GROWING SMARTER *in Plymouth's Fifth Century*

Town of Plymouth, Massachusetts Master Plan, 2004-2024

Plymouth Planning Board
Master Plan Committee

August 2006

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Thanks to everyone in Plymouth who helped create the Master Plan.

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Vision Statement for Plymouth, Massachusetts

In 20 years, the Town of Plymouth will be a beautiful, maturing community with vibrant and pleasant village centers, a preserved and enhanced historic heritage, long stretches of accessible coastline, integrated areas of commerce and compact housing, and vast, connected areas of open space set aside for preservation, outdoor activities, and appreciation of nature. Plymouth will retain its outstanding visual character, defined by clean ponds, rivers, wetlands, coastline, and forests. The town will efficiently provide a full array of services and amenities while also preserving natural areas. Economic prosperity will prevail through abundant opportunities for desirable business investment, employment, shopping, tourism, housing choice, and entrepreneurship. In 2024, Plymouth will be an even more desirable town to live in than it is today.

This vision for Plymouth will be achieved through continual focus on six core goals established by the Master Plan Committee. These goals reflect the stated priorities of Plymouth residents who provided input to the master plan process through participation in meetings and community surveys. They are:

- **Control Sprawl**
  Sprawl is large-lot low density development that consumes open space.
- **Protect the Environment**
  Plymouth is a center of biodiversity and lies above the largest aquifer in Massachusetts.
- **Preserve Character**
  Plymouth's diverse natural and built landscapes include historic sites, village settlements, rural landscapes, forests, coastline, ponds, streams, wetlands, and cranberry bogs. These landscapes define Plymouth's character and must be preserved.
- **Encourage Economic Development**
  Economic development provides jobs for Plymouth residents and tax revenues to help pay for town services.
- **Balance Costs and Growth**
  Compact commercial and residential development costs less than sprawling development, both in terms of town service costs and impact on the land.
- **Improve Quality of Life**
  Residents want opportunities to live, work, and play in town and to enjoy Plymouth's uniqueness.

These six items are referenced throughout the Master Plan and serve as the guiding principles for the Plan's strategies and recommendations. This 2004 Master Plan retains as its fundamental premise the overarching goal established in 2000 by the Master Plan Committee:

To achieve a balance of natural resource preservation, residential growth, economic development, and financial stability through the judicious use of land use controls that respect development rights. To ensure that future growth is responsive to a carefully considered assessment of the town's functional areas, including village centers, growth areas, rural areas, and environmentally sensitive areas.

Master Plan Overview

Plymouth has faced accelerated residential growth for the past 30 years. This growth is unprecedented in the region and is due in large part to Plymouth's desirable location, rich natural resources, coastal amenities, and vast areas of open space. Despite these intense development pressures, Plymouth still has over 25,000 acres of privately owned developable land, much of which is located in the remote, rural sections of the community. Since 1984, Plymouth has relied on large lot zoning to discourage development in these rural areas. However, this zoning strategy is no longer an effective deterrent to residential sprawl. If current growth rates continue, Plymouth could face a loss of rural lands and erosion of the town's quality of life. The very characteristics most valued by local residents—small town character, natural resources, historic heritage, open space—are threatened by sprawling development patterns. An analysis prepared by the Massachusetts Executive Office of Environmental Affairs for the Town of Plymouth predicts that, at full build out:

- Plymouth's population will more than double to 105,000 people.
- The school population will double to 17,000 students.
- Twenty thousand (20,000) new households will be constructed.
- New households will generate 2,000,000 new vehicle trips per day on Plymouth's roads.
- Tens of thousands of acres of forest and open space will be converted to other uses.

(Source: Executive Office of Environmental Affairs 1999)

The 2004 Plymouth Master Plan focuses on changing land use patterns and policies to prevent this outcome and to minimize the negative impacts of growth and change on the community.

Plymouth's tradition of planning for its future dates back to colonial times. The original Mayflower Compact established a framework of community rules for self-governance. Modern planning efforts began in 1949 with the adoption of the *Plymouth Compact of 1949–A Guidebook To Plymouth's Future*. This early master plan was followed by the *Plymouth Compact as revised to 1961,* the *Plymouth Compact III–a 1966 comprehensive plan for Plymouth,* the *1978 Goals for Plymouth,* and the groundbreaking *1980 Village Centers Plan*. The current planning effort builds off of this rich planning tradition.

The Planning Board initiated the current master plan process in 1997 with the creation of the Plymouth Master Plan Task Force, followed by the Plymouth Master Plan Committee. In October 2000, the Committee established the groundwork for the 2004 Plymouth Master Plan with the creation of Plymouth's Interim Master Plan Report. The report established a provisional goals statement and a work program that identified focus issues.

The 2004 Plymouth Master Plan was developed based on guidance and direction from Plymouth's residents, the members of the Planning Board, and the Master Plan Committee. The goals, strategies,

and recommendations stem directly from the comments, concerns, and issues raised by the community. The Master Plan Committee conducted an extensive and inclusive public process including village-based and town-wide meetings, focus groups, surveys, and presentations to town officials and boards. Finally, town residents and other interested parties were able to provide written comments to the consultants and the Committee via mail and e-mail. Planning Department staff and consultant Michael Pessolano assisted the Committee by leading public meetings, helping to develop Master Plan recommendations, and preparing reports, maps and graphics.

The Plymouth Master Plan provides a revised **framework for both preservation and growth.** To balance these potentially conflicting goals, the Plan includes a combination of mutually-supportive zoning requirements and preservation initiatives with an emphasis on incentives. The Master Plan framework identifies what is most important to preserve, where growth is most acceptable, and how growth should be accommodated. It also defines specific roles for the Town and expectations of private property owners. The Plan is intended to guide the Town's land use, development, and conservation decisions for the next 20 years. The Master Plan provides broad policy guidance and should be codified into laws, guidelines, and incentives, through Town Meeting actions.

Key recommendations include:

- **Revise the Zoning Bylaw, Phased Growth Rate Bylaw, and Zoning Map to include provisions which guide growth to sites with existing infrastructure, restrict growth in rural and natural areas, and encourage compact development.**
- Assure that future versions of the Open Space and Recreation Plan and Capital Improvement Plan reinforce these goals. **Establish a Growth Map**, setting forth definitive boundaries for the extension of municipal infrastructure.
- Protect key natural resources both through zoning restrictions and the allocation of public funds for land preservation. **Integrate zoning and funding strategies.**
- Prioritize the protection of waterways through the effective **control and treatment of wastewater and the implementation of best management practices for stormwater discharge.**
- **Retain and expand existing economic development zones. Add new economic development zones adjacent to major transportation routes**, specifically at highway interchanges.
- **Facilitate higher-density housing in growth areas.** Detached single family homes on large lots are an important part of Plymouth's housing stock, but they cost more to service per unit than multi-unit housing types on smaller tracts of land. Plymouth can provide needed services without excessive tax increases. Zoning and bylaw changes must be made which allow the development of compact higher density housing.
- **Create a Transportation and Access Committee to explore alternatives to automobile use and to develop a long-term alternative transportation strategy for Plymouth.**
- **Preserve Plymouth's historic heritage and promote Plymouth as a destination for heritage tourism. Develop a Plymouth Tourism Council** to promote the town's historic sites, facilitate private-public

sector partnerships, and enhance cooperation among the many parties involved in the local tourism industry. Guide the growth of the tourism industry and attract increased revenues from tourism.

- **Increase access to the ocean, bay, and ponds. Strengthen Plymouth's identity as a prime location for outdoor recreation.** Amend zoning regulations to allow certain water-enhancement uses along the coast and to facilitate recreational access to some large ponds. Develop appropriate standards to assure appropriate density, siting, and public access.

The Master Plan Committee identified the following **key Plymouth assets** which should be protected and enhanced:

NATURAL RESOURCES

- Undeveloped open land, including publicly-owned land and the 12,600-acre Myles Standish Forest
- 360 ponds
- Plymouth-Carver aquifer
- Twenty-one mile coastline, including dramatic shorefront cliffs
- Outstanding biodiversity, including areas of rare species habitat and unique concentrations of rare species
- Wetlands, rare coastal plain ponds, and features such as Pine Hills, Plymouth Pine Barrens, and the open fields of Chiltonville
- Hiking trails
- Natural scenic features in every part of town

CULTURE/HISTORY

- Global recognition of Plymouth's unique role as one of the first European colonies in what was to become the United States
- Historic structures, landscapes, sites, and artifacts
- Cultural diversity

ECONOMY

- Growing and diverse economy, which provides a good mix of goods, services, and employment opportunities and which relies heavily on small businesses
- Regional center for Southeastern Massachusetts, with county and state offices, a major hospital, and airport
- Culturally-rich and attractive downtown area and beautiful, working waterfront
- Vacant land for business and industrial growth
- Strong labor force
- Positive business climate

TRANSPORTATION

- Convenient highway access

LAND USE

- Five village areas which provide a sense of place, compact development, and a mechanism for the efficient delivery of municipal services
- Good mix of neighborhood types from the densely-developed downtown to pastoral rural settings

GOALS

I. Land Use/Development Patterns

1. Create pleasant, safe, and desirable residential neighborhoods, village centers, commercial, and industrial areas with an emphasis on fostering a sense of community for residents and property owners.

2. Use incentives and land use controls to prevent conversion of open lands and discourage sprawling patterns of development.

3. Support a balanced and sustainable mix of housing, shopping, and employment opportunities, community and cultural facilities, and natural systems.

4. Promote growth within or near existing village service areas, with an emphasis on directing development to areas that can accommodate growth with minimal extensions to existing infrastructure.

5. Promote mixed-use development linked to public transit.

II. Open Space

1. Increase the supply of well-maintained public and private permanent open space.

2. Increase public access to open space, including coastal and inland water bodies, in locations where public access will not adversely impact the protection of priority natural resources.

3. Set aside large tracts of permanently-protected, contiguous open spaces linked via trails and open space corridors.

4. Preserve open space parcels within or near every village and residential neighborhood.

III. Recreation

1. Increase the supply and accessibility of active and passive recreational facilities throughout town.

2. Maintain existing and develop new recreational facilities for residents and visitors.

3. Increase access to water-related recreation facilities.

4. Realize Plymouth's potential as a destination site for heritage tourism.

IV. Environmental Protection/Natural Resources

1. Protect natural and scenic features, including air, land, plant, wildlife, and water resources, and improve their conditions. Preserve the town's scenic beauty.

2. Encourage and support energy, water, and soil conservation by residents, businesses, and governmental agencies.

3. Minimize pollution.

4. Protect wildlife habitats from growth pressures.

5. Protect drinking water quality.

V. Village Centers

1. Maintain and strengthen the village centers concept, as originally defined in the 1978 Plymouth Master Plan. Promote a balanced mix of uses for each village center.

3. Establish Quality of Life Focus Areas combining preservation of historic character and accommodation of infill, redevelopment, and new growth in the village centers. Develop density and design standards for these focus areas.

4. Plan infrastructure to support growth, including parking, walkable streets, and neighborhood-scaled open space.

VI. Transportation

1. Develop transportation alternatives to the private automobile and encourage the use of environmentally-friendly transportation options.

2. Maintain automobile, pedestrian, and bicycle routes throughout town to ensure safety and attractiveness.

3. Reduce dependence on the private automobile by building community facilities and services in transit-compatible locations and by investing in facilities and services that encourage multi-modal travel.

4. Reduce traffic volume on town roadways.

5. Minimize road expansion.

VII. Housing

1. Provide housing choices for various age and income groups, with housing for different age and income groups located throughout town.

2. Encourage maintenance of existing housing stock.

3. Produce an optimal balance of housing types and quantities to strengthen and support Plymouth's revenue-to-cost ratio.

VIII. History and Cultural Resources

1. Recognize, preserve, and enhance the historic and cultural heritage of Plymouth and the surrounding region.

2. Support use and enjoyment of the town's historic and cultural resources by residents and visitors. Maintain, manage, and expand resources to maximize the fiscal and economic benefit of these resources for the town.

3. Expand efforts to develop and market Plymouth as a heritage tourism destination for natural and international travelers.

IX. Public Facilities and Services

1. Plan for capital investments and preventive maintenance in an orderly manner to optimize provision of facilities and services while maintaining an even level of expenditure from year to year.

2. Provide and maintain public facilities, services, and amenities with an emphasis on efficiency and on securing new, nontraditional sources of funding to offset costs.

3. Encourage the continued growth of Plymouth as a regional governmental and service center.

X. Economic Development

1. Identify and optimize economic benefits from existing and potential economic assets in Plymouth and provide for their sustainability.

2. Designate local and regional economic activity areas and sustain their viability and vitality through appropriate town and business property owner actions.

3. Create and sustain adequate organizational and resource capacity in the town to implement long-term economic development strategies.

4. Balance economic development goals with other master plan priorities and promote a coordinated approach to their implementation.

SUMMARY RECOMMENDATIONS

Priority Goals

Throughout the master planning process, the Committee continually considered issues that squarely fell into six fundamental priority categories, which have now become the foundation blocks of this plan. Building on the foundation laid by the Plymouth Village Center Plan, the following strategies describe how this plan recommends dealing with the major planning priorities facing the town:

CONTROL SPRAWL

Approach: Control sprawl by guiding future growth to Town-designated growth areas and by restricting development in areas with priority natural resources. Focus infrastructure spending within the growth areas and avoid extension of new municipal infrastructure outside the village and commercial/industrial growth areas. Infrastructure investment in growth areas shall include investment in water/sewer facilities to accommodate increased density. Invest in the transportation network that serves the Village Centers and provides a convenient and reliable alternative to automobile use.

ENCOURAGE ECONOMIC DEVELOPMENT

Approach: Encourage new commercial development through expanded commercial zones. Significantly enhance the tourism industry by investing resources in new tourist attractions and accommodations, especially along the waterfront, and by developing a single entity to coordinate tourism initiatives and promote Plymouth as a travel destination. Encourage redevelopment of major opportunity sites.

BALANCE COSTS AND GROWTH

Approach: Limit extension of infrastructure into rural areas and encourage compact development. Encourage construction of housing which is less costly to service than single family residences on large lots.

PRESERVE CHARACTER

Approach: Preserve and promote historic resources so that Plymouth's rich history is more readable in the environment. Create a coalition of the historic preservation groups in Plymouth and work with groups to create a coordinated approach to the preservation and marketing of Plymouth's historic resources. Preserve scenic roads and encourage compatible design in Village Centers and near historic resources.

PROTECT ENVIRONMENT

Approach: Restrict development in areas with valuable natural resources. Work collaboratively with private and nonprofit entities to preserve priority resources with a focus on areas of greatest environmental sensitivity, including rare species habitats and Pine Barren forests. Develop a program of transferable development rights (TDR). Mitigate stormwater discharges into wetlands, ponds, and coastal waters. Prevent degradation of groundwater and surface water from inappropriate land use. Pursue wastewater planning. Pursue wildlife management planning.

IMPROVE QUALITY OF LIFE

Approach: Expand coastal and pond access, increase recreation options, improve the appearance and vitality of Village Centers, and increase the number and variety of cultural venues.

Prioritized Recommendations

Short-Range Recommendations (1 to 5 Years)

RECOMMENDATION	RESPONSIBLE PARTY	TIMETABLE
1. Designate areas for preservation and areas for growth. Prepare a zoning map amendment designating growth and preservation overlay districts.	Planning Board	2007
2. Adopt development standards for growth and preservation overlay districts.	Planning Board Planning Department	2007
3. Focus growth intensity around current and future transit hubs. Revise Zoning Bylaw to promote growth around existing and planned public transit facilities.	Planning Board	ongoing
4. Establish limits for infrastructure expansion. Adopt a joint policy resolution to limit extension of town infrastructure. Maintenance of existing infrastructure, investments for public health emergencies, and expansion necessary for public facilities shall be exempt from this policy.	Board of Selectmen, Capital Outlay Committee, Finance Committee	2007
5. Provide more housing options, including small (2-4 family) multi-unit housing and affordable housing.	Board of Selectmen	
• Support the formation of a locally-based nonprofit housing organization, such as a community development corporation, to produce affordable housing.	Planning Board	2007
• Expand housing staff within the community development office, with the goal of increasing housing programs for low- and moderate-income households.	Community Development Department	2008
• Produce an annual housing report, detailing progress towards meeting 40B goals, promoting more compact housing, and restricting unwanted development.	Community Development Department	2007
• Develop and implement an inclusionary zoning policy.	Planning Board, Board of Selectmen, Board of Assessors	2005
• Pursue legislative approval to provide preferential tax treatment for fixed-income elderly homeowners.		2005
6. Develop design guidelines for each of the village centers.		
• Provide funding for an architect to work with the Design Review Board, Planning Board, Zoning Board of Appeals, Building Department, and citizen groups to develop design guidelines.	Board of Selectmen	2009
• Develop amendments to incorporate design guidelines into Zoning Bylaw.	Planning Board	
7. Develop a Transferable Development Rights program which fairly compensates property owners for the loss of value associated with down zoning of properties in preservation areas.	Planning Department	2006
• Hire legal counsel to help structure an equitable TDR program.	Planning Board	
• Develop necessary management structures to include an oversight body and a TDR bank.	Board of Selectmen	

RECOMMENDATION	RESPONSIBLE PARTY	TIMETABLE
8. Initiate a proactive land protection program. • Evaluate and rank natural resources according to sensitivity. • Gather baseline data on conditions in major water bodies. • Develop comprehensive resource management plans for natural resources. • Coordinate acquisition prioritization activities of the Open Space Committee and Community Preservation Committee. • Seek funds (above and beyond CPA funds) for land protection. • Fund a full-time Land Protection Specialist to act as the Town's acquisition agent and coordinate land protection activities.	Open Space Committee, Conservation Commission, Natural Resources Office, Parks and Forestry, and Recreation Conservation nonprofits	ongoing
9. Provide large tracts of open space, recreation land, and community facilities at village fringes.		ongoing
10. Continue build-out of economic development areas. Continue funding the Plymouth Economic Development Foundation and related economic development resources.		ongoing
11. Prevent incompatible development in Economic Development Opportunity Zones. • Amend the Zoning Bylaw to restrict single family development in Economic Development Opportunity Zones. • Acquire strategically-located sites within proposed Economic Development zones.	Planning Board, Town Meeting	ongoing
12. Increase support for tourism.		2006
13. Develop a Transportation Plan.		2007
14. Establish village centers for West Plymouth and Cedarville.		2010
15. Redevelop Cordage Park.		2007
16. Pursue the use of impact fees. Obtain legislative approval and draft bylaw for implementation of impact fees.		2005
17. Address wastewater treatment issues.	Department of Public Works	2007
18. Match growth to capacity of existing infrastructure.	Department of Public Works	2007
19. Encourage major new developments to fund own infrastructure.		ongoing
20. Commit to school expansion only within growth areas.		2005
21. Preserve historic and archaeological resources.		ongoing
22. Promote historic resources.		ongoing
23. Preserve scenic roads.	Planning Board/Town Meeting	ongoing
24. Preserve scenery related to water features.		ongoing
25. Protect priority natural resources. • Formulate a stormwater management and remediation plan. • Establish Conservation Districts. • Strategically acquire land for natural resources protection.	Department of Public Works, Highway, Engineering, and Natural Resources Divisions Planning Board, Planning Department, and Conservation Commission	2008 2010 ongoing
26. Preserve and improve the quality of coastal environment and waterfront areas.	Conservation Commission	ongoing
27. Encourage coastal access in all four coastal villages; increase pond access town-wide.	Community Preservation Committee Open Space Committee	ongoing

RECOMMENDATION	RESPONSIBLE PARTY	TIMETABLE
28. Encourage pedestrian and bicycle travel. Appoint a bikeway and walkway committee to: • Explore ways to increase pedestrian and biker safety in Plymouth. • Recommend bike routes and walkways that link common destinations. • Provide citizen input to proposed Green Networks proposals.	Board of Selectmen	2007

RECOMMENDATION	RESPONSIBLE PARTY	TIMETABLE
29. Establish new recreation areas.	Parks and Recreation Department	2008
30. Increase the Town's management capacity. Expand management capacity to implement the Master Plan by funding the following positions: Land Protection Specialist — Conservation Commission Project Manager/Field Inspector (2) — Department of Public Works, Engineering Department Land Manager — Department of Public Works, Parks and Forestry Maintenance Staff — Department of Public Works, Parks and Forestry Program Staff — Natural Resources Department Director of Housing — Community Development Department Program Assistant, Housing — Community Development Department GIS Manager — Planning Department GIS Analyst — Planning Department Additional staff are also needed for police, fire, schools, and libraries, as detailed in the Public Facilities section.		ongoing

Mid-Range Recommendations (6-10 years)

ENHANCE THE TRANSPORTATION NETWORK

The Planning Board should work with developers of major construction projects to secure private contributions to improved transit services. Contribution to transit infrastructure could be provided as a means of addressing traffic impacts of proposed large-scale projects.

EXPLORE ZONING ENHANCEMENTS FOR COMMERCIAL USES IN VILLAGE CENTERS

As village centers become more active in hosting commercial uses, the Planning Board should explore tools for shaping such areas:

- TDR for commercial uses—After a few years of successful operation, the TDR program should be examined for possible expansion to include increased density for commercial uses.

MAKE GREATER USE OF MYLES STANDISH STATE FOREST

The Board of Selectmen should convene several public forums to explore ways to better utilize the forest.

PROMOTE VILLAGE CENTER VITALITY

The Plymouth Economic Development Foundation should conduct a series of workshops aimed at producing a strategic plan for enhancing village center vitality. Among the issues to be addressed are:

- Promoting full occupancy of commercial spaces with a healthy mix of uses
- Encouraging and supporting village center associations

- Developing and using thematic village center icons
- Encouraging regular property maintenance
- Securing improvements to public spaces
- Creating public gathering spaces
- Improving parking
- Developing and funding gateway treatments

ENHANCE HISTORIC VILLAGE CHARACTER WITH COMPATIBLE STREETSCAPE IMPROVEMENTS

Install streetscape improvements along the Route 3A historic corridor. Use distinctive elements in each Village Center to emphasize the uniqueness and historic heritage of each Village.

Long-Range Recommendations (11 years or more)

EXPLORE TRANSPORTATION CONCEPTS

Appoint a Transportation Advisory Committee to explore the feasibility of long-term transportation investments including a loop road, monorail system, high-speed ferry, and smart roads.

ADDRESS WATER ISSUES

Update the Municipal Water System Master Plan.

BALANCE THE DISTRIBUTION OF PUBLIC FACILITIES

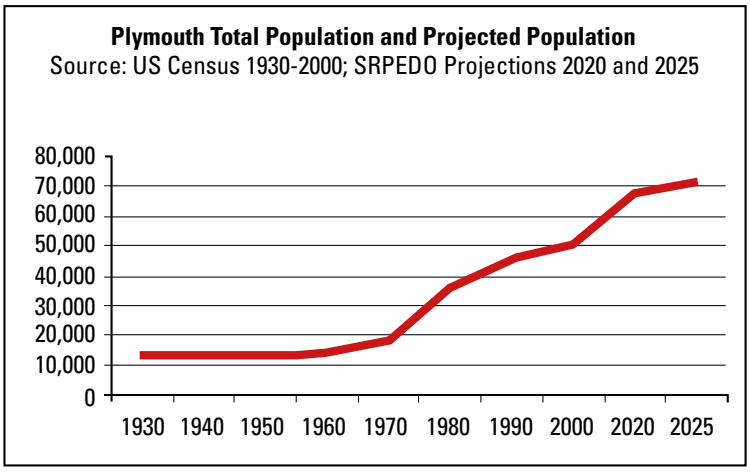
Hold joint sessions with village Steering Committees to develop ways to distribute public facilities fairly among the town's villages.

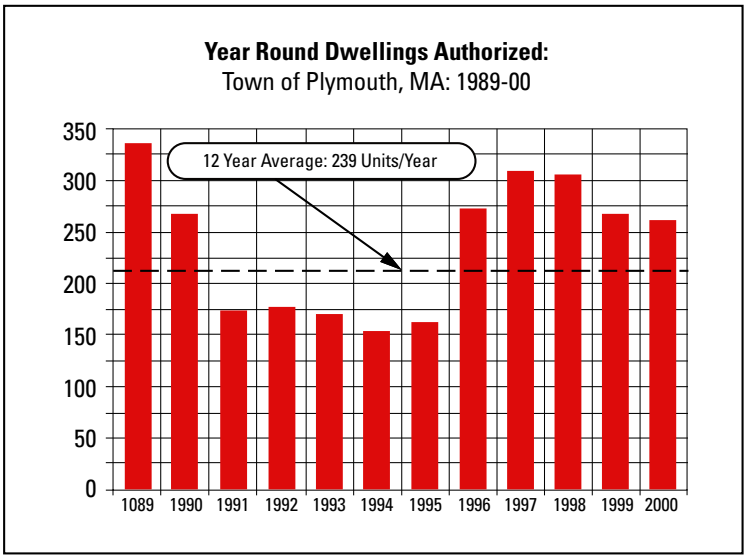
EXPLORE BURIAL OF ELECTRIC LINES

The Board of Selectmen should appoint a committee to investigate the feasibility of electric/phone/cable burial.

1. Land Use

I. GROWTH AND THE CHALLENGE OF SPRAWL





A. Introduction

Southeastern Massachusetts is the fastest-growing region in Massachusetts and one of the fastest-growing on the East Coast. Plymouth's population almost doubled between 1970 and 1980, and it grew another 26% during the 1980s. During the 1990s, growth moderated somewhat, but still increased another 13%. Plymouth had 18,606 residents in 1970 and 51,701 residents by 2000.[1] Based on current trends, regional planning agencies forecast continuing high growth for at least 15-20 years.[2]

With residential parcels increasing at an average rate of 276 per year between 1998 and 2003, housing growth and values have outpaced business growth and values. The result is an ever-increasing tax burden for single-family homeowners of 5% per year since 1998.

Sprawling growth of single family

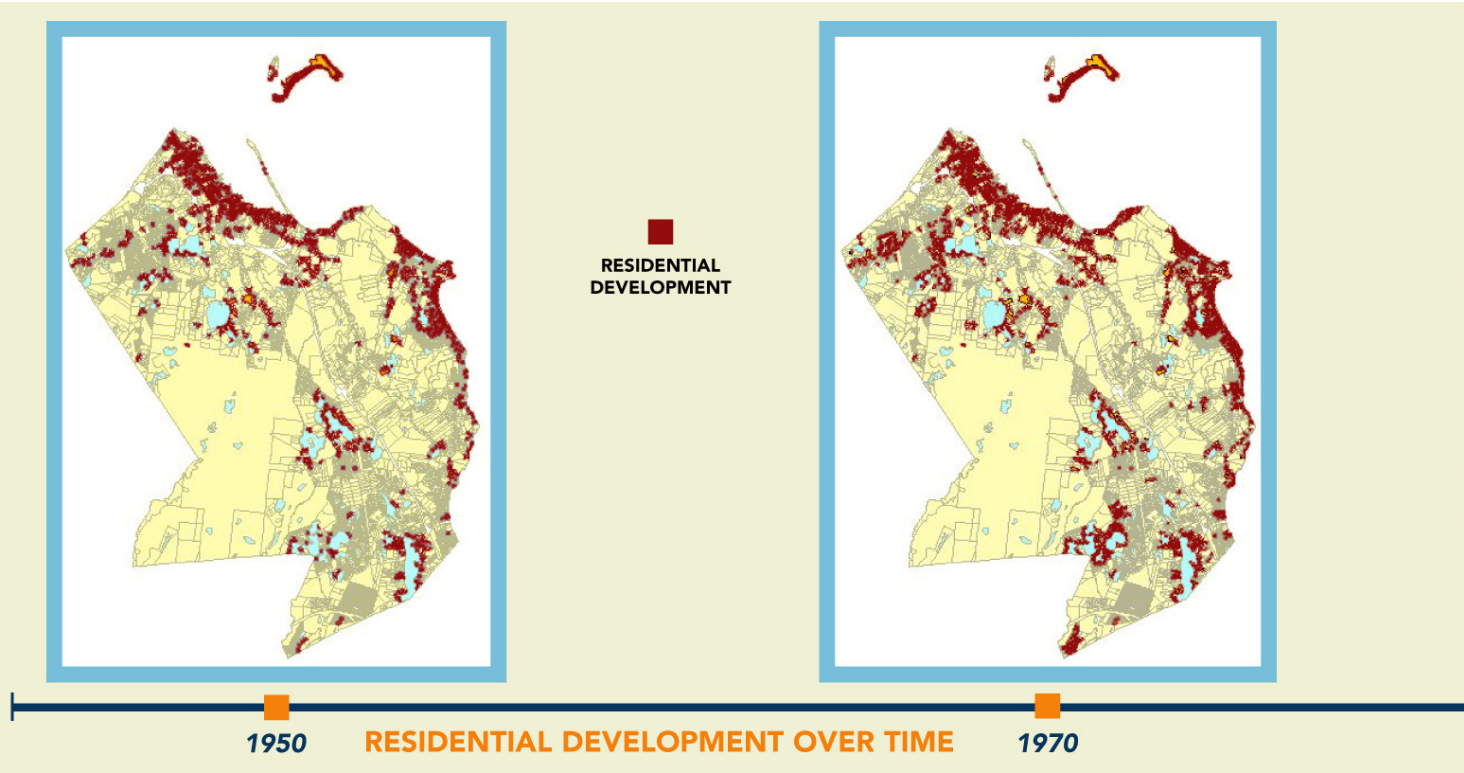
[1] United States Census, 1970, 1980, 1990, 2000.
[2] Metropolitan Planning Council Regional Population Projections.

homes on large lots brings higher costs in town services. Overall, residential development costs the Town $1.14 for every $1.00 in property tax collected. But averages disguise the difference between the costs of sprawl growth and smarter growth. The average cost to service a single family home in Plymouth's rural areas exceeded $8,600 in Fiscal Year 2001, more than double the cost of servicing the higher-density homes in older village centers, where lot sizes are typically under ½ acre. Similarly, the average cost to service an "empty nester" unit, such as at White Cliffs or the Pinehills, was roughly $2,200, half the cost of higher-density village center development. A variety of factors contribute to these cost differentials. "Empty nester" homes cost less because these homes do not have school age children needing public school education. However, the differential between higher-density and large-lot service costs relates more to infrastructure extension and maintenance costs.

B. Development since the Village Centers Plan

In 1980, the Town of Plymouth released the Village Centers Plan, which established the boundaries of five village areas: North Plymouth, Plymouth Center, West Plymouth, Manomet, and Cedarville. The Village Centers Plan initiated Plymouth's efforts to encourage growth within the villages and restrict development in outlying areas. The 1980 Plan stated that villages would develop uniquely but share common features. Each village would have a central village green and a central commercial and institutional core, surrounded by residential uses. The 1980 Plan targeted infrastructure investments to villages, with limited extension of municipal infrastructure to rural areas. In 1999, the Town of Plymouth created a sixth growth area: the Pinehills.

(For the boundaries of Plymouth's villages, see Map #1 - Village Centers in the map section)



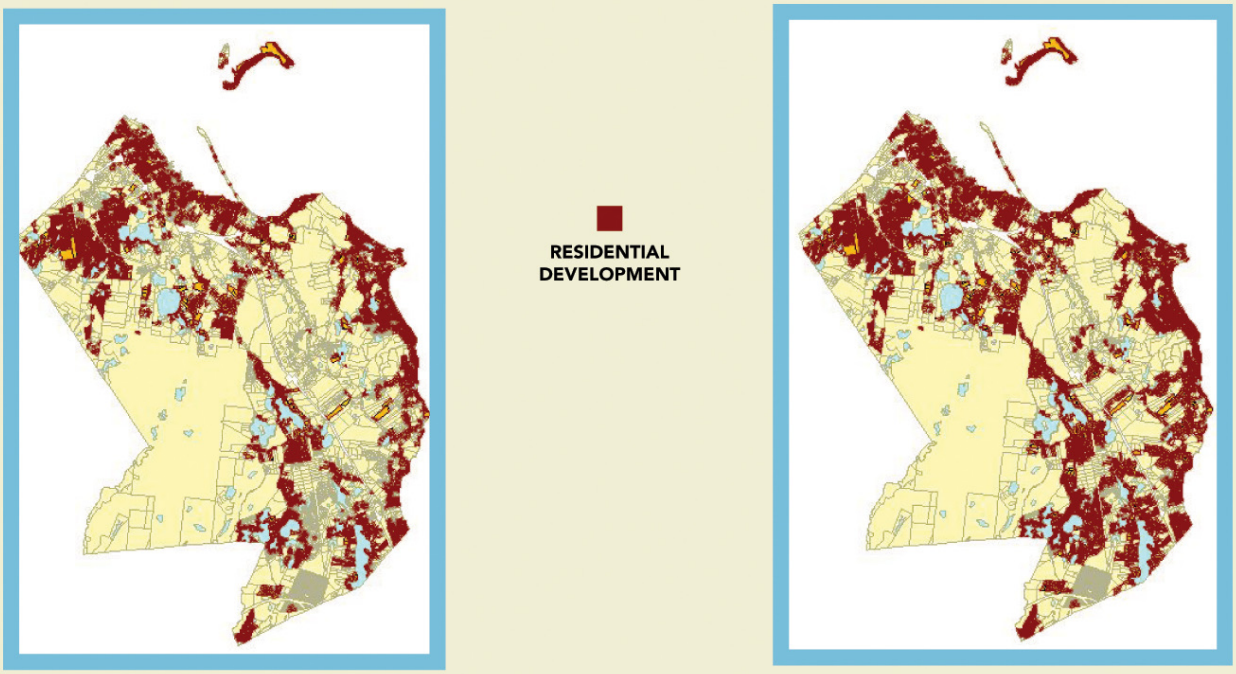
Rural areas are located outside of the villages. Rural areas are Federal Furnace, Bourne Road, and Ellisville.

Over the past 25 years, Plymouth has taken several important steps to implement the vision established in the Village Centers Plan. The town established a 3-acre minimum lot size for the Rural Residential Zoning District and created Rural Residential Development and Recreational Development special permits to allow for flexibility in the design and creation of permanently-protected open space. The town also created a Transfer of Development Rights system to protect natural resources and set aside land for future municipal uses. In 1998, as an interim measure, Plymouth established a building cap, limiting residential permits to 155 annually.

However, these land use policies have been less effective than hoped. Since 1980:

- Most of the new housing constructed in Plymouth has been single family homes;
- Fifty eight percent (58%) of all single family homes have been built outside of the villages;
- Eighty-two percent (82%) of single family homes have been built in large lot zoning districts;
- Average land consumption per single family unit has almost doubled from an average lot size of 0.6 acre to 1.0 acre; and
- Average lot size has grown to 0.7 acre within the villages and 1.26 acres in the rural areas.

As housing development has spread outward from the Boston area, Plymouth's combination of beaches, open space, developable land, and relatively affordable housing prices have put the town near the top of the list in the number of new housing units produced in Massachusetts cities and towns.



1990 RESIDENTIAL DEVELOPMENT OVER TIME 2004

Between 2000 and 2002, Plymouth issued more permits for single family houses than all but one other Massachusetts community. The Massachusetts Executive Office of Environmental Affairs estimates that, if current trends continue, Plymouth's population will grow from 51,701 people in 2000 to 67,778 in 2020. Assuming that Plymouth's average household size remains the same (2.67 people per household), Plymouth will build nearly 7,000 new housing units between 2000 and 2020 **(See Map #2 - Residential Development Before 1960 and Map # 3 - Current Development [2005]).**

C. Land Available for Development

Plymouth has a significant amount of open land which could, under current (2005) zoning, be developed into large-lot single family housing. In fact:

- Thirty-four percent (34%) of Plymouth's total land area could be developed for new housing; and
- Eighty-eight percent (88%) of this developable land (28% of Plymouth's total land area) is located in the large-lot, Rural Residential zoning district.

(See Map #4 - Developable Land and Map #5 - Developable Land and Village Density Zoning Districts.)

Potentially developable land includes currently vacant properties as well as parcels which could be converted to residential development. For example, thousands of acres now used for agriculture, forestry, and outdoor recreation lie within zones which permit residential development. These properties are temporarily protected under Massachusetts General Laws, Chapters 61, 61A, and 61B, but unless these properties are permanently protected, they could be converted to residential use. Land farmed by cranberry farmers presents a particular challenge because fluctuating prices for cranberry crops have put intense economic pressure on growers to sell their land. For example, one of the largest cranberry producers in Plymouth, A.D. Makepeace, may develop its 3,600 acres of land. All of this Makepeace property is located in the Rural Residential District and some of it is in the most remote section of Plymouth where no public services exist.

Over the past 15 years, an average of 127 residentially-zoned parcels has been lost to development each year. A portion of this land is fragile pine barren country. More sprawling development could deplete the water table, increase pollution of ponds and streams, contaminate the aquifer, and require more suppression of the natural cycles of wildfire essential to this ecosystem. More houses create more demand to pave rural gravel roads, resulting in higher speeds and more traffic. The globally-rare coastal plain pond ecosystems could be permanently damaged by development impacts.

D. The Future: Sprawl or Smart Growth

Sprawl is a development pattern which is characterized by low-density residential development, exclusive reliance on automobile transportation, and rapid annual rates of land consumption.

- Sprawl depletes natural resources by fragmenting forests, destroying habitats, and increasing air and water pollution.

- Sprawl relies upon continuous extensions of infrastructure into rural areas with resultant increases in municipal service costs.
- Sprawl degrades water resources by increasing paved areas, limiting groundwater recharge, and increasing non-point source pollution.

The septic systems of single family detached homes disperse pollutants over wide areas, making pollution management inefficient and largely ineffective. Continuation of sprawl development in Plymouth will mean loss of open space and rural character, reduction of critical habitat for rare species, encroachment on sensitive natural resources–especially water–and increase in traffic congestion. It will also undermine the village center concept by making the least, not the most, use of existing infrastructure.

Sprawl is more costly to Plymouth taxpayers, because dispersed single family houses on large lots cost more in town services than they provide in taxes. In 2000, the Town of Plymouth commissioned RKG Associates to conduct an economic development and cost of community services study. The study found that 56 % of municipal costs are associated with single-family dwellings.

By contrast, smart growth emphasizes mixed-use development in existing village centers, increased residential density, and minimal extension of new infrastructure. Smarter growth preserves Plymouth's open spaces, facilitates greater diversity of transportation and housing options, and encourages the preservation of the town's historic and cultural character. It emphasizes infill development, adaptive reuse, and appropriately-scaled vertical growth. Smart growth maximizes the value of existing developed areas for economic opportunity before opening up new greenfield areas. When development does occur on open lands, smart growth emphasizes the use of cluster zoning and small residential lots to protect natural resources and minimize infrastructure costs.

II. CURRENT LAND USES

A. Existing Distribution of Uses

Plymouth has 65,920 acres of land, including surface water and road rights-of-way. Twenty-nine percent (29%) is developed. Of that, twenty-one percent (21%) is residential, just over 4% is commercial and industrial, and 4% is occupied by nonprofit uses.

Seventy-one percent (71%) of Plymouth is undeveloped. Thirty-eight percent of Plymouth land is publicly-owned property and protected open space. Myles Standish State Forest, a 12,500-acre park owned by the Commonwealth of Massachusetts, represents about half of the publicly-owned property. Twenty-three percent of Plymouth properties are privately held in Chapter 61, 61A, and 61B uses. These are privately-held lands currently utilized for agriculture, forestry, and outdoor recreation. However, they could be sold or converted to other uses in the future. Almost 12% of town land is vacant. Of this land, 8.8% is in a residential zone and almost 3% is in a commercial or industrial zone. Together, Chapter

61 properties and vacant residentially-zoned land constitute one third of the town's land area. These properties are of particular importance because they could potentially be developed with additional sprawl-style housing.

The table below shows Plymouth land uses in 2004.

Town of Plymouth Land Use 2004

LAND USE	ACREAGE*	PERCENTAGE
RESIDENTIAL	**14,395**	**22.2%**
Single family detached	11,959	18.44
Single family attached	1,542	2.37
2-3 family building	196	0.3
4+ unit building	111	0.17
Mobile homes	262	0.004
Group quarters	6	—
Accessory to residential land	319	0.4
VACANT LAND IN A RESIDENTIAL ZONE	**5,737**	**8.84**
Developable land	3,200	4.93
Potentially developable land	739	1.13
Undevelopable land	1,798	2.76
COMMERCIAL	**1,257**	**1.93**
VACANT LAND IN A COMMERCIAL ZONE	**606**	**0.93**
INDUSTRIAL	**1,324**	**2.04**
VACANT LAND IN INDUSTRIAL ZONE	**662**	**1.02**
PUBLIC SERVICE PROPERTIES: NONPROFIT/CHURCH	**2,352**	**3.62**
OPEN SPACE/PUBLICLY OWNED LAND	**23,316**	**35.96**
CHAPTER 61 PROPERTIES	**14,574**	**22.48**
Agriculture	7,421	11.44
Forestry	4,958	7.64
Recreation	1,592	2.45
WATER	**603**	**0.93**
TOTAL	**64,826***	**100.00**

Source: FY2004 Assessor Database

* *Rounded to nearest acre*

** *Plymouth has 65,920 acres of land and this chart shows 64,826. The discrepancy is attributable to road rights-of-way.*

B. Residential Uses

As shown above, most of Plymouth's developed land is dedicated to residential uses and most of Plymouth's housing is detached single family units. According to FY2004 Assessor records, **11,959** parcels have detached single family homes. Single family detached housing comprises 83% of Plymouth's resi-

dential tax base. From 1989 to 1999, 93% of all residential building permits were for detached single family homes. This percentage dropped to 76% from 2000-2003.

An additional **1,542 dwellings are attached single family units**. Single family attached units are primarily townhouse-style condominiums within one of Plymouth's 107 condominium complexes. Six hundred and sixty-four of the most recently built units are part of the Pinehills community.[3] This mixed-use community, projected for completion in 2015, will eventually have 2,817 dwellings clustered on a total of just under 1,000 acres, along with 2,000 acres of open space and a projected 1.3 million square feet of commercial space. Other developments with single family attached units are White Cliffs in Cedarville, Marc Drive in West Plymouth, and Chapel Hill Drive in Plymouth Center. Single family attached units represent 10% of the residential tax base.

Plymouth has **629 parcels** with **2-3 family dwellings**, comprising 4% of the residential tax base. One thousand eighty eight **(1,088) units** are in **two-family** homes and **192 units** are in **three-family** homes. Almost all of Plymouth's 2-3 family homes were built around the turn of the century, and there has been limited construction of 2-3 family units over the past one hundred years.

Plymouth has **153 parcels** used for **multi-family** purposes. Ninety-seven acres of Plymouth land is used for multi-family housing and there are **991 housing units** in multi-family buildings in Plymouth. Almost all of Plymouth's multi-family housing is in Plymouth Center (51%) and North Plymouth (44%). A significant percentage of multi-family housing in Plymouth is owned by the Plymouth Housing Authority, which has five multi-family parcels and a total of 197 units. PHA housing is fairly concentrated, with 143 units located on two sites in Plymouth Center and 54 units on three sites in North Plymouth. Multi-family properties comprise 1.6% of Plymouth's tax base.

(See Map #3 – Current Residential Development.)

C. Commercial Uses

Three percent of Plymouth is zoned for commercial uses and approximately two percent is currently occupied by commercial uses. Most commercial development in Plymouth consists of retail and service establishments including restaurants, lodging, and some mixed commercial/residential uses. There are 1,257 occupied acres and an additional 606 vacant acres in commercial zones. There are over **350 commercial parcels** and almost **100 parcels of mixed commercial and residential** use. Approximately 70 parcels are vacant and developable.

Plymouth has more than **4 million square feet of commercial space.** Commercial and industrial development has accelerated rapidly in the last half century. From 1900 to 1959, developers constructed an average of 16,000 sq. ft. of new commercial and industrial space each year. In the 1960s, the rate of new commercial/industrial construction tripled, with an average of 50,843 sq. ft. of new space added

[3] As of December 31, 2004. Three hundred and seventeen permits were issued prior to December 31, 2003.

each year. In the 1970s, the average square footage constructed per year was 89,198 and, in the 1980's, an average of 187,787 square feet was constructed each year. The number dropped in the nineties to 72,361 square feet per year.

According to the ***Plymouth Master Plan Update: Economic Development and Cost of Community Services Study***, completed by RKG Associates in 2001, "most of the remaining undeveloped parcels in Plymouth's commercial/industrial zones are smaller than 5.0 acres." Because of the relatively small lot sizes, Plymouth is restricted in the type of commercial and industrial uses it can attract. All commercial and mixed commercial parcels had a FY 2003 valuation of $431,165,645, or 6.7% of the total tax base.

D. Industrial Uses

A little over two percent of the town's land area is committed to industrial use and 3.04% of Plymouth is zoned for industrial uses. Plymouth has **90 parcels currently occupied by industrial uses and over 100 parcels of vacant, developable industrial land, totalling 662 acres of land.** Plymouth has over 2.8 million square feet of industrial uses. Industrial uses are valued at $374.5 million, or 5.9% of the total tax base. Much of the industrial land is conveniently located near existing transportation routes, including the new Route 44 interchange.

E. Institutional Uses: Nonprofit and Church

There are **2,352 acres of nonprofit uses** in Plymouth. These include Jordan Hospital, churches, and various nonprofit camp facilities. These uses cover 3.6% of Plymouth's land.

F. Publicly-Owned Open Space

Plymouth has a wide range of open spaces, which include neighborhood parks, forests, beaches, conservation areas, playgrounds, and school playing fields. Thirty-six percent of Plymouth is open space and publicly-owned land.

(See Map #6 – Publicly-Owned Land.)

G. Recreation

Plymouth has a wide range of outdoor recreation opportunities and facilities. In addition to the facilities offered on publicly-owned land, Plymouth has **1,592 acres of Chapter 61B recreational land**, including golf courses and campgrounds. Approximately 2.4 % of the town's area is devoted to Chapter 61B commercial outdoor recreation.

(See Map #7 – Chapter Lands.)

H. Agriculture

Plymouth has a significant amount of **Chapter 61A agricultural land**, almost all of which is used for cranberry production. Eleven percent of Plymouth's land, a total of **7,421** acres, is agricultural. Cran-

berry farms preserve substantial amounts of open space. According to the University of Massachusetts Extension's Cranberry Production Guide for Massachusetts, "it takes more than a bog to grow cranberries. (Bogs) rely on a surrounding network of support acres—the fields, forests, streams, and ponds that make up the cranberry wetlands system." Upland property must be protected to assure crop purity.

I. Forestry

Seven percent of Plymouth's land, **4,958** acres, is used for **Chapter 61 forestry** purposes.

J. Vacant Land

There are **5,737 acres of vacant land within residential zones**. Of this land, 3,200 acres are developable and 739 are potentially developable. Many of the parcels are relatively small building lots; the median size of a vacant lot is 0.86 acres. Larger parcels include 75 parcels over 10 acres and 29 parcels over 20 acres. All parcels over 10 acres total 1,825 acres. By comparison, there are **606 acres of vacant land in the commercial zones and 662 acres of vacant land in industrially-zoned** areas. The vacant lands are generally free of significant development constraints, with only a few parcels limited in their ultimate development potential under current zoning.

III. DENSITY

Plymouth villages have higher single family residential densities than nonvillage areas, due to the minimum lot requirements in the Plymouth Zoning Bylaw. Development densities vary from village to village.

Single Family Density By Area, FY 2003

AREA	TOTAL SINGLE FAMILY	ACRES USED	NET SINGLE FAMILY DENSITY/ ACRE
North Plymouth	719	322	2.23
Plymouth Center	1,595	805	1.98
West Plymouth	2,824	1,788	1.58
Manomet	3,356	1,256	2.67
Pine Hills	39	18	2.17
Cedarville	931	579	1.61
All Villages	9,464	4,768	1.98
Rural Areas	6,424	6,410	1.00
Total	**15,888**	**11,178**	**1.42**

Source: FY 2003 Assessor Database and GIS Data FY 2003

Even more significant is the variation in average lot size between single family units built before and after 1980. Lots after 1980 are significantly larger.

Single Family Houses: Average Lot Sizes by Era of Construction

AREA	SINGLE FAMILY HOUSES BUILT THROUGH 1979		SINGLE FAMILY HOUSES BUILT FROM 1980-2003	
	Total Units	Average Lot Area (acres)	Total Units	Average Lot Area (acres)
North Plymouth	561	0.41	158	0.58
Plymouth Center	1,176	0.44	309	0.76
West Plymouth	2,173	0.59	614	0.76
Manomet	2,337	0.31	686	0.59
Pine Hills	1	2.00	38	0.42
Cedarville	488	0.49	426	0.78
All Villages	7,233	0.44	2,231	0.70
Rural Areas	3,237	0.74	2,837	1.26
Total	**10,470**	**0.58**	**5,068**	**1.01**

Source: FY 2003 Assessor Database FY 2003 and GIS Data

IV. ZONING IN PLYMOUTH

The Plymouth Zoning Bylaw provides for 17 underlying zoning districts and six overlay districts. There are six residential zones, as noted below:

Residential Zones

DISTRICT	NAME	MIN. LOT SIZE (VS.)	SINGLE FAMILY DETACHED ALLOWED?	DUPLEX ALLOWED?	MULTI-FAMILY ALLOWED? (Max. density 8 units/acre)	TOTAL LAND ACRES
RR	Rural Residential	120,000 (village-SP-60,000)	Y	N	N	46,000
R40	Large Lot Residential	40,000 (village-SP: 20,000)	Y	SP	N	1,271
R25	Medium Lot Residential	25,000 (village-SP-15,000)	Y	SP	N	9,003
R20SL	Small Lot Residential	20,000 (village-SP-15,000)	Y	Y	N	2,027
R20MD	Mixed Density	15,000	Y	Y	N	1,343
R20MF	Multi-Family	20,000 (village-SP-15,000)	Y	Y	SP	271

There are 12 commercial and industrial zones. Of these, the Downtown Harbor and Transitional Commercial zones allow single family and duplex housing. Multi-family housing is allowed by Special Permit (SP) in the Waterfront, Light Industrial/Waterfront, Transitional Commercial, General Commercial, and Downtown Harbor zones.

Commercial Zones

DISTRICT	NAME	MIN. LOT SIZE (SF)	PRIMARY USES	TOTAL LAND ACRES
MWD	Municipal Wastewater District	NA	Wastewater treatment facilities	171
NC	Neighborhood Commercial	20,000	Small-scale retail and office	29
TC	Transitional Commercial	20,000	Multi-family and small-scale commercial	80
GC	General Commercial	20,000	Retail and office	316
AC	Arterial Commercial	40,000	Automotive related retail	108
LI	Light Industrial	40,000	Office, warehousing, and manufacturing	1,152
LI/WF	Light Industrial/ Waterfront	20,000	Residential, commercial, and industrial mix	69
WF	Waterfront	20,000	Water related uses, multi-family, and commercial	121
MC	Mixed Commerce	40,000	Large retail and industrial	306
HC	Highway Commercial	40,000	Large retail	198
DH	Downtown/Harbor	None	Residential and commercial mix	82
AP	Airport	20,000	Airport-related and industrial	1,009

(See Map #8 – Zoning Districts.)

The town's zoning has the following basic features:

- Zones to accommodate the Village Center concept by providing for a compact commercial center in the central areas of each village, and allowing high- and medium-density residential development in areas surrounding the General Commercial (GC) zones. Smaller Neighborhood Commercial (NC) zones within village residential areas are also provided to meet the needs of established residential areas.
- Arterial and Highway Commercial Districts to accommodate automobile-oriented commerce (shopping centers and regional scale commercial uses).
- Industrial zones for large-scale and smaller light industrial uses, including an airport zone at the Plymouth Airport. In addition to privately-owned land within the Airport District, Plymouth Airport consists of almost 700 acres with 200 acres of vacant land available for lease.
- Mixed-use zones such as the Downtown/Harbor District, Light Industrial/Waterfront District, and Waterfront District, all of which can support commercial and residential uses, including a significant amount of new multi-family residential uses; and
- Rural Residential Zones to minimize densities and concentrations of development outside of the village areas.

Since 1980, 82% of detached single family construction has occurred within the R-25 and R-40 zones. Without significant zoning changes, single family detached housing is likely to continue to dominate the Plymouth landscape. There are currently over 22,000 acres of developable land in zones which allow single family construction and less than 50 acres of developable land in areas which allow 2-3 family or multi-family uses.

The current zoning scheme also seeks to encourage smart growth and resource protection through a variety of mechanisms, including:

- Growth rate controls
- Aquifer Protection Overlay District (use and density limits)
- Adequate facilities controls for accommodating growth within village service areas
- Flood Plain Overlay Zone
- Buttermilk Bay Overlay District (density limits)
- Rural Density Development option (open space development incentives)
- Village Open Space Development option (open space development incentives)
- Wetlands Overlay District (buffering/resource protection)
- OSMUD (open space, mixed-use development–the Pinehills)
- Recreational Development Overlay (recreational amenity/preservation incentives)
- Transferable development rights between parcels (rather than between large, designated sending and receiving zones).
- Miscellaneous regulations to limit specific uses, such as telecommunications towers, adult uses, lighting intrusion into the night sky, etc.

V. EOEA BUILDOUT ANALYSIS

In the late nineties, the Massachusetts Executive Office of Environmental Affairs (EOEA) developed buildout analyses and maps for all of the cities and towns in Massachusetts. These buildout studies showed what each town would look like if it fully developed its land according to existing zoning. EOEA completed a buildout analysis for Plymouth in 1999. The EOEA Plymouth buildout study estimates 29,043 developable acres in 1999. This estimate excludes developed property, water bodies, and protected open spaces. The study is based on an analysis of 1999 zoning conditions and does not include a detailed analysis of natural features. Therefore, the EOEA estimate does not exclude wetlands (which are subject to permanent protections under the Wetlands Protection Act), Title V buffer areas around water bodies, or floodplains. Since all of these areas have statutory development restrictions, the EOEA estimate of developable property is somewhat overstated. A copy of the build-out analysis is below.

COMMUNITY DATA PROFILE

This data profile includes summary statistics that are a component of a buildout map and analysis series. The analysis starts with available land in each zoning district and makes projections of additional housing units and commercial/industrial space according to each district's minimum lot size and other regulations. The projections only account for as of right development and do not include development by special or comprehensive permit that may increase the amount of development. These buildout projections were combined with 2000 Census and other data to create a profile of each community at buildout according to its current zoning.

BUILDOUT ANALYSIS SUMMARY

BUILDOUT COMPLETION DATE: 1999 **DEMOGRAPHIC PROJECTIONS**	
RESIDENTS	
1990	45,608
Current	51,701
Buildout	105,424
STUDENTS (K-12)	
1990	7,672
Current	8,726
Buildout	17,680
RESIDENTIAL UNITS	
1990	15,875
Current	21,250
Buildout	41,147
WATER USE (gallons/day)	
Current	5,037,482.19
Buildout	12,250,544.19
BUILDOUT IMPACTS	
Additional Residents	53,723
Additional Students (K-12)	8,954
Additional Residential Units	19,897
Additional Developable Land Area (sq ft)	1,265,111,859
Additional Developable Land Area (acres)	29,043
Additional Commercial/Industrial Buildable Floor Area (sq ft)	42,451,287
Additional Water Demand at Buildout (gallons/day)	7,213,062.00
Residential	4,029,215.00
Commercial and Industrial	3,183,847.00
Additional Solid Waste (tons/yr)	27,560.00
Non-Recyclable	19,598.00
Recyclable	7,962.00
Additional Roadway at Buildout (miles)	245.00

Of the 29,043 acres identified by the Executive Office of Environmental Affairs, 28,668 are located in zones which allow residential development. Eighty-two percent of the available land is in the Rural Residential (RR) District, which has a minimum density of development of one unit per 120,000 square feet.

However, because the minimum lot size is so large, only 42% of projected new lots could be created in this zone, with the remaining 58% carved out of zones which have one-acre, or smaller, minimum lot size. In fact, the total number of potential additional lots in the expansive RR Zone is exceeded by the combined future lot count in the R-25 and R-20 Zones, which have about 1/4 of the land area of the RR Zones.

The additional water demand for just residential use (4.03 million gallons per day) would mean nearly doubling the number or capacity of supply wells currently serving the town.

Many of the potentially-developable properties are environmentally-sensitive lands which Plymouth must protect in order to maintain water quality, preserve natural habitats, and avoid forest fragmentation. The Rural Residential District, in particular, has a significant amount of priority protection land which is vulnerable to development.[4]

(See Map #9 – Executive Office of Environmental Affairs Buildout.)

[4] Priority areas as defined by the Commonwealth of Massachusetts Natural Heritage Program.

VI. LAND USE OBJECTIVES AND STRATEGIES

Objective 1:

Limit sprawling development patterns.

STRATEGY:

Establish town Growth Areas and Rural Preservation Areas. Commit to policies and investments which successfully encourage development in growth centers and restrict it in preservation areas.

Objective 2:

Limit overall residential growth and encourage a greater diversity of housing types.

STRATEGY:

Utilize a mix of zoning restrictions, financial, and regulatory incentives to support the construction of desired housing and restrict unwanted residential development.

Objective 3:

Encourage commercial growth and expansion of the commercial tax base.

STRATEGY:

Maximize the value of existing commercial zones before initiating development in areas not currently zoned for commercial use. As existing commercial zones reach capacity, develop new commercial growth areas in strategic locations.

STRATEGY:

Encourage business growth in sectors which support the preservation of Plymouth's unique environmental and cultural heritage.

Objective 4:

Maintain and enhance existing villages as centers of community life.

STRATEGY:

Use regulation, guidelines, incentives, and investments to support the healthy growth of villages.

Objective 5:

Protect open space, fresh and coastal waters, and historic structures and landscapes.

STRATEGY:

Create Green (open space), Blue (water resources), and Cranberry (cultural heritage) networks to protect and link resources throughout Plymouth.

VII. KEY ACTIONS

Objective 1:

Limit sprawling development patterns.

STRATEGY:

Establish town Growth Areas and Rural Preservation Areas. Develop associated policies which successfully encourage development in growth centers and restrict it in preservation areas.

All of Plymouth will fall into one of two overall land use and development categories: preservation areas or growth areas. The boundaries of town Growth Areas and Rural Preservation Areas should be delineated on Plymouth's Zoning Map and specified in the Zoning Bylaw.

Town Growth Areas

Plymouth growth centers are areas which can accommodate development through redevelopment of existing sites, infill development on vacant sites, and new development in compact locations at the edges of existing growth areas. Plymouth shall have four types of growth areas:

1. **Village Centers:** These are the five existing villages: North Plymouth, Plymouth Center, Manomet, West Plymouth, and Cedarville. Village centers should allow infill and redevelopment, with design guidelines established to assure that new development complements existing character.

2. **Village Fringes:** These are the lands immediately adjacent to existing village centers. Village fringes should permit compact development which extends the village fabric but does not require extensive extensions of municipal infrastructure and services.

3. **Economic Development Opportunity Areas:** These are commercial districts located adjacent to transportation infrastructure. They shall include Cordage Park, Plymouth Industrial Park, Plymouth Municipal Airport, and Route 3, exits 2,3,5,6, and 7 and Route 44. Economic Development Opportunity Areas should incorporate commercial development, office space, and multi-family housing.

4. **Open Space Mixed-Use Development Zones:** These are districts, developed under special permit and in consultation with town officials, which incorporate mixed-use development, clustered housing, preservation of open space, and private provision of infrastructure and services. Such districts include the existing Pinehills development and may include additional developments on a case-by-case basis.

To encourage appropriate and sustainable development in growth areas, Plymouth must:

- **Provide and maintain the infrastructure** and municipal services needed to support higher density development. Infrastructure to support appropriate growth shall include new transportation systems, parking, attractive and walkable streets, and, as needed, expansion of sewer and wastewater treatment capacity;

- Create **design and density standards for each of the villages.** Design guidelines appropriate to each village's scale, character, and infrastructure capacity should be included as performance standards in the Zoning Bylaw;
- Make town Growth Areas the **receiving areas for development rights** transferred from rural areas. Density bonues can be calibrated as incentives for development of different sites;
- Incorporate **neighborhood green spaces** into town Growth Areas;
- Establish **infrastructure expansion limits**;
- Promote **compact development at village fringes** through greater allowable density inside the infrastructure limits. Consider providing for potential future expansion of village centers as the edges become built out;
- Up-zone and encourage **mixed-use (commercial/residential) development in selected areas of Village Centers and in new Economic Development Opportunity Centers.** Mixed use in villages should include residential adjacent to or above retail, to mitigate the traffic impacts of new growth;
- Revise the Zoning Bylaw to encourage **multi-family housing in existing mixed-use districts and in new Economic Development Opportunity Areas;**
- Accommodate **affordable housing** throughout Growth Areas; and
- Create and enhance zoning incentives or Planned Development Districts under special permit processes for the **redevelopment of major opportunity sites such as Cordage Park and the Route 44 corridor.**

Rural Preservation Areas

Rural preservation areas are lands that Plymouth seeks to protect for environmental, scenic, cultural, recreational and fiscal reasons. To conserve and protect Rural Preservation Areas, Plymouth must:

- Focus **open space preservation activities and investments** in these areas;
- **Limit infrastructure investment in rural areas to maintenance of existing infrastructure**. This shall include restrictions on paving of rural roads;
- **Restrict new development;**
- Maintain **low residential densities**;
- Collaborate with nonprofits, such as the Wildlands Trust of Southeastern Massachusetts and the Nature Conservancy, to **acquire and protect key rural landscapes;**
- Continue to refine the Transfer of Development Rights Bylaw to **facilitate transfers from preservation to growth areas.** A study should be conducted to determine the right balance between zoned development capacity in rural areas and the goal of directing the use of that development capacity to town Growth Areas;
- **Downzone rural areas** consistent with the optimum functioning of the TDR system;
- **Support the rural economy**, especially farming and renewable natural resource-based economies;
- Zone to allow small nodes **(rural hamlets) of service retail** within Rural Preservation Areas. Rural areas need small service areas so that residents do not have to drive long distances for convenience retail;

- Create **rural development and road improvements standards to minimize site disturbance** in sensitive areas where development cannot be avoided.

The parts of Plymouth outside the Village Centers should remain rural in character. This does not mean that no one should live in Rural Preservation Areas, but that further development should be limited as much as possible to the carrying capacity of the land without substantial infrastructure. Zoning requirements should reflect that character and the town should not encourage more development by upgrading infrastructure.

Objective 2:

Limit overall residential growth and encourage a greater diversity of housing types.

STRATEGY:

Utilize a mix of zoning restrictions, financial incentives, and regulation to support the construction of desired housing and restrict unwanted residential development.

- Amend the Zoning Bylaw to create more zones which allow 2-3 family and multi-family housing.
- Develop regulatory and financial incentives to encourage construction of 2-3 family housing, multi-family development, infill housing, adaptive reuse, and single family housing on smaller lots.
- Facilitate the development of new Open Space Mixed-Use Developments by establishing mandatory, by-right conservation (open space) subdivision zoning, with site plan review to preserve open space in rural areas.
- Develop policies regarding accessory units and in-law apartments.
- Encourage developers of large scale residential projects to fund required infrastructure. Utilize density bonuses and other mechanisms to facilitate private financing.
- Reduce the threat of 40B challenges by incrementally increasing Plymouth's affordable housing stock.

Objective 3:

Encourage commercial growth and expansion of the commercial tax base.

STRATEGY:

Maximize the value of existing commercial zones before initiating development in areas not currently zoned for commercial use. As existing commercial zones reach capacity, develop new commercial growth areas in strategic locations.

- Revise development standards in commercial zones to allow increased density, including vertical expansion as appropriate.
- Identify commercial districts which could become mixed-use zones and amend the Zoning Bylaw to create mixed commercial/residential use zones.

- Provide infrastructure planning and investment to support increased density in targeted mixed-use areas.
- Develop policies to increase occupancy rates in underutilized properties in the Downtown and Waterfront districts of Plymouth Center and North Plymouth.
- Encourage infill development within the town's established industrial parks and commercial corridors.
- Create additional economic development zones at highway interchange areas along Route 3 and explore feasibility and benefits of creating new access from Route 25.

STRATEGY:

Encourage business growth in sectors which support the preservation of Plymouth's unique environmental and cultural heritage.

- Support natural resource-based industries, including cranberry farming and seafood harvesting, as long as operators use best management practices to protect the environment.
- Facilitate growth in these industries through tax incentives and streamlined permitting processes for establishment and expansion of natural resource product facilities so that such uses are based in Plymouth, employ Plymouth residents, and associate the products with the Plymouth area.
- Encourage growth of the tourism industry, with a focus on heritage tourism and ecotourism, by supporting the development of appropriate facilities.

Objective 4:

Maintain and enhance existing villages as centers of community life. Make all village centers into walkable environments.

STRATEGY:

Use regulation, guidelines, incentives, and investments to support the healthy growth of villages.

- Develop design guidelines for each of the village centers. Standards for village centers should address built features such as architectural style, building scale, setbacks, densities, and signage and site features such as parking and landscaping. Create zoning incentives to encourage consistent application of the design guidelines.
- Support the creation of green open spaces within each village center.
- Revise zoning to encourage most intensive land use activity around key transportation nodes, such as intersections of arterial roads and primary corridors.
- Encourage mixed commercial and residential uses in central areas within village centers.
- Consider increases in allowable building heights in appropriate locations within village centers.
- Link developer density bonuses to provision of public benefits, including open space, parking, affordable housing, and infrastructure.
- Secure sites within village centers for new community facilities (See Public Facilities section).

- Provide convenient and reliable transit access to residents of village centers by investing in transit infrastructure as described in the Transportation section.

Objective 5:

Protect open space, fresh and coastal waters, and historic structures and landscapes.

STRATEGY:

Create Green (open space), Blue (water resources), and Cranberry (cultural heritage) networks which link and protect natural and built resources throughout Plymouth.

- Link open space and wildlife habitats throughout Plymouth in a Green Network of protected lands, public parks, trails, wildlife corridors, bikeways, and greenways.
- Protect Plymouth's Blue Network of water resources, including surface water resources and groundwater.
- Expand opportunities for public access to the ocean and ponds while restricting access to water resources which are too fragile to permit public use.
- Create a Cranberry Network of culturally- and historically-significant buildings and landscapes with markers, mapped routes, and interpretive materials.

The Green, Blue, and Cranberry Networks are also described in the Natural Resources and Historic Preservation sections. Creation of these town-wide networks requires the following land use actions:

Green Networks

- Evaluate and rank unprotected open space resources according to criteria for environmental sensitivity and scenic and cultural value.
- Pursue development of Wishbone*, North Plymouth/Downtown Rail Trail, Waterfront walkway and other trail initiatives. (*ENSR, *Open Space Corridor Plan*, November 1999.)
- Create greenways and green belts outside village area infrastructure limits by pursuing conservation restrictions.
- Work with nonprofit conservation organizations to protect critical open space.
- Seek donation of conservation restrictions from landowners, who will benefit by reduced property taxes.
- Seek additional dependable revenue streams for conservation purposes.
- Establish development standards with incentives for protection of large blocks of open space, public access, or other public benefits.
- Designate and protect scenic roads through zoning overlays that require new construction and landscape treatments to complement the existing character.
- Retain gravel roads in existing rural areas and limit density of development along these roads.
- Develop Conservancy Districts to complement the regulatory provisions now enforced by the town's Conservation Commission.
- Provide zoning bonuses for development proposals which protect open space resources.

Blue Networks

- Identify the recharge areas to large ponds and major waterways and limit development in these recharge areas.
- Amend the Zoning Bylaw to limit development along pond shorelines and to prohibit development by coastal plain ponds.
- Amend the Zoning Bylaw to facilitate appropriately-sited, environmentally-sensitive uses along the coastline. Such uses could include marinas, lodging, restaurants, housing, and increased public access areas. Require appropriate buffering and mitigation of impacts to natural systems.
- Review subdivision and building requirements to promote low-impact development.
- Implement a town-wide stormwater management plan.
- Integrate a comprehensive wastewater management plan with land use goals.
- Expand opportunities for coastal access in all four coastal villages. Develop new neighborhood-scaled beach facilities.

Cranberry Networks

- Pass a Demolition Delay Bylaw to encourage alternative uses of historic buildings. Demolition Delay Bylaws require that all demolition permits for structures deemed of historic significance (according to criteria spelled out in the bylaw) must be delayed for a period of 6-12 months while alternatives to demolition are pursued.
- Consider Neighborhood Conservation Districts, a Landmarks Bylaw, and preservation easements to preserve buildings and sites outside of Plymouth's local historic district.
- Designate Route 3A as a historic corridor and create design guidelines for landscaping and new construction along the corridor.
- Designate Scenic Roads. On designated Scenic Roads, cutting of trees and changes in stone walls within the road right of way cannot be made without a public hearing before the Planning Board.
- Explore official recognition for historic landscapes under the Massachusetts Heritage Landscape Program.
- Protect cranberry bogs as a scenic resource.

2. Natural Resources

I. OVERVIEW

The Town of Plymouth is blessed with extensive natural resources. Despite over 400 years of human settlement and the intensified development pressures of the past thirty years, Plymouth retains a diverse landscape which includes some of the most important environmental resources in Massachusetts. Many of Plymouth's predominant natural features, including its pine barren forests and coastal plain ponds, are globally rare ecosystems. Ten percent of Massachusetts ponds and lakes are located in Plymouth and one quarter of the state's "endangered, threatened and rare" animal species can be found here. Both community members and town officials agree that careful stewardship of the environment is essential.

Plymouth's natural landscape has several unique features. First, the town has an abundance of water resources, both above ground and beneath the land surface. The town sits atop the Plymouth-Carver aquifer and is adjacent to the Atlantic Ocean. Inland, Plymouth has 343 ponds and lakes, including 32 coastal plain ponds and 64 ponds over ten acres in size. The town has ten rivers and streams and is dotted with cranberry bogs, wetlands, and vernal pools. Second, Plymouth has a significant inventory of open space, including forests, meadows, agricultural lands, and parks. These open spaces impart a rural character to the town and provide important habitats for a wide range of plants and animals, including many rare and endangered species. Plymouth's natural resources provide an array of benefits to local residents and many resources have national, and even international, significance.

II. TOPOGRAPHY AND SOILS

The glaciers that advanced and retreated over New England in the Pleistocene Era have determined the essential characteristics of Plymouth's surficial geology. Plymouth is covered by moraines (deposits of stone and other debris left by retreating glaciers) and outwash plains (flat areas of glacial till). A low-ly-

ing community, Plymouth is mostly between 0 and 200 feet above sea level with a predominantly flat or gently rolling topography. The Pine Hills are the highest elevation in town, rising 395 feet above sea level.

Ninety-three percent of Plymouth is covered with well-drained sandy soils.[5] The average depth to bedrock is over 100 feet. Geologists classify soils according to "soil associations," which have common characteristics. Although there are six soil associations in Plymouth, sandy soils of the Carver-Gloucester, Carver-Hinckley and Carver-Merrimac associations cover 97% of town. These Carver-associated soils present no constraints to the development of buildings, septic systems, or wells.

The remaining soil associations are:

- Muck-Scarboro-Peat Association: Found in low lying areas, including kettle hole depressions and stream beds. These soils are poorly drained.
- Coastal Beach Association: Lining the ocean shoreline, coastal beach soils are sandy.
- Essex-Scituate Association: Located in areas with high water tables, these soils characteristically have larger stones and boulders.

(See Map #10 - Topography.)

III. WATER RESOURCES

A. Groundwater: Plymouth-Carver Aquifier

Plymouth rests atop the Plymouth-Carver aquifer, which provides drinking water for the two towns and partially supplies neighboring communities. The aquifer is an underground water source 140 square miles in area with an estimated 500 billion gallons of potable water.[6] Composed of saturated glacial sand and gravel, the aquifer ranges in depth from 20 feet to over 200 feet.[7] Great South Pond and Little South Pond are maintained as back-up water supplies.

The aquifer has a groundwater divide which runs north-south near the western edge of Route 3. Water east of this divide flows east to Plymouth Bay and water to the west flows southwest to Buzzards Bay and the Taunton River. The Plymouth-Carver aquifer is designated by the Environmental Protection Agency as a Sole Source Aquifer, the second largest in Massachusetts and one of only 70 Sole Source Aquifers in the United States. Sole Source Aquifers provide at least 50% of their communities' water supply. These aquifers are subject to federal and state regulations to ensure water quality.

[5] Hansen, Bruce and Lapham, Wayne. *Geohydrology and Simulated Ground-Water Flow, Plymouth-Carver Aquifier, Southeastern Massachusetts*, United States Geological Survey, Water Investigations Report 90-4204, 1992.

[6] Williams, John R. and Tasker, Gary R. *Water Resources of the Coastal Drainage Basins of Southeastern Massachusetts, Northwest Shore of Buzzards Bay*. Hydrologic Atlas HA-560, United States Geological Survey, 1978.

[7] Hansen, Bruce and Lapham, Wayne. *Geohydrology and Simulated Ground-Water Flow, Plymouth-Carver Aquifer, Southeastern Massachusetts*, United States Geological Survey, Water Investigations Report 90-4204, 1992.

Both public and private wells tap the aquifer. Water is returned to the aquifer through precipitation, septic system discharges, and infiltration of water used to irrigate crops. North Plymouth, Plymouth Center, and parts of West Plymouth have access to town sewers. Wastewater from these areas is treated at the new wastewater treatment plant located at Camelot Industrial Park and then discharged into Plymouth Bay or the headwaters of the Eel River. The rest of Plymouth uses on-site septic systems for disposal of waste.

(See Map #11 – Sole Source Aquifer.)

Aquifer capacity:

The Plymouth-Carver aquifer has sufficient water for existing and projected demand. However, if Plymouth were to fully build out all its developable land, the town would double its annual water consumption.[8] While the aquifer could accommodate this water demand, excessive water withdrawals would adversely impact Plymouth's coastal plain ponds and wetlands, which depend on adequate groundwater volume to maintain the necessary water elevation to support their existence. The Town must therefore limit development to prevent excess water withdrawal.

B. Ocean

Plymouth's 21 miles of coastline extend from Plymouth Bay to Cape Cod Bay. Just north of the Eel River, Plymouth Beach juts out into Plymouth Bay and creates the semi-enclosed Plymouth Harbor. Located adjacent to downtown Plymouth, Plymouth Harbor is the site of many of the town's tourist attractions, including Plymouth Rock and the original Plimoth settlement. In the 17th and 18th centuries, downtown Plymouth was a major shipbuilding, fishing, and trading hub. Today, the harbor continues to support a modest commercial fishing and shellfishing industry. Several tour boat companies are based here, and private boat owners launch a variety of small craft from the harbor area. There are two small marinas.

Ocean access:

Major public beaches are located on Long Beach and in Manomet and include Priscilla Beach, Manomet Beach, and White Horse Beach. Three smaller beaches are just south of Manomet: Oceanaire Beach, Surfside Beach, and Bayside Beach. In Downtown Plymouth, the Town owns two parks directly adjacent to the ocean. These are Nelson Street Recreation Area and Stephens Field. The State-owned Ellisville Harbor State Park abuts Cape Cod Bay. Despite these resources, most of the coast is not publicly accessible because most shorefront land is privately owned.

C. Ponds and Lakes

1. Freshwater Ponds and Lakes

Plymouth has 343 ponds and lakes. Sixty four are large ponds over ten acres in size. Nineteen of these

[8] Executive Office of Environmental Affairs, Build Out Analysis, 1999.

are Great Ponds, which are defined as ponds naturally over ten acres in size without manmade improvements.

Pond access:

During the master planning process, many residents identified lack of public pond access as a significant issue. Two thirds of the large ponds, or fifty ponds, lack public access. Many of the ponds that do have public access lack adequate accommodations, such as parking, changing facilities, and public bathrooms. Twenty-three Plymouth ponds have significant fish populations and are suitable for recreational fishing. Ponds which are publicly accessible for swimming are Billington Sea, Little Pond, Fresh Pond, and various ponds in the State Forest. In the 2004 Open Space and Recreation Plan, the town Open Space Committee identified additional ponds and lakes which are most suitable for swimming. This list was later amended based upon a Buzzard Bay Coalition study which recommended against public access to coastal plain ponds.

2. Coastal Plain Ponds

Thirty-two of Plymouth's ponds are coastal plain ponds. Coastal plain ponds are globally rare ecosystems which support a variety of threatened plant and animal species. Coastal plain ponds are defined as "shallow, highly acidic groundwater ponds in glacial outwash and usually with no inlet or outlet. The water level in coastal plain ponds fluctuates due to changes in the water table, which typically exposes a gently sloping shoreline in late summer. In wet years, the pond shore may remain inundated."[9]

Many of the rare species that live in coastal plain ponds depend upon large expanses of natural habitat that encompass two or more ponds and surrounding woodland. According to the 2004 Open Space and Recreation Plan, "...Plymouth and to a lesser extent Cape Cod are the only places on Earth where these plant communities (coastal plain ponds) occur in complexes of 5 or more adjacent ponds." [10] The Nature Conservancy identifies these pond complexes as a global priority for conservation. In addition, more than half of the rare plants in Plymouth are located in coastal plain ponds. According to the Massachusetts Natural Heritage and Endangered Species Program, Plymouth has 23 rare plant species, fourteen of which are associated with coastal plain ponds.

Pond access:

Due to their fragility, coastal plain ponds are not suitable for public access. A 2002 study by the Buzzards Bay Coalition recommended against the use of coastal plain ponds for most recreational activities, cautioning that such activities could damage ponds. However, a study by the Massachusetts Natural Heritage and Endangered Species division of the Executive Office of Environmental Affairs found evidence of both formal and informal beach areas at a number of coastal plain ponds. Other coastal plain ponds were highly built up along the shoreline.

[9] Massard, Valerie, Plymouth Open Space and Recreation Plan, December 2004 Draft, p. 32.
[10] *Ibid.*, p. 40.

D. Rivers and Streams/Watersheds

1. Watersheds

Plymouth lies within two major watersheds: the South Coastal watershed drains to the Atlantic Ocean and the Buzzards Bay watershed drains to Buzzards Bay. Watersheds are defined as regions which drain to a common river, river system, or body of water. Within these two major watersheds, Plymouth has nine smaller watersheds, which drain to different locations along Buzzards Bay and the ocean.

2. Rivers and Streams

There are ten major waterways in Plymouth: Agawam River, Beaver Dam Brook, Eel River, Frogfoot Brook, Harlow Brook, Herring Brook, Indian Brook, Red Brook, Town Brook, and Wankinco River. Of these, five are anadromous fish runs, which are brooks traversed by fish who live in the sea but spawn in fresh waters. The fish runs are Agawam River, Eel River, Herring Brook, Red Brook, and Town Brook.

WATERSHED	AREA COVERED	HEADWATERS	DRAINS TO
Eel River Watershed	Central coastal Plymouth, including Pinehills, Federal Furnace, Camelot Industrial Park Significant land uses: Residential, commercial, wastewater treatment plant, cranberry bogs, agriculture, open space	Little South Pond, Great South Pond, Boot Pond, Hoyts Pond, Gunners Exchange Pond, Russell Millpond, Forges Pond* **Note: Consulting engineer Camp, Dressker, McKee has mapped these as head waters; however, not all flow maps consistently show these waters as linked.*	Cape Cod Bay at Long Beach
Beaver Dam Brook Watershed	Manomet Significant land uses: Single family residential, conservation land at headwaters	Presidents Pond, Warner Pond, Fresh Pond, Beaver Dam Pond, Long Island Pond	Bartlett Pond at Manomet and then to Cape Cod Bay at White Horse Beach
Indian Brook Watershed	South Manomet Significant land uses: Conservation land at headwaters	Morey Hole, Briggs Reservoir, Island Pond, Shallow Pond	Cape Cod Bay at Manomet Beach
Town Brook Watershed	Town Brook from Billington Sea to Plymouth Harbor Significant Land Uses: Linear park from Jenney Pond and Brewster Gardens to Morton Park at Billington Sea, cranberry bogs	Billington Sea	Plymouth Harbor
Herring River Watershed **Designated as ACEC**	Southern Plymouth Significant Land Uses: Single family residential, 11 lakes and ponds, cranberry bogs, freshwater wetlands, remains of Wampanoag settlement for "Herring Pond Indians"	Little and Great Herring Ponds	Cape Cod Canal

WATERSHED	AREA COVERED	HEADWATERS	DRAINS TO
Agawam River Watershed	Southwestern Plymouth and Wareham Significant Land Uses: Cranberry bogs, Makepeace, with major potential development along the river corridor	Halfway Pond, Fawn Pond	Wareham River and then to Buzzards Bay
Wankinco River Watershed	Southwestern Plymouth and Wareham Significant Land Uses: Cranberry bogs	Ponds in Myles Standish State Forest	Agawam River in Wareham
Crane Brook Watershed	Western Plymouth & Carver Significant Land Uses: Myles Standish State Forest	Federal Pond and ponds in Carver	Weweantic River in South Carver
Red Brook Watershed	4.5 mile stream from White Island Pond to Century Bogs Significant Land Uses: Conservation land, campgrounds, open space	White Island Pond	Buttermilk Bay

(See Map #12 – Water Resources.)

E. Wetlands

Plymouth has just over 11,328 acres of wetlands and open water, of which 7,000 are wetlands. The Massachusetts Office of Coastal Zone Management defines wetlands as "areas where water covers the soil, or is present either at or near the surface of the soil for at least part of the growing season. The occurrence and flow of water largely determine how the soil develops and the types of plant and animal communities living in and on the soil."[13] Wetlands are broadly classified as tidal or nontidal, and Plymouth has both types of wetlands.

1. Coastal Wetlands

Along the coast, Plymouth has 1,321 acres of coastal tidal wetlands, which are wetlands linked both to river estuaries and the ocean. Salt and fresh water mix in coastal wetlands. Areas designated as coastal wetlands may include barrier beach, coastal beach or bluff areas, salt marshes, tidal flats, and rocky intertidal shore. Coastal wetlands are rare habitats which support a range of animal and plant species. Plymouth's coastal wetlands provide a unique food supply and cover for migrating shore birds.

Coastal wetland access:

Coastal beaches are important to residents and visitors, especially bird watchers. Plymouth's coastal wetlands could support additional beaches but the Town would need to develop plans to properly mitigate human impacts. Needed facilities would include properly-sited parking, sanitary facilities, and waste receptacles.

[13] Massachusetts Office of Coastal Zone Management web site <http://www.mass.gov/czm/wawetype.htm>. Accessed 12/6/2004.

Along the coast, the 600-acre Ellisville Harbor is a State-designated Area of Critical Environmental Concern. The Ellisville Harbor ACEC includes the harbor, barrier beach, dunes, salt marsh and bog, and upland meadow and woodlands. One hundred acres of the ACEC is owned by the State and maintained for passive recreation, including beach access. There are two Native American burial grounds in the area.

The ACEC Program was established in 1975 when the Massachusetts Legislature authorized and directed the Secretary of Environmental Affairs to identify and designate areas of critical environmental concern to the Commonwealth and to develop policies for their acquisition, protection, and use. The purpose of the Areas of Critical Environmental Concern (ACEC) Program is to preserve, restore, and enhance critical environmental resources and resource areas of the Commonwealth of Massachusetts. The goals of the program are to identify and designate these ecological areas, and to increase the level of protection for ACECs. An ACEC designation recognizes significant ecosystems and is intended to foster appreciation and stewardship of the unique natural and cultural resources in an area. The designation works through the existing state environmental regulatory and review framework. Projects within an ACEC that are subject to state agency jurisdiction or regulation–particularly those that require a state permit, or are funded by a state agency–are reviewed with closer scrutiny to avoid or minimize adverse environmental impacts.

(See Map #13 – Areas of Critical Environmental Concern.)

2. Freshwater Wetlands

Inland, Plymouth has 5,717 acres of wetlands which include bogs, marshes, and swamps. Swamps and marshes serve as critically important environments for resident and migrating birds, reptiles, and other animals. Cranberry bogs are included as wetlands, although many are managed for agriculture. Wetlands have the benefit of the Massachusetts Wetlands Protection Act and the Plymouth Wetlands Bylaw, which provide land buffers around wetland areas and prohibit development in wetlands.

Naturally-occurring bogs not used for cranberry cultivation are particularly rare in Massachusetts, and 156 acres are located in Plymouth. Plymouth's bogs host several rare animal species, including Jefferson Salamander, Blue Spotted Salamander, Spotted Turtle, Pale Green Pinion Moth, and Pitcher Plant Borer Moth.

F. Cranberry Bogs

Cranberry bogs are an important part of the Plymouth landscape. They help secure the rural character of town, especially because each cranberry bog typically has 2-3 acres of upland open space buffering the bog. The bogs are located throughout town.

While cranberry bogs are a key natural and economic asset for Plymouth, they also pose some concerns. Cranberry farming requires significant use of water. Cranberry farmers may use fertilizers and pesticides to control pests and these chemicals are flushed into the ground when the bogs are covered with water for harvesting or frost control. In addition, the significant volumes of water used in cranberry farming may excessively depress the water table, threatening coastal plain ponds which depend on adequate water volume for their existence.

Finally, the volatile market for cranberries creates insecurity, which increases the pressure that local cranberry businesses feel to sell their land at a profit. Such sales are potentially problematic because of the limited ability of planning officials to control uses when property changes hands. For example, the A.D. Makepeace Company owns 3,560 acres of land in Plymouth. The company has stated that it will continue to cultivate cranberries but is also proceeding with plans to develop portions of its land. The town is working with the company to develop alternatives to conventional subdivision development for the Makepeace land. Gravel removal and homes near bogs also present challenges.

G. Vernal Pools

Vernal pools are freshwater ponds often formed by rising groundwater and increasing rainfall in the fall and winter months. Because vernal pools usually become dry in the summer, they provide an inhospitable environment for fish. The absence of fish predators enables amphibians and invertebrates, including rare species, to flourish. Through the Massachusetts Natural Heritage and Endangered Species program, the Massachusetts Division of Fish and Wildlife identifies potential vernal pools. Division staff members identify potential pools through aerial photography and pools are certified by the State through a voluntary process by which volunteers submit documentation to the state.

There are 12 certified vernal pools in Plymouth and 396 potential pools. Certified vernal pools are protected as wetland resources, but potential pools do not have any special protections.

(See Map #14 – Vernal Pools.)

IV. WATER QUALITY

Plymouth's water faces contamination threats from a variety of sources. Chief among them are septic system discharges, stormwater runoff from roads and parking lots, and fertilizers and agricultural chemicals. Other potential sources of water contamination are inadequately treated wastewater, solid waste facilities, landfills, and hazardous releases, especially from underground storage tanks. Pilgrim Nuclear Power Plant stores radioactive materials on site, which is continuously monitored to assure safety.

A. Groundwater Quality

Maintenance of groundwater quality is critical for the town's future. Plymouth's highly-permeable soil is good for recharging the Plymouth-Carver aquifer, but it also makes the groundwater vulnerable to pollutants. Because water drains rapidly through the soil to the aquifer, bacteria in the soil often are not able to remove excess nutrients, including nitrogen and phosphorous.

Septic system discharges present a particular challenge. It is difficult to monitor individual septic systems. Groundwater can be impaired by too much septic system density and by old or failing systems. Even well-drained soils have a limited percolation capacity of 10-15 years, after which septic systems and their leaching fields should be relocated. Septic systems can also cause contamination if they are located too close to, or within, groundwater.

Landfills and contaminant spills can also adversely affect groundwater. Former landfills are located at Long Pond Road, Beaver Dam Road, and Hedges Pond Road. Hazardous material release sites are shown in the table below. The Planning Department has conducted a study and review of the 165 Site/Reportable Release locations in Plymouth reported by the Massachusetts Department of Environmental Protection. The majority of these 13 sites are isolated gasoline stations and do not require direct state supervision or approval when cleaned up by a Licensed Site Professional. The Revere Copper and Brass site on Water Street is the only site identified as a viable Brownfield site. Revere Copper is a designated DEP Brownfields site monitored under tracking number RTN-4770. The Town of Plymouth is pursuing a best practice plan for the property. The Plymouth Redevelopment Authority (PRA) and the Massachusetts Department of Solid Waste, with the support of the Town, have developed a remedial action plan. Furthermore, in 2002 the Town appropriated $500,000 to purchase and clean up the land. Remediation and reuse is expected in the near future.

NAME	ADDRESS
Samoset Auto Service, Inc.	40 Samoset St.
Revere Copper & Brass	Lothrop St. at water
No Location Aid	109 Sandwich St.
Gellars, Inc.	506 State Rd.
Property	State Rd./Brook Rd.
Town Wharf Enterprises	3A Water St.
No Location Aid	23 Womponoag Rd.
Water Department	Howland St.
Mobil Station 01	109 Court St.
Levis & Song Gulf, Inc.	102 Court St.
Getty Service Station	724 State Rd.
???? Park	59 Armstrongs Rd.
Mayflower Seafoods FMR	Town Wharf
Revere Copper & Brass	5 Boundary St.

(See Map #15 – Hazardous Releases and Landfills.)

The quality of Plymouth's drinking water is continuously monitored by the State and action is taken to keep contaminants within safe ranges. Current efforts are underway to determine whether some contaminants, such as perchlorate, should be added to the list of regulated contaminants. All public water suppliers monitor water quality and produce an annual Consumer Confidence Report.

Plymouth has twelve public water supply systems. These range in scale from the Plymouth Water Company, with its 2 million gallon water reservoir and treatment plant to The Baird Center and New Testament Church, each of which draws water from a single on-site well. Plymouth's public water suppliers are Plymouth Water Company, Plymouth Water Division, Plymouth South Elementary School, Plymouth South High School, The Baird Center, New Testament Church, the Pinehills Water Company, Herring Cove Condominiums, and MCI Plymouth. The neighboring towns of Bourne and Wareham have public supply wells which rely upon recharge areas that include significant amounts of land in Plymouth.

To maintain potable water, Plymouth must limit potential pollutants, especially in and around public wells and recharge areas. As required by the federal Clean Drinking Water Act, the Massachusetts Executive Office of Environmental Affairs designates Zone I and Zone II wellhead areas around public water supplies. A Zone I wellhead area is a 100-400 feet radius around a well and is essentially a surface projection of the underground cone of depression created by the pumping activity at the well. This area must be owned or otherwise controlled by the water supplier and limited to water supply activities. Zone II is the primary recharge area for the well's aquifer, as determined by hydrogeologic studies. In areas where a well's recharge area has not been determined, the State establishes Interim Wellhead Protection Areas in place of Zone IIs. The Town of Plymouth limits uses in Zone II areas through the use of a local Aquifer Protection Zone. In addition, Title V requires a 400-foot buffer around surface public water supplies, which in Plymouth includes Great South Pond and Little South Pond. No septic systems or wastewater treatment systems are allowed within buffer zones.

(See Map #16 – Aquifer Protection.)

Most of Plymouth's Zone I areas do not meet DEP standards, because the Zone I wellhead protection areas are not fully controlled by the water suppliers and often include land uses which are not directly related to water supply activities. This is not unusual, as the establishment of Zone I requirements is relatively recent. However, to assure compliance with State requirements and limit the risk of groundwater contamination, the Town must work with public water suppliers to help them gain control over their Zone I areas, remove inappropriate uses, redirect drainage patterns, prohibit pesticide and fertilizer storage and use, and establish best management practices for storage and disposal of hazardous materials.

Zone II and Interim Wellhead Protection Areas (IWPA) need to limit land uses. Residents within Zone IIs and IWPAs need to be educated regarding their special responsibility in protecting the town's water supply. Resident education must include:

- Inspection and maintenance of septic systems and leaching fields;
- Proper handling of household hazardous wastes; and
- Stormwater and impact of pet wastes and lawn fertilizers/pesticides in creating non-point source pollution.

Roadways are obvious sources of pollution within Zone IIs, due to customary use, accidental spills, and illegal dumping. Best management practices (BMPs) direct stormwater away from groundwater sources and use natural techniques to filter pollutants from water and limit erosion. Other BMPs include regular street sweeping, inspection and maintenance of catch basins, and development of stormwater maps and town-wide stormwater plans.

PUBLIC WATER SUPPLY SYSTEMS
SUMMARY RESULTS: 2003 SOURCE WATER ASSESSMENT & PROTECTION REPORTS

Plymouth Water Company, 133 Raymond Road
Source susceptibility: Moderate
2 million gallon water reservoir and treatment plant, two wells
Zone I: 400'. Not completely controlled by water company as required by DEP.
Gravel mining, electric power transmission lines, 3 homes.
Zone II: N/A; 25% residential, roads, schools, agriculture.

DEP Zone I Recommendation: Remove non-water uses in Zone I or obtain conservation restriction/right of first refusal on residential land. Use BMPs for storage, use, disposal of hazardous materials. Prohibit storage of pesticides, fertilizers, or road salt.
DEP Zone II Recommendations: Public education for residents, limit or prohibit use of pesticides/herbicides/road salt along road right-of-ways, BMPs for stormwater management, school handling of hazardous wastes, BMPs for application of pesticides and fertilizers by cranberry farmers.

Plymouth Water Division, 11 Lincoln St.
Source susceptibility: Moderate to high
10 active; 1 inactive well
Zone I: 400' around each well. Nine wells are compliant with DEP requirements. Wannos Pond Well and Ship Pond Well have homes with septic systems within Zone I. Darby Pond Well has a cranberry bog in Zone I.
Zone II: Varies by well. Residential uses, roads, agriculture, hazardous materials storage and use, including 15 DEP-regulated facilities.

DEP Zone I Recommendations: To extent possible, remove non-water supply uses. Prohibit uses of pesticides/fertilizers/road salt.
DEP Zone II Recommendations: Public education regarding septic systems, household hazardous materials, heating oil storage, and stormwater. BMPs for stormwater. Catch basins to drain outside Zone I. For industries and businesses using, producing, and storing hazardous materials, prohibit disposal to septic systems or floor drains, educate re: BMPs, register facilities, and ensure effective emergency response in case of spills. Cranberry farmers to follow UMass Cranberry Experiment station best practices and maintain pesticide license or certification.

Herring Cove Condominiums, Nightingale Rd.
Two wells east of Nightingale Rd.
Source susceptibility: High
Zone I: 140'. Nightingale Rd. passes within Zone I.
IWPA: 473'. Residential land uses, on-site transformer.

DEP Zone I Recommendations: Reroute Nightingale Rd. so that it does not pass within Zone I or re-grade so that road drains away from Zone I. Prohibit storage of pesticides, fertilizers, and road salt.
DEP Zone II Recommendations: Inspect and maintain septic system, educate maintenance staff re: disposal of hazardous waste, direct stormwater runoff away from well, determine whether transformer has PCBs and, if so, replace. Include IWPA in town's Aquifer Protection Zone.

PUBLIC WATER SUPPLY SYSTEMS
SUMMARY RESULTS: 2003 SOURCE WATER ASSESSMENT & PROTECTION REPORTS

Plymouth South High School, 409 Long Pond Rd
Two wells
Zone I: 312′ around each well. Owned by Town but northeastern edge abuts athletic field.
Source susceptibility: Moderate
IWPA: 978′ around each well. Land uses: golf course, vehicle parking for school, access roads.

DEP Zone I Recommendations: Prohibit storage and application of fertilizer/pesticides or road salt on parts of field within or draining to Zone I.
DEP IWPA Recommendations: Limit fertilizer/pesticide use on golf course. Ensure that hazardous materials uses in classrooms and building operations and maintenance are properly handled, stored, and disposed of. Direct stormwater drainage from parking lot and access roads away from wellhead. Include IWPA in Aquifer Protection Zone.

Pinehills Water Company
431 Beaver Dam Road
Three wells
Zone I: 400′ around each well. Fully owned and controlled by Pinehills LLC. Only water supply uses allowed.
Zone II: N/A. Land uses include residential (7%), golf course, Plymouth Fire Station, Route 3, local roads.
Source susceptibility: Moderate

DEP Zone II Recommendations: Public education re: storage and disposal of household chemicals, inspection and maintenance of septic systems and oil storage tanks, adopt BMPs for stormwater management. Limit storage and use of pesticides and fertilizers on golf course. Use BMPs for handling of chemicals and washing trucks at fire station.

Ensure that stormwater drains discharge outside Zone II. Inspect, maintain, and clean catch basins. Street sweep regularly. Develop storm drainage maps. Limit use of pesticides/fertilizers along right-of-ways.

Plymouth South Elementary School
One well
Zone I: 221′. Water supplier does not own all of Zone I land. Land uses include part of school, parking area, and access roads.
IWPA: 542′. School septic system, parking, and access roads.
Source susceptibility: Moderate

DEP Zone I Recommendations: Remove non-water supply uses or consider relocation of well. Direct parking lot and road drainage away from well. Prohibit storage/use of pesticides, fertilizers, road salt. Prohibit disposal of hazardous materials in school drains within Zone I.
DEP IWPA Recommendations: Inspect/maintain septic system. Prohibit storage/use of pesticides/fertilizers/road salt. Public education to school personnel and students. BMPs for lawn care. IWPA within Aquifer Protection Zone.

The New Testament Church
1120 Long Pond Rd
One well
Zone I: 250′. Owned by church but land uses include parking and part of church's septic system.
IWPA: 750′. Above-ground storage tanks with heating oil, residential uses, roads.
Source susceptibility: Moderate
Water treatment: None

DEP Zone I recommendations: Direct parking lot drainage away from wellhead. Prohibit disposal of hazardous chemicals, fertilizers, pesticides, and road salt within Zone I.
DEP IWPA recommendations: Stormwater BMPs, public education for residents, ASTS to be located on impermeable surface and contained in area large enough to hold 110% of spill volume. Encourage AST owners to upgrade tanks to incorporate proper containment and safety features.

MCI Plymouth, Myles Standish Forest
GP Well Forestry Camp, east side of Circuit Drive north of facility
One well
Zone I: 250′. Includes athletic field.
IWPA: 720′. Includes prison, 1000 gallon underground storage tank for a backup diesel generator, vehicle parking lots, and very small quantity hazardous waste generator.
Source susceptibility: High
Treatment added: Chlorine and potassium hydroxide

DEP Zone I Recommendations: Remove athletic field, prohibit use of pesticides/fertilizers.
DEP IWPA Recommendations: Consider replacing diesel generator with liquid propane-powered generator; BMPs to reduce risk of spills; educate prison officials to ensure that BMPs in place for handling, storage, and disposal of hazardous materials.

The Town of Plymouth currently conducts its wastewater treatment and disposal within a watershed context. Plymouth has a 3 million gallons per day state-of-the-art wastewater treatment plant located at Camelot Industrial Park near Route 3 at Exit 5. In operation since the summer of 2002, the treatment plant discharges 1.75 mgd of treated effluent to Plymouth Bay through the existing outfall pipe at Samoset Street. The plant has the capacity to handle 1.25 mgd through on-site infiltration basins along the Eel River. The current State DEP permit restricts the plant to .75 mgd of on-site infiltration. The treatment plant is treating and discharging sewage within State-permitted standards.

Plymouth is developing and implementing a Nutrient Management Plan to minimize the impact of wastewater treatment and non-point source nutrient pollution on Plymouth Harbor, the Eel River, and the 15.4-mile Eel River Watershed. The Nutrient Management Plan has six components:

- Public education to improve septic system maintenance, encourage green lawn care, reduce improper disposal of household hazardous wastes and pet wastes, and address risks associated with above-ground and underground storage tanks (home heating oil);
- Open space and setback requirements focused on increasing buffer zones around water resources;
- Stormwater and runoff controls to include enforcement of subdivision bylaw and erosion/sediment controls, expansion of best management practices (BMPs) along roadways (*e.g.*, vegetated buffers, infiltration basins, water quality swales, street sweeping, catch basin maintenance) and development of Stormwater Management Plan as per Phase II EPA/DEP requirements;
- Septic systems management, including mapping of existing systems, analysis of effects, and possible development of regulations to address septic impacts on water quality by requiring inspection and pump-out of systems and upgrades for existing septic systems near water resources;
- Cranberry bog best management practices, including continuation of existing BMPs and possible development of additional BMPs, along with support for cost-effective efforts to limit the impact of fish hatcheries on water quality; and
- Reclaimed water use at golf courses or recreational fields.

The town monitors 20 chemical and biological indices to detect any changes in groundwater or surface water within the watershed. Plymouth's aim is to manage nutrients so that there is no increase in phosphorous load. Massachusetts is likely to set goals for nitrogen within 1-2 years, after analyzing the results of a Plymouth Harbor study.

Many of the practices targeted for the Eel River Watershed are suitable for town-wide implementation. Plymouth has been active in addressing stormwater impacts throughout town, through the funding and implementation of specific stormwater projects. Plymouth has also been working cooperatively with the towns of Duxbury and Marshfield to develop a model stormwater bylaw.

Finally, Plymouth is in the process of developing a new Water Master Plan that will address existing infrastructure, future growth, water supply needs, and land protection, including the impact of water withdrawals on our coastal plain pond communities.

B. Ocean

A variety of sources contribute to pollution in Plymouth Harbor. These include:

- Inadequately treated wastewater discharged directly to the harbor from the former Water Street treatment plant (recently upgraded to correct issues)
- Stormwater runoff from downtown streets, especially the Samoset Street corridor, which has adversely impacted the Harbor
- Near-shore use of fertilizer
- Septic system discharges

Due to pathogen levels, both Plymouth Bay and Plymouth Harbor are Category 5 waters requiring a Total Maximum Daily Load in the Massachusetts Year 2004 Integrated List of Waters.

The Town is engaged in a variety of clean-up measures aimed at restoring the health of the harbor. The new wastewater treatment plant is discussed above. The Town is addressing stormwater impacts on the harbor through stormwater mitigation projects at Town Brook, Stephens Field, Howes Lane, Lincoln Street, and Samoset Street.

C. Ponds and Lakes/Coastal Plain Ponds

Pond quality is determined by inputs from surface run-off and groundwater constituents entering ponds, such as from poorly-sited or -maintained septic systems. All of these contain excess nutrients, which accelerate the natural aging of ponds, stimulating the growth of algae, reducing the amount of dissolved oxygen in the waters, and leading to invasive plant growth and, ultimately, the loss of plant and animal life in the pond. This process is known as eutrophication.

Pond recharge areas, especially subsurface recharge areas, have not been delineated for most ponds in Plymouth, although The Nature Conservancy is working to delineate recharge areas around Plymouth's coastal plain ponds.

The Massachusetts 2004 Integrated List of Waters is a report listing the results of water quality assessments throughout Massachusetts. Surface waters are assessed to determine whether they have attained the quality needed to support their designated use. Designated uses include aquatic life, fish shellfish consumption, drinking water, primary and secondary contact. Waters are further analyzed to determine pollutant levels. Those waters whose pollutant levels exceed state and federal limits for designated use are impaired. A Total Maximum Daily Load (TMDL) is established for impaired water bodies. A TMDL is "the maximum amount of pollutant that may be introduced into a waterbody and still ensure attainment and maintenance of water quality standards. Furthermore, a TMDL must also allocate the

acceptable pollutant load among all potential uses."[14] (Waters are assessed in a 5-year cycle, with data collection activities occurring in the first 2 years of the cycle and TMDL development, permitting, and allocation of grant funds occurring in the last 3 years of the cycle.)

The Integrated List is a useful tool but incomplete because many ponds and lakes, especially in Plymouth, have not been assessed for their designated use. The List assigns water bodies to one of five categories:

Category 1: Unimpaired and not threatened for all designated uses
Category 2: Unimpaired for some uses and not assessed for others
Category 3: Insufficient information to make assessments for any uses
Category 4: Impaired or threatened for one or more uses but not requiring the classification of a TMDL
Category 5: Impaired or threatened for one or more uses and requiring a TMDL

IN 2004, PLYMOUTH'S WATER BODIES WERE CLASSIFIED AS FOLLOWS:

Category 1: Waters

None in Massachusetts due to state-wide fish advisory.

Category 2: Attaining some uses, other uses not assessed

Primary and Secondary Contact (Swimming and Boating)

Charge Pond, College Pond, Curlew Pond, Fearing Pond, New Long Pond

Secondary Contact, Aesthetics

Bartlett Pond, Black Jimmy Pond, Bloody Pond, Boot Pond, Elbow Pond, Forge Pond, Fresh Pond Gunners Exchange Pond, Hedges Pond, Hoyt Pond, Island Pond, Little Herring Pond, Little Pond, Little South Pond, Lout Pond, Morey Hole, Savery Pond, Triangle Pond

Category 3: No uses assessed

Abner Pond, Big Rocky Pond, Big Sandy Pond, Deer Pond, East Head Pond, Ezekiel Pond, Fawn Pond, Five Mile Pond, Gallows Pond, Halfway Pond, Kings Pond, Little Long Pond, Little Rocky Pond, Little Sandy Pond, Little West Pond, Long Duck Pond, Long Pond, Mare Pond, Rocky Pond, Round Pond, Three Cornered Pond, Wankinco River (although some portions are assessed as Category 5), Whites Pond, Eel River, North Triangle Pond, Shallow Pond, Ship Pond, South Triangle Pond

Category Four: Impairment not caused by pollutant

Exotic species: Beaver Dam Pond, Briggs Reservoir, Cooks Pond, Island Pond (west of Manomet section), Long Island Pond

[14] Massachusetts Department of Environmental Protection, Division of Watershed Management, Proposed Massachusetts Year 2004 Integrated List of Waters, April 2004, p. 2.

Category Five: Waters requiring a TMDL

- Agawan River: unknown toxicity, unionized ammonia, nutrients, organic enrichment/low dissolved oxygen, pathogens
- White Island Pond: nutrients, organic enrichment/low dissolved oxygen, noxious aquatic plants, turbidity, exotic species
- Billington Sea: noxious aquatic plants, turbidity
- Great Herring Pond: metals
- Great South Pond: metals
- Russell Millpond: noxious aquatic plants
- Plymouth Bay: pathogens
- Plymouth Harbor: pathogens
- Wankinco River: nutrients, pathogens

D. Rivers

As noted above, the Eel River is an eventual effluent receptor of the town sewage treatment plant and Plymouth's wastewater discharge permit requires ongoing monitoring of the river's status to identify changes in nutrient levels. Eel River is also downgradient from the now-capped landfill behind the current police station. Of course, all of Plymouth's rivers are vulnerable to pollutants. In addition, water withdrawals for irrigation can also adversely impact rivers. Both Agawam and Wankinco appear to have lost fish population due to water withdrawals for irrigation. Fish populations have also significantly diminished in Eel River, Town Brook, and Red Brook, and the loss of fish population may be attributable to dams, pollution, hydrologic alterations, and temperature changes. These reductions in fish population are particularly problematic because anadromous fish runs are vitally important to fishery health. The species which spawn in Plymouth's rivers are significant to the food chain in the ocean. Fish spawning in Plymouth's fresh waters need long-term protection to assure biodiversity in all affected habitats. Plymouth's Parks Deparment is addressing the impact of dams by removing dams along Town Brook and Jenney Pond.

E. Coastal and Fresh Water Wetlands

Threats to wetland viability generally include filling and dredging, direct discharges of polluted road run-off, excessive water table reductions, leaching of fertilizers and pesticides/herbicides from adjacent land uses, and siltation from upland erosion. Excessive nutrients from roads, fields, or septic systems damage wetlands, spurring the growth of invasive species such as Purple Loosestrife and Phragmites. Certain wetland resources, such as natural bogs, are also vulnerable to humans trampling on the peat.

While the bogs themselves and their immediate buffer areas are protected by the Wetlands Protection Act, they may still be threatened by actions taken far off site, such as hydrologic alteration. All wetland communities, even those not considered rare, warrant adequate buffering from disruptions to preserve their natural ecological functions.

F. Cranberry Bogs

Cranberry farming has the potential to impact ponds and lakes due to the volume of water required for cranberry harvesting and the use of pesticides, fertilizers, and fungicides, all of which drain into the ground or run off when cranberry fields are flooded with water. The volumes of water used in cranberry farming have been shown to depress the water table, which leads to a reduction in the elevation of coastal plain ponds, threatening these ponds and the rare species which live in them. The DEP South Coastal Nonpoint Pollution Assessment Project found that pond impairment from noxious aquatic weeds was linked to cranberry farming activities. However, best management practices limit potentially negative impacts of cranberry harvesting. The University of Massachusetts Cranberry Experiment Station has published a Best Management Practices Guide and Cranberry Production Guide which outlines recommended practices.

G. Vernal Pools

Excessive water draw-downs are a threat to vernal pools, as is development near vernal pools. Wildlife associated with vernal pools often live near but not in the pools. Protection requires that vernal pools be certified and that adequate buffers are protected around pools.

V. FORESTS

Most of Plymouth forests are either oak or pine barrens. Plymouth oak forests consist mostly of white oak supported by other oak varieties, white pines, pitch pines, and red maples. The pine barrens are characterized by coastal pitch pine and scrub oak trees coupled with low lying berries and bracken fern. Plymouth's pine barrens forests are especially important because there are only three major concentrations of such forests in the world: Plymouth's pine barrens and the pine barren forests in New Jersey and Long Island. The sandy, well-drained soil in the Plymouth area provides the basis for the pine barrens.

The Plymouth pine barrens contain several frost pockets, which are landscape depressions which can develop frost conditions throughout the year. Because frost is possible at any time, the depressions have few trees and support only low-lying vegetation such as scrub oak, huckleberry, bearberry and grasses. The pine barrens support six rare and endangered plant species and numerous common and rare animal species.

Fires play a critical role in maintaining the pine barrens communities, which have evolved to be fire-dependent. The continued encroachment of residential development into pine barrens forest puts such homes at risk of destruction from wind-driven forest fires. It also increases the suppression of fires, which would otherwise burn out naturally. This effectively increases the intensity of catastrophic fires

when they do occur because of the natural build-up of forest duff layers which burn at much higher temperatures and with more intensity than if they build up over time.

The largest assemblage of pine barrens forest in Plymouth is Myles Standish State Forest. The oldest and largest public park in Massachusetts, Myles Standish has 12,500 acres of forestland with 16 ponds and a variety of recreational facilities. When Massachusetts originally acquired Myles Standish, much of the forest area had recently burned.

(See Map #17 –Historic Forest Fires and Map #18–Pine Barrens.)

VI. AGRICULTURE

Outside of cranberry farming, Plymouth has limited agriculture. Active farms are County Farm, Obery Street, Barengo's Farm, Route 44, and hay farms along Eel River, Jordan Road, Clifford Road, and Old Sandwich Road. Some of these hay farms have permanent development restrictions; others are vulnerable to development pressures.

VII. WILDLIFE

Plymouth's varied habitat supports many animals, including both common species and those considered rare and endangered. The State of Massachusetts Natural Heritage and Endangered Species Program lists 23 rare animals in Plymouth. As the 2004 Plymouth Open Space and Recreation Plan notes, "Virtually no other town in Massachusetts has the benefit of hosting such a significant portion of the biological diversity of the Commonwealth."

Gray fox, deer, and wild turkey are found throughout town. Other species are associated with particular habitats. Some of the common and rare species found in Plymouth and their primary habitats are:

HABITAT	COMMON SPECIES	RARE/ENDANGERED SPECIES
COASTAL AREA: **PLYMOUTH LONG BEACH** **ELLISVILLE HARBOR**	Migratory shorebirds, including terns and plovers	
PINE BARRENS FORESTS		Barrens buckmoth Whippoorwill Insects and moths
RIVERS	Anadromous fish: alewives, herring, white perch, rainbow trout, rainbow smelt Fresh water fish: brook, brown, and rainbow trout	

HABITAT	COMMON SPECIES	RARE/ENDANGERED SPECIES
COASTAL PLAIN PONDS	45 species of dragonflies & damselflies, turtles	Blue spotted salamander, Plymouth red belly turtle, triangle floater, comet darner, spotted turtle, New England bluet, pine barrens bluet, walker's limpet, tidewater mucket, eastern pond mussel, osprey, smooth branched sponge
OCEAN	Bluefish, cod, flounder, mackerel, pollock, shad smelt, striped bass, clams, crabs, mussels, mollusks, lobsters and scallops	

Rare species habitat is concentrated in the western, central, and southern parts of Plymouth, where there is significant unfragmented pine barrens forest. Unfragmented areas are critical to the viability of many rare species.

Shell fishing and lobstering are managed through licensing of harvesters and regulation of harvesting areas.

Land development threatens rare and common animal species. Common species which have previously thrived in Plymouth are increasingly being displaced by subdivisions and wildlife corridors for animal movement are increasingly less viable as sprawl continues.

VIII. AIR

Local and regional factors affect air quality in Plymouth. Prevailing national wind patterns drive pollutants from midwest industrial areas through the northeast urban corridor and across Massachusetts. Locally generated air pollution is primarily derived from automobiles and home heating systems.

Ground level ozone is created when chemicals in motor vehicle exhaust combine with naturally occurring heat from sunlight. In New England, between May and September, ozone is frequently present in quantities that exceed national air quality standards and can cause harm, especially to people with respiratory ailments.

Local levels of ozone can be reduced through reduction of automobile use, reduction of street level temperature (through methods such as the planting of shade trees along streets and paved parking areas), and the use of alternative energy sources for home heating and hot water.

IX. NATURAL RESOURCES OBJECTIVES AND STRATEGIES

Objective 1:

Protect groundwater and assure an abundant supply of clean drinking water.

STRATEGY:

Protect land in Zone I and Zone II wellhead protection areas.

Objective 2:

Protect Plymouth's water resources from non-point source pollution.

STRATEGY:

Develop and implement a town-wide stormwater management plan.

Objective 3:

Restore and maintain the quality of Plymouth's ponds, lakes, rivers, and wetlands.

STRATEGY:

Delineate recharge areas, expand water quality monitoring, and implement remediation and management plans based on water quality data and recharge mapping.

Objective 4:

Increase access to freshwater and salt water resources, where such access is consistent with natural resource protection.

STRATEGY:

Create new beach access points in coastal villages and around selected ponds, with the appropriate resources needed to support these uses.

Objective 5:

Protect and restore ocean waters and coastal zones.

STRATEGY:

Continuously monitor and upgrade wastewater treatment systems to limit adverse impacts on Eel River and Plymouth Harbor.

STRATEGY:

Prevent harm to life and property from coastal flooding.

STRATEGY:

Implement other strategies to maintain ocean health.

Objective 6:

Protect Plymouth's characteristic vegetation, especially pine barren forests, and prevent forest fragmentation.

STRATEGY:

Preserve forest land through acquisition, conservation restrictions, and zoning regulations.
Establish green networks, linking open spaces via wildlife corridors, trails, and greenways.
Restrict activities which disturb natural vegetation and encourage replanting and maintenance of plants in public areas.

Objective 7:

Protect wildlife–both common species and "rare, endangered and threatened species"–through the protection of wildlife habitat, breeding areas, and wildlife corridors.

STRATEGY:

See Objective 8 below.

Objective 8:

Coordinate environmental protection and open space planning activities.

STRATEGY:

Pursue a coordinated land preservation strategy, using acquisition, incentives, partnerships, and regulation to protect natural resources and open space.

Objective 9:

Improve air quality.

STRATEGY:

Implement transportation objectives aimed at reducing roadway demand.

X. KEY ACTIONS:

Objective 1:

Protect groundwater and assure an abundant supply of clean drinking water.

STRATEGY:

Protect land in Zone I and Zone II wellhead protection areas.

- Work with water suppliers to help them gain ownership or control of Zone I areas.
- Remove non-complying uses from Zone I areas.
- Develop comprehensive wellhead protection programs to include establishment of wellhead protection committees, development and testing of emergency response plans for spills within Zone IIs, public education for residents within Zone IIs, and incentives and requirements for septic system inspections, pump-outs, and upgrades.

- Work with local cranberry farmers to encourage best management practices, especially within Zones I and II.
- Continue to restrict development in Zone II and Interim Wellhead Protection Areas.
- Identify possible new locations for wells and secure land around sites.
- Evaluate water and waste impact of new developments and develop a system of impact fees, open space requirements, and other tools to mitigate environmental impacts of large-scale development projects.
- Work with towns that share the Plymouth-Carver aquifer to protect and manage water quality and quantity.

See also Open Space and Recreation, Objective 1: Utilize open space planning to advance the Town's priority Natural Resource objectives: water protection and land conservation.

Objective 2:

Protect Plymouth's water resources from non-point source pollution.

STRATEGY:

Develop and implement a town-wide stormwater management plan to include:

- Mitigation of all known storm drain discharges from public ways that directly or indirectly enter Plymouth Bay, Cape Cod Bay, and Plymouth Harbor.
- Elimination of all direct discharges of road run-off into wetland resources, both inland and coastal, through installation of interceptor drains that filter the runoff as it discharges to the water table.
- Prioritize remediation in areas with known water quality problems.
- Town investment in stormwater BMPs along roadways and Town properties.
- Regulations requiring private developments to provide onsite stormwater capture and filtration.
- Incentives for existing developments to improve stormwater management efforts.
- Public education for town residents.

Objective 3:

Restore and maintain the quality of Plymouth's ponds, lakes, rivers, and wetlands.

STRATEGY:

Delineate recharge areas, expand water quality monitoring, and implement remediation and management plans based on water quality data and recharge mapping.

- Restore and maintain waters in Billington Sea, Halfway Pond, and Long Pond to address nutrient loading and noxious weed problems.
- Delineate surface and subsurface recharge areas to Plymouth ponds and rivers and use conservation restrictions, outright purchase, and other conservation tools to limit adverse land uses in recharge areas.

Develop a pond management plan which addresses different pond types, uses, and sensitivities.

- Expand water quality monitoring in Plymouth's fresh waters and work to identify and remediate pollutant sources.
- Identify recharge areas around coastal plain ponds and coastal plain pond clusters. Protect coastal plain ponds through creation of land buffers with particular emphasis on protection of land around coastal plain pond clusters. Utilize conservation and open space tools to convert polluting land uses and protect open parcels.
- Restrict access to coastal plain ponds and develop mechanisms for addressing existing development in fragile pond areas.
- Identify, certify, and protect vernal pools throughout the town. Establish 300-feet buffer areas around certified vernal pools, restricting any disturbance.
- Amend Zoning Bylaw to create a Conservancy District around wetlands, recharge areas for ponds, and waterways.

Objective 4:

Increase access to freshwater and salt water resources, where such access is consistent with natural resource protection.

STRATEGY:

Create new beach access points in coastal villages and around selected ponds.

- Create new beach access points in four coastal villages and develop management plans for protection of beach areas.
- Identify ponds which are suitable for recreation and develop facilities to support access.

See also Open Space and Recreation, Objective 5: Increase access to ponds and ocean.

Objective 5:

Protect and restore ocean waters and coastal zones.

STRATEGY:

Continuously monitor and upgrade wastewater treatment systems to limit adverse impacts on Eel River and Plymouth Harbor.

- Improve wastewater treatment to further reduce salt water impacts from the Eel River, which eventually receives the groundwater discharge from the sewage treatment plant. Develop plans to continuously monitor discharges and upgrade plant facilities as new technologies, including living systems, become available for the further cleansing of waste water at a reasonable cost.

STRATEGY:

Prevent harm to life and property from coastal flooding.

- Prevent building or re-building in all "V" (velocity) flood zones and all coastal floodway areas prone to high-velocity coastal flooding, such as along Taylor Avenue in Manomet by amending the Zoning Bylaw to further restrict development in the Flood Plain Overlay District. Such restrictions should be coupled with compensatory measures to include TDR or direct Town purchase of affected properties.
- Prevent coastal erosion by increasing required building setbacks.

STRATEGY:

Implement other strategies to maintain ocean health.

- Map and protect areas for fish and shellfish growth and nourishment.
- Continue to implement the boat pump-out program.

Objective 6:

Protect Plymouth's characteristic vegetation, especially pine barrens forests, and prevent forest fragmentation.

STRATEGY:

Preserve forest land through acquisition, conservation restrictions, and zoning regulations.

See key actions listed under Objective 8 below.

STRATEGY:

Establish green networks, linking open spaces via wildlife corridors, trails, and greenways.

- Continue to acquire parcels and funding to develop the "Wishbone" that links Ellisville State Park to the Downtown Harbor.
- Work with neighboring communities to link Plymouth trails and wildlife corridors to regional trails and corridors.

See also Objective 8, below, and Open Space and Recreation, Objective 2: Create town-wide Green Networks.

STRATEGY:

Encourage the planting and maintenance of shade trees within developed areas and along roadways.

Objective 7:

Protect wildlife–both common species and "rare, endangered and threatened species"–through the protection of wildlife habitat, breeding areas, and wildlife corridors.

See key actions under Objective 8, below.

Objective 8:

Coordinate environmental protection and open space planning activities.

STRATEGY:

Pursue a coordinated land preservation strategy, using acquisition, incentives, partnerships, and regulation to protect natural resources and open space.

- Using criteria established in the 2004 Open Space and Recreation Plan, evaluate and rank open spaces according to criteria for environmental sensitivity and scenic and cultural value.
- Prioritize preservation of pine barren forests, especially core areas of unfragmented pine barrens habitat and large parcels over 100 acres.
- Create permanent connections between priority open space resources by preserving wildlife corridors.
- Work with nonprofit conservation organizations to protect critical open space.
- Seek donation of conservation restrictions from landowners who will benefit by reduced property taxes. Seek federal and state funds to implement acquisition strategy.
- Seek additional revenue streams for conservation purposes, such as a land transfer tax or other designated and renewable funding sources.
- Continue to utilize Community Preservation Act funds for acquisition of priority sites and work with government agencies and nonprofit organizations to tap additional sources of funds available for acquisition and easements.
- Establish development standards with incentives for protection of large blocks of open space, public access, or other public benefits.
- Seek funds (above and beyond CPA funds) for land protection. One possible approach is the establishment of a Matching Fund program, through which Plymouth would commit to an annual conservation appropriation and work to obtain matching commitments from the federal government (Department of Interior), state agencies (MA DEM, Division of Fisheries and Wildlife), and conservation nonprofits (The Nature Conservancy, Trustees of Reservations, Wildlands Trust of Southeastern Massachusetts). Another option is a Land Bank surcharge tax on real estate.
- Fund a full-time Land Protection Specialist to act as the Town's acquisition agent and coordinate land protection activities.

Many of these Objective 8 key actions are also listed under Open Space and Recreation, Objective 1: Utilize open space planning to advance the Town's priority Natural Resource objectives: water protection and land conservation.

Objective 9:

Improve air quality.

STRATEGY:

Implement transportation objectives aimed at reducing roadway demand.

3. Open Space and Recreation

I. INTRODUCTION

Plymouth's abundance of open space presents both a threat and an opportunity. Substantial development of currently vacant lands would create unacceptably high densities in Plymouth, straining the Town's ability to provide services, maintain rural character, and protect natural resources. However, successful open space planning, including acquisition of key sites, strengthening of regulatory controls, and improvement of management and maintenance, will facilitate Plymouth's efforts to control sprawl, maintain water quality, and protect natural resources. Open space preservation is also a key component of Plymouth's efforts to attract tourism and provide recreational opportunities.

II. OPEN SPACE

A. Permanently-Protected Open Space

Plymouth has **17,744** acres of permanently-protected open space. At **12,500 acres**, **Myles Standish State Forest** represents a significant percentage of this protected land. Owned by the Commonwealth's Department of Conservation and Recreation, the park has miles of trails for hiking, horseback riding, biking, cross-country skiing, and snowmobiling. It provides camp sites and several ponds for swimming and fishing. As noted in the Natural Resources chapter, Myles Standish State Forest consists primarily of pine barrens woodlands, a globally-rare ecosystem which supports many rare and endangered plants and animals. **Ellisville State Park** is a 45-acre waterfront park and nature preserve adjacent to Cape Cod Bay. Three other State-owned conservation areas are **Triangle Pond**, **Red Brook**, and **Grassy Pond**, totaling **120 acres**.

The federal government owns the **Massasoit National Wildlife Preserve**, totaling **198 acres** of conservation land.

The **Town of Plymouth** owns **2,349 acres** of permanently-protected conservation land on approximately 30 sites and has secured an additional **2,450 acres** of protected land through conservation restrictions established on the **Pinehills Open Space Mixed-Use Development**. An additional **400 acres** of permanent conservation restrictions were pending in 2005. The largest Town-owned conservation areas are:

NORTH PLYMOUTH	Russell Sawmill Hedge Pond Conservation Area
MANOMET	Beaver Dam Conservation Area
	Carolyn Drive Conservation Area
	Indian Brook Conservation Area
	Little Island Pond Conservation Area
CEDARVILLE	Cedarville Conservation Area
PINE HILLS	Briggs Estate
FEDERAL FURNACE	Town Forest
	Boot Pond Conservation Area
	Russell Mill Pond Conservation
	Rocky Pond Conservation Area
LONG POND ROAD	Bloody Pond

In addition, there are over 30 privately-owned conservation areas, which provide additional acres of permanently-conserved land. Conservation groups active in Plymouth include the Wildlands Trust of Southeast Massachusetts, the Nature Conservancy, the Six Ponds Association, the Eel River Watershed Association, the Trustees of Reservations, and the Manomet Center for Conservation Sciences.

Some of the conservation areas in Plymouth restrict any public access; others are used for activities including passive recreation, nature study, hiking, swimming, boating, picnicking, and fishing.

(See Map #19 – Permanently Protected Open Space.)

B. Temporarily-Protected Open Space

Under Massachusetts General Laws Chapters 61, 61A, and 61B, properties which are used for agriculture, recreation, and forestry may apply for tax abatements for as long as these uses continue. These lands are temporarily-protected open space. If any of these lands is sold, the town has the right of first refusal and abated taxes must be repaid if the land is sold for development purposes. There are **13,268 acres** of temporarily-protected "Chapter 61" property in Plymouth.[15]

In addition, Entergy owns **1,600** acres of open land surrounding the Pilgrim Nuclear Power Plant. These lands are temporarily protected from development while Entergy owns the property.

(See Map #7 – Chapter Land.)

[15] FY2004 Plymouth Assessor's Records.

C. Wetlands

Plymouth has **11,328** acres of wetlands and open water areas.[16] Unless there is a change in Massachusetts law, these lands are effectively protected from development under the provisions of the Massachusetts Wetlands Protection Act.

D. Prioritizing Open Space Preservation

Because Plymouth has such an abundance of natural resources, the Town cannot protect all of its existing assets. In fact, some environmentally-sensitive areas—an estimated 8,000 acres-- are already partially developed. The town's Open Space Planning Committee has developed ranking criteria for the preservation of open space.[17] These criteria prioritize the following areas for protection:

- Environmentally-sensitive areas, including wetlands, vernal pools, surface water sources, wildlife habitat, and pine barrens forests;
- Lands around existing and potential wells (Zone I , Zone II, Interim Wellhead Protection Area)
- Historic landscapes
- Agricultural properties
- Scenic views

Large tracts of land, especially land over 100 acres, are prioritized for conservation, as are properties needed to establish or maintain wildlife corridors.

III. RECREATION

In addition to lands set aside for conservation purposes, Plymouth has a significant inventory of active parkland. This includes historical monuments and open spaces, large town parks, small village parks and playgrounds, school facilities, and beaches.

(See Map #20 – Town Owned Land.)

A. Town Parks

Brewster Gardens/Jenney Pond Park/Town Brook Nature Trail/Billington Street Park

These four linked parks run along Town Brook from the harbor area to Billington Sea. Brewster Gardens is the site of the original garden plot tilled by Pilgrim William Brewster in 1620, and the adjacent lands formed the nucleus of the original settlement at Plymouth. Jenney Mill is a replica of an early grain mill.

[16] MassGIS.

[17] Massard, Valerie. Plymouth Open Space and Recreation Plan, December 2004 Draft, pp. 120-121.

Historic Monuments of Downtown Plymouth and Historic Cemeteries
Other open spaces and monuments of Plymouth's downtown area are relatively small in size, but their historic importance makes them significant for the entire town. Pilgrim Memorial Park, Cole's Hill, Burial Hill, and the National Monument to the Forefathers are all among the main historic attractions which draw tourists to Plymouth.

Beyond the downtown area, Plymouth has a variety of historic cemeteries, including Native American cemeteries and the Parting Ways Cemetery. Just south of downtown, the Training Green is one of the oldest town parks, cleared in 1711 and later landscaped by Frederick Law Olmsted.

Morton Park/Billington Sea
Morton Park/Billington Sea, a 200-acre park west of downtown, was established in 1889. It includes swimming beaches along Little Pond and Billington Sea, forest areas, and walking paths.

Forges Field/Crosswinds Golf Course
Forges Field is a new park with soccer, baseball, and football playing fields and a large playground.

B. Village Parks and Playgrounds

There are 22 village parks and playgrounds in Plymouth. Fifteen of these parks and playgrounds are in North Plymouth, Plymouth Center, and Manomet. Both Cedarville and West Plymouth have one park each, but the parks are relatively large in scale. Federal Furnace has no village parks and Bourne Road has two playgrounds, both under an acre in size.

C. School Playing Fields

All local schools have adjacent recreation fields, which may also include basketball, tennis courts, and playground equipment.

D. Indoor Recreation

There are two major indoor recreation facilities: the publicly-owned Manomet Youth Center/Bartlett Hall in Manomet and the nonprofit Plymouth Boys and Girls Club in North Plymouth.

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
PLYMOUTH CENTER		
HISTORIC DOWNTOWN OPEN SPACES		
Town Wharf	Commercial fishing, boat tours	
National Monument to the Forefathers (S)	Monument	10
Plymouth Maiden Monument	Monument	<1
Fisherman's Memorial Park	Park	<.1

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
PLYMOUTH CENTER		
Pilgrim Memorial Park	Wharf, Mayflower II, Plymouth Rock	6
Brewster Gardens	Historic park	4
Jenney Pond Park	Historic park	3
Billington Street Park/Town Brook	Historic park	35
Training Green	Historic park (Olmsted)	1
VILLAGE PARKS AND PLAYGROUNDS		
Stephens Field	Playground, swimming, boat launch, fields	8
Holmes Playground	Playground, ball courts and fields, fish ladder	2
Sirroco Memorial Playground	Playground/basketball court	1
Haskell Field/Avery Memorial Playground	Baseball field	3
Sever/Allerton Street Playground	Playground/playfield/skateboard park	1
Depot Park	Ornamental park	<1
Mabbett Park	Picnic area	1
Burton Park	Ornamental park	1
SCHOOL PLAYGROUND AND PLAYING FIELDS		
Nathaniel Morton School	Playground/playfields	4
Mt. Pleasant School	Playground/playfields	2
Cold Spring School	Playground/playfields	7
Plymouth North High School	Ball fields, tennis courts, gym	42
BEACH/CONSERVATION AREA		
Plymouth Beach/Long Beach	Beach	3
TRAIL		
Jackson (Jacobson Park)	Nature trail	1
CEMETERIES		
Cole's Hill (S)	Pilgrim burial site	1
Burial Hill	Historic cemetery	6
Vine Hill Cemetery	Cemetery	34
Oak Grove Cemetery	Cemetery	17
Braley and Caswell Cemetery	Cemetery	25
PRIVATELY OWNED RESOURCES		
Manter's Point	Permanent conservation	1
Plymouth Country Club	Golf, tennis	215
Long Beach Conservation Area	Permanent conservation	<1
OTHER		
Plymouth County Courthouse (C)	Courthouse	<1
Plymouth County Farm (C)	County farm	207

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
NORTH PLYMOUTH		
VILLAGE PARKS AND PLAYGROUNDS		
Nelson Memorial Playground	Waterfront park, playground, boat launch	10
Veterans Memorial Playground	Park and playground	3
Siever Field	Baseball, basketball, and playground	5
SCHOOL PLAYGROUNDS		
Hedge School	Playground abuts conservation area below	3
CONSERVATION AREA		
Russell Sawmill-Hedge Pond	Conservation, hiking, fishing	64
TRAIL		
North Plymouth Rail Trail	Rail trail under construction	16
PRIVATELY-OWNED RESOURCES		
Plymouth Boys and Girls Club	Clubhouse, pool, and playing fields	
Holmes Field	Permanent conservation	26

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
MANOMET		
VILLAGE PARKS AND PLAYGROUNDS		
Briggs Playground	Playground/ball fields/basketball/tennis	4
Brook Road Playground	Playground/ball fields/basketball	5
Emerson Playground	Baseball/tennis (LT lease from Entergy)	5
Fresh Pond Park/Indian Cemetery	Passive recreation, swimming, boating, fishing, cemetery	13
Manomet Recreation Facility	Playground/ball fields	7
SCHOOL PLAYGROUNDS AND PLAYING FIELDS		
Indian Brook Elementary School	Ball fields/basketball	15
Manomet Elementary School	Playground/field	4
INDOOR FACILITIES		
Manomet Youth Center/Bartlett Hall	Indoor gym	<1
CONSERVATION AREAS		
Bartlett Pond	Conservation/hiking	13
Beaver Dam Road Conservation Area	Conservation/hiking/fishing	119
Carolyn Drive Conservation Area	Conservation-limited access	167
Indian Brook Conservation Area	Conservation/hiking	50
Little Island Pond Conservation Area	Conservation/hiking/swimming	119
Pond View Circle Conservation Area	Conservation	<1
Rabbit Pond	Conservation	1
Shallow Pond-pond frontage only	Conservation-no access	2
State Road	Conservation	<1
Taylor Avenue Wetlands	Conservation/hiking	6
BEACH		
Manomet Bluffs	Beach area below bluffs	5
White Horse Beach	Dunes and beaches/swimming/fishing	15

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
MANOMET		
TRAILS		
Old Sandwich Road Trail		N/A
LANDING		
Churchill Landing		N/A
GROUNDWATER PROTECTION SITES		
Wannos Pond Well Site	Groundwater protection	9
PRIVATE		
Mayflower Park	Permanent conservation	2
Manomet Center for Environmental Sciences	Environmental research/birdwatching	18
Herbert Bartlett	Permanent conservation	40

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
CEDARVILLE		
VILLAGE PARKS AND PLAYGROUNDS		
Elmer Raymond Park	Playground/ball fields and court/tennis/passive recreation/trails	18
INDOOR FACILITIES		
Old/Little Red Schoolhouse	Historic schoolhouse/community center	<1
CONSERVATION AREAS		
Cedarville Conservation Area	Conservation	40
CEMETERIES		
Cedarville Indian Cemetery	Cemetery	1
LANDING		
Cedarville Landing	Beach access	4
PRIVATE		
Boy Scout Camp	Campground	N/A
YMCA Camp	Campground	84
Camp Dennison	Campground	88
Camp Bournedale	Campground	7

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
WEST PLYMOUTH		
TOWN-WIDE PARK		
Morton Park/Billington Sea	Historic park, swimming, boating, hiking, playground	209
VILLAGE PARKS AND PLAYGROUNDS		
West Plymouth Recreation Area	Ball fields	40
SCHOOL PLAYGROUND AND PLAYING FIELDS		
West Elementary School	Gym, playing fields	16
CONSERVATION AREAS		
Micajahs Pond	Conservation	2
Big West/Grassy Pond	Conservation	1
Triangle Pond (S)	Conservation	10

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
WEST PLYMOUTH		
King's Pond Access	Pond access	<1
CEMETERIES		
Parting Ways Cemetery	Historic cemetery	N/A
BEACH		
Clear Pond Beach Area	Beach access	4
GROUNDWATER PROTECTION SITES		
Murdock's Pond	Groundwater protection	3
Cooks Pond Well	Groundwater protection	22
Darby Pond Well	Groundwater protection	11
Industrial Park Water Tank	Water tank	2
INDOOR		
Armstrong Ice Skating Area (S)	Ice rink	N/A
PRIVATE		
Plymouth Rod and Gun Club	Shooting range	92
Squirrel Run Country Club	Golf course	N/A
Ellis Haven Camping Area	Campground	25
Pinewood Lodge and Campground	Campground	136
OTHER		
Plymouth Airport	Commercial/private flights	735

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
PINE HILLS		
VILLAGE PARK		
Cleft Rock Park	Park, sightseeing	9
CONSERVATION AREAS		
Briggs Estate	Conservation, hiking, boating, fishing	385
Dugway Pond Conservation Area	Conservation	2
TRAIL		
Old Sandwich Road Trail	Trail linkage to be developed	37
Talcott Property	Trail linkage to be developed	188
GROUNDWATER PROTECTION		
Ship Pond Road Well	Groundwater protection	15
PRIVATE		
The Pinehills	Conservation, golf, recreation–OSMUD	2,450
Entergy lands	Temporary preservation	1,600
Reid Pond Preserve	Permanent conservation	34
Thrasherville Preserve	Permanent conservation	20
Eel River Preserve	Permanent conservation	N/A
Withington Preserve	Permanent conservation	<1

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
PINE HILLS		
CEMETERY		
Chiltonville Cemetery	Cemetery	4
Jordan Rd Cemetery	Cemetery	<1

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
ELLISVILLE		
TOWN-WIDE PARK AND CONSERVATION AREA		
Ellisville Harbor State Park (S)	Conservation, trails, beach	45
CONSERVATION AREA		
Dugway Pond Conservation Area		N/A
LANDING		
Harlow's Landing		N/A
GROUNDWATER PROTECTION		
Quail Run Well	Groundwater protection	19
Ellisville Well	Groundwater protection	142
PRIVATE		
Eyster Sanctuary	Permanent conservation	1
Richard Wynn Memorial Preserve	Permanent conservation	83
Surfside Beach	Beach/swimming	1
Pierce Park	Passive recreation, swimming	1
Camp Catchelot	Campground	800

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
FEDERAL FURNACE		
TOWN-WIDE PARK		
Myles Standish State Forest (S)	Camping, fishing, swimming, trails	12,500
SCHOOL PARKS AND PLAYGROUNDS		
Federal Furnace Elementary School	Ball fields/tennis	20
Plymouth Community Intermediate School	Ball fields/gym	5
CONSERVATION AREAS		
Town Forest	Hiking/passive recreation	287
Boot Pond Conservation Area	Conservation/beach	66
Russell Mill Pond Conservation Area	Conservation	130
Rocky Pond Conservation Area	Conservation	33
Gunners Exchange Conservation (F)	Conservation	N/A
County Woodlot (C)	Open space, woods	106
GROUNDWATER PROTECTION		
Federal Furnace Water Department	Groundwater protection	29
Boot Pond Water Department	Groundwater protection	38
Billington Street Water Department	Groundwater protection	35

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
FEDERAL FURNACE		
PRIVATE		
Big Point Preserve	Permanent conservation	23
Joe Brown House	Permanent conservation	4
Conant-Storrow Nature Preserve	Permanent conservation	27
Boys/Girls Camps Inc.	Campground	10
McNeil Preserve	Permanent conservation	40
Barnes-Jenkins Hole	Permanent conservation/hiking	4
Domino Cortelli Preserve	Permanent conservation-no access	10
Nickerson Conservation Restriction	Conservation restriction-forestry	12
Philips Preserve	Permanent Conservation	3

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
BOURNE ROAD		
TOWN-WIDE PARK		
Forges Field Recreation Facility & Crosswinds Golf Club	Ball fields, walking and biking trails, golf course	630
VILLAGE PARKS AND PLAYGROUNDS		
Buttermilk Bay Playground	Playground	<1
Huntley Playground	Playground	<1
SCHOOL PLAYGROUNDS AND PLAYING FIELDS		
Plymouth South High School	Ball fields	121
South Elementary School	Playground, ball fields	20
Massachusetts Maritime Academy (S)		9
CONSERVATION AREAS		
Blueberry Conservation Area	Conservation	1
White's Pond Conservation Area	Conservation-no access	<1
Bloody Pond Conservation Area	Conservation/swimming/fishing/hiking	62
Red Brook Conservation Area (S)	Conservation	84
Grassy Pond Non-Game Area (S)		26
Massasoit National Wildlife Refuge (F)	Conservation	196
LANDING		
Herring Pond Boat Ramp		N/A
Jake's Pond Common Land		10
Herring Pond ROW	Old railroad ROW	N/A
GROUNDWATER PROTECTION		
Long Pond Road Water Dept.	Groundwater protection	2
CEMETERIES		
Herring Pond Indian Cemetery	Historic Native American cemetery	2
Halfway Pond Douglas Cemetery	Cemetery	<1
Wareham Road Cemetery	Cemetery	<1
Herring Pond Road Cemetery	Cemetery	<1

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
BOURNE ROAD		
Long Pond Road	Various small cemeteries	N/A
PRIVATE		
Bramhall Preserve	Permanent conservation	80
Red Brook	Permanent conservation	93
Camp Wind in the Pines	Campground	141
Camp Squanto	Campground	367
Camp Massasoit	Campground	128
Pinewoods Camps	Campground	25
Gallows Pond Preserve	Permanent conservation	56
Emery Preserve	Permanent conservation	116
West Shore Preserve	Permanent conservation	232
Manternarch Preserve	Permanent conservation	5
Taylor-Touster Wildland	Permanent conservation	61
Old Field Pond Preserve	Permanent conservation	30
Benjamin Harrison	Permanent conservation	5

OPEN SPACE AND RECREATION AREAS	TYPE	ACRES
SAQUISH/GURNET		
CONSERVATION/BEACH		
Saquish Beach	Conservation	2.5
LIGHTHOUSE		
Gurnet Lighthouse	Historic lighthouse	4.5
PRIVATE		
Clarks Island	Beach preserve	17
Gurnet Beach	Beach preserve	31
Saquish Beach	Beach preserve	37
Saquish	Swimming, recreation	8

Acreage rounded to nearest acre.

III. OPEN SPACE PLANNING INITIATIVES

A. Town-wide Green Networks

From 1980 to 1996, Plymouth's open space planning was organized around village districts, with a particular emphasis on providing a town square or park within each village center and open spaces at village fringes. In 1998, with the Rural Trails Concept Plan, Plymouth initiated efforts to link major tracts of open space into a town-wide Green Network of trails, wildlife corridors, walking paths, and bikeways. Subsequently, Plymouth and the Massachusetts Division of Conservation and Recreation developed a plan–dubbed the "Wishbone"–to link Ellisville State Harbor to Waterfront Park.

The "Wishbone" will consist of a primary greenway connecting Myles Standish State Forest, Waterfront Park, and Ellisville State Park. The greenway will travel through Forges Field, the northern section of the Pinehills Development, South Middle/High Schools, and the Entergy property. Secondary greenways will connect the "Wishbone" to Plimoth Plantation and Indian Brook Reservation.

When developed, the "Wishbone" will benefit Plymouth by

- Linking some of Plymouth's most important natural assets.
- Encouraging visitors to venture beyond the downtown area to explore Plymouth's natural heritage.
- Providing alternative transportation which enables residents to reach hiking and conservation areas by riding along bike paths instead of driving in a car.

In 2005, several other trails were in development. The major initiatives are:

North Plymouth-Downtown Plymouth Rail Trail

This is a 1.7-mile trail currently under construction. It begins at Hedges Road and ends at the Nelson Street Playground.

Waterfront Walkway: Town Wharf to Caswell Lane and Town Brook

This is a 4-mile pedestrian walkway which will allow residents to walk along the waterfront. The walkway continues from the Nelson Street playground to Brewster Gardens and travel along Town Brook ending on Billingston Street within close proximity to Morton Park.

B. Village Open Space

While there are a variety of village open spaces, parks and playgrounds are unevenly distributed through town. Manomet, West Plymouth, North Plymouth, and Cedarville each lack a central village park or green which could serve as a village focal point. South Plymouth has few parks and playgrounds to meet the needs of its expanding population.

While Plymouth's villages are designated growth areas, each village has important open spaces which must be protected in order to maintain the village's character and protect scenic views. Existing open spaces can also be enhanced by efforts to connect parks and open lands through trails, easements, or land acquisition. Creating Green Networks within villages facilitates a sense of place and provides local residents with alternative transportation and recreation opportunities. These smaller networks can, over time, be linked to the larger town trails and walkways.

IV. RECREATION NEEDS

A. Maintenance of Existing Resources

Given Plymouth's significant inventory of open space, one of Plymouth's main challenges is stewardship of existing resources. Several of Plymouth's parks suffer from high rates of vandalism, and all

parks need preventive maintenance and periodic equipment upgrades. Reducing vandalism and maintaining safety requires a combination of capital investments (lighting, repairs), police coordination (patrols, surveillance), management initiatives (increased programming), and resident involvement (watch groups, clean-up days, business sponsorships). Engaging residents in "Friends of Morton Park" groups will increase informal monitoring and surveillance of parks, create a local sense of ownership over public resources, and provide organizational structure for citizen advocacy and fundraising.

B. Expansion of Athletic Fields

Athletic fields are heavily utilized. Both the 1996 and the 2004 Open Space and Recreation Plans recommend that Plymouth expand its available sports fields. The plans also suggest that athletic fields suffer when many different sports are played on a single field. The plans suggest separate baseball fields and soccer fields and recommend incremental reconstruction and refurbishing of existing fields, coupled with expansion of resources to meet high demand.

C. Increased Beach Access

Plymouth has relatively limited beach areas, despite the abundance of ponds, rivers, and ocean coastline. Increasing access to targeted resources, while protecting habitats and water quality, is a priority. Plymouth's Open Space Committee has identified several possible beach access points. In Plymouth Center, Stephens Lane, Water Street and Howes Lane are possible new beach access points. In Manomet, Taylor Avenue and Manomet Point Road are possible access points.

V. OPEN SPACE AND RECREATION OBJECTIVES AND STRATEGIES

Objective 1:

Utilize open space planning to advance the Town's priority Natural Resource objectives: water protection and land conservation.

STRATEGY:

Directly acquire open spaces which protect groundwater, buffer surface water resources, or support significant wildlife or vegetative communities.

STRATEGY:

Utilize regulatory approaches and incentives to protect natural resources.

Objective 2:

Create town-wide Green Networks of linked open space and wildlife habitats. Protect sensitive ecosystems and wildlife corridors while providing recreational opportunities and alternative transportation on those lands which can accommodate human impacts.

STRATEGY:

Acquire parcels and use conservation restrictions to develop town-wide Green Networks.

Objective 3:

Create Village Green Networks.

STRATEGY:

Provide open space resources in each village center area. These should include village greens in the heart of each village area, pocket parks in residential neighborhoods, and bicycle/walking trails.

STRATEGY:

Provide pedestrian and bicycle linkages connecting open space in village centers to open areas at village fringes, and connecting village fringes to town-wide trails and recreation resources.

Objective 4:

Maintain Plymouth's scenic views and the historic character of the town's villages and rural areas.

STRATEGY:

Identify and preserve historic landscapes.

STRATEGY:

Establish a process for identification of scenic and historic views, followed by design and development restrictions to preserve these views.

Objective 5:

Increase access to ponds and the ocean.

STRATEGY:

Expand public beach access to selected ponds and ocean areas while restricting access to coastal plain ponds.

Objective 6:

Improve access to and use of existing recreational resources, including Myles Standish State Forest.

STRATEGY:

Increase safety and attractiveness of parks through a coordinated strategy of police surveillance and resident involvement.

STRATEGY:

Increase programming and use agreements to encourage use of parks.

VI: KEY ACTIONS

Objective 1:

Utilize open space planning to advance the Town's priority Natural Resource objectives: water protection and land conservation.

STRATEGY:

Directly acquire open spaces which protect groundwater, buffer surface water resources, or support significant wildlife or vegetative communities.

STRATEGY:

Utilize regulatory approaches and incentives to protect natural resources.

Land Acquisition/Regulation

- Utilizing guidelines developed in the 2004 Open Space and Recreation Plan, evaluate and rank open spaces according to criteria for environmental sensitivity and scenic and cultural value.
- Prioritize preservation of pine barren forests, especially core areas of unfragmented pine barrens habitat and large parcels over 100 acres.
- Create permanent interconnections between priority open space resources by preserving wildlife corridors.
- Work with nonprofit conservation organizations to protect critical open space.
- Seek donation of conservation restrictions from landowners who will benefit by reduced property taxes. Seek federal and state funds to implement this acquisition strategy.
- Seek additional revenue streams for conservation purposes, such as a land transfer tax or other designated and renewable funding sources.
- Continue to utilize Community Preservation Act funds for acquisition of priority sites and work with government agencies and nonprofit organizations to tap additional sources of funds available for acquisition and easements.

Water Protection

- Address outstanding groundwater protection concerns identified in State Source Water Assessment Protection reports, to include: removal of noncompliant uses in Zone I areas, restrictions on development in Zone II and Interim Wellhead Protection Areas, adoption of best management practices in maintenance, spill response, storage of materials, and enhanced education of residents in Zone II areas.
- Identify possible new locations for wells and secure land around sites.
- Identify recharge areas to large ponds and waterways and develop restrictions to promote recharge.
- Identify recharge areas around coastal plain ponds and coastal plain pond clusters. Protect coastal plain ponds through creation of land buffers with particular emphasis on protection of land around coastal plain pond clusters. Utilize conservation and open space tools to convert polluting land uses and protect open parcels.
- Amend the Zoning Bylaw to create expanded buffer areas around water resources.

Private Development

- Evaluate the water and waste impact of new developments and develop a system of impact fees, open space requirements, and other tools to mitigate environmental impact of large scale development projects.
- Establish development standards with incentives for protection of large blocks of open space, public access, or other public benefits.

Objective 2:

Create town-wide Green Networks of linked open space and wildlife habitats. Protect sensitive ecosystems and wildlife corridors while providing recreational opportunities and alternative transportation on those lands which can accommodate human impacts.

STRATEGY:

Acquire parcels and use conservation restrictions to develop town-wide Green Networks.

- Continue to acquire parcels and funding to develop the "Wishbone" linking Ellisville State Park, the State Forest, and the Downtown Harbor.
- Continue to develop the North Plymouth-Downtown Plymouth Rail Trail.
- Complete the Waterfront Walkway from Town Wharf to Town Brook.
- Work with neighboring communities to link Plymouth trails and wildlife corridors to regional trails and corridors.

Objective 3:

Create Village Green Networks.

STRATEGY:

Provide open space resources in each village center area. These should include village greens in the heart of each village area, pocket parks in residential neighborhoods, and bicycle/walking trails.

STRATEGY:

Provide pedestrian and bicycle linkages connecting open space in village centers to open areas at village fringes, and connecting village fringes to town-wide trails and recreation resources.

- Complete development of Cordage Waterfront Park to include a central open space for North Plymouth.
- Develop village greens for Cedarville, Manomet, and West Plymouth.
- Expand park resources in South Plymouth.
- Work with village master plan committees to design village-scale Green Networks and to develop implementation strategies.
- Use conservation restrictions to preserve tracts of open space and recreation land at village fringes to help preserve rural character and village identity.
- Construct new athletic fields near underserved residential and school areas.

Objective 4:

Maintain Plymouth's scenic views and the historic character of the town's villages and rural areas.

STRATEGY:

Identify and preserve historic landscapes.

STRATEGY:

Establish design and development restrictions to preserve scenic views.

- Create and regularly update an inventory of scenic views.
- Preserve coastal views by restricting development that blocks salt water views. Map coastal viewsheds for use as an overlay district.
- Preserve viewsheds of scenic rivers from public roads and public lands.
- Promote the accessibility of scenic views by providing parking areas and links to trails and transit.
- Develop design guidelines and restrictions for scenic views. Establish restrictions for land sold for development.
- Work with private owners and nonprofit conservation organizations to preserve cranberry bogs and upland open spaces.
- Permanently protect open spaces significant to adjacent historical structures.
- Identify, locate, and map historic rights of way. Designate Scenic Roads and require a Planning Board hearing before trees are cut or stone walls altered on Scenic Roads.
- Work with the Massachusetts Historical Commission to establish an inventory of heritage landscapes and to develop and implement a protection strategy.

Objective 5:

Increase access to ponds and the ocean.

STRATEGY:

Expand public beach access to selected ponds and ocean areas while restricting access to coastal plain ponds.

- Restore and maintain waters in Billington Sea, Halfway Pond, and Long Pond to address nutrient loading and noxious weed problems.
- Identify potential ocean and pond beachfronts, with an emphasis on beach areas which could be located near population centers.
- Conduct environmental impact analyses, and evaluate capital and operating costs associated with the expansion of swimming, boating, and fishing access.
- Invest in parking areas and the expansion of public transit to identified access areas.
- Link beachfronts to walking and biking trails.
- Utilize management plans and development controls to support and protect open space on Long Beach, Saquish, and Clark Island.
- Develop strategies to limit coastal plain pond access and address problematic land uses adjacent to coastal plain ponds.

Objective 6:

Improve regional and local access to and use of existing recreational resources, including Myles Standish State Forest.

STRATEGY:

Invest in capital repairs, upgrades, and preventive maintenance to assure high-quality recreational resources.

STRATEGY:

Increase the safety and attractiveness of parks through a coordinated strategy of police surveillance and resident involvement.

STRATEGY:

Increase programming and use agreements to encourage the use of parks.

- Explore ways to enhance access and wayfinding to major local and regional recreation areas such as Forges Field and Myles Standish State Forest.
- Evaluate park needs for expanded parking, signage, equipment, and lighting and invest in needed upgrades.
- Provide preventive maintenance and timely repairs to park properties.
- Expand resident involvement, including watch groups, clean-up days, and resident and business sponsorship of parks.
- Expand educational outreach and interpretive materials at selected parks.
- Expand programming and events at parks through Town-sponsored events and use agreements with nonprofit, private, and school groups.
- Construct new ball fields and refurbish existing facilities with a focus on providing different fields for different sports.
- Explore a transition to Olmsted-like park system with provisions for enhanced cultural, educational, and recreational uses.

4. Housing

I. INTRODUCTION

Plymouth has traditionally provided relatively affordable housing for its residents. However, over the past five years, Plymouth has been increasingly impacted by housing market pressures, and housing prices and rents have soared upwards. The State of Massachusetts requires that all cities and towns in the State provide their "fair share" of affordable housing. This means that ten percent of all housing units should be affordable to households at or below 80% of area median income. Plymouth falls short of that goal, with just 4.1% of its units as affordable housing. By contrast, 41.5% of Plymouth households have incomes that are at or below 80% of area median income and would potentially qualify for affordable units, if produced. One in four of Plymouth households has an income below 50% of area median income. Six percent of households live below the poverty line. Expanding affordable housing is needed both to meet the needs of local residents and to respond to State mandates. Chapter 40B has recently been amended so that cities and towns which show progress towards the goal of 10% affordability can resist challenges from private developers seeking to override zoning regulations through a comprehensive permit. However, if it does not make progress towards these goals, Plymouth will be vulnerable to developments which may not be consistent with the Town's land use goals.

The following housing section was written using data and analysis from the 2004 Plymouth Housing Plan, prepared by Judith Barrett of Community Opportunities Group, Inc. All tables are from the 2004 Housing Plan and all Census data and Assessor data referenced were analyzed by the Community Opportunities Group.

II. HOUSING CHARACTERISTICS

Plymouth's housing stock is predominantly newer single family housing. Of the town's **21,500** housing units, 75% are single family and 70% were built within the last 50 years. By comparison, 52.4% of

Massachusetts homes are single family and 50% were built within the last 50 years.[18] Plymouth Center and North Plymouth have some older streets lined with 2-4 family houses; however, single family housing predominates throughout most of Plymouth. As noted in the Land Use section, newer homes in Plymouth are likely to be significantly larger than homes built in the past, and they are likely to be built on larger lots. The increase in average lot size reflects the fact that an increasing percentage of Plymouth's housing units have been built outside of the traditional village centers. North Plymouth, Plymouth Center, and Manomet are the most densely settled villages, followed by West Plymouth and Cedarville. In the past 30 years, however, residential growth in rural areas has roughly equaled growth in village centers. Since 1970, 4,787 housing units have been constructed in village centers and 4,310 units in rural areas.[19]

SINGLE-FAMILY HOME CHARACTERISTICS IN PLYMOUTH

LAND USE				AVERAGE BUILDING FEATURES			AVERAGE TOTAL VALUE
Year Built	Parcels	Total Acres	Average Lot (acres)	Gross Area (sf)	Number of Bedrooms	Number of Bathrooms	
1998-2003	1,338	1,631.1	1.22	4,120	3.5	2.6	$366,159
1990-1997	1,611	1,727.1	1.07	3,319	3.3	2.2	$311,301
1980-1989	2,542	2,235.3	0.88	3,246	3.1	2.1	$297,161
1970-1979	4,145	2,530.9	0.61	2,845	3.2	1.8	$269,166
1960-1969	1,611	757.5	0.47	2,400	2.7	1.4	$241,134
1950-1959	2,152	804.3	0.37	2,038	2.4	1.3	$227,304
1940-1949	726	314.1	0.43	2,031	2.4	1.3	$223,262
1920-1939	929	490.8	0.53	2,154	2.7	1.4	$237,620
1900-1919	996	523.8	0.53	2,778	3.1	1.6	$266,843
1866-1899	240	149.4	0.62	2,934	3.2	1.6	$274,065
1800-1865	186	175.2	0.94	3,246	3.3	1.8	$288,915
pre-1800	75	85.9	1.15	3,615	3.3	2.1	$317,543

Source: Plymouth Department of Planning and Community Development, Assessor's Parcel Records FY 2004.

III. HOUSING TENURE AND AGE OF HOUSING

At the time of the census in 2000, 86.7% of Plymouth's housing units were occupied and 13.3% (2,827) units were vacant. Eighty percent of the "vacant" housing units, 2,242 units, were used seasonally as summer or vacation homes. The number of vacation/summer homes declined by 19.8% from 1990 to 2000, with approximately 550 units converting to year-round use.[20]

Plymouth has more homeowners than renters. Seventy-seven percent of Plymouth residents are homeowners and 22% are renters. Renters are much more likely than owners to occupy older

[18] Source: Census 2000, Summary File 1, Table H30 and Plymouth Assessor's Parcel Records, FY2004.

[19] Judith Barrett, Community Opportunities Group, Town of Plymouth Housing Plan, 2004. p. 23.

[20] *Ibid.*, p. 26.

housing. In fact, of the 4,132 renters listed in the 2000 Census, only 121 renters lived in housing built since 1990 and 403 lived in housing built in the 1980s. This is significant not only because it reflects the fact that renters are likely to live in lower quality housing, but also because it means that renters are more likely to live in housing with lead paint. Lead paint was used in residential construction until 1974.

Although Plymouth has recently had rates of childhood lead poisoning lower than the state average, lead paint is both a hazard to children under the age of 6 and a potential obstacle for families seeking housing.[21] Landlords with older housing are often reluctant to rent to families with young children, because they are concerned about the costs and liability associated with de-leading their property.

AGE OF HOUSING STOCK FOR ALL UNITS AND OCCUPIED UNITS BY TENURE

	YEAR OF CONSTRUCTION						MEDIAN YEAR BUILT
AREA	1990-2000	1980-89	1970-79	1960-69	1950-59	PRE-1950	
ALL UNITS							
MASSACHUSETTS	218,407	292,701	336,814	314,855	337,660	1,121,552	1956
Plymouth County	19,636	22,913	31,170	24,554	24,199	59,052	1963
Bourne	1,267	1,575	1,773	1,049	1,514	2,470	1968
Carver	685	1,333	1,244	259	252	354	1980
Duxbury	666	1,061	1,277	594	511	1,236	1973
Kingston	1,003	894	501	374	538	1,215	1973
PLYMOUTH	3,032	3,682	5,312	2,158	2,034	5,032	1973
Wareham	805	1,134	2,144	1,476	1,722	3,389	1962
Owner-Occupied							
Massachusetts	160,306	185,869	170,437	184,833	216,870	589,933	1958
Plymouth County	16,816	17,698	21,892	17,831	16,907	36,095	1966
Bourne	996	1,105	978	549	502	1,191	1974
Carver	602	1,243	1,123	194	222	263	1980
Duxbury	558	884	1,142	493	395	926	1973
Kingston	932	688	453	265	349	783	1977
PLYMOUTH	2,692	2,880	4,066	1,205	968	2,480	1976
Wareham	529	807	1,354	798	815	1,890	1965
Renter-Occupied							
Massachusetts	41,107	85,539	143,880	108,874	99,279	456,653	1951
Plymouth County	1,659	4,117	8,038	5,135	4,758	17,415	1957
Bourne	124	244	450	174	616	510	1959
Carver	27	90	82	43	20	75	1974
Duxbury	75	148	109	47	65	104	1975

[21] Massachusetts Department of Public Health, Childhood Lead Poisoning Prevention Program, "Screening and Incidence Statistics by Community, FY2003," <http://www.mass.gov/dph/clpp/clpp.htm>.

AGE OF HOUSING STOCK FOR ALL UNITS AND OCCUPIED UNITS BY TENURE							
	YEAR OF CONSTRUCTION						MEDIAN YEAR BUILT
AREA	1990-2000	1980-89	1970-79	1960-69	1950-59	PRE-1950	
Kingston	71	152	48	87	123	297	1957
PLYMOUTH	121	403	854	573	441	1,740	1957
Wareham	118	129	534	309	351	566	1963
Source: Census 2000, Summary File 3, Tables H34, H35, H36, H37.							

IV. HOUSING QUALITY

Existing data sources provide limited information on housing quality. However, Plymouth has no residential neighborhoods which are substantially deteriorated. Assessor records for FY 2004 show 1,600 single family homes below the 10th percentile building value, and 306 rated in fair to poor condition. Ten percent of 2-family homes, 17% of 3-family homes, and 8% of Plymouth's multi-family buildings are rated in fair to poor condition.[22]

Both the Plymouth Redevelopment Authority and Plymouth Community Development Office offer a variety of Housing Rehabilitation loans to landlords and low-income homeowners. The Town uses half of its annual $2.3 million CDBG allocation for housing rehabilitation loans.

V. HOUSING MARKET: SALES

Compared to suburban communities closer to Boston, Plymouth offers reasonably priced housing. However, housing costs have risen sharply over the past ten years. In 1995, the median price of a single family home in Plymouth was $112,500. By 2004, the median price had risen by over $200,000 to $325,450.[23]

Condominium prices rose 175% in the same period of time, from $67,958 to $187,500.[24] Strong demand has driven prices upward. Despite the fact that Plymouth added 2949 units from 1990 to 2003, vacancy rates have been quite low.

Plymouth homeowners have benefited from increases in the market value of their homes, increases which have averaged 150-200%, while tax bill assessments have increased by significantly lower percentages. However, the increase in home costs makes it more difficult for new homebuyers to purchase homes. Affordability is discussed in more detail below.

[22] Plymouth Department of Planning and Community Development, FY2004 Assessor's Parcel Records, July 1, 2004.

[23] Barrett, Town of Plymouth Housing Plan, 2004, pp. 28-29 citing The Warren Group and Massachusetts Department of Revenue statistics.

[24] *Ibid.*, p. 29.

CHANGE IN SINGLE-FAMILY ASSESSMENTS AND PROPERTY TAX BILLS, 1995-2004[25]								
	Fiscal Year 1995			Fiscal Year 2004			Change	
Town	Assessed Value	Tax Rate	Tax Bill	Assessed Value	Tax Rate	Tax Bill	Assessed Value	Tax Bill
Bourne	$145,682	$12.30	$1,792	$347,540	$7.37	$2,561	138.6%	42.9%
Carver	$112,571	$17.60	$1,981	$229,224	$14.01	$3,211	103.6%	62.1%
Duxbury	$215,980	$18.10	$3,909	$510,324	$11.33	$5,782	136.3%	47.9%
Kingston	$134,491	$15.39	$2,070	$313,525	$10.95	$3,433	133.1%	65.8%
PLYMOUTH	$110,784	$19.06	$2,112	$273,821	$11.81	$3,234	147.2%	53.1%
Wareham	$91,472	$13.31	$1,217	$182,556	$10.22	$1,866	99.6%	53.3%
State Average	$153,571	$14.21	$2,182	$307,417	$11.10	$3,413	100.2%	56.4%

Source: Massachusetts Department of Revenue, Municipal Data Bank.

VI. HOUSING MARKET: RENTS

Rents have also increased significantly over the past ten years. In early 2005, a Community Opportunities Group survey of advertised rents in Plymouth found the following market rents:

Studio	$750
One Bedroom	$830
Two Bedroom	$1,200
Three Bedroom	$1,450

The survey was conducted from November 2004 to January 2005 and included 55 units advertised in the *Old Colony Memorial*, *The Brockton Enterprise,* and the *Boston Rental Exchange*. Seventy-five percent of advertised apartments included utility costs in the rent.

According to the 2004 Plymouth Housing Plan, South Shore rents are generally lower than rents in Boston, and the north and west suburbs, although Plymouth rents tend to be higher than those in surrounding South Shore towns.[26] However, as noted above, most Plymouth renters live in older housing. Over time, as this housing stock ages further and needs repair and upgrades, owners may want to offset renovation costs by increasing rents or converting rental units to condominiums.

As noted in the 2004 Plymouth Housing Plan, "Akin to the escalation in home values that occurred locally and regionally during the 1990s, the range of market rents narrowed in Plymouth such that by 2000, low-end rents had risen much faster than high end rents."[27] The 2000 Census reflects this narrowing of rent range in its analysis of contract rent by quartiles, comparing the lowest-priced apart-

[25] *Author's note:* Average single-family assessed values shown in Table 23 reflect values for fiscal years ending June 30, 1995 and June 30, 2004, which means they reflect prior-year market conditions. As a result, they are not directly comparable to sale prices reported in Table 21, which are based on calendar year transactions. Moreover, the six towns are on different three-year revaluation cycles, so for some communities the assessed values are closer to actual market conditions. Variances due to three-year revaluation cycles should decrease somewhat with the advent of annual valuation updates now required by the Department of Revenue.

[26] *Ibid.*, pp. 31-32.

[27] *Ibid.*, p. 32.

ments to the highest-priced apartments. Although the 2000 analysis reflects 1999 rents and does not capture the recent upsurge in price, it does capture the relatively narrow range of rental costs.

CONTRACT RENTS FOR OCCUPIED UNITS BY QUARTILE AND PERCENT CHANGE, 1990-2000

	Renter	Contract Rent Quartiles (2000)			% Change 1990-2000		
Area	Units	Lower	Median	Upper	Lower	Median	Upper
Massachusetts	935,528	$407	$605	$838	26.0%	19.6%	25.4%
Plymouth County	41,095	$423	$601	$757	19.5%	12.5%	13.2%
Bourne	2,115	$419	$579	$760	3.2%	5.7%	14.6%
Carver	339	$361	$611	$779	77.0%	28.6%	13.4%
Duxbury	552	$333	$545	$1,109	-3.8%	-7.0%	28.7%
Kingston	775	$420	$647	$794	9.9%	11.6%	13.9%
PLYMOUTH	4,131	$518	$670	$797	26.3%	14.7%	10.4%
Wareham	1,999	$323	$508	$669	-0.3%	3.0%	10.4%

Source: Census 2000, Summary File 3, Tables H55-H57; 1990 Census, Summary File 1, Tables H032A-H032C.

While the federal government defines an affordable housing unit as one in which rent and utilities do not exceed 30% of gross income, low- and even moderate-income renters can rarely, if ever, find such units in the private market. Significantly, the 2004 Housing Plan also notes that "Except for the luxury apartments in the Avalon at Pine Hills development, Plymouth has attracted no new investment in rental housing for many years."[28]

VII. AFFORDABILITY GAP

Incomes have risen over the past decade, but the growth of incomes has been substantially more moderate than the growth of housing costs. In 1990, the median Plymouth household income was $39,886 and the median family income was $45,212. By 2000, incomes had risen by 37% for households and 40% for families. The median 2000 household income was $54,677 and the median family income was $63,266.

This means that households are paying increasing percentages of their income for housing. This is especially true for people on fixed incomes, such as elderly and disabled people, and for people seeking to enter the Plymouth housing market, such as children who grew up in Plymouth and would like to establish their own home in town, renters seeking to become homeowners, and families seeking to relocate in Plymouth. The narrowing of the rental market, noted above, means that low-income families pay disproportionately high percentages of their income for housing.

[28] *Ibid.*, p. 33.

Housing is deemed affordable if monthly housing costs are 30% of monthly gross income. For homeowners, monthly housing costs are mortgage, property taxes, and housing insurance plus utilities. For renters, monthly housing costs are rent and utilities. In 2000, a median-income Plymouth resident could afford the median sales price of a single family home in Plymouth.[29] However, by 2004, the continuing escalation in housing costs put the median-priced home out of reach. According to the 2004 Plymouth Housing Plan, "...a homebuyer at Plymouth's Census 2000 median household income ($54,677) could have afforded a maximum purchase price of $167,055. In 2000, the town's median single-family home sale price was $175,000." The gap between median-priced homes and median incomes was relatively modest.[30] However, by 2004, the median sales price had leaped to $325,450.

DECLINE IN HOUSING AFFORDABILITY OF SINGLE-FAMILY HOMES IN PLYMOUTH, 2000-2004

HOUSING AFFORDABILITY IN 2000					
Area	**Median Household Income**	**Affordable Purchase Price**	**Median Sale Price (2000)**	**Local Affordability Gap**	**Plymouth's Affordability (+/- $175,000 Sale Price)**
Massachusetts	$50,502	$153,437			-$21,563
Plymouth County	$55,615	$170,114			-$4,886
Bourne	$45,113	$135,859	$177,750	-$41,891	-$39,141
Carver	$53,506	$163,235	$169,075	-$5,840	-$11,765
Duxbury	$97,124	$305,509	$381,500	-$75,991	$130,509
Kingston	$53,780	$164,129	$236,250	-$72,121	-$10,871
PLYMOUTH	$54,677	$167,055	$175,000	-$7,945	-$7,945
Wareham	$40,422	$120,558	$122,700	-$2,142	-$54,442
Boston PMSA	$54,823	$167,531			-$7,469
80% Boston PMSA	$50,200	$152,452			-$22,548
HOUSING AFFORDABILITY IN 2004					
Area	**Median Household Income**	**Affordable Purchase Price**			**Plymouth's Affordability (+/- $325,450 Sale Price)**
Boston PMSA	$82,600	$245,228			-$67,316
80% AMI	$66,150	$194,254			-$120,972

Data Sources: Census 2000, The Warren Group, HUD.

While single family homes are now priced beyond what a median income Plymouth resident can afford, condominiums remain an option. The median condominium sales price for 2004 was $187,500.[31] However, many condominiums are smaller units, and, while they are affordable to the median Plymouth household, they are still priced above what a single-person wage earner makes, as shown in Table 30 from the 2004 Plymouth Housing Plan.

[29] *Ibid.*, p. 36-7.
[30] *Ibid.*, p. 36.
[31] *Ibid.*, p. 38.

AFFORDABILITY OF CONDOMINIUMS IN PLYMOUTH			
CONDOMINIUM AFFORDABILITY BY HOUSEHOLD SIZE AND INCOME			
Household Income Measure	**Median Household Income**	**Affordable Purchase Price**	**Plymouth's Affordability (+/- $187,500 Sale Price)**
Median Household Income (2004)	$82,600	$240,822	$53,322
By Household Size			
4-Person @ 80% AMI	$66,150	$187,165	-$335
4-Person @ 100% AMI	$82,688	$241,107	$53,607
3-Person @ 80% AMI	$59,550	$165,637	-$21,863
3-Person @ 100% AMI	$74,438	$214,197	$26,697
2-Person @ 80% AMI	$52,950	$144,109	-$43,391
2-Person @ 100% AMI	$66,188	$187,287	-$213
Plymouth Renter Households	$39,800	$101,216	-$86,284
CONDOMINIUM AFFORDABILITY FOR ONE-PERSON HOUSEHOLDS AT AVERAGE LOCAL WAGES			
Local Industry	**Average Weekly Wage**	**Affordable Purchase Price**	**Plymouth's Affordability (+/- $187,500 Sale Price)**
Manufacturing	$786	$104,713	-$82,787
Professional Services	$1,114	$160,346	-$27,154
Health Care Services	$732	$95,554	-$91,946
Data Sources: Census 2000, The Warren Group, HUD.			

Because half of Plymouth's residents earn income below the area median, they face more significant obstacles accessing housing and are most likely to pay more than 30% of their gross income as rent. According to the 2000 Census, 41.5% of Plymouth households are moderate income (incomes at or below 80% of area median) and 25% are low income (incomes at or below 50% of area median).[32] Six percent of households are below the poverty line.[33] The table below shows the percentage of Plymouth households which are housing cost-burdened, focusing on the impact of housing costs on elderly and low-income homeowners and renters.

HOUSING COST-BURDENED HOMEOWNERS & RENTERS BY AGE AND INCOME						
	HOMEOWNERS			RENTERS		
Area	**All**	**Elderly**	**Low-Income**	**All**	**Elderly**	**Low-Income**
Massachusetts	26.2%	25.2%	56.0%	38.7%	50.5%	64.0%
Plymouth County	27.7%	29.5%	63.7%	39.1%	48.3%	64.4%
Bourne	34.5%	25.1%	56.5%	42.0%	34.4%	64.4%
Carver	27.6%	42.9%	83.5%	43.7%	65.3%	72.6%
Duxbury	23.4%	27.8%	78.8%	49.1%	47.0%	58.8%
Kingston	34.7%	38.4%	66.7%	36.6%	37.7%	55.9%

[32] *Ibid.*, p. 19 and p. 21 citing Census 2000, Summary File 3 Tables P080A, P107A and U.S. Department of Housing and Urban Development.

[33] *Ibid.*, p. 21 citing Census 2000, Summary File 3, Tables P90, P92.

HOUSING COST-BURDENED HOMEOWNERS & RENTERS BY AGE AND INCOME						
Area	All	Elderly	Low-Income	All	Elderly	Low-Income
PLYMOUTH	29.1%	31.5%	67.6%	39.7%	57.5%	71.9%
Wareham	31.6%	37.0%	62.8%	43.2%	53.5%	61.3%
Source: Census 2000, Summary File 3, Tables H69, H71, H72, H94, H96, H97.						

VIII. AFFORDABLE HOUSING

The Commonwealth of Massachusetts, through Chapter 40B, the Comprehensive Permit Law, requires that all cities and towns work towards the goal of making 10% of their housing stock affordable to people at or below 80% of area median income. The Massachusetts Department of Housing and Community Development prepares an annual inventory of affordable units in each city and town in Massachusetts. DHCD shows Plymouth with 19,008 housing units and **771 affordable units (4.1%)**. The Plymouth Housing Authority owns 349 of these units, with 191 apartments for elderly individuals and 158 family units. The remaining units are privately-owned and -managed units, mostly rental. Waitlists for elderly housing stretched up to 6 months and the wait for family housing is 7 or more years.

To have 10% affordable housing, Plymouth would need to add **1,130 affordable units** to its current inventory.[34] Of course, with 41.5% of Plymouth households at or below 80% of area median income and 25% with incomes below 50% of area median income, reaching Chapter 40B targets would still leave a significant shortfall of affordable units.

Until recently, cities and towns that did not have 10% affordable housing were vulnerable to an override of local zoning regulations, because developers proposing developments with a minimum of 20-25% affordable housing could apply for a comprehensive permit. The 40B regulation was recently amended to allow towns which made progress towards affordability (2% increase in affordable housing permitted within 12 months or .75 % increase plus an approved housing plan) to be deemed in temporary compliance.

Plymouth's subsidized housing units are shown below:

CHAPTER 40B SUBSIDIZED HOUSING INVENTORY IN PLYMOUTH				
DEVELOPMENT & TYPE	LOCATION	CHAPTER 40B UNITS	EXPIRATION	SUBSIDY
Rental				
Plymouth Housing Authority				
High Cliff Apartments	23 Prince Street	82	Perpetual	HUD
Nick's Rock Road	Nick's Rock Road	30	Perpetual	HUD
Olmstead Terrace	Olmstead Terrace	40	Perpetual	DHCD

[34] *Ibid.*, p. 7.

CHAPTER 40B SUBSIDIZED HOUSING INVENTORY IN PLYMOUTH				
Castle Hill Elderly	Castle Court	50	Perpetual	DHCD
Cherry Hill Elderly	128 Court Street	81	Perpetual	DHCD
Southfield Elderly	105 South Street	60	Perpetual	DHCD
Scattered Sites	N/A	6	Perpetual	DHCD
Privately-Owned Rental Developments				
Algonquin Heights	Algonquin Terrace	201	2019	MassHousing
Mayflower Village	South Street	100	2010	HUD
Mayflower Village II	Colonial Terrace	58	2013	HUD
Group Homes				
DMR Group Homes	Confidential	7		DMR
DMH Group Homes	Confidential	16		DMH
Other Rental Housing				
Section 8 Mod Rehab	Scattered Sites	12	2006-07	DHCD
Homeownership				
Ocean Point	2512 Highland Terrace	20	Perpetual	DHCD
Plymouth HOR Program	N/A	8	2008	DHCD
Total Subsidized Housing		771		
Total Year-Round Units		19,008		
Percent Subsidized		4.06%		

Source: Department of Housing and Community Development, February 2005.

While half of this housing is affordable in perpetuity, **359 units have affordability restrictions which will expire over the next 1-14 years.** This means that Plymouth will lose half of its affordable inventory unless restrictions are extended.

IX. HOW AFFORDABLE IS AFFORDABLE?

While public housing and voucher programs have been structured to allow the poorest residents to pay 30% of their income towards rent, housing built by private and nonprofit developers is often targeted to households at the upper limit of the "at or below 80% median" range.

The outcome of current federal housing debates is unknown but some of the prominent issues under discussion (cuts in public housing operating subsidies, significant cuts in federal voucher programs) will pose challenges for Plymouth as it seeks to provide housing opportunities for the 25% of its households which are at or below 50% of area median income and the 6% of households in poverty.

X. HOUSING OBJECTIVES AND STRATEGIES

Goal 1:

Meet the requirements of Massachusetts General Law Chapter 40B by incrementally expanding affordable housing stock until 10% of Plymouth's housing units are affordable to families at or below 80% of area median income.

Goal 1b:

Seek to expand affordable housing stock beyond mandated minimums so that Plymouth households at or below area median income have options in the Plymouth housing market.

STRATEGY:

Provide town leadership in preserving expiring 40B units and developing new rental and homeownership units, including units targeted for very low-income (30% of area median), low-income (60% of area median) and moderate-income (80% of area median) households.

Goal 2 :

Encourage the production of affordable housing by the private sector.

STRATEGY:

Utilize zoning, regulation, and incentives to facilitate private sector production of affordable housing.

Goal 3:

Make additional funds available for affordable housing development.

STRATEGY:

Seek designated funding sources for affordable housing.

Goal 4:

Integrate new affordable housing into existing communities.

STRATEGY:

Support mixed-income housing, avoid concentration of affordable units in individual buildings or neighborhoods, and encourage high-quality construction and design.

Goal 5:

Encourage landlords to provide well-maintained and reasonably-priced rental housing.

STRATEGY:

Provide financial and tax incentives to encourage landlords to maintain affordable rents.

Goal 6:

Help elderly and disabled individuals live independently within the community.

STRATEGY:

Expand the supply of housing that is accessible and affordable to elderly people and people with mobility impairments.

Goal 7:

Develop the management capacity to carry out the Town's housing agenda.

STRATEGY:

Expand senior-level housing staff within the Planning Department or Community Development Department.

STRATEGY:

Facilitate the creation of a nonprofit community development corporation.

XI. KEY ACTIONS

Goal 1:

Meet the requirements of Massachusetts General Law Chapter 40B by incrementally expanding affordable housing stock until 10% of Plymouth's housing units are affordable to families at or below 80% of area median income.

STRATEGY:

Preserve expiring 40B units and develop new rental and homeownership units, including units targeted for very low-income (30% of area median), low-income (60% of area median) and moderate-income (80% of area median) households.

- Identify town, state, and federal properties that would be suitable for affordable housing development.
- Identify major economic development sites which could incorporate affordable housing components, and work to include affordable housing within the larger mixed-use proposals. Examples of potential sites include Revere Copper, Cordage Park, and brownfields sites.
- Identify state intermediaries, and private and nonprofit partners willing to work with the Town of Plymouth on development of sites for affordable housing.
- Work with MassHousing, HUD, and identified property owners to extend expiring use restrictions.
- Continue and expand first-time homebuyer programs.
- Conduct community and educational programs to develop a broader community constituency for affordable housing.

Goal 2:

Encourage the production of affordable housing by the private sector.

STRATEGY:

Utilize zoning, regulation, and incentives to facilitate private sector production of affordable housing.

- Amend zoning to facilitate production of single family homes on smaller lots, 2-3 family housing units, multi-family housing, and accessory units in appropriate areas, consistent with village concept development.
- Develop a Transfer of Development Rights (TDR) system to direct residential development to areas with existing infrastructure.
- Develop an Inclusionary Housing Bylaw.
- Provide financial and tax incentives for the donation of land or buildings for affordable housing.
- Consider exempting affordable units from the town's building cap.
- Identify and address barriers to affordable housing in the local permitting process.
- Amend zoning to allow accessory (in-law) apartments.
- Allow density bonuses for on- and off-site affordable housing, with mitigation requirements, including coordination with the TDR option in the bylaw.

Goal 3:

Make additional funds available for affordable housing development.

STRATEGY:

Seek designated funding sources for the production of affordable housing.

- Develop a Plymouth Affordable Housing Trust, with separate accounting on housing-related revenue and expenses (*e.g.*, Lexington and Acton Home Rule Petitions, Chapter 491).
- Consider expansion of impact fees.
- Explore a transfer tax on real estate sales to create an affordable housing fund pool.
- Continue to direct a percentage of Community Preservation Act funds to the production of affordable housing.

Goal 4:

Integrate new affordable housing into existing communities.

STRATEGY:

Support mixed-income housing projects, avoid concentration of affordable units in buildings or neighborhoods, and encourage high quality of construction and design.

- Develop strategies to encourage mixed-income housing rather than housing exclusively targeted to low-income households.
- Develop a 10% affordable housing goal for each Village Center, including goals for the production of

both senior housing and housing for families.

- Support the production of affordable housing which is contextual in design and which has a quality of construction compatible with market-rate units. Ensure standards are met by providing adequate design review prior to the issuance of a building permit and adequate inspection prior to the issuance of an occupancy permit.

Goal 5:

Encourage landlords to provide well-maintained and reasonably-priced rental housing.

STRATEGY:

Provide financial and tax incentives to encourage landlords to maintain affordable rents.

- Develop a first-time homebuyer program and a rehabilitation loan/grant program for homebuyers who purchase 2-3 family buildings. Homebuyers would occupy one unit and keep other units affordable with deed restrictions. (Boston model)
- Explore property tax relief for owners of affordable housing.
- Explore an amnesty program for illegal units if deed-restricted. (Barnstable model)

Goal 6:

Help elderly and disabled individuals live independently within the community.

STRATEGY:

Expand the supply of housing accessible and affordable to elderly people and people with mobility impairments.

- Create a rehabilitation loan/grant program to facilitate accessibility upgrades to existing housing.
- In multi-family developments larger than four units, require a percentage of units to be handicapped accessible. This requirement should apply to both market-rate and affordable units.

Goal 7:

Develop management capacity to carry out the Town's housing agenda.

STRATEGY:

Expand senior-level housing staff within the Planning Department or Community Development Department.

STRATEGY:

Facilitate the creation of a nonprofit community development corporation.

- Secure funds for additional senior level housing staff.
- Organize community and political leaders to facilitate creation of a community development corporation and acquire seed funding.

5. Historic and Cultural Resources

I. PLYMOUTH'S HISTORY AND HISTORIC SITES

Plymouth, Massachusetts is internationally known as the site of the first Pilgrim settlement. Plymouth attracts thousands of tourists annually, and most Massachusetts schoolchildren take at least one school field trip to see Plymouth Rock, Plimoth Plantation, and the Mayflower II. However, Plymouth's colonial heritage is only one aspect of the town's rich and unique history. The following section gives a broad overview of Plymouth history and describes some of the important historic sites in Plymouth. It is based upon the Public Archaeology Lab's *Town of Plymouth Narrative History Comprehensive Survey, Phase IV, 1997*.

WAMPANOAG SETTLEMENT

Plymouth was originally settled by the Wampanoag people. Archaeological evidence suggests that Wampanoag tribes lived near the coast during warm months, planting corn, beans, and squash, and fishing from the ocean and streams. The Wampanoag were part of a larger confederation of Native Americans who lived throughout southeastern Massachusetts. A network of trails connected the Plymouth-area residents to communities north, west and south. Route 3A, Summer Street, and Long Pond Road all are laid out along trails originally defined by the Wampanoag. Historians believe that Sandwich Road, Old Sandwich Road, and Ellisville Road also probably echo earlier Native American trails, as do River Street in Chiltonville and Brook Road in Manomet. A major settlement called Comassukaumet was located adjacent to Great Herring Pond in Cedarville. Smaller settlements were located at Town Brook, Billington Sea, Eel River, Watson's Hill, Great South Pond, Long Pond, Halfway Pond, Little Herring Pond, Beaver Dam Brook, Fresh Pond, and Hobshole Brook. Prior to the permanent settlement by the English, the Wampanoag people endured three epidemics, which destroyed the local population, in some cases wiping out entire villages.

EARLY COLONIZATION

The Pilgrims arrived in 1620 on the Mayflower, stopping first in Provincetown, and then traveling up the coast to choose a permanent place to stay. Like the Wampanoag, they were attracted to the

spring-fed **Town Brook**, which emptied into the ocean at Plymouth Harbor and provided fresh water and abundant fish, along with reeds useful for thatching roofs. The colonists built Plymouth's first street, **Leyden Street**, just north of Town Brook. Of the 102 Mayflower passengers who disembarked in Plymouth in 1620, half died during the first winter and were buried at **Cole's Hill**. The hill was planted over to hide the deaths from the Native American population.

In 1621, the Pilgrims laid out **North Street, Middle Street, Carver Street, Court Street**, and **Market Street.** Most of the Mayflower passengers remained concentrated along these streets just north of Town Brook or moved south into what is now known as the **Training Green** area. However, some ventured beyond, staking claim to lands near Hobshole Brook and Eel River as early as 1623. Later, as the population expanded, the town laid out Sandwich Street, traveling south along the coast and Spring Lane and Summer Street, traveling westward. English colonists were granted lands in Manomet in 1638 and in Cedarville in 1654. Each of these areas was still occupied by the Wampanoag people when the English began staking their claims.

Colonization of these outlying lands was limited until the 1675-6 King Philip's War and the subjugation of the Native American population. While both Wampanoag and English settlers continued to coexist peacefully in Cedarville throughout the 18th century, the Native American presence in other parts of Plymouth was greatly reduced after the war. By contrast, the colonial population grew, increasing from 600 in 1676 to 2,655 by 1776.

PLYMOUTH DOWNTOWN/TOWN BROOK

Town Square, at the head of Leyden Street, was the original civic and commercial center for Plymouth. The Pilgrims built their first church, market, and fort/meeting house adjacent to the square. **Burial Hill**, the site of the original fort, remains. The original church was destroyed by fire, and, in 1892, the congregation rebuilt **First Parish Church** on the same site. The former **County Courthouse** (1749) is adjacent to Town Square, as is the **Church of the Pilgrimage**. The Church of the Pilgrimage was built in 1802 by a group of First Parish congregants who split off when the First Parish Church converted from Congregationalism to Unitarianism.

The oldest remaining house identified in Plymouth is the **Richard Sparrow House** (ca. 1649) at 42 Summer Street. None of the homes which originally stood on Plymouth's first six streets remains. These streets are now lined with historic residences from the Colonial (1700-1776) and Federal (1776-1830) periods. Other significant buildings in the downtown area include **Pilgrim Hall** (1824) at 75 Court Street, which was commissioned by the Pilgrim Society as a monument to the first settlers, and the **Spooner House**, built as a residence in 1809 but later converted to its current use as a museum for the Plymouth Antiquarian Society.

Plymouth's early economy was oriented to the sea and relied heavily on shipbuilding, fishing, and trade. Cottage industries, such as shoemaking and tailoring, also developed to support the local popu-

lation. As the colonies grew, Plymouth developed into a major port, and maritime activities were predominant throughout the eighteenth century. In the nineteenth century, the importance of maritime trade declined, and Plymouth's economy became more industrial. Town Brook supported a succession of mills and factories, first grain mills, then fulling and tanning mills, followed by cordage factories, iron forges, and textile mills.

The first mill for grinding corn, **Jenney's Grist Mill**, was built adjacent to Town Brook in 1632. Later acquired by Robbins Cordage Company, the mill was operational until 1847, when it was destroyed by fire. The current Jenney's Grist Mill is a reconstruction which was built in the 1970s.

The first iron forge was built along Town Brook in 1790 but metal products did not become a major Plymouth industry until the nineteenth century. Using bog iron from local kettle holes, iron manufacturers created nails, tacks, rivets and wires and forged bells and tools. Many different iron mills and forges were built along Town Brook in the nineteenth century and the successful growth of the iron industry contributed to a period of prosperity which lasted until the Great Depression.

Textile manufacturing was another important Plymouth industry in the nineteenth century. The Plymouth Woolen Mill company, later acquired by the American Woolen Mill company, was a major mill, operating from 1863 to 1955. A Sheraton Inn now stands on the site of the former American Woolen Mill factory buildings but some workers' housing built by the mill remains. Twenty five units of **workers' housing** are on Murray Street, Sawyer Place, and Eaton Street and nine two-family units are on Nelson and Shaw Courts. A number of mills operated along Town Brook. During urban renewal in the 1960s, most of these industrial buildings were demolished. The only partially-remaining factory from Plymouth's industrial period is **Edes Manufacturing Company** at 222 Water Street.

The late nineteenth and early twentieth centuries were prosperous times for Plymouth. The town's prosperity is reflected in the many institutional structures built during this time, including the **Plymouth Public Library, National Guard Armory, Post Office, Probate Court Building,** and **Memorial Hall. Brewster Gardens** was first laid out in 1920. During this period, the Pilgrim Society was active in establishing many of Plymouth's historic attractions including the **Plymouth Rock Monument** (1880), **National Monument to the Forefathers** (1889), and the commemorative park on **Cole's Hill**.

TRAINING GREEN

In the late seventeenth century, the land south of Town Brook was allocated to the descendants of several of Plymouth's founding families. Four of the oldest houses in Plymouth are in the Training Green area. These are the **William Harlow House** (1649) at 8 Winter Street, the **Harlow Old Fort House** (1677) at 119 Sandwich Street, the **Jabez Howland House** (1666) at 33 Sandwich Street, and the **Dotey home** at 131 Sandwich Street. Many of these early Training Green families either worked in the maritime trade or were active in Plymouth public affairs. As their children came of age, these families subdivided their properties and passed them along to their descendants, many of whom remained in the

area for generations. In 1711, the area bounded by Sandwich, Pleasant, North, Green, and South streets was retained as common land and labeled the **Training Green**. The Training Green was later converted into an ornamental park. Entrepreneurs and sea captains developed wharves in the Bradford/Union area, and the Training Green has many examples of eighteenth- and nineteenth-century residential architecture, including the Carpenter Gothic homes at **27-37 Bradford Street**.

WELLINGSLEY

Many of Plymouth's first families also moved to Wellingsley (or Hobshole), an area just south of Training Green along Sandwich Street. Some prominent families, such as the Churchills, Bartletts, Mortons, Holmes, Rickards, and Manters, remained in Wellingsley for generations and many of their early homes still stand. Wellingsley was primarily residential until the mid-1800s, when industries began to develop along Hobshole Brook. Of these, only the **Plymouth Rock Trout Company**, established in 1895, remains. In the mid-nineteenth century, Jabez Churchill opened a general store at the intersection of Sandwich and Warren Street. This corner became known as **Jabez's Corner** in honor of the store.

The development of Wellingsley and Manomet to the south was facilitated by the construction of rail lines in the late nineteenth century. The Old Colony Railroad first linked Plymouth and Boston in 1845, and the development of the coastal areas of Plymouth was spurred by the construction in 1889 of an electric streetcar which traveled from Kingston through Plymouth Center and along Sandwich Street, Warren Avenue, and Rocky Hill Road to the Manomet Shore. The trolley lines were abandoned in the 1920s.

CHILTONVILLE/EEL RIVER

European families began settling in Chiltonville in the early 1600s. However, Chiltonville was the site of a major battle in King Philip's War and all of the first homes were destroyed. After the war, increasing numbers of families began settling here again, with major expansion in the early 1800s. Prominent early families included the Dotens, Clarks, and Churchills, and their homes remain at **4, 11, 22,** and **51 Doten Road, Clifford-Warren House, 3 Clifford Road, 131 Sandwich Road.** Other important sites are **Chiltonville Congregational Church** (1840) and **Bramhall's Store** at 2 Sandwich Street. (ca. late nineteenth century). For most of its history, Chiltonville was a fishing and farming community, and the area still has several important fish hatcheries. In the mid-nineteenth century, Shingle Brook was dammed to create Forge Pond and factories producing cotton duck cloth and zinc products were built along the Eel River and Shingle Brook. Most of the Hayden Duck Cloth Mill buildings are gone, although the power canal and some structures remain.

In 1895, Eben Jordan, son of the founder of Boston's Jordan Marsh Department Store, developed the **Forges**, a luxurious 1,300-acre estate in Chiltonville. Most of the buildings on the estate have been torn down but some of the land has been preserved as open space. Jordan also donated funds for Plymouth's first hospital, Jordan Hospital. On Obery Street, the County operated the **Plymouth County Correctional Facility** from the 1920s to the 1980s. For many years, the prison farm was one of the largest working farms in Massachusetts.

WARREN AVENUE/MANTER'S POINT

In the late 1700s, fishermen and shipbuilders began moving to the coastal area at the base of Plymouth Beach near Eel River. David Manter was one of the first fisherman to locate on the point, and he was followed by other seamen, carpenters, and farmers. By the late 1800s, with the establishment of the trolley line and the paving of roads around Warren Avenue, the Manter's Point area became an increasingly popular vacation spot. Cottages were built along with inns and hotels.

MANOMET

Farmers began building houses in Manomet south of the Pine Hills in the seventeenth century and by 1739, the area had enough families to support its own church, the **Second Church of Plymouth Congregational.** The original burial ground for this church, **White Horse Cemetery**, still exists, but the original church building was replaced in 1826 with a new building. The Holmes family was one of the first families in Manomet and their descendants continue to live in the area.

For most of its history, Manomet has been relatively isolated from the rest of Plymouth due to the physical barrier created by the Pine Hills. Development in the area accelerated rapidly at the turn of the twentieth century when transportation routes were extended through the Pine Hills. These included the State Road, the State Highway, and the electric rail line. The new roads and electric rail helped transform Manomet into a summer resort community. Developers built large homes and hotels on Manomet Bluffs and Manomet Point while smaller-scale cottages were built in the area around White Horse Beach. **White Horse Beach** was itself established in 1917 with the transfer of land to the town. The adjacent **Priscilla Beach** was developed ten years later, on a portion of the old Taylor Farm. In the 1930s and 1940s, Priscilla Beach was an attractive destination for famous actors who often performed at the **Priscilla Beach Theater** and stayed in surrounding homes.

NORTH PLYMOUTH

Holmes Reservation was a mustering ground in the Revolutionary War. Commercial uses began to develop along Court Street in the Colonial Period, and by 1800 some houses began appearing on period maps. However, North Plymouth was not significantly developed until Bourne Spooner founded the Plymouth Cordage Company in 1824. A Mayflower descendant, Spooner built the Plymouth Cordage Company into Plymouth's dominant business. At its peak, the company employed 3,000 workers. The Plymouth Cordage Company constructed ropewalks, factories, workers' housing, a company store, dining hall, school and recreation buildings, and a library. Remaining mill buildings are part of the **Plymouth Cordage Company Commercial Area**. From 1824-1920, the company built 351 units of housing in 125 buildings, with the aim of creating a planned community. Some of the housing developed by the company includes **413-23 Court Street, 6 Ropewalk Court, Spooner House, 289 Court Street, 22-24, 46-52, and 54-68 Spooner Street.** Workers housing is clustered in several areas in North Plymouth: the **Plymouth Cordage Company Workers Housing Area, Cherry Street–Cordage Terrace Area**, and **Holmes Terrace Area** (housing for management). The Plymouth Cordage Company ceased operations in 1971.

CEDARVILLE

Cedarville is notable for its remote location and the relatively peaceful coexistence between Native American and European populations. Before the arrival of the Colonists, Cedarville was populated by Wampanoag Indians living along Great Herring Pond. When Europeans arrived in Cedarville, they intermarried with Native Americans. Some freed African slaves also moved to the area and were able to live harmoniously and intermarry. From 1700-1869, there was a 3,000-acre **Herring Pond Reservation** along Great Herring Pond. In 1850, two-thirds of the reservation land was divided and each reservation resident received an individual house lot and wood lot. Many current Cedarville families can trace their lineage to the original Herring Pond Indians. The village's population has remained small and stable up until the late twentieth century.

The early European settlers established mission churches, the First and Second Indian Meetinghouses, on the reservation. The Second Meetinghouse later became Pondville Baptist Church and is now **Pilgrim Evangelical Church**. The first known school, the **Cedarville Schoolhouse**, was built in 1830. There are five historic cemeteries in Cedarville, four of which are Native American cemeteries. These are **the Indian Cemetery**, **Lower Herring Pond Cemetery**, **Cedarville Cemetery**, **Lakewood Cemetery**, and **Nightingale Cemetery.**

Cedarville's cranberry bogs have been commercially harvested for over 110 years.

SOUTH POND/SIX PONDS AREA

The first house built in this area was the **Richmond-Burgess-Daley House** (1769) at 125 Boot Pond Road. The Holmes, Burgess, Sampson and Wright families lived in this area, which was associated with farming and cranberry cultivation. In 1857, the original house at 125 Boot Pond Road was converted into a hotel. The area remained sparsely settled until the nineteenth century, when small clusters of houses were built in the South Pond and Boot Pond areas. A school (now converted into a residence) and church, **Union Chapel** (1870-4) were built on Long Pond Road. From the late nineteenth through the early twentieth centuries, area owners began to sell land around Boot Pond and Six Ponds for **summer cottages**. Many of the cottages in Six Ponds were destroyed in a 1900 fire which began in the Myles Standish Forest. At the turn of the century, Le Baron Barker established the **Barker Estate** near Halfway Pond and developed the largest independent cranberry farm in the country. Along Morgan Road, Howland Davis established the **Davis Estate**.

ELLISVILLE

Ellisville is named for William Ellis, the first known European settler who established a farm here around 1709. For the next 200 years, the Ellis family was active in farming, cranberry cultivation, and timber harvesting. In the early 1800s, the Harlow family established their farm near the Ellis family. Ellisville remained an isolated agricultural community until the late twentieth century, when Ellisville and the larger South Plymouth area began to experience intense development pressure. The Town of

Plymouth, area neighbors, and the State of Massachusetts worked together to create **Ellisville Harbor State Park**, which includes open fields, a cemetery, the former **Harlow Farm**, and other lands along the coast.

WEST PLYMOUTH

After the Revolutionary War, the Town of Plymouth granted freedom to four African-American slaves who had fought in the war. The four men—Quamony Quash, Plato Turner, Cato How, and Prince Goodwin—were given 94 acres of land along the Kingston/Plymouth border. This land, which had previously been cleared for use as a communal sheep pasture, was occupied and farmed by these men and their families, making it the first free settlement of African-Americans in the United States. Excavated in the 1970s, the land is now called the **Parting Ways Archaeological District**. It includes burial sites, building foundations, and household relics. A nonprofit group, Parting Ways, Inc., is working to reconstruct the settlement, which at its largest had 30-40 residents. The group also plans to build a Museum of African-American and Cape Verdean History adjacent to the reconstructed settlement.

Carver Road (Route 44) and **Federal Furnace Road** were two of the earliest roads in West Plymouth. **Dunham Farm** was the only occupied land along Federal Furnace Road until the twentieth century. Cranberries were cultivated at the farm and Dunham family members lived nearby at **317** and **329 Carver Road**. These lands are still in use for cranberry farming.

A small settlement of houses was built in the mid-nineteenth century along Carver Road in what is now known as **Darby Station Village**. In 1892, the Old Colony Railroad Company extended a rail line from North Plymouth to Middleboro and Carver, with the tracks running for three miles parallel to Carver Road. A station was built along Darby Pond and later abandoned. The railroad tracks were torn up for scrap metal during World War II.

Plymouth's **water supply system at Billington Sea** and aqueducts were originally constructed in the mid-nineteenth century, with upgrades over the years. **Morton Park** was established in 1889.

II. HISTORIC DESIGNATIONS

From 1993-1997, the Massachusetts Historical Commission (MHC) and the Town of Plymouth worked with the Public Archaeology Laboratory (PAL) to identify the historic and cultural resources of Plymouth. In its final report, ***Town of Plymouth Narrative History Comprehensive Survey, Phase IV***, the Public Archaeology Laboratory identified 1,045 historic structures and sites in Plymouth. All of these were added to the MHC Inventory of the Historic Assets of the Commonwealth. As of February 2005, the Massachusetts Cultural Resource Information Service listed **1,767 historic resources in Plymouth**. These are 1,591 buildings, 87 structures (gates, dams, herring ladders, cranberry bogs, mill ponds, parks, and lighthouses), 55 historic districts, 22 cemeteries, and 12 statues or monuments.

Massachusetts Register of Historic Places

The Massachusetts Historical Commission maintains a more selective list, the Massachusetts Register of Historic Places, which includes historic sites and structures.

Sites which are placed on the Massachusetts Register of Historic Places receive some limited protections. In some circumstances, the Massachusetts Historical Commission (MHC) reviews proposed alterations to properties on the Massachusetts and National Registers of Historic Places, but this review can only be triggered if state or federal funding, permitting, or licensing is involved. Most private development does not require state or federal action and therefore does not trigger MHC review.

In addition, Massachusetts has a small Massachusetts Preservation Project Fund which provides matching grants for the renovation of historic properties. Municipalities and nonprofits may apply for MPPF matching grants from the fund, which is subject to annual legislative appropriation. The State offers a Historic Rehabilitation Tax Credit for up to 20% of the costs of the rehabilitation of a qualified structure. Qualified structures are those that are on the National Register of Historic Places or structures which the Massachusetts Historical Commission deems eligible for National Register status. The State Historic Rehabilitation Tax Credit is authorized as a five-year program (January 2005 to December 2009) with $10 million in credits available annually (830 CMR63.8R1).

PLYMOUTH'S DESIGNATED HISTORIC PROPERTIES							
		NATIONAL				STATE	LOCAL
Location	Name	Register Individual	Register District	Thematic Area	Historic Landmark	Historic Landmark	Historic District
32 Court St.	Hedge House	X					X
Bradford St.	Bradford Historic District		X				
3 Clifford Rd.	Clifford/Warren House	X					
Carver St.	Cole's Hill	X	X		X		X
119 Sandwich St.	Harlow Fort House	X					
8 Winter St.	Sgt. W. Harlow Homestead	X					
230 Summer St.	Hillside	X					
33 Sandwich St.	Jabez Howland House	X					
Bug Light	Lighthouse of New England			X			
Allerton St.	Forefathers Monument	X					
Plympton Rd.	Parting Ways		X				
75 Court St.	Pilgrim Hall	X				X	X
126 Water St.	Plymouth Antiquarian Society	X					X
Downtown	Plymouth Historic District						X
Gurnet	Plymouth Light	X		X			
Leyden St.	Old Court House	X	X				X
5 Main St.	Post Office Building	X					X
Water St.	Plymouth Rock	X					X

PLYMOUTH'S DESIGNATED HISTORIC PROPERTIES							
		NATIONAL				STATE	LOCAL
Location	Name	Register Individual	Register District	Thematic Area	Historic Landmark	Historic Landmark	Historic District
Village District [35]	North/Carver/Leyden St.		X				X
42 Summer St.	Richard Sparrow House	X	X				X
Off Summer St.	Town Brook		X				

National Register of Historic Places

Fifteen Plymouth sites and four districts are on the National Register of Historic Places. In addition to national recognition, the National Register provides many of the same potential benefits and limited protections as the Massachusetts Register. A federal tax incentive program is available for National Register properties which are used for commercial, industrial, or residential rental purposes. The incentive provides up to 20% of the costs of rehabilitating a qualified structure according to Department of Interior standards.

Plymouth sites on the National Register are listed in the chart above. The four districts are described below:

NATIONAL REGISTER OF HISTORIC PLACES (36 CFR 60)
Historic Districts:

Plymouth Village Historic District: North, Middle, Leyden, Winslow, and Carver Streets.
This district includes the streets originally laid out as the first Pilgrim settlement in 1620. Includes Brewster Park, Cole's Hill, and about 60 residences, many from the seventeenth and eighteenth centuries.

Town Brook Historic and Archaeological District: Directly adjacent to the Plymouth Village Historic District, this district includes the 1.25 mile stretch of Town Brook from Plymouth Harbor to the south side of Billington Street. The area includes Brewster Gardens, the brook, four mill ponds, seven mill privileges, dams, five herring ladders, and the sites of former mill buildings.

Bradford-Union Street Historic District: Bradford/Union/Emerald/Water Cure/Freedom Streets.
From the eighteenth century through the early nineteenth century, this area just south of Town Brook was a residential and commercial district housing seamen and their families. Much of the area's later development is attributed to Captain Samuel Doten, who erected the town wharf, now the site of the Plymouth Yacht Club.

Parting Ways Archaeological District: Located adjacent to the Plymouth/Kingston Line in West Plymouth, this area was cleared for use as a common sheep pasture and later granted to four slaves who fought in the Revolutionary War and were granted their freedom in return. The site is a burial ground with archaeological remains.

[35] The original historic district prior to its expansion in 1995.

Local Historic District: Plymouth Downtown District

Massachusetts state law allows municipalities to establish local historic districts. Once a local historic district is established, development in the area is overseen by a local historic district commission, which has the authority to review, and approve or deny, changes to the exterior of structures within the district. The commission may review and approve materials, colors, mass, siting, and signage for all governed structures. Landscaping may also be reviewed to assure compatibility with the historic preservation context.

Plymouth has one local historic district: the Plymouth Downtown Historic District. This district is roughly bounded by Water Street, North Park Avenue, Burial Hill, and Summer Street. It includes six of the twelve sites on the National Register for Historic Places and includes the Plymouth Village. Several of the town's earliest and best-known historic sites are located in the Downtown Historic District.

III. LOCAL PRESERVATION OPTIONS

The intense development pressures which threaten Plymouth's natural landscapes also put the town's historic resources at risk. Aside from properties in Plymouth's Downtown Historic District, few of Plymouth's historic sites are protected against demolition or development. Plymouth needs to create new regulatory mechanisms which give the Town options in addressing developments which affect historic sites.

Some preservation options which have been used by other Massachusetts cities and towns and which could be applied in Plymouth are:

Local Historic Districts: Many Massachusetts cities and towns have multiple local historic districts. Plymouth has just one local historic district in the downtown area. The PAL report identified concentrations of historic resources in eight areas of town. Additional local historic districts could preserve the assets in these areas. In addition, local historic districts can be highly targeted. M.G.L. Ch. 40c defines a historic district as "one or more parcels of land, or one or more buildings or structures on one or more parcels or lots of land." Therefore, a local historic district designation could be used to preserve a single site.

Neighborhood Conservation District: Similar to historic districts, neighborhood conservation districts differ in that the conservation district commission establishes a more flexible range of controls over property owners. The conservation district might provide advice, consultation, or regulation, depending upon the importance of a specific property to the district.

Landmarks Bylaw: A landmarks bylaw could be passed to protect the most important historic sites in Plymouth. These could include properties on the National Register of Historic Places and/or other properties which public officials and community members decide are most important to preserve.

Preservation Restrictions: Individual properties could be preserved with a preservation restriction. These are similar to conservation restrictions and are negotiated with individual property owners, who often receive tax benefits in exchange for agreeing to preserve some part of their property.

Scenic Roads: Roads can be designated scenic roads.

Municipal Preservation Plans: Municipal Preservation Plans identify key historic resources, describe threats to those resources, and develop regulatory proposals, management, and capital improvement plans to address the preservation needs of privately- and publicly-owned properties.

IV. HISTORIC PRESERVATION GROUPS

Plymouth has many historic groups devoted to the history of a specific site or period of time but no overarching entity working on the preservation and promotion of historic heritage throughout Plymouth. Some of the groups promoting the preservation of specific sites or periods of time are:

- 1749 Courthouse Museum Committee: Oldest wooden courthouse in United States
- Burial Hill Preservation Alliance: Burial site of prominent Pilgrims
- Jenney Grist Mill: Re-creation of mill and history of mill operations
- Mayflower II: Re-creation of Mayflower and history of passage
- Mayflower Society House
- Parting Ways, Inc.: First settlement of freed African slaves
- Plimoth Plantation: Re-creation of Leyden Street and Wampanoag settlements
- Pilgrim Hall Museum: Oldest continuously-operated museum in United States
- Plymouth National Wax Museum: Wax museum
- Plymouth Archaeological Rediscovery Project: Archaeology of Colonial period, 1620-1692
- Plymouth Colonial Archives Project: Archives of Colonial period, 1620-1692
- Richard Sparrow House: Oldest residence in Plymouth
- Spooner House

There are several private groups offering tours of historic sites, a Tourist Information Center, and collections of historical archives at a variety of sites, including the Plymouth Public Library.

Plymouth has many historic organizations but no umbrella organization which works to promote the historic heritage of the town as a whole. There has not been coordinated town-wide preservation planning nor has there been a sustained effort to define and market Plymouth as a heritage tourism destination. A nonprofit alliance of historic organizations could work collaboratively to promote public understanding and appreciation of Plymouth's unique history.

V. CULTURAL RESOURCES

Plymouth has several arts organizations which enhance the quality of life in town. These include music groups such as the Plymouth Philharmonic Orchestra, the Pilgrim Festival Chorus, multidisciplinary organizations such as Project Arts of Plymouth, youth-serving agencies such as the Boys and Girls Club of Plymouth, and promoters of visual arts, including the Plymouth Community Art Center.

The Plymouth Cultural Council provides support to arts organization based in Plymouth and to regional groups which serve Plymouth residents. The Council provides small grants on an annual basis to support concert series and other arts programming.

VI. HISTORIC/CULTURAL OBJECTIVES AND STRATEGIES:

Objective 1:

Increase local capacity to preserve historic sites, structures, roads, landscapes, and districts.

STRATEGY:

Develop a Plymouth Municipal Preservation Plan and establish new protective measures to prevent demolition or substantial alteration of historic structures.

Objective 2:

Preserve the town's historic character.

STRATEGY:

Encourage contextual design in each of the town's historic areas.

Objective 3:

Increase heritage tourism.

STRATEGY:

Develop physical infrastructure which makes Plymouth's history more "readable."

Objective 4:

Increase coordination and effectiveness of existing groups working on historic preservation issues.

STRATEGY:

Establish a Plymouth Historic Alliance to unite the many organizations working on historic preservation and promotion.

Objective 5:

Encourage continued vitality of the arts within Plymouth.

STRATEGY:

Support cultural facilities and events within each of Plymouth's villages.

KEY ACTIONS:

Objective 1:

Increase local capacity to preserve historic sites, structures, roads, landscapes, and districts.

STRATEGY:

Develop a Plymouth Municipal Preservation Plan and establish new protective measures to prevent demolition or substantial alteration of historic structures.

- Form a municipal preservation planning committee to develop a Plymouth Municipal Preservation Plan.
- Develop regulations and bylaws which provide town officials with greater capacity to review, delay, and, where necessary, restrict substantial alteration to historic properties. Such regulations and bylaws may include, as appropriate, new local historic districts, neighborhood conservation districts, landmarks bylaw, a demolition delay bylaw, and Scenic Road designations.

Objective 2:

Preserve the town's historic character.

STRATEGY:

Encourage contextual design in each of the town's historic areas.

- Develop design guidelines for each of the town's primary historic areas to encourage new development that harmonizes with traditional architecture in terms of massing, materials, and detailing.
- Encourage private owners of historic buildings to restore their properties by providing design guidelines for the renovation of traditional architecture. Incorporate information from existing federal and state preservation advisory guidelines and create local guidelines that are specific to Plymouth's unique architectural heritage.

Objective 3:

Increase heritage tourism.

STRATEGY:

Develop physical infrastructure which makes Plymouth's history more "readable" on the land.

- Provide urban design features which educate residents and visitors about Plymouth's unique history. Install signs along scenic roads and signs and banners identifying historic districts. Post plaques and brief explanatory markers at historic sites. In a central location within each historic district, install kiosks with maps identifying historic features.
- Consider developing special interest brochures, tours, and trails (*e.g.*, the African-American Experience in Plymouth, Native Americans and Plymouth, Mayflower Passengers and their Descendants, Industry and Labor, Seaside Retreats, and Domestic Architecture).

Objective 4:

Increase coordination and effectiveness of existing groups working on historic preservation issues.

STRATEGY:

Establish a Plymouth Historic Alliance to unite the many organizations working on historic preservation and promotion.

- Organize a Plymouth Historic Alliance, uniting the many groups working on historic issues. This organization could work collaboratively with the Town's economic development entity to educate the public about Plymouth's history, build support for preservation initiatives, and promote Plymouth's historic attractions to potential visitors.

Objective 5:

Encourage continued vitality of the arts within Plymouth

STRATEGY:

Support cultural facilities and events within each of Plymouth's villages.

6. Economic Development

I. INTRODUCTION/GROWTH TRENDS

From 1970 to 2000, Plymouth's commercial and industrial sectors expanded significantly. Economic growth was particularly robust in the 1980s but continued to be strong in the 1990s, when 235 companies and 4,100 jobs were created in Plymouth.[36] As of 1999, **Plymouth had 1,200 companies employing 19,000 workers.**[37]

Positive business growth has contributed to Plymouth's steadily-enlarging tax base. From 1989 to 1999, total annual revenues collected by the Town increased by $75.5 million, an increase of nearly 150%. Property tax revenues accounted for 52% of this increase while state aid and Enterprise Funds made up much of the remainder. From 1988 to 1999, state aid grew by an average of more than 12% per year.[38]

However, residential and commercial development patterns of the past 30 years suggest that Plymouth may face fiscal strains in the future. While commercial growth has been strong, residential development has vastly outpaced commercial development, and the costs associated with servicing single family housing in rural areas exceeds the tax revenues generated by such housing. To assure long term fiscal stability, Plymouth must increase its non-residential tax base.[39]

New business growth has been almost entirely in services and trade rather than manufacturing. New and emerging sectors in Plymouth need different resources and different kinds of facilities than the town had traditionally depended upon. One of the most important resource needs is a bigger and more highly-skilled work force.[40] In addition, Plymouth must compete with neighboring towns to attract and retain business. Several nearby communities have aggressive economic development programs and potentially attractive development sites.[41]

[36] RKG Associates, Plymouth Master Plan Update: Economic Development and Cost of Community Services, 2001, Volume II, p. 28.
[37] *Ibid.*, Volume I, p. 7.
[38] *Ibid.*, Volume I, p. 11.
[39] *Ibid.*, Volume I, p. 16.
[40] *Ibid.*, Volume I, p. 11.
[41] *Ibid.*

Plymouth's challenge is to expand its tax revenue through non-residential growth and to provide the kind of jobs and services needed by Plymouth residents. The town's economic development policy will be affected by housing market trends. In particular, successful businesses need housing for workers at a range of incomes. While Plymouth has traditionally been more affordable than other communities in Greater Boston, housing prices have risen sharply over the past five years, suggesting that housing affordability may become an increasing concern over the next 20 years.

II. TOURISM AND THE ECONOMY

Plymouth's natural and cultural resources are major economic assets, with tourism contributing more than $300 million dollars per year to the town's economy. These assets can be damaged by sprawl, which threatens the sustainability of natural systems and damages the integrity of the town's historic and cultural heritage.

Plymouth's waterfront is primarily oriented to tourism-related uses. Given conditions in the Massachusetts' fishing industry and conditions at other ports in the region, Plymouth is unlikely to see an expansion of its commercial fisheries. However, retention of existing commercial fishing is important to Plymouth's character. Plymouth is the regional center for excursion boating with whale watches, harbor tours, amphibious duck tours, and party fishing. There is also a summertime daily ferry to Provincetown.

Strengthening Plymouth's economy requires preservation of waterfront commercial and recreation uses and integration of these uses into the town's larger Green, Blue, and Cranberry networks. Plymouth's tourism is predominantly focused on the waterfront and downtown areas. Plymouth's more far-flung historic attractions and its natural beauty, remain relatively untapped tourism opportunities. By integrating trail networks with the waterfront area, Plymouth could encourage visitors to venture beyond the downtown and link heritage tourism and eco-tourism initiatives.

As noted in the Land Use, Natural Resource, and Historic Preservation sections of this Master Plan, Plymouth's tourism infrastructure should be enhanced. This could include development of heritage and nature trails with signs, maps, and interpretative materials, increased access to the waterfront and inland ponds, and expansion of tourist accommodations and related facilities.

In 2000, Plymouth retained RKG Associates to create an *Economic Study, The Plymouth Master Plan Update: Economic Development Strategy and Cost of Services Study*. With direction provided by the Plymouth Department of Planning and Development and Office of Economic Development, the RKG report included market research, fiscal forecasting, and site analysis. The study included a fiscal impact modeling tool, the Scenario Builder, to help Plymouth evaluate the fiscal impacts of specific development proposals and broad land use decisions. RKG's Economic Development Strategy is a 15-year plan

which is described in detail in the five-volume report. The RKG plan has been adopted as the economic development component of the master plan. This section summarizes the major objectives of that plan and adds one additional economic development goal: "Diversify and enhance Plymouth's appeal as a tourist designation."

III. ECONOMIC DEVELOPMENT OBJECTIVES AND STRATEGIES

Objective 1:

Make more land available for commercial and industrial development. Sustain a rate of non-residential growth that is sufficient to: (a) replace a portion of the expected losses in assessed valuation associated with the pending devaluation of the Pilgrim Nuclear Power Plant; and (b) balance the service costs of future residential growth.

STRATEGY:

Create a larger, more flexible inventory of land for future development.

STRATEGY:

Increase the assessed value per acre of non-residential development within existing commercial and industrial zones.

STRATEGY:

Increase property values within the downtown and waterfront areas of Plymouth Center and North Plymouth through redevelopment, tourism development, and complementary strategies.

Objective 2:

Preserve marketability and capacity of key locations to support high value development.

STRATEGY:

Invest in water/sewer, transportation, and fiber-optic infrastructure as needed to promote increased density and preserve transportation capacity within the town's most valuable commercial and industrial zones.

Objective 3:

Build organizational and resource capacity within the Town of Plymouth to implement a successful long-term economic development strategy.

STRATEGY:

Establish and gain needed resources for an effective local economic development organization to direct real estate-related development activities.

STRATEGY:

Build resource capacity to address non-real estate related economic development issues such as labor supply, worker education and training, small business financing, entrepreneurial development and related issues.

Objective 4:

Diversify and enhance Plymouth's appeal as a tourist destination.

STRATEGY:

Expand tourism infrastructure to encourage visitors to stay longer and spend more money in Plymouth.

IV. KEY ACTIONS:

Objective 1:

Make more land available for commercial and industrial development. Sustain a rate of non-residential growth that is sufficient to: (a) replace a portion of the expected losses in assessed valuation associated with the pending devaluation of the Pilgrim Nuclear Power Plant, and (b) balance the service costs of future residential growth.

STRATEGY:

Create a larger, more flexible inventory of land for future development.

- Develop/implement a Master Plan for disposition of County-owned properties, including Obery Street Farm and downtown properties.
- Rezone targeted areas to create new Economic Opportunity Zones for non-residential development. Areas to be considered for rezoning should include the County Farm at Obery Street, and the New England Park site.
- Expand the boundaries of existing non-residential zones, such as the zone between Route 3 and Long Pond Road. Expand neighborhood commercial zones, if supported by local residents, with priority expansion for Manomet and Cedarville.
- Consider applying a mixed-use overlay (OSMUD) to parcels as appropriate. Consider creating a new neighborhood commercial district for the Bourne Road Area by applying OSMUD to one or more Makepeace parcels.
- Initiate long-range planning and site analysis for possible New England Park development.

STRATEGY:

Increase the assessed value per acre of non-residential development within existing commercial and industrial zones.

- Increase densities and building heights in prime locations near existing and proposed highway interchanges.
- Encourage more retail, office, and hospitality uses around highway interchanges (Route 3/44, exits 2, 3, 5, 6, and 7).

- Limit new industrial, warehouse, and outdoor storage uses to the area east of Long Pond Road along Camelot Drive in the vicinity of the Plymouth Airport.
- Develop Airport Industrial Park, and transfer construction management and marketing responsibility to Plymouth Economic Development Corporation.

STRATEGY:

Increase property values within the downtown and waterfront areas of Plymouth Center and North Plymouth through redevelopment, tourism development, and complementary strategies.

- Implement the major recommendations of the Plymouth Center/Downtown Waterfront plan.
- Support Cordage Park redevelopment through investment in transportation infrastructure, including Route 3A improvements and completion of a pedestrian connection on the rail bed linking Cordage Park to Plymouth Center.
- Advocate expansion of commuter rail service to North Plymouth.
- Expand marine-related uses at Cordage Park and the Downtown Waterfront area, including Town Wharf.
- Implement recommendations of the ongoing downtown parking study.
- Complete a downtown market study and analysis of tourism patterns.
- Invest in infrastructure improvements, including fiber-optic infrastructure in the downtown area.

Objective 2:

Preserve the marketability and capacity of key locations to support high-valued development.

STRATEGY:

Invest in water/sewer, transportation, and fiber-optic infrastructure as needed to promote increased density and preserve transportation capacity within the town's most valuable commercial and industrial zones.

- Conduct a Long Pond Road Corridor Study and develop a transportation master plan for Exit 5.
- Work with nonresidential property owners in Route 3/44 and Long Pond Road areas to devise financing strategies for long-range water, sewer and traffic improvements.
- Develop mechanisms to require future developments along Long Pond Road to contribute to roadway improvements.
- Amend subdivision and site review regulations to leverage private funds to support a greater share of public infrastructure costs, especially in rural sections of town.
- Work with Bourne and Wareham to advocate extension of I-495 to provide a limited access connection to Route 3, including one or more exits in Plymouth.

Objective 3:

Build organizational and resource capacity within the Town of Plymouth to implement a successful long-term economic development strategy.

- Create a new organizational entity, the Plymouth Economic Development Corporation (EDC), to lead economic development efforts. This new organization will engage in real estate development, business financing, and marketing activities and will work to substantially increase funds available for downtown/waterfront development, tourism/hospitality industry growth, and industrial/office park development. The EDC will develop public/private sector partnerships and work cooperatively with businesses and residents to develop support for economic development efforts.

The Town will retain responsibility for strategic planning, infrastructure planning, and public funding related to economic development.

STRATEGY:

Build resource capacity to address non-real estate related economic development issues such as labor supply, worker education and training, small business financing, entrepreneurial development and related issues.

- Support the efforts of the Plymouth Higher Education Partnership to locate a satellite campus of the state university or community college system in Plymouth to serve both Plymouth County and Cape Cod communities.
- Increase coordination and leveraging of regional and state job training, entrepreneurial development, and business financing programs to encourage local start-ups and support small businesses.
- Increase contact and communication between economic development officials and local business owners.
- Develop a business incubator within Cordage Park.
- Encourage reverse commuting by marketing Plymouth's advantages to workers north and west of town.

Goal 4:

Diversify and enhance Plymouth's appeal as a tourist destination.

STRATEGY:

Expand tourism infrastructure to encourage visitors to stay longer and spend more money in Plymouth.

- Commission a tourism market study, possibly funded by a public-private partnership, to identify strategies which:
  - Enhance Plymouth's profile as a heritage tourism destination;
  - Attract tourists and encourage them to stay longer and spend more;
  - Attract visitors from beyond Eastern Massachusetts; and
  - Promote Myles Standish State Forest as a tourist destination.

The market study should also identify optimum locations, regulatory changes, and other conditions necessary for the establishment of new hotels, bed and breakfasts, a conference center, restaurants, and other tourist facilities.

- Identify waterfront sites appropriate for tourism and recreational development. Amend regulations and invest in infrastructure as needed to support development on selected sites.
- Create marked and mapped heritage and recreational routes and trails for visitors.
- Establish a Tourism Liaison position within Plymouth's Economic Development office to strengthen tourism's position as an economic engine for Plymouth.
- Organize a coalition of groups active in the tourism industry which can work with the Tourism Liaison and the new Economic Development Corporation to commission the market study and to develop and implement a coordinated tourism enhancement strategy.

7. Public Facilities/ Services

I. FIRE DEPARTMENT

Plymouth Fire and Rescue has seven fire stations. These are:

FIRE STATION	AREA SERVED	PROJECTED CAPITAL NEEDS
Main Station/Headquarters, 141 Sandwich Street *Constructed: 1979*	Downtown Plymouth	Additional space for storage Upgrades for ADA compliance and gender accommodations On site expansion capacity: limited
240 Samoset Street *Constructed: 1974*	West Plymouth	Gender accommodations
12 Pinehills Drive *Constructed: 2000*	Pinehills & South Plymouth	
533 Bourne Road *Constructed: 1976*	Bourne Area	Building needs to be replaced with larger facility capable of housing an aerial ladder truck. On site expansion capacity: inadequate
827 State Road *Renovated: 1988*	Manomet	
2209 State Road *Constructed: 1996*	Cedarville	On site expansion capacity: land available for expansion
0 Spooner Street *Constructed: Early 20th century*	North Plymouth	Small two-bay station needs to be expanded and relocated. On site expansion capacity: inadequate

In addition, the Plymouth Municipal Airport on South Meadow Road operates its own fire response, utilizing some Town-owned equipment. Expansions may be required with the additional development planned for some 250 acres at this facility. However, revenues from leasing of building space would cover all costs required for such expansion.

The Fire Department has 123 FTE staff, with staff working four daily shifts. According to the National Fire Protection Association standards, all fire companies should have four people on each shift. For Plymouth to have this staffing at all times, the Town would need to hire an additional 20 firefighters.

Over the next 20 years, Plymouth will need additional fire-fighting capacity to meet the needs of an estimated additional 10,000 inhabitants. This will require at least one additional fire station, in the Route 3, Exit 5 area, with associated apparatus and another 20 new personnel.

Plymouth's large size makes firefighting particularly challenging. In some areas, such as Buttermilk Bay and the Makepeace area, awkward, lengthy routes and poor road quality slow response times.

Bourne and Wareham often cooperate in responding to fires in Buttermilk Bay.

Home construction within fire-prone areas presents another challenge. Myles Standish State Forest and the surrounding woodlands are at risk of rapidly-moving forest fires due to the cumulative time since any previous fires. Forest fires occur naturally and consume the layers of forest floor debris. With many years since the last burn, a significant accumulation of many layers of dead material has built up throughout the area. In the same time period, hundreds of new homes have been built around the forest and are at substantial risk of loss from forest fire. The State does not maintain an adequate fire-fighting capacity and the Town does not have the resources to quickly contain a large wind-driven fire in the Forest. (See **Map #17-Historic Forest Fires** for the areas of historic burns.) Private water companies pose a risk for adequate fire protection because pressures and flows may not be as assured as with Town control.

II. POLICE

The Plymouth Police Department is headquartered at 20 Long Pond Road. The department has 140 staff. The Department has 18 marked cruisers, each of which has a computer for instant report filing.

The International Association of Chiefs of Police recommends 2.2 officers per 1,000 population as an adequate staffing level. The Plymouth Police Department has a staffing level of 1.73 per 1,000 people.

Plymouth's Police Chief notes the following deficiencies affecting current operations:

- Inadequate overall staffing levels. Twenty-five additional officers are needed to bring staffing to 2.2 police per 1,000 people.
- Inadequate number of supervisory personnel.
- Inadequate number of investigative personnel.
- Inadequate number of clerical personnel. The managerial staff (Chief, Captain of Operations, Captain of Administration) and the Detectives, Training, and Prosecution have no clerical staff. They have to do their own typing, filing, and copying. Existing clerical staff people focus on responding to requests for public records and other day-to-day operations.
- Inadequate building maintenance.
- Inadequate funding for technology.
- Need for new vehicles, marked and unmarked.
- Need for four new School Resource Officers.
- Need for expanded overtime budget. Accepted standards call for 15% of the salary line item. Plymouth budgets 9.9%.
- Need for funds to support specialized training. Officers receive only basic training with no additional funds for advanced or specialized training. Homeland security concerns have placed additional strain on the Police Department. The Department has had to provide training on security issues re-

lated to the nuclear power plant, without specialized funds for this training. Eight hours of training for the entire staff costs roughly $30,000.

Service for incidents on State property is a growing concern. The State Police have responsibility for monitoring the Route 3 ramps but their other priorities have shifted much of the accident work to the Plymouth Police Department with no provision for funding. In addition, the Plymouth Police are the primary law enforcement agents in the State Forest with no financial consideration from the State for these services.

In 2002, there were 35,935 calls for police assistance, up 14% from 31,624 calls in 2000 but somewhat lower than 2001. The call volume is expected to increase with increases in population and with expansion of tourist activity. In 2001, traffic citations and motor vehicle accidents were the most frequent police actions, followed by crimes against public order, crimes against property, and crimes against persons.

III. LIBRARY

The Plymouth Town Library has two branches: the Main Branch at 132 South Street in Plymouth Center and the Manomet Branch at 12 Strand Avenue. Staff members rotate between existing branch libraries. The Plymouth library system has the tenth-highest circulation in the state, indicating strong demand for library services. Library services within the community include:

- Outreach in every nursing home in town;
- Year-round children's programming in the Plymouth Public Schools;
- Literacy program in the County Jail; and
- Repository for historic resources.

The Main Branch was built in 1991. Capital expenses are addressed through a cooperative relationship between the Town of Plymouth and the Plymouth Public Library Corporation. Since the building opened, the Town has addressed issues with mechanical systems, elevator upgrades and compliance, and water issues. The Library Corporation has purchased the adjoining vacant lot for future parking lot expansion, replaced exterior doors, and maintained and replaced carpeting.

The Library Corporation and staff are currently undertaking a Master Plan project. Development in the Bourne Road area suggests the need for a new library to serve that community. The Library Director reports that Bourne Road residents are accessing library services from neighboring towns, such as Wareham and Sandwich. The feasibility of developing a new library for the Bourne Road area will be a central issue to be addressed in the Library's Master Plan. Staff members suggest that a stand-alone Bourne Road facility would be approximately 4,000 square feet and would have many of the same services as the Manomet Branch Library, including ready reference, fiction, popular non-fiction, youth collection and programming, and Internet access. If a stand-alone facility is not feasible, another option

the Library is interested in exploring is a Multi-Service Facility to include the Library and the Council on Aging, Veterans' Services, Recreation Center, and/or other social and cultural uses. A new facility would obviously require staffing increases. The Library will be defining staffing needs as part of its Master Plan.

IV. DEPARTMENT OF PUBLIC WORKS

The Department of Public Works has a variety of divisions, including Engineering, Highways, and Building Maintenance.

A. Engineering

The Engineering Division develops plans for the improvement of Town infrastructure and maintains data on the Town's roads and drainage structures.

1. ROADS

In 2002, Plymouth had 503 miles of roadway. Forty percent of roads are Town-owned, 40% are private, and 20% are State-owned. Plymouth owns approximately 194 miles of paved roads and 20 miles of gravel and stone roads.

The Engineering Department inspects roads periodically and evaluates their conditions. In 1999, the department developed a Pavement Management System to track road conditions. In its initial report, the Engineering Department found that 22 miles of road were in poor condition and 41 miles were in fair condition, with the remainder of roads being in good or very good condition. Every year, twenty percent of Plymouth's roads are supposed to be re-inspected in order to keep the Pavement Management System (OMS) current. However, there have been no updates since the original 1999 evaluation. Additional staff resources are needed to complete the needed inspections and keep the PMS current.

While the Engineering Department is responsible for infrastructure planning, the Highway Division is responsible for maintenance and repair. The Highway Division has two maintenance garage/salt sheds, one on Long Pond Road and one in Cedarville. Both are adequate for current needs but may need to be expanded as Plymouth's population grows. The Highway Division is responsible for maintenance of Town roads and for limited maintenance and repairs on private roads. Work includes plowing, sanding, minor patching, and re-surfacing. The Division also spends significant time dealing with repetitive maintenance filling and leveling of gravel roads.

Plymouth has approved and funded a 5-year Road, Bridge, and Sidewalk Improvement Initiative. Plymouth is spending $2 million per year on infrastructure upgrades, using $1.3 million in Town funds and $.7 million in State Chapter 90 funds. The Town does some maintenance on private roads through the Private Roads Improvement Program, through which the Town provides funding and private owners match town resources.

2. BRIDGES AND CULVERTS

In 1999, Plymouth commissioned a study of bridges and culverts less than 20 feet long. (The State is responsible for spans greater than 20 feet.) An improvement list was developed and needs are being addressed incrementally. The Engineering Department has completed work on the Carver Street Bridge and Clifford Road Bridge, both of which are now ready for construction.

3. DAMS

Dams on Town Brook were analyzed and one dam has been removed. The others were found to be sound and are to be left in place for now.

4. DRAINAGE STRUCTURES/STORMWATER MANAGEMENT

Stormwater management is a major issue. The Stormwater Management Act has prompted closer scrutiny of how drainage water is handled. An EPA grant has helped fund an upgrade of treatment of drainage flows to the harbor area with installation of best management practice measures in key locations. However, there is a critical lack of good data about drainage infrastructure. The town has purchased equipment and commenced a long-term program to capture data points through use of GPS (Global Positioning System) technology. The GPS will help locate the various components of widely distributed infrastructure, such as manholes, valves, hydrants, etc.

Infrastructure management, in general, is a major challenge, due to the vast and growing network of ever-aging facilities in Plymouth. Fortunately, the town has the benefit of enterprise funds for water, sewer, and solid waste capital facilities and operations.

B. Building Maintenance

The Building Maintenance Division provides maintenance for Town-owned buildings and vehicles. Five mechanics repair and maintain Town vehicles and equipment. Three building craftsmen provide repairs for the Town's 25 buildings, which range from the Town Hall to the water pumping stations. Both Town Hall and 130 Court Street also have on-site building custodians.

V. CEMETERIES

Plymouth operates 30 cemeteries. In 2003, these cemeteries contained 21,200 known burials. There are also three private cemeteries in town. The Town-owned cemeteries have enough burial plots to last the next eight years, according to the Cemetery Supervisor. The private cemeteries have roughly the same capacity.

Plymouth averages 160 burials per year and inters cremated remains at an average rate of 58 per year. The cremation rate in Plymouth has been steadily increasing and is expected to continue increasing. The Parting Ways property on Route 80 in West Plymouth has been surveyed and designed for roughly

3,000 new graves. At the current rate of burials, this new supply should add another 19 years to the town's cemetery capacity. Beyond that, however, additional capacity will be needed.

The Town has secured State and local approval to construct and operate a municipal crematory. Construction of the new facility is on hold. The crematory will be constructed in the Vine Hills and Oak Grove Cemetery at the intersection of Route 3 and Westerly Road. It is expected to generate steady revenue for the Town after the initial start-up costs have been absorbed.

Plymouth has six staff working in the cemeteries. The national industry standard for adequate personnel is one person per 10 acres of cemetery land. With only six people, the division has a current staff shortage of four to six people. The new crematory may need as many as four specially trained operators, at least two full-time per shift. When Parting Ways Cemetery comes on line, the total cemetery acreage would increase to 167 acres, increasing the staff deficit to ten to eleven people (per national standard), not including crematory staff.

VI. PARKS AND FORESTRY

The Parks and Forestry Division maintains 50 Town-owned park facilities. Routine duties include tree and lawn maintenance, trail maintenance, beach maintenance, and trash removal. The Division is also responsible for abatement of potential hazards. Illegal dumping and vandalism create additional work for the Division, particularly in areas which are not regularly visited by Parks and Forestry staff, such as the Briggs Estate in Manomet. Dumping and vandalism take staff away from their normal maintenance duties and thus impact the whole system, not just the specific park which has been the subject of illegal activity.

The Parks and Forestry Division is housed in inadequate make-shift structures at Stephen's Field. The Division's equipment requires dry storage. While the main building is structurally sound with a recent new roof and sturdy walls, it is poorly insulated and lacks central heating, proper sanitary facilities, and employee areas for its current staff of 13. A plan has been developed which proposes a new Parks and Forestry maintenance building adjacent to the existing DPW facility in the Camelot Road Industrial Park. A second maintenance facility will be needed in South Plymouth to address maintenance needs in that area.

Additional staff will be needed to maintain the Green Network of trails which the Town will develop over the next 20 years. Staff will also be needed to monitor and maintain new beach facilities.

The Town Forest Committee helps to monitor the well-being of the Town Forest by conducting inventories of flora and fauna, sponsoring trash pick-ups, and generally monitoring conditions in the Forest. The Parks and Forestry Division is not staffed or funded to collect or maintain any data on the health of

plant and animal species or the overall quality of the natural resources it manages. This is a significant deficiency, given the vast area of wildlife habitat under the Division's purview that should be routinely monitored to the same standard as the Town Forest.

The Division has had help from local nonprofit organizations–the Garden Club, Rotary Club, Kiwanis Club, Elks, Plimouth Plantation, Friends of Raymond Field–in maintaining certain features in town. It may be possible to expand this type of assistance through a focused outreach program.

VII. WATER/SEWER

The town continues to follow the recommendations of the Water Supply Master Plan prepared by Amory Engineers, last updated in 1995. The Water Plan projects the need for additional wells and pumps to meet the expected water demand through 2010.

A. Collection and Treatment System

The Sewer Division operates and maintains the Town's sewer collection and treatment infrastructure. Plymouth has 50 miles of sewer mains that collect and transport sewage to the new treatment plant behind the Camelot Drive Industrial Park. The Town's bonded investment in the current system, including the plant, is between $40 and $50 million. The users of the system–approximately 3,000 accounts–are largely retiring this debt along with funding daily operations.

The Town is directly responsible for about 10% of the total costs of funding the Sewer Department operations. The other 90% comes from the Sewer Enterprise Account, which is exempt from the constraints of Proposition 2 1/2. Sixty percent of the Enterprise Account is funded by user fees, according to water use, while the remaining 40% comes from non-rate fees, such as processing fees and tax liens.

The system serves the most densely developed portions of the town (about 10% of all homes) and certain major industrial and commercial facilities. The area includes everything north of Samoset Street and west of Route 3 (plus Cherry Street Industrial Park), east of Route 3 and south along Route 3A to Timothy Lane and Jordan Hospital, and west along Long Pond Road to PCIS.

B. Camelot Drive Treatment Plant

The treatment plant is designed and approved for 3 million gallons per day. Actual flow as of January 2003 was about 1.6 million gallons per day. The Town has signed a 20-year agreement with U.S. Filter to operate the Town's plant per state licensing requirements. The Town's license is renewed every five years to allow for improvement to treatment techniques and conformity with increasing effluent standards. According to the Town's Sewer Department Superintendent, new phosphorus removal standards may be imposed in the next license renewal process, which would require re-tooling the plant for better

performance. Phosphorus is a nutrient for algae, which chokes the needed oxygen out of water bodies and greatly impairs the conditions for desirable aquatic organisms.

Effluent treated at the Camelot Drive plant is disposed of using the existing ocean outflow and in on-site leaching beds.

A parcel nearly a mile away has been reserved for an alternate disposal area if ever needed. Due to ever-changing treatment requirements, it is difficult to reliably estimate the ultimate capacity of the sewage treatment plant site.

The Town is investigating a process of mixing de-watered sludge (the solid by-product of sewage treatment) with biodegradable household solid waste, called co-composting, to make a marketable compost material. This may help defray the cost of both sludge and solid waste disposal for the Town.

C. Extension Plans

The sewage treatment plant is sited on a 100-acre parcel behind the Camelot Drive Industrial Park. Ironically, the plant does not yet serve the businesses there. A connector line and pump station will be required to collect and treat the sewage from this industrial area.

The Town has recently started accepting septage wastes from other communities in an effort to recoup costs. However, this policy may be discontinued when local tie-ins to the sewer system bring daily flow nearer the 3 mgd maximum capacity for the current plant.

D. Individual "Package" Plants

There are eight small-scale sewage treatment plants, often called "package plants" and "small community systems," now licensed and operating in Plymouth as follows:

- Plymouth South High School/Middle School–This system is designed for 40,000 gallons per day and has had a nitrogen removal upgrade.
- Pinehills–Plant for treating sewage for 3,000 homes.
- White Cliffs
- Mark Drive
- Whitehorse Beach
- Marriot Assisted Living Center, Warren Avenue
- Plymouth Municipal Airport–This system is designed for 40,000 gallons per day.
- Entergy Power Plant

Such plants represent a viable way to prevent water pollution in discrete geographical areas because they can achieve cleaner discharge levels than individual "Title V" septic systems, which do nothing to remove nitrogen and phosphorus, the two main by-products of the septic system process that degrade water quality.

VIII. PUBLIC FACILITIES AND SERVICES OBJECTIVES

Objective 1:

Assure that the Police and Fire Departments have adequate staffing, facilities, and equipment to meet town needs.

STRATEGY:

Develop and implement Fire Department and Police Department Strategic Plans to address staffing shortfalls, future staffing needs, facility requirements, and emerging public safety challenges. Police and Fire Department Strategic Plans shall address currently identified and emerging needs.

Staffing:

Short Term: Significant expansion of public safety personnel (20 Fire Department personnel; 29 Police Department personnel)

Long Term: Expansion to meet needs of increasing population

Facilities:

Construct a new fire station at Route 3, Exit 5.
Construct a new North Plymouth Fire Station to replace the one on Spooner Street.
Construct a new fire station for the Bourne Road area.

Emerging Challenges:

Develop a strategy to ensure that private water systems are adequately maintained with adequate pressure for fire protection. This may include a local bylaw with minimum standards approved by the State Department of Public Utilities, and with DPU oversight.

Minimize hazards associated with fire-prone areas around Myles Standish State Forest by developing and implementing an integrated strategy of public education, building regulation, and code enforcement. Additional town bylaws may be needed to restrict growth in high-risk areas.

Objective 2

- **Emphasize the multi-purpose design of new or expanded public buildings, especially schools.**
- **Evaluate library needs in the Bourne area and consider a new stand-alone or multi-purpose facility.**

OBJECTIVES: PUBLIC WORKS

- **Expand wastewater treatment capacity as needed to facilitate growth and increase density in Village Centers and Economic Development Opportunity Zones.**
- **Develop and implement a Stormwater Management Plan.**
- **Construct a new facility for the Parks and Forestry Division. Expand Parks and Forestry staff as needed to monitor and maintain new trail networks.**

8. Transportation

I. OVERVIEW

Plymouth, like most Massachusetts communities, is largely dependent on the automobile for basic transportation. The town's 103-square mile area, its dispersed population, and the separation of residential and commercial areas contribute significantly to the reliance on the private automobile. Naturally, as Plymouth's population has grown and its commercial base has expanded, the number of cars on the town's roads has also increased.

Over the next 20 years, traffic volume increases may strain the capacity of local roads. Already, there is growing congestion at key intersections, especially during peak travel hours in the morning and evening. There are currently few alternatives to the private automobile. Limited bus service does connect the major points in the community. Commuter rail service extends from Kingston through North Plymouth. However, bus and rail have relatively low riderships, and much of Plymouth is not served by any form of public transit.

II. ROADS

The Town of Plymouth contains 530 miles of roadways. Most road segments and intersections in the town function very well under current traffic loads. In fact, many miles of rural roadway experience limited traffic volumes. However, several arterial and collector streets and related intersections experience significant congestion and safety problems.

Samoset Street (Former Route 44) :

Samoset Street (Route 44) experiences frequent traffic congestion, both due to high volume and to turning movements within ¼ mile east and west of Route 3.

Samoset Street west of Route 3 has been widened to four lanes; however, physical constraints limit widening options east of Route 3. In addition, while road widening accommodates flow, it may also introduce greater safety risks.

Route 3A (Court Street/Main Street/Main Street Extension/Sandwich Street)

Several segments along Route 3A have capacity problems. Congestion occurs on portions of Court Street in North Plymouth and Main Street in downtown in Plymouth during much of the day. As a tourist destination, the situation is exacerbated during the summer months. Turning cars, automobile maneuvering into parking spaces, pedestrians, and traffic signals all slow the movement of traffic in these areas. Despite the frustrations experienced by drivers, the slow pace of traffic through these dense areas increases the margin of safety for pedestrians. However, too much congestion can be a negative when customers are frustrated in their attempts to get into or out of the downtown and North Plymouth areas.

Route 3A (Warren Avenue/State Road)

State Road in Manomet and Cedarville also experiences congestion, particularly at peak morning and evening hours. The high volume of traffic on this road can make left turns onto State Road particularly risky and difficult. Because traffic moves more quickly along State Road, the danger of higher-speed accidents is increased. The left turn from State Road onto Herring Pond Road at Route 3, Exit 2 is particularly challenging.

Long Pond Road

Significant recent growth in the Route 3, Exit 5 area has brought additional traffic to Long Pond Road. There are signals at the Home Depot Plaza which help facilitate turns just west of Route 3. However, limited right-of-way width and the narrow Route 3 underpass near the plaza make it difficult for this stretch of road to accommodate any increase in traffic. “Shops at 5” has pledged to provide design plans for the Route 3 bridge reconstruction.

South Street

This older street provides the most direct access to the downtown area from Route 3 Northbound and Long Pond Road. Congestion and delays occur in the vicinity of Obery Street and at the intersection between Sandwich and South streets. A signal near the Mayflower Grocery provides some security for automobiles seeking to turn. There is no signal at the Sandwich/South intersection. However, Home Depot has pledged to provide design plans for a signal at the corner of Sandwich and South streets.

III. POPULATION GROWTH AND TRAFFIC

Plymouth and its neighbors are squarely in the path of future growth pressure radiating outward from the Boston metropolitan area. In addition, as the county seat of Plymouth County and with more jobs and commercial and cultural facilities than its nearest neighbors, Plymouth experiences increased traffic due to growth in neighboring communities.

Recent traffic studies for major development proposals have estimated that background traffic increases in Plymouth at a rate of about 2% per year, largely due to population growth. The extensive and dispersed nature of Plymouth's road network enables most roads to absorb such increases with little evidence of sudden change. However, in key areas of chronic congestion, the impact of traffic growth may be much more significant. For example, actual traffic growth on Route 44 between 1977 and 1990, according to Old Colony Planning Council historic traffic data, increased 3% to 8%, depending on location of measurement.

Below is a list of major Plymouth roadways and their relative annual rates of traffic growth.

ROUTE	LOCATION	ANNUAL GROWTH/ LOSS RATE	LATEST DATA PERIOD	YEAR AVERAGE DAILY TRAFFIC
3	North of Bourne town line	2.42%	1980-1995	30,832
3	South of Exit 5	3.92%	1976-1992	50,300
3	North of Route 44	3.81%	1980-1995	57,000
3	South of Route 44	3.78%	1980-1994	49,000
3A	South of Manomet Point Road	1.82%	1986-1997	12,587
3A	South of Rocky Hill Road	.42%	1978-1995	13,000
3A	Court Street at Kingston Line	.65%	1978-1997	15,731
3A	South of Route 44	-4.13%	1983-1993	7,974
3A	South of Summer Street	-1.66%	1985-1997	17,677
3A	Bourne Town Line	4.23%	1983-1997	6,249
Samoset Street	Carver Town Line	3.33%	1985-1997	9,019
Samoset Street	East of Route 80	6.56%	1980-1989	21,346
Samoset Street	West of Route 80	3.88%	1980-1994	15,000
Samoset Street	East of Route 3	1.47%	1980-1997	23,713
Samoset Street	West of Route 3	4.48%	1980-1994	36.042
Route 80	North of Samoset Street	7.46%	1989-1997	7,721

Source: Old Colony Planning Council historic traffic count data & MassHighway .

IV. RESIDENTIAL DEVELOPMENT AND TRAFFIC

Future land use choices have the potential to affect rates of traffic growth. The Institute of Transportation Engineers estimates that single-family detached homes generate traffic at a rate of about ten vehicle trips per day. Eighty-two percent of Plymouth residents commute to work alone by car, with an average travel time to work for all workers at 34.7 minutes (U.S. Census 2000). The ITE empirical traffic research indicates that attached and multi-family housing typically produce lower vehicle trip rates than single-family detached, especially if built near transit options and pedestrian-accessible facilities and services.

V. COMMERCIAL DEVELOPMENT AND TRAFFIC

Commercial development also affects traffic volume. Plymouth requires major developers to develop mitigation proposals, to address the traffic impacts of new construction. Some of the commercial projects and associated mitigation measures which will be developed over the next 20 years are:

Route 3A, Plymouth Center

Project: Home Depot at Long Pond Road
Estimated area of impact: Intersection of South and Sandwich Streets
Projected LOS: F (with or without Home Depot)
Mitigation: Signal.

Long Pond Road (Exit 5 area)

Project: Home Depot at Home Depot Drive
Projected LOS: C by 2004
Estimated area of impact: Exit 5 area
Mitigation: Rebuilt intersections and road segments to address traffic flow and safety concerns in entire Exit 5 area.

Project: New England Development retail subdivision–Shops at 5
Estimated area of impact: Long Pond Road between Camelot Drive and County Drive
Projected LOS: D by 2007 at the intersection of Long Pond Road and County Drive and A at Camelot Drive
Mitigation: New signals and new southbound Route 3 access ramp.

Route 3A, North Plymouth

Project: Wal-Mart at Cordage Park (already built)
Estimated area of impact: Court Street and surrounding intersections
Projected LOS: C and D during peak hours.

Route 3A, Cedarville

Project: Cedarville Commons project
Estimated areas of impact: Route 3A, State Road and Hedges Pond Road
Projected LOS: A-C for all but one area intersection; State Road and Hedges Pond Road at LOS D during summer peak conditions
Mitigation: Three new signals.

Route 44, New Alignment

Project: Plymouth Gateway retail center
Projected LOS: Peak hour LOS C or better
Mitigation: New roadway surface and signals.

These mitigation initiatives can improve existing conditions but may not fully address the long-term impacts of growth. Most traffic impact mitigation plans for large projects address the traffic created directly by the development and base their analyses over a five-year time period. Assuming an estimated 2% annual increase in traffic volume, Plymouth's traffic will grow by 20% per decade until buildout. This increase in traffic volume will not be evenly spread throughout town, but will be more concentrated in existing and projected areas of high volume, such as those areas in and around retail developments.

Most Plymouth traffic studies set Level of Service (LOS) D as a target design level. MassHighway sets Level of Service (LOS) D as a minimum for improvements within its jurisdiction. But, if background traffic does indeed increase by 2% per year, these LOS D zones may quickly degrade to E and F. At such point in time when additional improvements are required, usually indicated by increased delays and accidents, the Town will be responsible for funding these improvements, absent any new major construction projects to address the problems through mitigation.

The Town's choices may be very limited at that time. One option would be a general bond issue to fund needed improvements but that would likely involve an override or debt exemption vote. Another option would be betterment assessments. However, such additional taxes could serve to undermine the Town's attempts to attract business.

Another consideration is that the proliferation of traffic safety improvements throughout the town could ultimately produce very inefficient travel even over short distances. Most of the proposed projects include traffic signals as part of their mitigation design. While these signals may be installed to improve safety in the immediate project area, other intersections will eventually warrant traffic signals as accidents and frustration increase due to growth-related traffic on the existing road network. The presence of signals at nearly every intersection can significantly impede local traffic flow.

Given these constraints, the Town would be well-served by finding ways to minimize the need for additional road infrastructure to accommodate future growth. While simply not making the improvements is an option, it is not very likely, as history has shown that the combined effects of excessive delay and accidents tend to produce improvements in one form or another.

The optimal solution may lie in the simultaneous pursuit of two initiatives. One is the reduction of total travel demand through reductions in ultimate development potential. The second is the promotion of efficient land use patterns that reduce dependence on the automobile and optimize the viability and use of transit solutions.

VI. MASS HIGHWAY STUDY OF GROWTH IMPACTS

In 1999, MassHighway completed a study analyzing the potential impacts of population growth on traffic volumes in Plymouth, Kingston, and Plympton. The study examined the impacts of:

- The widening of Route 3 from four to six lanes;
- The re-establishment of commuter rail service from Kingston to Plymouth; and
- The re-alignment of Route 44.

The study investigated the impacts of four possible scenarios:

- Existing development
- Development of 50% of remaining buildable lots
- The development of 75% of remaining buildable lots
- The development of 100% of remaining buildable lots

This study predicted the ratios of volume to capacity for major road segments and intersections in the study area. Not surprisingly, it found that 1995 congestion was worst along Route 3A through Plymouth Center. It also indicated that, at just 50% buildout, traffic along the entire length of Route 3A from Beaver Dam Road to Route 106 in Kingston would exceed capacity. Rocky Hill Road was also shown to exceed capacity as early as 50% build-out. The study concluded that at 100% build-out, most major intersections in the entire study area would become chokepoints with volume exceeding capacity.

In the past, when projected automobile volume has exceeded capacity, investments have been made to upgrade transportation infrastructure. However, at the current rate of population growth, needed transportation investments to accommodate added capacity would be an ongoing expense far in excess of any such expenditures to date. Thus, there is a significant challenge ahead in managing the town's transportation infrastructure.

VII. MASSHIGHWAY RECOMMENDATIONS

The MassHighway study recommended that the Town of Plymouth:

Consider Regional Strategies

- Participate in an environmental impact study for the proposed widening of Route 3.
- Pursue traffic demand reduction initiatives.

Make Roadway Improvements

- Identify and remediate traffic hot spots as build-out continues.
- Improve intersections at Route 3A and Rocky Hill Road.
- Limit curb cuts on re-aligned Route 44.

Extend and Coordinate Commuter Rail Service

- Advocate for extension of the MBTA commuter rail to Plymouth Center.
- Consider long-term planning to bring MBTA commuter rail south of Plymouth Center, stopping at Plymouth's historic attractions, and extending through town to Cape Cod.
- Increase the number of peak hour commuter rail trips to Plymouth.
- Evaluate options for improving access between the Route 3/Route 44 intersection and the commuter rail station at Cordage Park.
- Coordinate commuter bus and rail schedules to provide efficient feeder service to rail facilities.
- If commuter rail is brought to Plymouth Center, prepare a transit-oriented development strategy around the new station area.

VIII. PUBLIC TRANSPORTATION

Plymouth is served by the Greater Attleboro Taunton Regional Transit Authority (GATRA) public transportation system. Plymouth and Brockton (P & B) Street Railway Company, based in Plymouth, provides the Plymouth Area Link (PAL) transit services on behalf of GATRA. P&B also provides regional transit services to and from Cape Cod and Boston, including Logan Airport. GATRA buses run through the five villages on a fixed route and fixed schedule, but buses may also be flagged for a pick-up at any location along the routes.

In 2003, there were three fixed routes serving northern and coastal areas of Plymouth:

LIBERTY/FREEDOM LINKS:

Serves portions of Plymouth Center, North Plymouth, and West Plymouth at points between Exit 5 (Route 3), Jordan Hospital, Independence Mall, and the Kingston train station, including designated stops at the following additional locations: Plymouth Library, North High School, Mayflower Village

Apartments, Downtown Post Office & CVS, Council on Aging, Cordage Park, Plymouth Industrial Park, West Plymouth Plaza, and K-Mart/Shaw's Plaza. On these links, buses run every hour from 6:20 a.m to 5:20 p.m.

MAYFLOWER LINK:
Serves points between Cedarville (Bruno's Corner) and Exit 5 (Route 3) with other stops at Ellisville Harbor State Park, Indian Brook Recreation Area, Seaside Café, Manomet Center (Stop & Shop), White Horse Beach, Woodcrest Apartments, Gellar's, Yankee Village, Plymouth Beach, and Plimoth Plantation.

On these links, buses run every two hours from 7:20 a.m to 5:20 p.m.

PURITAN LINK:
Serves West and North Plymouth by starting in Carver at the South Shore Community Action Council and goes as far north as Kingsbury Plaza in Kingston. Plymouth destinations include Plymouth Airport, South Shore Head Start, Pinehurst Village, Montgomery Drive, South Meadow and Federal Furnace Roads, Downtown CVS, and the P&B terminal off of Cherry Street. On these links, buses run every hour from 8:15 a.m to 5:15 p.m.

IX. PUBLIC PARKING

Public parking is limited, with most public parking spaces available in the Downtown/Waterfront Area. The Town's Engineering Department conducted a survey of public parking spaces in a discrete area of the Downtown/Waterfront area in January 2003. The Department found that there were 1,672 public parking spaces and 293 private, off-street spaces in the area bounded by Lothrop Street, Plymouth Harbor, the intersection of Water and Sandwich Streets, and one block west of Sandwich, Main, and Court Streets.

The Town's 2003 commissioned study of Downtown/Waterfront area parking reported that the utilization rate of a parking inventory should be around 95% to avoid excessive frustration and re-circulation of vehicles looking for spaces. Taking this into account, the study calculated a total effective supply (public and private) of 1,867 spaces (.95 x 1,965) and a shortfall of 618 spaces.

The parking analysis study identified the following opportunities for increasing parking in the Downtown/Waterfront area:

- Adding off-street parking–possible construction of garages on Memorial Hall and the Main Street Extension lots.
- Adding on-street parking–Reorganizing existing parking areas and making modifications to certain street flows for one-way travel.

- Managing existing parking–Some lots are underutilized and shared parking arrangements could be explored.
- Remote parking–Establish remote parking facilities linked to the downtown area by shuttle buses.

The parking analysis also described the need for consistent enforcement of parking regulations, separation of employee and customer parking areas, and installation of meters to assure turnover of the most desirable parking spaces. It also described some on-street parking spaces which should be removed in order to improve traffic flow and pedestrian safety.

Currently, parking demand is greatest in the Downtown/Waterfront area. The other village centers have more off-street parking. However, as the land use changes suggested in this plan are implemented, village centers will need to provide additional parking in their central business areas to accommodate increased population concentration.

X. BICYCLE AND PEDESTRIAN FACILITIES

Bicycle Facilities

Plymouth is about to construct the town's first bike path along the former Old Colony rail bed from North Plymouth to Plymouth Center. Additional bikeways are in the planning stages. The creation of an inter-connected trail system throughout Plymouth will facilitate biking and walking, promoting healthy commuting alternatives and enhancing Plymouth's attractiveness as a tourist destination.

As described in the Natural Resources and Open Space sections of this report, Plymouth could develop green networks: parks, forests, and playgrounds connected through wildlife corridors and bike/walking trails. Scenic bikeways could link population centers to natural areas, schools, and employment opportunities. A bikeway to the sea would be a particularly attractive amenity.

There are paved bicycle trails parallel to the main road in Myles Standish State Forest. However, according to the Plymouth Police Department's bicycle safety officer, many of Plymouth's roads lack adequate provisions for safe bicycle use. This includes Long Pond Road, which is a designated bike route. Bike lanes would improve safety for bicyclists.

Plymouth does not have a local bicycle advocacy group; therefore, the Massachusetts Bicycle Coalition should be included in planning efforts focused on bike safety.

Pedestrian Facilities

Many of the Village Center roads have sidewalks along major roadways. Plymouth Center and North Plymouth seem to have the best sidewalk infrastructure. However, as population expands, sidewalks will have to be built along many roads, especially in West Plymouth, Cedarville, and Manomet.

In addition, the roads between residential neighborhoods and schools should have sidewalk facilities. According to the Plymouth Police Department, many areas around schools lack safe areas for pedestrians and bikes. Furthermore, many roadway segments that serve as school bus routes lack adequate room for children to walk to their respective bus stops.

The absence of adequate bike and pedestrian facilities in key areas will require a long-term commitment of resources to reasonably address deficiencies. Because there is currently no organized effort to address problems related to pedestrian and bicycle safety, it appears that a committee or task force on bicycle and pedestrian safety is warranted.

XI. AIRPORT

Plymouth Airport on South Meadow Road is an important transportation asset that appears to be underutilized. While the airport has a reasonable amount of air traffic, there is little integration of the airport with the rest of the community. While the Puritan Link bus runs between the airport and downtown in 20 minutes, its frequency is only once every two hours.

According to the 2005 Airport Development Master Plan, "The Plymouth Municipal Airport on South Meadow Road consists of approximately 755 acres. The Airport is an active General Aviation airport serving the business and recreation aviation needs for southeastern Massachusetts. As a gateway to the community, the airport services business aircraft up to 12 passenger jets. The airport is home to 175 based aircraft, 38 hangars, with 21 based aviation and non-aviation companies employing some 225 persons. Corporate/business aircraft activity has been increasing in recent years as commercial/industrial activity has increased in the Plymouth area overall. This increase is anticipated to continue into the future. The airport is currently developing some 250 acres on the south side of the airport for the expansion of aviation and compatible non-aviation industrial activity. The Plymouth Airport is headquarters to the Massachusetts State Police Airwing, basing 4 helicopters and one aircraft. Also Boston Medflight bases their emergency medical helicopter at Plymouth, operating 6-7 flights per day. The Airport has an active capital improvement program to improve the infrastructure on both the aviation and non-aviation side of the facility. The Airport is operated as a municipal enterprise account which funds the operations and capital improvements of the airport."

XII. HARBOR

The harbor area and waterfront could be better utilized for transportation. Ferry service to Boston and Provincetown could provide an attractive and important linkage for tourist and commuter travel. However, the absence of such service suggests that demand may still be too low to make affordable ferry travel viable, given the relative ease in using highways. Nonetheless, ferry travel may become a preferred alternative when highway congestion and delays become even greater obstacles.

Plans for a ferry out of the Cordage Park area have been discussed as part of the re-use of that location. This might be the first viable location for private ferry service. Consideration should be given to possible ferry service out of Plymouth Harbor.

XIII. TRANSPORTATION OBJECTIVES AND STRATEGIES

Objective 1:

Ensure that Plymouth's roads adequately meet the needs of projected increases in traffic volume over the next 20 years.

STRATEGY:

Invest in roadway improvements in growth areas and restrict improvement in rural areas.

Objective 2:

Reduce traffic congestion and air pollution.

STRATEGY:

Minimize traffic demand by implementing land use plans which support compact development, transit-oriented development, and walkable villages, linked by green networks of bikeways and walking trails.

Objective 3:

Encourage greater use of alternatives to the automobile.

STRATEGY:

Invest in public transit, extending commuter rail from Boston and providing improved transit services within Plymouth.

STRATEGY:

Encourage shared vehicle options, shuttle buses, and use of waterways for travel.

STRATEGY:

Develop biking and walking trails which link village residential areas to transit hubs and major commercial and recreational destination points.

XIV. KEY ACTIONS

Objective 1:

Ensure that Plymouth's roads adequately meet the needs of projected increases in traffic volume over the next 20 years.

STRATEGY:

Invest in roadway improvements in growth areas and restrict improvement in rural areas.

Growth areas

- Facilitate improved east-west travel between Route 3 and Manomet.
- Facilitate improved north-south travel through West Plymouth.
- Improve intersections at Route 3A and Rocky Hill Road.
- Limit curb cuts on re-aligned Route 44.
- Identify and address hazards within intersections and along road segments.

Protection areas

- Minimize use of gravel roads; avoid paving such roads.
- Avoid widening rural roads for additional travel lanes.
- Identify rural protection areas and minimize traffic growth.

Objective 2:

Reduce traffic congestion and air pollution.

STRATEGY:

Minimize traffic demand by implementing land use plans which support compact development, transit-oriented development, and walkable villages, linked by green networks of bikeways and walking trails.

- Work with regional partners to pursue traffic demand reduction initiatives.

Objective 3:

Encourage greater use of alternatives to automobile.

STRATEGY:

Invest in public transit, extending commuter rail from Boston and providing improved transit services within Plymouth.

STRATEGY:

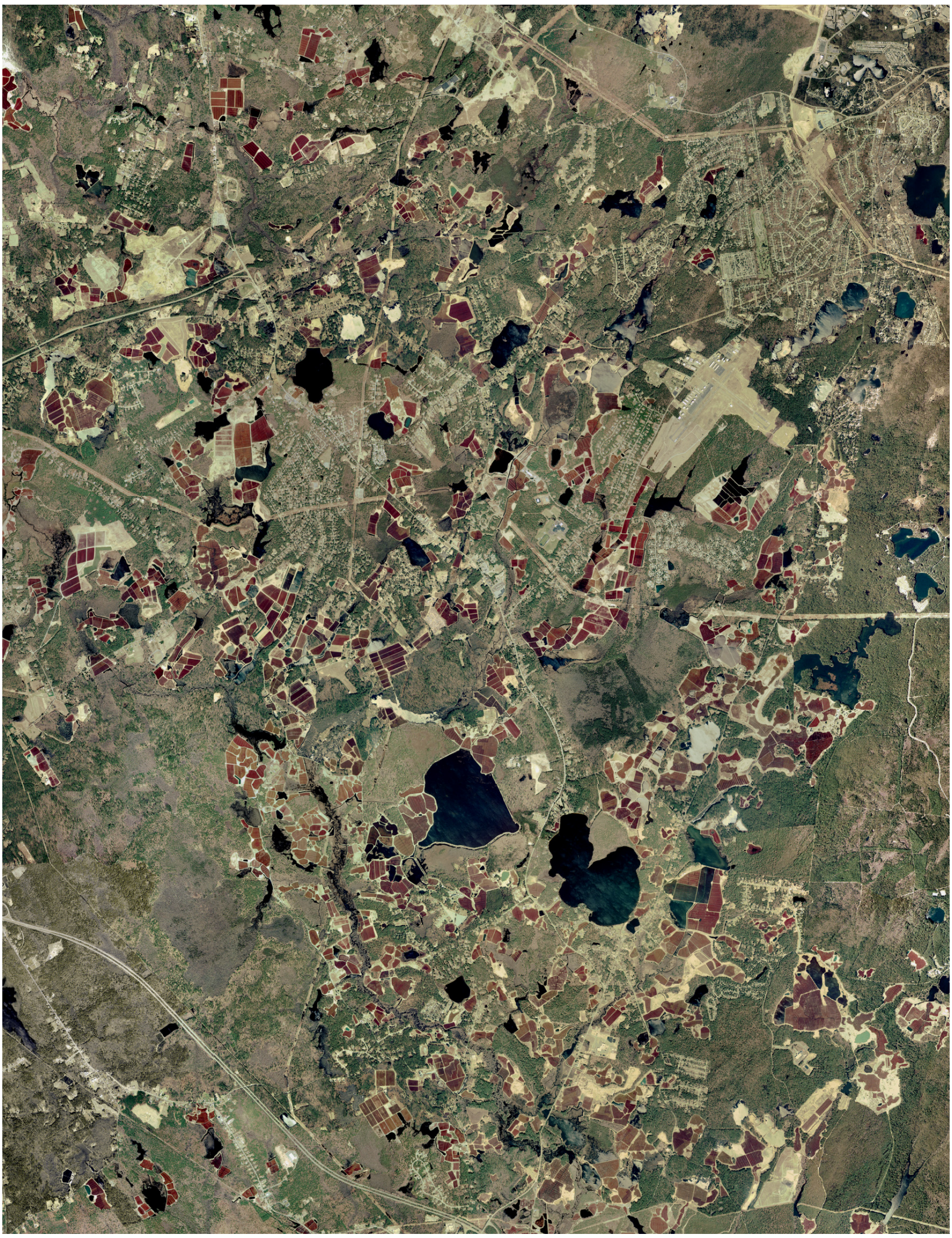
Encourage shared vehicle options, shuttle buses, and use of waterways for travel.

- Advocate for extension of the MBTA commuter rail to Plymouth Center and beyond to Plymouth's historic sites and towns along Cape Cod.
- Increase the number of peak hour commuter rail trips to Plymouth.
- Improve access at the Route 3/Route 44 intersection and commuter rail station at Cordage Park.
- Coordinate commuter bus and rail schedules to provide efficient feeder service to rail facilities.
- Encourage transit-oriented developments around new transit stops.
- Encourage carpooling and shared automobile options ("Zipcar").
- Provide transportation between surplus parking facilities and public beach areas.
- Provide remote parking outside the Downtown/Waterfront area with convenient shuttle service.

- Pursue long term plans for the introduction of ferry service, linking points along Plymouth coast and extending to Boston and/or Provincetown.

STRATEGY:

Develop biking and walking trails which link village residential areas to transit hubs and major commercial and recreational destination points.

- Provide sidewalk and bikeway access between village residential and village center areas.
- Emphasize integrated pedestrian and bikeway design among private property and public ways.
- Provide additional sidewalks, especially in West Plymouth, Cedarville, and Manomet.
- Prioritize sidewalk and bikeway construction around schools and school bus routes.

Appendix: Maps