street.
2. Construct a public boat launch on the City-owned River Street parcel when the treatment plant and Public Works facilities are relocated.
3. At the confluence of Reyner's Brook and the Cochecho River, County Farm Road creates an impoundment or ponded area on the brook. There is a 7.8 acre (assessor's map B - 19I) wooded parcel adjacent to this impoundment which would make an ideal low-impact picnic, fishing and natural setting recreation area. It would also have a lot of value from a wildlife conservation perspective. The City should pursue the acquisition of, or an easement on this property.

4. The City owns a small (20,000 sq. ft.) parcel along the Cochecho River where the covered bridge (destroyed) used to cross from County Farm Road (assessor's map C-5). This parcel should be developed as a natural waterfront park/picnic area. Perhaps a footbridge could be placed across the river for fishing and pedestrian/bicyclist access.
5. Another small parcel of land (10,000 sq. ft.) was recently donated to the City on the Bellamy River adjacent to the Route 108 bridge (assessor's map H-11A). This area should be developed as a waterfront park/picnic area with a canoe launch.
6. Evaluate the present management and use of recreation facilities by the School and Recreation Departments in order to achieve optimum use of these facilities for both departments.
7. Develop a system of impact fees designed to assess new developments for its share of the cost for providing the necessary recreation facilities.

Section Four

HISTORIC RESOURCES

**HISTORIC PRESERVATION: A FRAMEWORK FOR PRESERVING
THE HISTORIC CHARACTER OF THE CITY OF DOVER**

Introduction

This report presents the results of a Windshield Survey of the historic resources of the City of Dover. The survey identified historic structures, objects and sites on a base map, the same scale as the other maps included in the city's master plan. This text explains these maps, the methods used to arrive at their conclusions and makes suggestions for steps which could be taken to preserve these important resources.

The first step for maintaining the character of Dover has been taken by identifying it in the Windshield Survey of Historic Resources. The next step could be to conduct and complete a thorough (building by building) Historic Resources Survey to provide detailed documentation. The Historic District Commission will take leadership in this process. The Commission will be seen as the city's authority for historic preservation issues, both by town boards and private property owners.

WINDSHIELD SURVEY

Methodology

Preliminary research was conducted to enable better field determination of historic significance. This included a survey of city histories and collecting historic maps. Copies of the historic maps were used during the field survey, primarily from the years 1858 and 1892. These maps were useful in identifying the ages of questionable buildings and in locating historic sites where resources were no longer standing. They also helped by eliminating newer roads as only resources built before World War II were considered.

A route was planned and field work conducted on an area by area basis. The route was driven slowly and resources mapped on the base maps. The railroads, water ways, and older roads were delineated to highlight transportation networks important in understanding the historic development of the City of Dover. In rural and less densely settled areas, resources were mapped on the city base map. These resources were not dated. Areas of open land were delineated to show significant tracts of historic farmland which added to the significance of the historic buildings. Clusters of farms with historic integrity were grouped together as historic agricultural areas.

The densely settled urban core was drawn on the map designated for use in the Dover Master Plan. This map delineates parcels but not individual buildings. Once again, historic roads, railroad routes and water resources were highlighted to help understand the geographic context of the urban core. Next the route was slowly driven and parcels and neighborhoods were color designated according to date of construction. These "eras" of development are described in detail in the following section.

RESULTS: HISTORIC OVERVIEW AND SURVIVING BUILT HISTORIC RESOURCES

Settlement - Pre-Revolutionary Period 1640-1775

The Piscataqua-Great Bay Region is formed by five tributary rivers flowing together to make Great Bay, Little Bay and the Piscataqua River which flows through Portsmouth Harbor to the Atlantic Ocean. This extensive water system transforms New Hampshire's small fourteen mile coastline into a historically significant maritime center.

Although humans have lived in the area for over 10,000 years, the first European settlement in the region dates from 1623. During the next 100 years, this section of what later became known as New Hampshire, was divided into four great "towns" or plantations of Portsmouth, Dover, Exeter and Hampton. Until 1680, this area was part of the Massachusetts Bay Colony. Portsmouth developed as a rich mercantile center and a thriving commercial port exporting timber products and importing everything from food to European finery.

The Town of Dover developed further up the Piscataqua River at the confluence of the Salmon Falls, Cocheco and Bellamy Rivers. The first area of settlement was at Dover Point, also known as "The Neck". This point of land is located at the very center of the confluence of the five tributaries of the navigable Piscataqua River and became the natural hub of activity from all points inland as the area was settled. The first village supported itself primarily by fishing and farming. The settlers were able to establish a community, building wooden homes and clearing the fields. This base was not, however, sufficient for economic expansion.

Fortunately, the Cocheco River offered large falls for water power which soon brought the center of the town to its banks. Mills were built to saw and process the timber from the rapidly expanding region. There were twenty saw mills in New Hampshire by 1665, and fifty by 1770. Lumber that was not used to build the expanding town was shipped by gundalow to Portsmouth and on to Boston. Boston was expanding and the City of London was being rebuilt after the great fire of 1666. There was a great demand for timber resources. Lumbering became incredibly lucrative in the new colony and remained that way for over 100 years. Dover was a natural center for lumber activity. The rivers offered both power for the mills and easy natural transportation to Portsmouth and Boston and Europe beyond. Therefore, lumber became the economic base of the town throughout the 17th and 18th centuries.

Moving inland the settlers cleared the land using and selling the timber and making way for corn fields and the beginnings of agriculture. They moved the rocks from the fields and constructed stone fences and built sturdy, four square, wood frame houses. A system of roads crisscrossed the town with bridges and ferries to cross the rivers. By the middle of the 18th century, Dover had established itself with large, self-sufficient farms and cleared open land; a thriving town center with sawmills at the falls of the Cocheco River. Other industry included brickyards, shipbuilding and trade. The popular "gundalow" trade boat was built in

Dover.

Surviving Resources of the Period

The evidence of the earliest periods of Dover's habitation survive in archeologically sensitive areas. Prehistoric archeological sites, representing thousands of years of habitation, have been recorded along Great Bay and the streams and rivers which flow into it. The area of first European settlement on the neck, or Dover Point, has changed radically and no standing resources survive. Pressing inland, however, many of the large early 18th century farms have survived in an intact condition and the town still possesses a remarkable amount of open farmland. The area around the landing on the Cochecho has seen successive generations of use and is today once more clear of built resources. This area would be likely to yield significant historic archeological evidence.

Architecturally, Dover residents chose to build in a plain, utilitarian style. The grand Georgian mansions built by the sea captains and entrepreneurs in the nearby capitol of Portsmouth were not duplicated in Dover. One possible reason for this may have been the relatively large number of Quakers who chose to settle in the area. Perhaps the finest surviving example of Georgian architecture in the city is the Friends' Meeting House, c. 1769. The Tuttle Farm is a good example of early farm settlement. The John Gage House, c. 1723, is a fine example of vernacular Georgian building surviving in the center of town. The Damm or Damme Garrison, c. 1674, is an interesting example of a primitive fortress structure used in the Indian wars. Originally located in the area of town now known as Back River Road, it was moved to a protected location at the Woodman Institute in 1915.

Post Revolutionary Federal Period 1775-1820

The period following the Revolution was a time of regional expansion in industry, education, transportation and architecture. During this period, the first capital, Portsmouth, reached a peak of mercantile success, building streets of stately mansions in the new Federal style of architecture. Dover also grew and prospered as the lumber industry continued to thrive. During the 1790's there appeared to be a lumber crisis as the supply of quality trees dwindled. However, Dover merchants united against the possible loss of their economic base and constructed the first New Hampshire turnpike and other roads into the interior. These improvements in transportation provided easier access to inland timber sources, and the city maintained its economic base through this time of crisis.

The disastrous years of the embargo and War of 1812, which cut off the lucrative ocean trade, changed forever the destiny of Portsmouth which never recovered an industrial base. Although Dover was also affected by these events, the town turned again to its water resources to develop industry. A group of local entrepreneurs formed in 1812 and incorporated as the Dover Cotton Factory. By 1821, Boston financiers had invested in this operation and by 1830 Dover was one of the largest manufacturing

centers in the country. These events radically changed the character of the city.

Agricultural enterprise expanded as local farmers took advantage of new "technologies" to improve their farms. Imported animals, plants and trees added variety to their crops and livestock.

Surviving Resources of the Period

Following the embargo of 1812, many of the wealthy entrepreneurs invested their money in building fine homes because they couldn't invest in shipbuilding and trade. This employed some of the same carpenters and woodworkers. These fine Federal mansions are concentrated in the area known as Tuttle Square and scattered throughout as agricultural settlement continued throughout the city. Brick became a popular building material in Dover. Fires in Newburyport and Portsmouth had made this material a necessity as well as an aesthetically desirable material. Dover's coastline supported numerous brickyards which supplied brick throughout the region. Many of the new mansions and industrial buildings were built of this brick. Significant examples include the William Woodman House, c. 1818, and the John Williams/John Parker Hale House, c. 1814. (John Williams was the agent of the first cotton mill.)

Industrialization and the Civil War 1820-1870

During this period, the expansion of the town was phenomenal. The population grew from 2,871 in 1820 to 5,449 in 1830. This growth generated a need for business and commerce and an area of shops and stores developed on Central Avenue, known as "Merchant's Row". Local brick was used to build attractive, "fireproof" buildings. (Many substantial brick structures have been lost to fire despite these precautions.) Dover's commercial village center grew to equal any of the neighboring towns.

As Portsmouth's maritime prosperity declined, Dover's manufacturing wealth grew. At one time more vessels entered Boston from Dover than from any other place east of New York except Portland, Maine. Good transportation for the import and export business was improved by dredging the Cochecho River, and in 1842 the railroad came to Dover and changed the major mode of transportation from water to rail. Dover was the hub of several railroads coming into the city. The Boston & Maine Railroad ran roughly east/west and a later southern division spur was built from Portsmouth across Dover Point running north/south through the city on roughly the route used today by the Spaulding Turnpike. Railroad yards were located in the city's center to serve both passengers and the mills.

The Sawyer Mills were located on the south side of Dover on the Bellamy River, manufacturing woolen goods. This industry was fairly self-contained, with mills and worker housing in close proximity. The Cochecho Manufacturing Company in the center of the city produced wool, cotton, calico, and other print fabric and exported them far and wide. The construction of the great brick mills continued throughout the second and third quarters of the 19th century. These mills became the focus of the

community and their presence altered its character.

Not only did manufacturing bring about a visual change in Dover, but it changed the social character of the town as well. The increase of population brought on by a combination of the demand for labor in industry and political problems in Europe, introduced new ethnic groups into the population. In the beginning, the company built fine boarding houses in order to attract the women from farm families in the region to come and work in the mills. Eventually, these "millgirls" were replaced as immigrant families of French, Irish and Greek descent moved to the city. Several new churches were built during this period due to both the proliferation of new nationalities and the freedom granted by the Toleration Act of 1819. (The number of churches grew from two to ten in a single decade!)

Agriculture continued to prosper, but the advent of the railroad changed the character of the farms as well. The railroad gave the farmers new markets for their crops and the all-purpose farms gave way to the era of the specialty farm. Dairy farming was especially popular in Dover, supplying milk to the city and to Boston.

Surviving Resources of the Period

Many brick commercial buildings survive in upper and lower squares. One particularly significant block is the Hosea Sawyer Block at 29-31 Main Street, built in 1825. The rounded front and square granite lintels are particularly noteworthy. The extensive mills of the Sawyer and Cochecho Manufacturing Companies survive in a remarkably intact condition. Worker housing is particularly well-preserved in the First through Fifth Street neighborhood, an area that housed wave after wave of immigrants coming to the city. The best examples of mill-built housing are next to the Sawyer Mills on Charles Street. One unique circumstance was the construction of individual houses on Fifth Street made from a long mill shed.

The Greek Revival Style was the most popular Architectural Style of this period and wealthy Dover industrialists embraced it with enthusiasm. White temple-front residences lined Silver and Locust Streets. The architectural character of Dover varied radically, therefore, from the other cities on the Seacoast because Dover was prospering in an era when the rest of the region was economically depressed.

Two outstanding examples of the Greek Revival Style are the Corporation House c. 1830, at 113 Locust Street, and the Benjamin Barnes House at 89 Locust Street. These were built to house the agent and clerk of the Cochecho Manufacturing Company and they set the style to which others aspired.

Other architectural styles which were popular in this period were the French Second Empire and Italianate Styles. Excellent examples of the French Second Empire or Mansard Styles are found on Summer Street. Number 45-47 Summer Street became Dover's first hospital in 1897.

Other resources which shaped the character of the city include: the railroad--most of the large identifiable railroad structures have been torn down except for an early (c.1842) round house off Chestnut Street and a twentieth century round house on Oak Street.

Post Civil War Victorian Era 1870-1910

The 30 years that followed 1870 seemed to have been one of the most difficult periods that local farmers had ever faced, a time when they had to adapt to the changing needs of a nation that was moving west. Throughout New Hampshire, many farms were abandoned. In Dover, the agricultural economy was maintained through these ups and downs, primarily in the dairy sector, which continued to supply milk for Portsmouth and Boston.

The period following the Civil War saw the continued expansion of the mills in Dover. From 1876-1878 a new Mill #1 was constructed at the site of the present day Clarostat. Water wheels were replaced with turbines and overhauls of all the original mill structures were begun. During the 1880's a new Mill #2 was built on the north side of the river, and eventually #2, #3, and #4 were joined to form one continuous building, 732 feet long by 74 feet wide. By 1885 the Cochecho Manufacturing Company had five mills and the printery in full operation.

One noteworthy addition to the city's transportation network was the street railway. This was originally a horsecar system (1882-1890) which ran on Central Avenue between Sawyer's Bridge and Garrison Hill. In 1889, the business was sold to Henry W. Burgett of Brookline, Massachusetts, who expanded the operation to Somersworth and converted it from horse to electric power. The name changed accordingly from the Dover Horse Railroad Company to the Union Street Railroad. Burgett built an amusement park at Willard Pond in Somersworth (no longer extant) to attract passengers. After a series of bad business operations, the company was consolidated as the Dover, Somersworth and Rochester Street Railway. This type of transportation was soon eclipsed (The last car was removed on October 15, 1926.) by the advent of a wonderful new invention - the automobile.

Surviving Resources of the Period

New residential neighborhoods were built during this period. Many of these neighborhoods involved expensive and large Victorian houses. An unusual change took place in the Silver Street area. The stylish Greek Revival houses were extensively remodelled to a new Victorian look. Many became multi-family dwellings as well. Some of the older residential neighborhoods of the 1840's and '50's became worker housing stock, or the first place people lived before they made good and could move into the new larger Victorian houses. Surviving noteworthy examples are found on 1st and 2nd streets.

Besides the new mill buildings, many new commercial structures were built in Victorian style. Civic and church buildings built during this era include: The Stratford Bank Building (c. 1895) on the corner of Washington Street and Central Avenue, and the Baptist Church (c. 1895) at Washington

and Fayette Streets.

EARLY 20TH CENTURY 1910-1940

After the Civil War, the textile industry began in the South, and because of lower production costs and cheaper labor, it continued to expand. In response, the northern textile business declined. In 1909, the Pacific Mills of Lawrence, Massachusetts took over the Cochecho and tore down the printworks in 1913. Operations slowed, then stopped entirely in 1940. The physical plant was sold at auction to the City of Dover in 1941. A mill committee made up of city officials then leased space in the facilities to smaller industries such as Miller's Shoe and Eastern Air Devices. Currently the mills have been purchased and are being refurbished and renovated for retail, commercial and residential use.

With the exception of a few successful vegetable and dairy farms, most farming operations were abandoned during this time period.

Despite the economic decline, new residential neighborhoods developed in Dover between 1900 and 1940. The architectural styles included in these neighborhoods are predominantly the Bungalow and the "Square House". New residential neighborhoods developed in walking access to the street car line which ran on Central Avenue. Particular areas of development are near Woodman Park, south of Silver Street, and the area between Oak and Hill Street, south of Oak Street between Park Street and Ela; also the northern part of Mount Vernon and Maple Streets developed during this era. The automobile put pressure on the owners of earlier houses and garages were built in the Arts and Crafts Style throughout the more affluent urban neighborhoods. The Colonial Revival Style expressed a respect for the city's early history. Numerous examples of this popular style are found on sub-divided lots throughout the city, often with exaggerated "colonial" details.

Civic and religious structures were added to the city's building stock in the late 19th and early 20th centuries, including the Court House, 1899, on 2nd Street and The Masonic Building. City Hall was built c. 1930. The Public Library and the 1891 Fieldstone Episcopal Church on the corner of Locust and Hale Streets form a "plaza" which still retains a particular turn-of-the-century character.

OBSERVATIONS AND RECOMMENDATIONS

Dover is fortunate to have a wealth of built resources surviving from its history. These resources are varied and scattered throughout the city. They are most significantly, numerous and remarkably intact. Critical resources divide into the following area:

Downtown, Commercial and Industrial Area: When most people think of the City of Dover, they think of the Cochecho Manufacturing Company. Indeed these giant brick mills have defined the character of the City for a century and a half. Good fortune has preserved the mills during the last decade and they move into the 21st century in a new incarnation as office space, and mixed commercial and residential use.

Dover's commercial area is also made of brick and particularly distinguishes the character of the City. Much of the Downtown, including Franklin and Central Squares has undergone a major rehabilitation/revitalization during the last decade. Most of the commercial buildings have been bought and remodelled for 1980's use.

Both the downtown and the mills appear to be safe for the foreseeable future. The Historic District Commission should monitor these two crucial areas and advise property owners on preservation techniques to insure their continued maintenance. Downtown's prosperity will depend on the continued upsurge in the local economy.

Urban Core Residential Neighborhoods: Expanding in all directions on both sides of the river from the mills, are areas of housing. Closest to the mill area are dense blocks of small wooden houses built in the 1830's and '40's, the main area of expansion. Radiating from this are large areas of older homes, first Victorian neighborhoods, and further 20th century residential neighborhoods.

The oldest houses, closest to the mills, are in probably the most dire need of rehabilitation. These intact neighborhoods should be considered as a focus of a community development program. Sensitive rehabilitation will assure the useful life of these historic neighborhoods for the future.

The large Victorian homes in the Silver Street area are also in some danger. Their size has made them impractical for modern single family use, and subdivision into apartments and condominiums is taking place. Some of this rehabilitation has been sensitive to the historic architecture; some of it has not. The Historic District Commission should run workshops and offer assistance and advice to property owners seeking to subdivide these large homes. Careful attention should be paid to parking regulations and other site features that are crucial to maintaining the character of these elegant late 19th century neighborhoods. Careful subdivision could preserve these wonderful resources for the future.

Many publications have been written that would be useful to the owners of early 20th century residential buildings. These include the "Old House Journal" and publications by the National Trust. Zoning should continue to

reflect the historic single family nature of these neighborhoods. When discussing neighborhoods, it is important to first work with a public education program for residents and property owners. Neighborhood organizations can then be created for the understanding, enjoyment and promotion of these fine resources.

The National Trust for Historic Preservation publishes an excellent newsletter called "Conserve Neighborhoods". In addition to the newsletter, they run conferences and programs for neighborhood leaders. Dover should consider participation in this program. Leadership for this effort might come from the Historic District Commission or from the Dover Planning Office. Various avenues might be explored for identifying neighborhood leadership. If this becomes a priority, the possibilities are limitless. These special areas are one of Dover's primary resources for maintaining a sense of community.

Historic Agricultural Areas: During the 18th and 19th centuries, much of the arable land in Dover was cleared for farming. This process has reversed in the 20th century, however, and today many of the farms have been abandoned and much of the land is returning to forest cover. To accommodate Dover's considerable housing boom, many of these historic farms have been bought and subdivided. The houses and barns remain, but the character of the landscape has changed.

The windshield survey identified many areas where the historic agricultural character of Dover was still remarkably intact. In these areas, the landscape combines with the historic farms to present a wonderful picture of the agricultural heritage of the city. Driving or walking through these areas it is possible to recall the days before the housing boom.

Many techniques are available for protecting land. These techniques include: municipal land use controls such as historic districting, agricultural zoning, land evaluation and its site assessment (LESA); the right to farm law, site plan review combined with cluster development and planned unit development, performance standards and transferable development rights. A combination of these techniques would be helpful in preserving open land in Dover. However, the disadvantage of most of these techniques is that they require considerable professional expertise. This could mean volunteer efforts or additional staff in the City Planning Department to initiate and manage such programs.

Private incentives for land protection could augment the city's efforts. A private/public partnership could be formed which could increase the potential for protecting open land. These techniques include the formation of local development corporations and revolving funds to be managed by a local development corporation. The local development corporation can include land trusts. The problem again, could be the need for staff time to make this happen effectively. Other private possibilities include estate planning, easements, covenants and deed restrictions, and outright acquisition by both public and private sectors.

The overall concept of partial development offers perhaps the strongest possibility. The advantage of this concept is that it involves the establishment of an informal partnership with the land owner and conservation groups, the developer and the bank responsible for financing the package. This approach is beneficial because it allows fair compensation to the large property owner and provides for new housing while protecting land resources critical to the city.

Transportation: Transportation routes have been historically important in Dover. In the beginning, the Piscataqua, Bellamy, Salmon Falls and Cochecho rivers were the highways of commerce to the sea. These rivers still exist and archaeological and historic evidence of their importance can be found on the banks of the Cochecho near "The Landing". This landing has ceased to be of transportation importance except for small recreational boating. The area is clearly historically significant and since it has been researched by the Heritage Group, could be of immediate educational and scenic importance to the city. Careful archaeological investigation should be made, and a master plan developed before developing this historic scenic area.

Most of the railroad lines have been abandoned, but some of the railroad structures survive. Attention should be paid to new use of these railroad corridors and to documenting the surviving historic railroad structures.

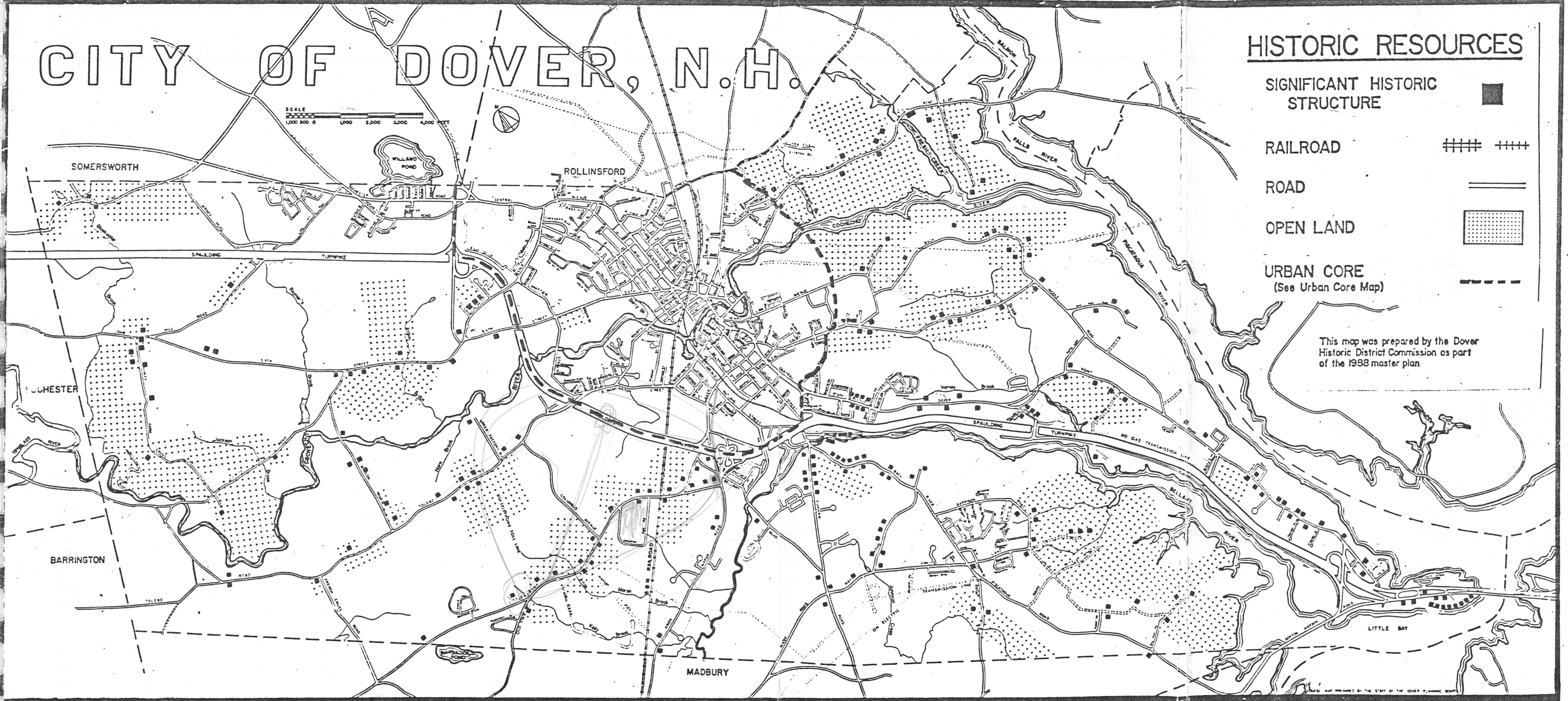
In historic agricultural areas, small country roads have been identified as making a major contribution to the character of these areas. Before widening and upgrading these roads, there should be consideration given to designating them as scenic roads. Roads through the historic agricultural areas should be maintained in keeping with the existing rural character.

Historic Districts: The Tuttle Square Historic District has been identified as the oldest surviving section of the urban core. As it evolved, this district added examples of nearly all of the major residential architectural styles, as well as significant community buildings such as churches and schools. This district should be preserved carefully as describing the evolution of Dover's heritage. This district will also serve as the model for preservation techniques. By focusing efforts in this area, the Commission can use it as an example to bring a better understanding of preserving the community's built heritage to citizens in other neighborhoods.

The creation of other historic districts may be deemed advisable in the future, but in the meantime, other neighborhoods and resources should be protected by encouraging property owners to follow the example set by the Historic District.

CITY OF DOVER, N.H.

SCALE
1,000 2,000 3,000 4,000 FEET



HISTORIC RESOURCES

- SIGNIFICANT HISTORIC STRUCTURE
- RAILROAD
- ROAD
- OPEN LAND
- URBAN CORE (See Urban Core Map)

This map was prepared by the Dover Historic District Commission as part of the 1988 master plan

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Waste Water Treatment Plant, Dover, N.H.
Victoria Bunker, PhD

Port of Dover

APPENDIX

UNDERGROUND STORAGE TANK INFORMATION FOR DOVER, AS OF 27 MAY

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Out-of Service Date
A. Lipson, Inc. 69 Fifth Street Dover, NH 03820	07	4,000	Pet-G	Steel	CIU		
A. Lipson, Inc. 69 Fifth Street Dover, NH 03820	07	3,000	Pet-D	Steel	CIU		
A. Lipson, Inc. 69 Fifth Street Dover, NH 03820	07	2,000	Pet-G	Steel	CIU		
Agway Inc. Box 925 Charles Street Dover, NH 03920	12	500 Empty		Steel	TOU		
American Lightning Rod Co. 400 Sixth Street Dover, NH 03820	15	1,000	Pet-D	Steel	CUI		
American Lightning Rod Co. 400 Sixth Street Dover, NH 03820	30	500	Pet-D	Steel	TOU		
Benn's Marina Inc. 423 Dover Point Road Dover, NH 03820	13	2,000	Pet-G	Steel	CUI		
Bill Dube Inc. 40 Dover Point Road Dover, NH 03820	3	1,000	Pet-G	Steel	CUI		
Bill Dube Inc. 40 Dover Point road Dover, NH 03820	3	500	Pet-UO	Steel	CUI		
Bob's Gulf 211 Central Ave. Dover, NH 03820	0	8,000	Pet-G	Steel	CUI	05-01-88	
Bob's Gulf 211 Central Ave. Dover, NH 03820	0	8,000	Pet-G	Steel	CUI	05-01-88	

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
Bob's Gulf 211 Central Ave. Dover, NH 03820	0	8,000	Pet-G	Steel	CUI	05-01-88	
Byrnes Chevrolet, Inc. 5 Dover Point Road Dover, NH 03820	12	10,000	Pet-G	Steel	CUI		
Byrnes Chevrolet, Inc. 5 Dover Point Road, Dover, NH 03820	12	10,000	Heating Oil	Steel	CUI		
Byrnes Chevrolet, Inc. 5 Dover Point Road Dover, NH 03820	12	2,000	Pet-UO	Steel	CUI		
Byrnes Chevrolet, Inc. 5 Dover Point road Dover, NH 03820	12	2,000 Empty		Steel	POU		06-01-80
Central Ave. Moving Ctr. 622 Central Ave. Dover, NH 03820	15	6,000 Empty	FO	Unknown	POU		10-01-76
Central Ave. Moving Ctr. 622 Central Ave. Dover, NH 03820	15	6,000 Empty	FO	Unknown	POU		10-01-76
Central Ave. Moving Ctr. 622 Central Ave. Dover, NH 03820	15	6,000	Pet-G	Unknown	CUI		
Central Ave. Moving Ctr. 622 Central Ave. Dover, NH 03820	15	6,000	Pet-G	Unknown	CUI		
Central Ave. Moving Ctr. 622 Central Ave. Dover, NH 03820	15	1,000	FO	Unknown	CUI		
Christie's Interiors 67 Third Street Dover, NH 03820	25	5,000	#5 FO	Steel	POU		
Christie's Interiors 67 Third Street Dover, NH 03820	25	3,000 Empty	Pet-G	Steel	POU		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
Christie's Interiors 67 Third Street Dover, NH 03820	25	4,000 Empty	#5 FO	Steel	POU		
Clarostat Mfg. Co., Inc. 1 Washington Street Dover, NH 03820	45	50	Pet-G	Unknown	CUI		
Clarostat Mfg. Co., Inc. 1 Washington Street Dover, NH 03820	10	10,000	#2 FO	Steel	CUI		
Cleary Cleaning, Dover So. 120 Central Ave. Dover, NH 03820	25	6,000	FO	Steel	CUI		
Coheco Bottling co. Pickering Rd. & Nadeau Dr. Dover, NH 03820	08	2,000	Pet-D	Steel	CUI		
Coheco Bottling Co. Pickering Rd. & Nadeau Dr. Dover, NH 03820	08	10,000	Pet-D	Steel	TOU		
Coheco Bottling Co. Pickering Rd. & Nadeau Dr. Dover, NH 03820	08	10,000	Pet-D	Steel	TOU		
Colony Auto co. & Body W 880 Central Ave. Dover, NH 03820	2	250	Pet-UO	Steel	CUI		
Corriveau-Routhier, Inc. 71 Broadway Dover, NH 03820	15	2,000	Pet-D	Unknown	CUI		
D & M Mobil 221 Central Ave. Dover, NH 03820	16	10,000	G	Steel	CUI		
D & M Mobil 221 Central Ave. Dover, NH 03820	16	6,000	Pet-G	Steel	CUI		
D & M Mobil 221 Central Ave. Dover, NH 03820	11	5,000	Pet-G	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
D & M Mobil 221 Central Ave. Dover, NH 03820	16	550	Pet-UO	Steel	CUI		
D & M Mobile 221 Central Ave. Dover, NH 03820	16	550	FO	Steel	CUI		
D.F. Richard Inc. 81 Broadway Dover, NH 03820	25	3,000	Pet-G	Steel	CUI		
David Dupont SS #5954 171 Silver Street Dover, NH 03820	10	8,000	Pet-G	Steel	CUI		
David Dupont SS #5954 171 Silver Street Dover, NH 03820	20	6,000	Pet-G	Steel	CUI		
David Dupont SS #5954 171 Silver Street Dover, NH 03820	10	4,000	G	Steel	CUI		
David Dupont SS #5954 171 Silver Street Dover, NH 03820	28	275	Pet-UO	Steel	CUI		
Davidson Rubber Interior Trim Division Industrial Park Dover, NH 03820	26	10,000	FO	Steel	POU		10-01-87
Davidson Rubber Interior Trim Division Industrial Park Dover, NH 03820	11	10,000	#6 FO	Steel	CUI		
Davidson Rubber Interior Trim Division Industrial Park Dover, NH 03820	9	1,000	Pet-D	Steel	CUI		
Dover Baptist Church Washington St. Dover, NH 03820	34	5,000	Pet	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
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Dover Carpenter Shop Grove Street Dover, NH 03820	05	3,000	Pet-G	Steel	CUI		
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Dover Catholic School Central Ave. Dover, NH 03820	03	10,000	FO	Steel	CUI		
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Dover City Hall Hale Street Dover, NH 03820	1	4,000	#2 Oil	Steel	CUI		
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Dover Fuel Facility Off Oak Street Dover, NH 03820	20	20,000	Pet-D	Steel	CUI		
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Dover High School Durham Road Dover, NH 03820	20	15,000	#4 Oil	Unknown	CUI		
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Dover Housing-Central Tow. Henry Law Ave. Dover, NH 03820	0	10,000	FO	FRP	CUI	10-01-87	
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Dover Housing-Niles Pk. 18 Union Ave. Dover, NH 03820	0	6,000	FO	Steel	CUI	10-01-87	
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Dover Jr. High School St. Thomas Street Dover, NH 03820	24	9,210	#4 Oil	Steel	CUI		
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Dover Maintenance Garage Route 16 Dover, NH 03820	08	4,000	Pet-G	Steel	CUI		
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Dover Maintenance Garage Route 16 Dover, NH 03820	08	2,000	Pet-K	Steel	CUI		
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Dover Maintenance Garage Route 16 Dover, NH 03820	25	2,000	Pet-G	Steel	CUI		
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Dover Paint & Varnish Co. 25 Littleworth Road Dover, NH 03820	03	10,000	Pet-G	Steel	CUI		
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Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
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Dover Paint & Varnish Co. 25 Littleworth Road Dover, NH 03820	03	5,000	Pet-G	Steel	CUI		
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Dover Paint & Varnish Co. 25 Littleworth Road Dover, NH 03820	10	4,000	Pet-G	Steel	CUI		
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Dover Paint & Varnish Co. 25 Littleworth Road Dover, NH 03820	10	4,000	Pet-G	Steel	CUI		
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Dover Paint & Varnish 25 Littleworth Road Dover, NH 03820	08	3,000	Pet-D	Steel	CUI		
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Dover Plaza BP 874 Central Ave. Dover, NH 03820	10	8,000	Pet-G	Steel	CUI		
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Dover Plaza BP 874 Central Ave. Dover, NH 03820	07	8,000	Pet-G	Steel	CUI		
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Dover Plaza BP 874 Central Ave. Dover, NH 03820	02	10,000	Pet-G	Steel	CUI		
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Dover Plaza BP 874 Central Ave. Dover, NH 03820	09	8,000	Pet-G	Steel	CUI		
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Dover Plaza BP 874 Central Ave. Dover, NH 03820	19	4,000	Pet-D	Steel	CUI		
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Dover Public Works Garage River Street Dover, NH 03820	16	10,000	#2 Oil	Steel	CUI		
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Dover Public Works Garage River Street Dover, NH 03820	15	5,000	Pet-G	Steel	CUI		
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Dover Public Works Garage River Street Dover, NH 03820	15	5,000	Pet-G	Steel	CUI		
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Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
Dover Public Works Garage River Street Dover, NH 03820	15	2,000	Pet-G	Steel	CUI		
Dover Public Works Garage River Street Dover, NH 03820	10	3,000	Pet-G	Steel	CUI		
Dover Public Works Garage River Street Dover, NH 03820	10	3,000	Pet-G	Steel	CUI		
Dover Recreation Ctr. Washington Street Dover, NH 03820	20	6,200	#2 Oil	Steel	CUI		
Dover State Armory Oak Street Dover, NH 03820	23	6,600	FO	Steel	CUI		
Drake Petroleum 809 Central Ave Dover, NH 03820	01	8,000	Pet-G	Steel	CUI		
Drake Petroleum 809 Central Avenue Dover, NH 03820	01	8,000	Pet-G	Steel	CUI		
Drake Petroleum 809 Central Avenue Dover, NH 03820	01	8,000	Pet-G	Steel	CUI		
Drake Petroleum 809 Central Avenue Dover, NH 03820	01	8,000	Pet-G	Steel	CUI		
Drake Petroleum 809 Central Avenue Dover, NH 03820	01	4,000	Pet-G	Steel	CUI		
Eastern Air Devices 1 Progress Drive Dover, NH 03820	08	10,000	Pet-R	Steel	CUI		
Fiberdyne, Inc. Crosby Road Dover, NH 03820	8	10,000	FO	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
First Parish Church 218 Central Ave. Dover, NH 03820	15	1,000	FO	Steel	CUI		
First Parish Church 218 Central Ave. Dover, NH 03820	15	2,000	#2 FO	Steel	CUI		
Garrison School Garrison Road Dover, NH 03820	22	10,000	#4 FO	Steel	CUI		
Gasse's Sunoco Route 16 Dover, NH 03820	0	4,000	Pet-G	Steel	CUI	10-01-86	
Gasse's Sunoco Rouse 16 Dover, NH 03820	0	5,000	Pet-G	Steel	CUI	10-01-86	
Gasse's Sunoco Route 16 Dover, NH 03820	0	6,000	Pet-G	Steel	CUI	10-01-86	
General Electric Co.(Bldg.T)17 Littleworth Road Dover, NH 03820		15,000	#6 FO	Steel	CUI		
General Electric Co.(Bldg.T) 4 Littleworth Road Dover, NH 03820		4,000	WTR&HYDRAL.O	Steel	CUI		
Hanscom's Dover Warehouse 72 Littleworth Road Dover, NH 03820	15	3,000	#2 FO	Steel	CUI		
Horne Street School Horne Street Dover, NH 03820	27	6,600	#4 OIL	Steel	CUI		
J.B. Austin, Inc. 68 Rutland Street Dover, NH 03820	10	5,000	FO	Steel	CUI		
J.B. Austin, Inc. 68 Rutland Street Dover, NH 03820	10	5,000 Empty		Steel	TOU		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
Ken's Southside Service 46 Central Ave. Dover, NH 03820	14	6,000	Pet-G	FRP	CUI		
Ken's Southside Service 46 Central Ave. Dover, NH 03820	14	8,000	Pet-G	FRP	CUI		
Ken's Southside Service 46 Central Ave. Dover, NH 03820	14	4,000	Pet-G	FRP	CUI		
Ken's Southside Service 46 Central Ave. Dover, NH 03820	40	550	Pet-UO	Steel	CUI		
Lord & Keenan Co. 63 Fourth Street Dover, NH 03820	15	1,000	Pet-D	Steel	CUI		
Lord & Keenan Co. 63 Fourth Street Dover, NH 03820	12	3,000	Pet-G	Steel	CUI		
Meineke 899 Central Ave. Dover, NH 03820	25	4,000	Pet-G	Steel	CUI		
Meineke 899 Central Ave. Dover, NH 03820	25	4,000	Pet-G	Steel	CUI		
Meineke 899 Central Ave. Dover, NH 03820	19	4,000	Pet-G	Steel	CUI		
Meineke 899 Central Ave. Dover, NH 03820	14	4,000	Pet-G	Steel	CUI		
Merchants National Bank 488 Central Ave. PO Box 609 Dover, NH 03820	5	2,000	#2 FO	Steel	CUI		
Moore Business Forms 279 Locust Street Dover, NH 03820	24	10,000	#4 FO	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
New England Telephone Co. 57 St.Thomas Street Dover, NH 03820	29	5,000	#2 FO	Steel	CUI		
New England Telephone Co. 57 St.Thomas Street Dover, NH 03820	02	1,500	Pet-D	Steel	CUI		
Northside Getty 547 Central Ave. Dover, NH 03820	04	4,000	Pet-G	Steel	CUI		
Northside Getty 547 Central Ave. Dover, NH 03820	04	4,000	Pet-G	Steel	CUI		
Northside Getty 547 Central Ave. Dover, NH 03820	04	4,000	Pet-G	Steel	CUI		
Northside Getty 547 Central Ave. Dover, NH 03820	02	2,000	Pet-D	Steel	CUI		
Northside Getty 547 Central Ave. Dover, NH 03820	02	2,000	Pet-K	Steel	CUI		
Northside Getty 547 Central Ave. Dover, NH 03820	02	4,000	New Oil	Steel	CUI		
Northside Getty 547 Central Ave. Dover, NH 03820	02	550	Pet-U0	Steel	CUI		
Old Colony Location #6927 250 Central Avenue Dover, NH 03820	20	5,000	Pet-G	Steel	CUI		
Old Colony Location #6927 250 Central Ave. Dover, NH 03820	20	6,600	Pet-G	Steel	CUI		
Old Colony Location #6927 250 Central Ave. Dover, NH 03820	20	9,200	Pet-G	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
Old Colony Location #6928 1 New Rochester Road Dover, NH 03820	17	10,000	Pet-G	Steel	CUI		
Old Colony Location #6928 1 New Rochester Road Dover, NH 03820	17	10,000	Pet-G	Steel	CUI		
Old Colony Location #6928 1 New Rochester Road Dover, NH 03820	17	10,000	Pet-G	Steel	CUI		
P.W. & H Shed Spaulding Tpk. Dover, NH 03820	08	4,000	Pet-G	Steel	CUI		
Preble Street 66 Central Ave. Dover, NH 03820	11	4,000	Pet-G	Steel	CUI		
Preble Street 66 Central Ave. Dover, NH 03820	12	4,000	Pet-G	Steel	CUI		
Prosper Shevenell & Son, Inc. 40 Maple Street Dover, NH 03820	20	5,000	#2 FO	Steel	CUI		
PSNH - Cochecho St. Facility 75 Cochecho Street Dover, NH 03820	19	3,000	Pet-G	Steel	CUI		
Quick Mart Store #30294 20 Somersworth Road Dover, NH 03820	12	12,000	Pet-G	FRP	CUI		
Quick Mart Store #30294 20 Somersworth Road Dover, NH 03820	12	12,000	Pet-G	FRP	CUI		
Quick Mart Store #30294 20 Somersworth Road Dover, NH 03820	12	12,000	Pet-G	FRP	CUI		
Rasco Parts Warehouse, Inc. 13 Park Street Dover, NH 03820	08	10,000	#6 FO	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
Red's Shoe Barn Inc. 35 Broadway Dover, NH 03820	13	2,000	Pet-D	Steel	CUI		
Riverside Rest Home 6th Street Extension Dover, NH 03820	0	4,000	#2 FO	Steel	CUI	10-01-86	
Riverside Rest Home 6th Street Extension Dover, NH 03820	0	4,000	#2 FO	Steel	CUI	10-01-86	
Seacoast Savings Bank 537 Central Ave. Dover, NH 03820	12	10,000	#2 FO	Steel	CUI		
Southside Getty 537 Central Ave. Dover, NH 03820	01	6,020	Pet-G	Steel	CUI		
Southside Getty 537 Central Ave. Dover, NH 03820	01	10,000	Pet-G	Steel	CUI		
Southside Getty 537 Central Ave. Dover, NH 03820	01	6,020	Diesel	Steel	CUI		
Southside Getty 537 Central Ave. Dover, NH 03920	05	2,000	FO	Steel	CUI		
Spaulding Citco 52 Central Ave. Dover, NH 03820	08	10,000	Pet-G	Steel	CUI		
Spaulding Citco 52 Central Ave. Dover, NH 03820	20	4,000	Pet-G	Steel	CUI		
Spaulding Citco 52 Central Ave. Dover, NH 03820	04	10,000	Pet-G	Steel	CUI		
Spaulding Citco 52 Central Ave. Dover, NH 03820	11	4,000	Pet-D	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
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Spaulding Citco 52 Central Ave. Dover, NH 03820	19	2,000	Pet-K	Steel	CUI		
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St. Ann Home 195 Dover Point Road Dover, NH 03820	28	6,670	#4 FO	Steel	CUI		
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St. John's U. Method. Chrh 28 Cataract Ave. Dover, NH 03820	17	6,000	FO	Steel	CUI		
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St. Thomas Aquinas HS 197-9 Dover Point Road Dover, NH 03820	25	10,000	FO	Unknown	CUI		
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Steam Heating Plant Washington Street Dover, NH 03820	15	20,000	#6 Oil	Steel	CUI		
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Straf. Co. Riverside Resthome 6th Street Extension Dover, NH 03820	9	10,000	#2 FO	Steel	CUI		
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Straf. Co. Riverside Resthome 6th Street Extension Dover, NH 03820	2	12,000	#2 FO	Steel	CUI		
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Straf. Co. Riverside Resthome 6th Street Extension Dover, NH 03820	10	4,000	Pet-G	Steel	CUI		
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Straf. Co. Riverside Resthome 6th Street Extension Dover, NH 03820	2	2,020	Pet-D	Steel	CUI		
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Straf. Co. Riverside Resthome 6th Street Extension Dover, NH 03820	10	1,000	Pet-G	Steel	CUI		
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Straf. Co. Riverside Resthome 6th Street Dover, NH 03820	09	1,000	Pet-D	Steel	CUI		
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Straf. Co. Riverside Resthome 6th Street Dover, NH 03820	07	250	Pet-D	Steel	CUI		
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Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
Strafford Guidance Center 130 Central Ave. Dover, NH 03820	23	2,000	#2 FO	Unknown	CUI		
Studio 590 590 Central Ave. Dover, NH 03820	20	5,000 Empty	Pet-G	Steel	POU		
Studio 590 590 Central Ave. Dover, NH 03820	20	5,000 Empty	Pet-G	Steel	POU		
Studio 590 590 Central Ave. Dover, NH 03820	20	2,000 Empty	Pet-K	Steel	POU		
Swift Ind. Packing Co. PO Box 577 Dover, NH 03820	15	4,000	Pet-D	Unknown	CUI		
Texaco Service Station 169 Silver Street Dover, NH 03820	1	10,000	Pet-G	FRP	CUI		
Texaco Service Station 169 Silver Street Dover, NH 03820	1	10,000	Pet-G	FRP	CUI		
Texaco Service Station 169 Silver Street Dover, NH 03820	1	12,000	Pet-G	FRP	CUI		
Texaco Service Station 169 Silver Street Dover, NH 03820	15	8,000	Pet-D	FRP	CUI		
Texaco Service Station 169 Silver Street Dover, NH 03820	15	550	UO	FRP	CUI		
US Postal Service Industrial Park Dover, NH 03820	0	6,000	#2 FO	Steel	CUI		
United Parcel Service Industrial Park Dover, NH 03820	2	10,000	Pet-G	Steel	CUI		

Facility Location Name and Address	Tank Age	Tank Cap.	Product Description	Material of Const.	Tank Status Description	Install Date	Service Date
United Parcel Service Industrial Park Dover, NH 03820	2	2,000	Pet-UO	Steel	CUI		
Wentworth-Douglass Hospital 789 Central Ave. Dover, NH 03820	1	10,000	#2 FO	Steel	CUI		
Wentworth-Douglass Hospital 789 Central Ave. Dover, NH 03820	1	10,000	#2 FO	Steel	CUI		
Wentworth-Douglass Hospital 789 Central Ave. Dover, NH 03820	1	10,000	#2 FO	Steel	CUI		
Wentworth-Douglass Hospital 789 Central Ave. Dover, NH 03820	1	10,000	#2 FO	Steel	CUI		
William's Cadillac Olds Inc. 38 Dover Point Road Dover, NH 03820	0	4,000	Pet-G	Steel	CUI	05-01-87	
Woodman Park School Towle Avenue Dover, NH 03820	0	10,000	#4 FO	Steel	CUI	09-01-87	

PET = Petroleum
 FO = Fuel Oil
 FRP = Fiberglass Reinforced Plastic
 G = Gasoline
 D = Deisel

K = Kerosene
 UO = Used Oil
 CIU = Currently In Use
 POU = Permanently Out of Use
 TOU = Temporarily Out of Use

Source: NH Water Supply and Pollution Control Division

DOVER WELL AND BORING DATA

*The wells contained in this appendix are illustrated on the "Hydrogeologic, Geophysical and Favorable Zone Map".

NEW HAMPSHIRE WATER
RESOURCES BOARD
DOVER WELL DATA

BC#	LATITUDE	LONGITUDE	TOTAL DEPTH	DEPTH TO BEDROCK	OVER BURDEN	YIELD GPM	ELEVATION FROM TOPO	BEDROCK ELEVATION
A-1	43 13 54	70 54 17	62	52	3,4	75	190	138
A-2	43 12 23	70 55 42	200	16	1,2	50		
A-3	43 11 52	70 54 26	203	6	3	20		
A-4	43 13 55	70 54 58	163	40	3,4	15		
A-5	43 12 08	70 54 22	102	6	1	12		
A-6	43 13 47	70 56 13	100	22	2	10		
A-7	43 11 54	70 54 31	283	6	3	7		
A-8	43 13 15	70 55 05	282	2	3	5.5		
A-9	43 11 34	70 54 28	182	8	1	5.5		
A-10	43 13 52	70 56 15	142	15	2	5		
A-11	43 14 29	70 54 52	300	25	3	5	180	155
A-12	43 12 40	70 54 00	302	15	2,3	5		
A-13	43 13 55	70 55 00	222	25	3	4.5		
A-14	43 14 38	70 54 50	142	6	3	4	170	164
A-15	43 14 33	70 54 51	142	9	1,3	4	180	171
A-16	43 13 29	70 56 27	302	12	1	4		
A-17	43 13 53	70 56 17	402	21	3	4		
A-18	43 12 54	70 55 25	348	15	3	3.5		
A-19	43 13 08	70 55 04	165	10	1-4	3		
A-20	43 13 54	70 55 31	340	70	4	3		
A-21	43 13 54	70 54 15	162	63	3,4	3	195	
A-22	43 13 35	70 54 51	150	12	1,2	3	175	163
A-23	43 13 57	70 56 14	225	16	2	2		
A-24	43 14 33	70 54 59	225	19	3	2		
A-25	43 13 15	70 55 25	402	18	2	2		
A-26	43 14 03	70 55 38	300	50	3	1		
A-27	43 13 58	70 56 12	300	22	2	1		
A-28	43 13 10	70 55 04	320	8	2	1		
A-29	43 13 09	70 55 04	402	15	2	0.25		
A-30	43 12 36	70 54 17	100					
A-31	43 12 36	70 54 17	300					

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RESOURCES BOARD
NEW HAMPSHIRE WATER WELL BOARD DATA

BC#	REGISTRATION #	TOTAL DEPTH	DEPTH TO BEDROCK	OVER BURDEN	YIELD GPM	ELEVATION
B-1	67.0082	250	130	1,2,4	25	165
B-2	67.0073	800	21	1	1	
B-3	67.0081	421	50	1	25	
B-4	67.0076	182	11	1	5	
B-5	67.0074	105	9	1	40+	
B-6	67.0069	244	6	1	12-150	HIT WATER AT BOTTOM
B-7	67.0067	300	12	1,2	5	
B-8	67.0059	402	25	2	1/4	FOR NEW DEVELOPMENT
B-9	67.0057	102	23	4	18	POSSIBLY ANOTHER WELL DRILLED
B-10	67.0062	320	8	2	1	43 13 170 55 04
B-11	67.0061	400	18	4	3	40
B-12	67.0055	120	11	2	5	
B-13	67.0052	333	5	1	15	WATER BETWEEN 300-335
B-14	67.0051	142	11	2	15	LOCATION VERY APPROX.
B-15	67.0050	102	6	2	18	LVA
B-16	67.0041	165	22		15	LVA
B-17	67.0038	242	38	2	2	LVA LOC. MISNAMED
B-18	67.0028	160	16	4	30	
B-19	67.0027	100	6	1	7	LOC. MISNAMED
B-20	67.0026	100	25	4	10	
B-21	67.0024	200	22	4	6	
B-22	67.0020	300	15	2	1/4	

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NEW HAMPSHIRE STATE
DOVER BRIDGE BORINGS

BCI#	BORING #	DEPTH TO BEDROCK	BEDROCK OR REFUSAL ELEVATION	OVERBURDEN LOG	COMMENTS
C-1	079/140	12'	100'	0-10 LOOSE SILTS AND SANDS 10-20 DENSE SILTY TILL 12 BEDROCK OR REFUSAL	TOP SECTION ALLUVIAL FILL?
C-2 (SW)	132/100	32'	21'	0-26 ALTERNATING SILTS & SANDS 26-32 TILL	
C-2 (NE)	132/100	9'	40-50'	0-5 SAND OR CLAYEY SILT 5-7 MUCH 7-9 TILL	? FILL
C-3 (SW)	101/150	107'	65'	0-17 MEDIUM SAND TO GRAVEL 17-52 SILTS AND CLAY WITH SAND OF BORINGS 52-102 SILTY SAND 102-107 SILTY TILL 107- BEDROCK OR REFUSAL	REPRESENTATIVE 11-20
C-3 (NE)	101-150	67'	107'	0-17 MEDIUM SAND AND GRAVEL 17-42 SILTS AND CLAY WITH SAND OF BORINGS 42-67 SILTY SAND 67- BEDROCK OR REFUSAL	REPRESENTATIVE 11-20
C-4	120/098	2'	56'	0-2 GRAVELLY SAND 2- BEDROCK	
C-5	121/106	12'	79'	0-1 TOPSOIL 1-6 FINE SAND AND SILT 6-12 SAND, STONE AND SILT 12- BEDROCK OR REFUSAL	
C-6	127/104	16'	42'	0-1 TOPSOIL 1-10 FINE SAND, SILT AND CLAY 10-16 SAND, SILT AND STONE 16- BEDROCK OR REFUSAL	
C-7	132/102 NB	14'	68'	0-10 SILT AND CLAY 10-14 HARD PAN 14- BEDROCK OR REFUSAL	
C-8	106/125	16'	74'	0-1 TOPSOIL 1-7 SILT 7-16 GRAVEL 16- BEDROCK OR REFUSAL	
C-9	105/138	35'	59'	0-28 INTERBEDDED AND MIXED SAND, SILT AND CLAY 28-35 SAND AND STONE 35- BEDROCK OR REFUSAL	HIGHLY VARIABLE
C-10	104/143	70'	111'	0-70 SAND AND GRAVEL 70- BEDROCK OR REFUSAL	

BCI#	BORING #	DEPTH TO BEDROCK	BEDROCK OR REFUSAL ELEVATION	OVERBURDEN LOG	COMMENTS
C-11	084/165	28'	127'	0-10 HARD SILT AND CLAY 10-20 SOFT CLAY 20-28 SAND AND GRAVEL	
C-12	071/100	38'	90'	0-11 SAND (MIXED) 11-29 CLAY 29-38 SANDY OR GRAVELLY TILL 38- BEDROCK - LIGHT GRAY QUARTZ SCHIST	
C-13	114/084	26'	60'	0-2 MUD AND SAND 2-8 YELLOW SAND AND CLAY 8-15 BLUE SAND AND CLAY 15-26 TILL (SAND, GRAVEL AND CLAY) 26- BEDROCK OR REFUSAL	
C-14	088/084	0	119'	BEDROCK AT SURFACE ALONG BELLAMY RIVER	
C-15	160/086	24'	5'	0-19 SAND AND GRAVEL 19-24 SANDY TILL 24' BEDROCK OR REFUSAL	
C-16	120/096	93'	-4'	0-23 SILTY SAND 23-64 SILTY CLAY 64-77 SAND AND GRAVEL 77-93 GRAY SAND, GRAVELLY TILL 93- BEDROCK OR REFUSAL	VERY GENERALIZED
C-17	194/149	16'	191'	0-6 FINE SAND 6-16 SILTY GRAVEL 16- BEDROCK OR REFUSAL	
C-18	119/107	15'	84'	0-15 SAND WITH SILT AND CLAY 15- BEDROCK OR REFUSAL	NOT PLOTTED
C-19	174/060	15'	15'	0-9 FINE SAND AND SILT 9-15 SILTY GRAVEL 15- BEDROCK OR REFUSAL	
C-20 (SW)	181/039	>65'	BELOW-49'	0-4 FINE SAND 4-9 SILT AND CLAY 9-16 FINE SAND 16-43+ GRAVEL	TOP OF GRAVEL IS VARIABLE NO REFUSAL
C-20 (NE)	181/039	>20'	BELOW-14'	0-20 GRAVEL 20 BOTTOM OF HOLE	NO REFUSAL
C-21	160/083	>55'	BELOW-18'	0-55 FINE TO MED. SAND WITH OCCASIONAL SILT	NO REFUSAL
C-22	134/122	40'	-21 TO -60	0-30 SILTY TO GRAVELLY SAND 30-40 SANDY FILL 40- BEDROCK OR REFUSAL	

USGS WELL AND BORING DATA

BCI#	USGS#	TOTAL DEPTH	DEPTH TO BEDROCK	OVER BURDEN	DEPTH	
D-1	DJW6	85	>=90	1,2		TOWN WELL
D-2	DJW31	85	>=85	1,2		TOWN WELL
D-3	DJA33	91	? 91	1,2	0-5	BORING
				4	5-44	? LOCATION - THERE ARE
				3	44-91	2 A-33 ON SOURCE MAP
D-4	DJW25	107	>=107	1,2	0-80	DISCREPANCY W/ DEPTH OF WELL
				3	-27	(65 FT)
D-5	DJW122	56	>=56	1	0-5.5	
				4	5.5-9	
				1	9-56	
				4	56-?	
D-6	DJW121	93	>=93	1	0-5	
				4	5-9	
				1	9-69	
				4	69-93	
D-7	DJW15	62	>60	1	0-45	
				4	45-60	
				1	60-?	
D-8	DJW119	100	100	1	0-39	
				4	39-84	
				1	84-100	
D-9	DJW118	94.5	? 94.5	1	0-42	
				4	42-84	
				1	84-94.5	
D-10	DJW124	141		1,2	0-50	
				1	50-91	
				1,2	91-141	
D-11	DJW123	76	>=76	1	0-76	
				6	76-?	6=SILT
D-12	DJW66	20	>=20	1,2	0-20	
D-13	DJW80	90	>=90	1,2	0-90	
D-14	DJW24	30	>=30	1,2	0-30	
D-15	DJW132	89	>=89	1	0-10	
				?	10-22	
				1	22-89	
D-16	DJW83	91	? 81	1,2	0-81	
				?	81-91	? INTO ROCK
D-17	DJW72	61	? 61	1,2	0-16	
				2	16-33	
				1,4	33-60	
				? 0	60-61	? INTO ROCK
D-18	SKW48	45	>=45	1	0-45	
D-19	RLW11	72	>=72	1	0-40	
				4	40-72	
D-20	RLW12	28	>=28	1	0-20	
				4	20-28	
D-21	SKW44	24	>=24	1	0-24	
D-22	RHA20	50	>=50	1	0-50	
D-23	RHW21	90	>=90	12	0-90	
D-24	RHW56	63.5	>=63.5	1	0-63.5	
D-25	DJW132	89	>89			

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BRADLEY WATER RESOURCES

BCI#	WELL	TOTAL DEPTH	DEPTH TO BEDROCK	OVER BURDEN	
E-1	36	165	165	1,2 FINE 1	0-80 FROM X-SECTION 80-120
				1	120-145 BR ELEV. (-25)
				1,2	145-165
E-2	43			1	0-35 FROM X-SECTION
		145	145	FINE 1	35-40 BR ELEV. (-15)
				MIXED 4	40-145

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GLEN STEWART FILES
 BCI-ROCHESTER AREA WELL LOGS COMPILATION
 1/83

BC#	GS#	TOTAL DEPTH	DEPTH TO BEDROCK	OVER BURDEN	YIELD	ELEVATION	BEDROCK ELEVATION	WL
F-1	D-122	65	45		25	205	158	20
F-2	D-108	100	30		15	140	110	20
F-3	D-110	215	30		4	200	170	12
F-4	D-125	80	0		10	120	120	
F-5	D-127	202	70		1.5	130	60	60
F-6	B-120	289	99		3	150	51	44
F-7	D-126	22	14			150	136	
F-8	D-109	202	150		8	200	50	25
F-9	S-104	100	30		0.5	205	185	20
F-10	R-129	129	41		5	220	179	24
F-11	S-100	100	25		2	180	155	4
F-12	R-132	200	52		10	235	183	
F-13	R-127	105	20			225	205	
F-14	R-145	360	35		45	230	195	
F-15	B-103	56	56		100	180	124	15
F-16	B-4	285	34		15	180	146	
F-17	S-101	145	71		55	185	114	19
F-18	S-103	85	18		8	200	182	13
F-19	S-102	78	38		3	210	172	12
F-20	S-107	53	6		10	225	219	15
F-21	S-105	595	15		20	210	195	

BRADLEY WATER RESOURCES

BC#	BRADLEY#	ELEVATION	TOTAL DEPTH	DEPTH TO BEDROCK	YIELD
G-1	M-54	200	330	190	
G-2	M-20	118	76	>=76	
G-3	M-19	105	44	>=44	
G-4	M-9	105	88	>=88	
G-5	M-18	105	91	>91	
G-6	D-45	95	53	>=53	
G-7	D-46	90	105	>=105	
G-8	D-49	87	110	>=110	
G-9	M-21	92	55	>=55	
G-10	D-13	95	30	>=30	
G-11	M-22	100	74	>=74	
G-12	M-23	98	55	>=55	
G-13	M-26	110	38	>=38	
G-14					
G-15	M-24	110	45	>=45	
G-16	M-25	115	52	>=52	
G-17					
G-18	M-28	135	81	>=81	
G-19	M-27	160	45	>=45	
G-20	D-50	107	38	>=38	
G-21	D-53	100	79	>79	
G-22	D-54	97	97	97	
G-23	D-59	125	106	>106	
G-24	D-55	90	59	>=59	
G-25	D-57	85	7	7	
G-26	D-58	105	18	18	
G-27	D-60	95	57	57	
G-28	M-45	115	47	47	
G-29	M-46	120	15	15	
G-30	M-42	55	35	35	
G-31	M-38	40	27	27	
G-32	M-37	82	37	37	
G-33	M-36	90	42	42	
G-34	M-32	78	91	91	
G-35	M-31	90	93	93	
G-36	D-82	100	100	100	
G-37	D-61	80	85	85	
G-38	D-74	95	54	54	
G-39	M-52	68	39	39	
G-40	M-39	40	82	82	

BRADLEY WATER RESOURCES (CONT'D)

BCI#	BRADLEY#	ELEVATION	TOTAL DEPTH	DEPTH TO BEDROCK	YIELD
G-41	M-43	50	82	82	
G-42	M-44	35	79	79	
G-43	M-34	60	58	58	
G-44	M-35	40	67	67	
G-45	M-8	105	129	129	
G-46	D-36	70	77	77	
G-47	D-62	60	135	135	
G-48	M-52	25	42	42	
G-49	M-50	22	30	30	
G-50	M-49	31	38	38	
G-51	M-47	33	62	62	
G-52	M-14	39	90	90	
G-53	D-39	135	107	107	
G-54	D-38	137	81	81	
G-55	D-37	137	55	55	
G-56	D-35	137	93	93	
G-57	D-36	140	166	166	
G-58	D-41	140	126	126	
G-59	D-33	130	21	21	
G-60	D-32	125	37	37	

L.A. HANNA & SONS
 HIGH YIELD WELL DATA
 DOVER, NEW HAMPSHIRE

BCI#	TOWN TAX MAP#/LOT#	TOTAL DEPTH	DEPTH TO BEDROCK	YIELD GPM	ELEVATION FROM TOPO	BEDROCK ELEVATION	YIELD RATIO	REMARKS
H-1	C/3 & 3D	100	16	7	180	164	0.09	EARLY AMERICAN HOMES
H-2	J/1C	180	120	75	60	-60	1.36	COURTHOUSE ROAD SEABORN HOSPITAL
H-3	I/80	160	27	30	80	53	0.23	GARRISON ROAD DAVID WOOD
H-4	A/43B	340	80	3	200	120	0.01	GARRISON ROAD NORMAN BROWN
H-5	C/49	160	21	15	170	149	0.11	LONG HILL ROAD GREG GOODWIN
H-6	K/19	280	22	80	+/-60	38	0.32	WATSON ROAD ELLIOT ROSE CO.
H-7	K/19	400	59	7	+/-60	1	0.02	MIDDLE ROAD ELLIOT ROSE CO.
H-8	K/19	190	57	150	+/-60	3	1.17	ROUTE 16 ELLIOT ROSE CO.
H-9	K/19	310	62	120	+/-60	-2	0.49	DOVER POINT RD. ELLIOT ROSE CO.
H-10	K/19	220	70	300	+/-60	-10	2.07	DOVER POINT RD. ELLIOT ROSE CO.
H-11	L/50	155	136	200	+/-20	-116	14.29	DOVER POINT RD. TOM WILSON
H-12	L/50	85	76	30	+/-20	-56	7.50	SALT IN WELL TOM WILSON
H-13	F/10A	340	26	15	160	134	0.05	SHORE OF BELLAMY RIV. ROBERT MARTEL
H-14	E/42 & 44	220	20	20	170	150	0.10	295 TOLEND PHIL JENNISON
H-15	I/97	277	20	100	120	100	0.40	WATSON ROAD MRS. O'BRIEN
H-16	A/23 & 24A	310	10	5	+/-170	160	0.02	BACKRIVER ROAD MILO COTTON
H-17	I/122	160	43	24	90	47	0.21	BLACKWATER ROAD DOVER ELKS DURHAM ROAD