Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire
by
Strafford Regional Planning Commission
Dover, New Hampshire

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Master Plan: Toward the Year 2010

Prepared by

Town of Madbury Planning Board

and the

Strafford Regional Planning Commission

Preface

Thank You!

To prepare this Master Plan, the Planning Board would like to thank:

Board of Selectmen

Citizens

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- Community Safety and Services at an Affordable Price/Stable Tax Amount.
- Balancing Economic Development with Environmental Protection.

The Vision for Madbury

Be a quality residential community that preserves and maintains the Town's historic and rural character.

Policy Goals

To achieve this Vision, the Town has established ten policy goals in order of priority:

1. Protect **water resources** in Madbury from contamination, depletion and disfigurement using watershed management principles. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

2. Preserve Madbury's **rural atmosphere and landscape**. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

3. Acquire additional interests in **land** for conservation, water supply, open space, public recreation, and Town facilities.

4. Insure a safe and secure **community**.

5. Keep the **property tax** stable.

6. Accommodate the service and **infrastructure** needs of residents without placing an undue burden on taxpayers.

7. Insure future **economic development** does not harm the **environment** or abutting properties.

8. Plan and implement a safe, attractive and efficient **transportation** network.

9. Focus Madbury's **civic and social activities** within the present civic district.

10. Allow a diversity of **housing** so people of all ages and income may live in Madbury.

Major Initiatives

Water Quantity and Quality Protection

Preservation of Open Space and Rural Character

Town Center Improvement

Implementation

Start now!!! The mission is results!!!

Part 1 --Introduction

A Master Plan

New Hampshire law (RSA 674:2) describes the purpose and structure of a Master Plan as follows:

The purpose of the Master Plan is to:

- *Set down as clearly and practically as possible the best and most appropriate future development of the area under the jurisdiction of the Planning Board, to*
- *Aid the Board in designing ordinances that result in preserving and enhancing the unique quality of life and culture of New Hampshire, and to*
- *Guide the Board in the performance of its other duties in a manner that achieves the principles of smart growth, sound planning and wise resource protection.*

The Master Plan shall be a set of statements and land use and development principles for the municipality with such accompanying maps, diagrams, charts and descriptions as to give legal standing to the implementation ordinances and other measures of the planning board.

Each section of the Master Plan shall be consistent with the others in its implementation of the vision section.

The Master Plan shall be a public record subject to the provisions of RSA 91-A (i.e. pertaining to assess to public records and meetings.).

The Master Plan shall include, at a minimum, the following sections:

- *A vision section that serves to direct the other sections of the plan. This section shall contain a set of statements, which articulate the desires of the citizens affected by the Master Plan, not only for their locality but for the region and the whole state. It shall contain a set of guiding principles and priorities to implement that vision.*
- *A land use section upon which all the following sections shall be based. This section shall translate the vision statements into physical terms. Based on a study of population, economic activity, and natural, historic, and cultural resources, it shall show existing conditions and the proposed location, extent, and intensity of future land use.*
- *The Master Plan may also include the following sections: transportation, community facilities, economic development, natural resources, natural hazards, recreation, utility and public services, cultural and historic resources, regional concerns, neighborhood plans, community design, housing and implementation.* (See RSA 674:2III.)

Thus, a Master Plan is:

- A long range, comprehensive, general description of what a municipality wants to be and how it will achieve it.

- A commitment to do something.
- Adopted, thus it reflects public policy.
- Used to make decisions about community development and preservation issues. The issues may range from water resource protection, residential development, and transportation improvements to town facilities and services.
- The basis for land use and development ordinances (e.g. zoning ordinance, street and highways ordinance, growth management ordinance) or regulations (e.g. subdivision regulations, site plan review regulations), capital improvement programming, town center development and beautification, open space or land conservation, and other programs and projects to improve the quality of life in a community.

Town of Madbury's Master Plan

The Town of Madbury has an adopted Master Plan that is periodically updated.

The Master Plan policy goals, principles and standards are aimed at achieving a quality residential community. Achieving them will require implementation (i.e. action to achieve results). These actions are described in the Master Plan.

In part this means setting and meeting current or new principles and standards for development. For if "quality" is defined as conformance to a standard, then continually improving quality means continually setting and achieving higher standards for excellence in planning, design, development, service and operations.

Citizens drive the standards: their aspirations, expectations, goals and principles.

Setting standards and monitoring progress will enable the Town to:

- Retain and improve the quality of life.
- Promote economic opportunity.
- Promote health and safety.
- Promote educational opportunity.
- Promote environmental protection.
- Enable sustainable development.

The Master Plan will describe these standards. Some exist in current ordinances and regulations. Others will need to be prepared and adopted over time. Achieving them will result in achieving the vision of a quality residential community.

The following is the status of the Master Plan sections and action by the Town Planning Board.

Demographics	Approved 2001
Water Resources	Approved 2001
Historic Resources	Approved 2001
Natural Resources	Approved 2002
Community Development/Vision	Approved September 2001/June 4, 2003
Land Use	Approved June 4, 2003
Housing	Approved June 4, 2003
Town Facilities and Services	Approved June 4, 2003
Transportation	Approved June 4, 2003

Part 2 - Master Plan Policies and Recommendations

2.1 The Vision for Madbury

Introduction

The Master Plan's Vision for Madbury describes what kind of town citizens of Madbury want. The Vision describes the overall character in terms of its natural, social and built environment.

The Vision for Madbury

The vision for Madbury is to **be a quality residential community that preserves and maintains the Town's historic and rural character**.

Public opinion in Madbury, as discerned from community expressions including public hearings, conversations among residents, and a Planning Board survey, clearly favors this vision. Since the Town does not offer suitable locations for significant retail or industrial development, no significant commercial center is anticipated. The scenic vistas of farms and open meadows, forests and wetlands, stonewalls and historic architecture, are what give Madbury its unique character and citizens want to preserve these.

Policy Goals

To achieve this Vision, the Town has established ten policy goals in order of priority:

1. Protect **water resources** in Madbury from contamination, depletion and disfigurement using watershed management principles. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

2. Preserve Madbury's **rural atmosphere and landscape**. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

3. Acquire additional interests in **land** for conservation, water supply, open space, public recreation, and Town facilities.

4. Insure a safe and secure **community**.

5. Keep the **property tax** stable.

6. Accommodate the service and **infrastructure** needs of residents without placing an undue burden on taxpayers.

7. Insure future **economic development** does not harm the **environment** or abutting properties.

8. Plan and implement a safe, attractive and efficient **transportation** network.

9. Focus Madbury's **civic and social activities** within the present civic district.

10. Allow a diversity of **housing** so people of all ages and income may live in Madbury.

2.2 Water Resources Policies and Recommendations

Introduction

The Master Plan Water Resources section includes policies and recommendations related to water resource protection.

Policies

1. Protect water resources in Madbury from contamination, depletion and disfigurement using watershed management principles.

2. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

Recommendations

1. Take reasonable and prudent precautions to protect all water resources from incompatible land uses, thus protecting the health and general welfare of the community.

2. Insure that sufficient water supplies exist for use by Madbury residents, as well as native wildlife and plant communities. The Town needs to examine and address water supply issues, watershed management, pollution, and potential aquifers/gravel areas.

3. Follow water resource management objectives to guide policies, regulations, and actions that affect Madbury's water resources including:

    Protect public health, safety, and welfare.

    Maintain high environmental quality.

    Ensure that growth does not compromise (degrade) environmental quality.

    Direct development to environmentally suitable areas.

    Assure adequate water supply for residents.

    Preserve water quality and quantity for future residents.

    Educate residents about water resource issues.

Participate in inter-municipal water resources management efforts.

Comply with applicable local, state, and federal regulations.

Surface Water Resources

1. Create a report documenting and mapping smaller water bodies and their uses.

Wetlands

1. Protection of water resources through the use of a wetlands conservation overlay zone applied to salt marshes, wetlands, and surface waters (ponds, first order streams, headwaters) is a priority of the Town to be enforced by the Planning Board.

Floodplains

1. Continue prohibition of construction within the 100-year floodplain.

Salt Marshes

1. Use best management practices, careful monitoring of activities, and restoration for land uses within the Little Bay watershed to prevent pollutants from entering the Great Bay estuary.

Water Quality

1. Pursue follow up testing of wells to determine the current state of Madbury's groundwater resources.

Groundwater Resources

Potential Surface Water and Groundwater Supplies

1. Ensure plentiful and safe groundwater supplies by protecting groundwater supplies through aquifer recharge protection ordinances and by advocating and participating in conservation of water resources.

2. Initiate studies to conclusively confirm or deny the existence of potential aquifers, identify sustainable yield rates from known aquifers, examine the potential for artificial recharge of groundwater, and establish a system of monitoring groundwater resources.

Potential Threats to Water Resources

1. Establish an aquifer protection overlay district or similar zoning tool to protect groundwater resources.

Non-Point Source Pollution

1. Develop an effective system to monitor non-point pollution over time.

Sand and Gravel Excavation

1. Modify ordinances to leave 4-8 feet of sand and/or gravel above the estimated seasonal high water table at gravel operations.

Scrap-Metal Recycling

1. Amend the zoning ordinance to control the use of excavation sites. Various types of controls are available, and could be implemented during the excavation permit application process under RSA 155-E.

2. Protect the Pudding Hill aquifer through the use of best management practices and monitoring of activities for existing development located within the Commercial and Light Industry zone.

Road Salt

1. Study the impacts of road salting on Madbury's ground and surface water supplies.

Dover Municipal Landfill

1. Devise a system whereby the Town receives regular updates on the status of Tolend Landfill contamination plumes and their effects on the water quality of the Bellamy Reservoir and nearby groundwater.

Regional Coordination

1. Negotiate, when needed, mutually beneficial municipal agreements that protect aquifers, crossing municipal boundaries.

2. Coordinate water resources database management with State and Town boards to further the protection and management of the water resources of the Town.

3. Protect aquifers existing completely within the Town and cross-boundaries with other municipalities.

Demand for Water

Local Projections

1. Study Madbury's per capita water use and groundwater recharge and estimate the effect that future population growth in town would have on groundwater supplies. Combine the results of this study with build out results to develop an understanding of Madbury's water resource needs vs. availability in the future.

Regional Projections

1. Support the efforts of watershed associations, regional planning commission, and municipalities to coordinate water protection and management within the Bellamy and Oyster River watersheds. Incorporate policies, regulations and other actions from watershed management plans through the Planning Board, Conservation Commission, and Water District.

Solid Waste Facilities

1. Identify alternatives to monitoring groundwater in the Pudding Hill Aquifer as well as Gerrish Creek to detect potential contamination.

Bellamy River Watershed

1. Become an active and vocal stakeholder in Bellamy River Watershed planning and management.

Water Law and Water Rights

1. Determine whether Madbury may or may not secure a right to Bellamy surface water.

2.3 Natural Resources Policies and Recommendations

Introduction

The Master Plan Natural Resources section includes policies and recommendations related to other natural resources including topography, landscape features, habitat and the conservation, protection and use of these resources, and their inherent interrelationship with water resources.

Policies

1. Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

2. Acquire additional interests in land for conservation, water supply, open space, public recreation, and Town facilities.

3. The Madbury Conservation Commission has highlighted the following types of landscape as priority areas for protection, preservation, and long-term resource management in the best interests of the environment and community:

    - Wetlands
    - Wildlife corridors
    - Agricultural areas

Recommendations

Resource Conservation and Protection

1. The Madbury Conservation Commission should take steps necessary to successfully undertake a conservation projects for land protection.

General Land Protection Measures

1. Develop a parcel-level plan for the Town to acquire and maintain new land and conservation easements to meet stated conservation goals.

2. Focus on lands along the Bellamy and Oyster Rivers for acquisition or easement.

3. Construct and maintain a database of protected land and easements that includes both Town-owned and private protected lands and conservation easements.

Preservation of Agricultural Resources

1. Discourage agricultural land uses that are incompatible with neighboring residential development.

2. Encourage continuance of traditional, low-impact agricultural practices.

3. Protect the Kingman Farm; work closely with UNH to ensure how important it is to the Town's conservation planning efforts.

4. Discourage development via the Zoning ordinance on the Town's Important Farmland Soils. Very large lot zoning should be considered for areas of Prime Farmland Soils.

5. Develop a long-term program for securing development rights on important farmland. Development rights could be acquired by the Town or by non-profit land trusts.

6. Encourage rather than hinder compatible agricultural operations, horticulture, agricultural experimentation, so-called "alternative farming", and the local marketing of local produce.

7. Protect lands that abut the Kingman Farm to minimize impacts on the farm from surrounding areas.

Contiguous Lands Protection

1. Plan for protection of contiguous lands for the benefit of wildlife and plant communities.

2. Establish adequate wildlife corridors as part of the process of assembling a network of contiguous lands.

Open Space Planning

1. Create an open space overlay map for properties > 10 acre, and use this overlay as base data for developing an open space plan. Investigate the Town of Newmarket Open Space Plan as a model for development of a similar plan for Madbury.

2. Promote conservation subdivisions that create quality open spaces that protect resources in the existing landscape.

3. Change Town zoning ordinance, subdivision regulations, and site plan regulations to promote conservation subdivisions.

Policy-Related Measures

1. Continue to allocate 50% or greater of current use penalty tax revenue to conservation efforts.

2. Monitor impervious surface and shore land protection status.

3. Use the Town's capital reserve or issue bonds for resource protection.

Development

1. Limit incompatible uses within priority conservation areas.

2. During the subdivision review process, the Planning Board should pay particular attention to preventing erosion and sedimentation that could result from construction related activities in marginal lands.

3. Consider adopting a Soil Type Lot Size system for determining the size of building lots. Madbury's Zoning Ordinance requires a building lot to be a minimum of 80,000 square feet, regardless of soil conditions. There are several, large, contiguous areas of soil with low and very low potential for supporting development. These areas should be protected from residential development and are prime candidates for open space and conservation land.

Resource Stewardship

Town Lands and Easements Database

1. Develop and maintain a database of Town-owned land and conservation easements to assist in planning efforts. The database should include LCIP/LCHIP lands, the Town Forest, the Hicks Hill and Bolstridge properties, and all new land and easement acquisitions.

Access and Use

1. Protect areas for hunting and fishing.

2. Provide for and proactively manage a Town greenbelt and trail system with trails that protect resources and that is sensitive to property owners.

3. Provide for recreational activities along roads and trails, such as biking, hiking, rollerblading, cross-country skiing, and jogging.

4. Encourage regional transit where possible to help to promote clean air and water.

5. Determine compatible uses and access levels for Town land and allow access and uses accordingly.

6. Formalize stewardship plans with owners or easement holders. Conservation Commission should evaluate private lands or easements for their contribution to overall resource protection goals and negotiate with owners and easement holders to formulate appropriate, written stewardship plans.

Habitat and Species Protection

1. Identify, protect, and maintain existing, significant transition zones, such as hedgerows, woodland buffers, riparian areas, and forest edge.

2. Balance protection and maintenance of transition zones with the need to protect un-fragmented habitat components of the landscape.

3. Include transition zones in conservation subdivision process as high value areas.

Rare and Endangered Species and Areas of Ecological Interest

1. Add a survey for rare and endangered species and areas of ecological interest to the Town's subdivision application for lots > 10 ac. The survey(s) should be conducted at a time of year when species and ecological communities are most likely to be found, if present.

2. Perform a wildlife habitat analysis for Madbury, following the procedure detailed in the wildlife habitat guide by NH Fish and Game referenced above.

3. Perform a new Natural Resources Inventory of Madbury, using the NRI report and guide by Auger and McIntyre referenced above.

4. Emphasize the value of wildlife and their habitats within town through education activities for all ages.

Wetlands and Watershed Resources

1. Consider placing mandatory conservation easements on wetlands within subdivisions. Use the Town of Lee as a model.

2. Consider providing stricter protection of the ecological services of wetlands, such as filtration.

3. Officially designate prime wetlands for Madbury.

4. Preserve areas surrounding wetlands, particularly prime wetlands and other high value wetlands with legal standing.

5. Continue to prevent development in floodplains.

6. Protect water supplies around wells and rivers possibly through establishment or upgrade of ordinances, such as wellhead protection districts, well recharge areas, aquifer protection districts, and substantial riparian setbacks for water conservation.

7. View development in light of the Town's role as a watershed steward, considering the critical combination of water and land resources.

2.4 Historic Resources Policies and Recommendations

Introduction

The Master Plan Historic Resources section includes policies and recommendations related to historic resource protection.

Policies

1. Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas and historic resources for the benefit of present and future generations.

Recommendations

1. Identify and map archeological sites.

2. Inventory, stabilize, and protect gravestones.

3. Preserve the historic character of Madbury's scenic roads. Two roads, Nute Road and Cherry Lane, are designated scenic roads. Work in the vicinity of scenic roadways should be carefully monitored, with particular attention paid to the preservation of large trees and stonewalls.

4. Identify historic resources in critical need of protection, and pursue a program for acquiring conservation easements.

5. Maintain the rural character of the Civic District by developing local historic design standards encompassing the Town Hall, the DeMerritt House, Elliot Rose, Hicks Hill, Boody Rock, Union Church, Kingman Farm, a graveyard and the town cemetery.

2.5 Land Use Policies and Recommendations

Introduction

The Master Plan's Land Use section included policies and recommendations related to land use protection.

Natural and Water Resource Lands

Policies

1. Development will be primarily residential with every effort made to preserve open spaces essential to the Town's rural character and natural resources.

2. Protect water resources by preserving forests and minimizing propagation of impermeable surfaces.

3. Careful attention will be given to septic system design and performance.

Recommendations

1. Adopt updated Open Space/Conservation Subdivisions and Conservation Easements Zoning Ordinance and Subdivision Regulations amendments.

Agricultural Lands

Policies

1. Existing agricultural lands will be used for viable agricultural activities consistent with a residential community and water resource protection. Agriculturally significant land not actively in use for agriculture will be conserved as open space.

Recommendations

1. Learn what agriculture-related activities are economically viable in Madbury and review zoning ordinances to make them compatible with appropriate activities.

2. Review zoning ordinances for appropriate constraints on agricultural businesses. Agricultural uses should not conflict with the dominant use: residential, and should not threaten the regional water supplies in town.

3. Organize a Town committee to work with UNH to discuss current and future uses of the Kingman Farm.

4. Develop strategies for the Town's acquisition of the property should UNH choose to sell or donate all or part of the property.

5. Consider zoning the Kingman Farm property for agricultural uses only, to reflect its current and historical use.

Residential Lands

Policies

1. Residential development will continue.

2. The rural character of the Town will be preserved and its water resources protected.

3. Infrastructure and services will be expanded as needed to meet demand and at a rate sustainable with stable property tax rates.

4. Appropriate housing will be available to all members of the community.

Recommendations

1. See Open Space/Conservation Subdivisions and Conservation Easements in Strategies section below.

2. Investigate incorporating shared-wall housing or accessory housing units within appropriate residential developments having access to shared water or sewage facilities.

3. Investigate allowing limited mixed densities (single and multifamily dwellings) in residential subdivisions that may provide more affordable housing opportunities.

4. Modify zoning ordinances to reflect existing densities and characteristics of particular regions in town.

Civic District

Policies

1. Promote the Town's civic district as a vital center for community life.

2. Possible future public service facilities include a library, additional elementary school space, expansion of Town Offices, and recreational facilities.

Recommendations

1. Work closely with the school district and community service organizations to ensure that Town and school facilities and programs enhance and support one another in order to maximize the public benefit.

Recreation

Policies

1. Preserve the Town's open spaces and ensure they remain available for recreation.

2. Continue to improve and expand civic facilities for recreation.

Recommendations

1. Adopt updated Open Space/Conservation Subdivision Design and Conservation Easements Zoning Ordinance and Subdivision Regulations Amendments.

2. Enhance public recreational facilities in the civic district. Develop hiking paths and nature trails in the civic district that utilize adjacent conservation land.

3. Incorporate the open lands in the civic district with the Bellamy Greenway to link these uses.

Town Facilities and Service

Policies

1. Public services will expand to keep pace with demand.

2. Town property taxes will remain stable by careful financial planning and growth management.

Recommendations

1. Use and maintain the Capital Improvement Program (CIP).

2. Investigate the feasibility and fairness of imposing impact fees on new development.

3. Investigate the long-term cost benefits of bonding funds for the acquisition of conservation lands and open space.

4. Investigate the cost benefits of sharing services with adjacent communities.

Commercial Development

Policies

1. Access to state highways will be managed to provide safe travel with increasing traffic volumes.

Recommendations

1. Adopt access management standards to ensure the preservation of road efficiency. Office and professional service activities might be compatible and sustainable uses of these highway corridors. These corridors will maintain their rural landscape and architectural values, possibly by conversion of existing structures. Curb cuts will be minimized. Appropriate office use would have relatively low impact on the community and adjacent properties.

2. Identify appropriate areas for non-industrial commercial development.

3. Do not re-zone long strips of land along these roadways where eventual development would result in inefficient sprawl.

4. Develop site plan design standards that will enhance and support the adaptive re-use of existing structures and developed areas while maintaining the rural landscape and architectural scale of development.

5. Home-based occupations may become more common without compromising the quality of life in residential areas.

6. Develop performance standards for home-based businesses that prevent negative impacts on surrounding properties and the community.

7. Continue to support home occupation in all districts.

8. Review regulations to ensure support for the marketing of farm products, local arts and crafts and traditional enterprises.

Industrial Development

Policies

1. Industrial development will not threaten water resources in any way.

Recommendations

1. Monitor existing gravel mining operations for potential adverse impacts to water resources and quality of life for neighbors.

2. Discontinue the metal recycling activity if that opportunity arises since it threatens an important aquifer.

3. Limit or prohibit industrial development that could adversely affect the Town's water resources.

Economic Viability

Policies

1. Balance taxable resources and non-discretionary spending, given the present state tax structure.
2. Consider the tax consequences of attracting a high proportion of school-aged children into the Town, since schools represent the dominant property tax burden.

Standards (for Land Use Development or Conservation)

(See existing Land Use / Zoning and Related Ordinances and Regulations and drafted updated Open Space/Conservation Subdivision Design Zoning Ordinance and Subdivision Regulation amendment.)

Implementation Strategy / Recommendations

1. Provide knowledgeable review of subdivision proposals. Our volunteer Planning Board lacks the expertise necessary to recognize all the planning issues presented by subdivision proposals.

2. Consider budgeting additional professional support services for the Planning Board.

3. Create incentives for developers to work to preserve existing resources within developments.

4. Revise the current cluster subdivision ordinance into an open space/conservation subdivision.

5. Structure development constraints and incentives to encourage the preservation of natural habitat, recreational space, scenic features, and water resources.

6. Adopt a natural resource review of each subdivision application that comes before the Planning Board.

7. Secure conservation easements and related land rights interests.

8. Identify and inventory parcels that are critical to the protection of our natural resources and watersheds.

9. Target key parcels for long-term protection.

10. Expand conservation land fund with annual funding allocations from Town government.

11. Identify protection methods and tools that would be most appropriate for the resources.

12. Consider creating Bellamy and Oyster River Greenbelts through the acquisition of conservation easements on lands not currently protected.

13. Review enforcement policies and practices.

14. Investigate bonding of subdivision performance by developers.

15. Review budgets for subdivision review staff and building and construction review services.

2.6 Transportation Policies and Recommendations

Introduction

The Master Plan Transportation section includes policies and recommendations related to transportation.

Policies

1. Plan and implement a safe, attractive and efficient transportation network.

2. Accommodate the service and infrastructure needs of residents without placing an undue burden on taxpayers.

Recommendations

Roads/Traffic Volumes

1. Maintain and preserve of existing roads versus developing new roads.

2. Monitor traffic volumes. Every two years the Strafford Regional Planning Commission collects traffic volume data on regionally significant roads for its member communities and NHDOT. Though the resources for this are limited, the Commission strives to accommodate its communities' requests.

3. Prohibit the extension of dead-end streets to the Town line. Such streets could eventually be extended into another municipality, possibly leading to an undesirable traffic flow that is beyond Madbury's control.

4. Encourage projects that aim to decrease through traffic on local roads and in residential neighborhoods by maximizing the use of primary transportation corridors.

Scenic Roads

1. Preserve narrow and curved roads and rural character of the towns' roads while not compromising public safety.

2. Create a prioritized list of roads that could potentially be designated as Scenic Roads and consider designating additional roads as scenic.

3. Preserve the scenic qualities of Madbury's historic roadway by permitting the removal of stonewalls or large trees only when there are no other feasible alternatives to assuring the public safety. Any proposed road widening or straightening should be very carefully reviewed with consideration given to the natural, historic and cultural resources that would be impacted by development or change.

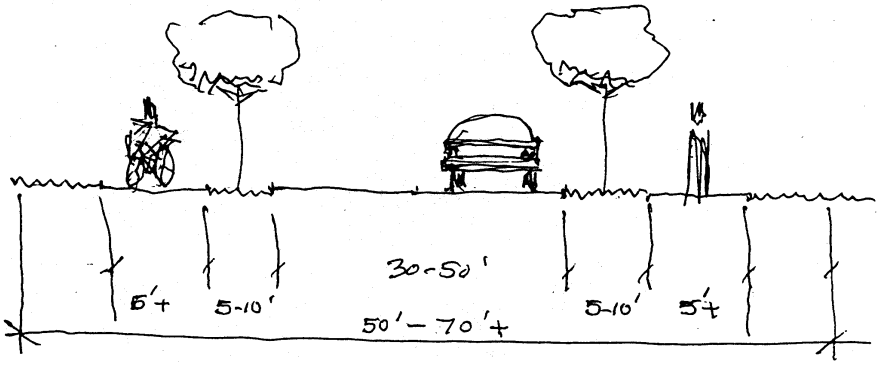
Bicycle and Pedestrian Ways

1. Accommodate the needs of pedestrians and bicyclists in Madbury by using natural paths that do not place an undue burden on taxpayers.

2. Implement projects to increase the safety of cyclists along all roads in Madbury. Specific attention should be paid to the routes that connect Dover and Durham, such as Knox Marsh Road/Route 155 and Madbury Road.

3. Amend road standards to allow the provision of additional right of way for street trees and walkways.

Expanded right-of way for walkways.



- Maintain rural character.
- No curbs.
- Walkways or Bikeways asphalt or natural material.

4-15-03/ERM

Road and Bridge Areas of Concern

1. Establish a strategy for improvement of these areas of concern and actively promote their implementation.

2. Establish a strategy for improvement of the Perkins Road Bridge and actively promote its implementation.

Transportation Project Implementation, Standards and Regulations

1. Ensure the protection of wetlands and other environmental resources in the development of transportation projects, with appropriate mitigation when impacts are unavoidable. All too often, wetlands are destroyed or created through careless road design

2. Develop and implement transportation infrastructure projects in an environmentally sound manner so as to protect the cultural, historic and recreational resources and avoid negative impacts such as habitat fragmentation; reduction in water quality or quantity; reduction in air quality; increase in noise and vibration; or decreasing aesthetically valuable resources such as scenic views.

3. Review existing Town driveway standards and develop new standards that would help maintain the safety, capacity and scenic value of the roadway.

4. Designate compact growth areas and limit the amount of development that can occur along less developed/rural arterials.

5. Discourage the development of strip development and the proliferation of single lot commercial/industrial development.

6. Review existing Town highway access (driveway) and road standards and adopt new standards to help maintain the safety, capacity, and scenic value of the roadway.

7. Respect the natural contours of the land when developing new roads. In addition to the aesthetic values thus preserved, such roads are generally easier to drain and less expensive to build.

8. Avoid over-specification of roadways. Gold Post Road in Dover, situated off of Drew Road just over the Madbury line, is a fine example of how not to build a road. This 1,000’ long cul-de-sac serves only seven homes. The road is straight and is an extraordinary 32’ in width. This excessive expanse of pavement is not in keeping with the rural character, which Madbury strives to maintain. The wider the road, the more costly the maintenance will be when the taxpayers assume responsibility.

9. Do not layout or extend dead-ended streets to the town line. If such streets were eventually extended into another municipality, it could lead to an undesirable traffic flow that is beyond Madbury's control.

10. Follow the street naming guidelines developed by the by the 1976 Bicentennial Committee. These are names that, due to their historical association with Madbury, are recommended for any future roads.

11. Require walkways within proposed commercial developments in order to assure safe pedestrian access.

12. Concentrate new development in areas where transportation infrastructure already exists.

Access Management/Driveways

1. Review all driveway permit applications at Planning Board meetings and incorporate the information provided about driveway permit requests by the NHDOT District Office into the local planning process. As noted above, each District Office sends a copy of each driveway permit application that has been submitted to the Office to the respective Town Office. It is recommended that the Board bring these applications to the Planning Board meetings, identify any concerns, and communicate those concerns to the District Office.

2. Draft and sign a Memorandum of Understanding to better coordinate access management between the Town and NHDOT. Use the NHDOT draft as a model.

3. Adopt an Access Management Plan for Routes 9, 108 and 1555 to specify/clarify the Town's policy on the development of access points. By sending this document to the NHDOT District Office, it will have a clearer understanding of the goals and intentions of the Town.

4. Minimize the number of curb cuts on existing and future roads. Fewer curb cuts reduce traffic obstructions caused by entering and turning traffic, and provide a generally safer situation.

5. Encourage or require that parking lots do not front on the street or that they have substantial vegetative buffers so as to aid in the maintenance of the rural and historic character.

Public Transportation Services and Facilities

1. Ensure that benefits and burdens of transportation are shared equitably throughout the community.

2. Continue to support the efforts of COAST and Wildcat Transit and other transit operators to increase public transit reduce traffic congestion and protect air quality.

3. Support efforts to educate residents about railway safety.

4. Support the development of Park-and-Ride lots throughout the region that are integrated with local and intra-city bus and rail routes.

2.7 Town Facilities and Services Policies and Recommendations

Introduction

The Town Facilities and Services section includes policies and recommendations related to the Town facilities and services.

Policies

1. Accommodate the service and infrastructure needs of residents without placing an undue burden on taxpayers.

2. Maintain the quality of services by the considered use of volunteers, employees, and contractual services.

Recommendations

1. Prepare a specific Town Center Development Plan to guide unified site planning and architectural design appearance and provide improved pedestrian and bicycle linkage between the facilities and the adjacent residential neighborhoods. Ensure the improvements protect and enhance the Town's traditional rural New England character and appearance.

2. Annually review growth and development as part of the capital improvement programming and the annual budgeting process to ensure that public facilities and services are adequate to meet community needs.

3. Earmark capital improvement funds for the acquisition of public safety vehicles and equipment.

4. Explore opportunities to share public facilities and services with adjacent communities, the school district, and other public entities to reduce costs (e.g. property taxes) and increase benefits.

5. Maintain an inventory of public lands including their use and resource value and consider additional acquisition, disposition and/or swap opportunities.

6. Designate a location for possible future public works facility.

7. Monitor easements as required and the summary table kept up to date.

2.8 Housing Policies and Recommendations

Introduction

The Master Plan Housing section includes polices and recommendations related to housing.

Policies

1. Allow a diversity of housing so people of all ages and income may live in Madbury.

Recommendations

1. Promote strategies for the provision of fair and equitable housing opportunities.

2. Examine regional housing needs in relation to the housing growth rate and cost of housing in Madbury. Should Madbury not be aligned with regional market demands, Planning Board will take appropriate steps to address the provision of life-cycle housing.

3. Madbury's land use regulations will continue to permit mobile homes and manufactured housing throughout town.

4. Amend the zoning ordinance to include a provision for multi-family housing in a specially designated area of town in which natural resources would not be adversely affected, where the soils can support a large septic system, and where access to transportation is convenient. This zoning amendment should provide for a modest density bonus in exchange for the setting aside of a prescribed percentage of new dwellings for low and moderate-income families.

5. Investigate incorporating shared wall housing or accessory-housing units within appropriate residential developments having access to shared water or sewage facilities.

6. Modify subdivision and site plan regulations to reflect existing densities and housing patterns within the Town.

7. Investigate allowing limited mixed densities (single and multifamily dwellings) in residential subdivisions that may provide more affordable housing opportunities.

Part 3 Master Plan Implementation Program

(To be developed by the Planning Board)

The Master Plan' Implementation Program describes how the policies and recommendations will be implemented; when they will be implemented and who is responsible. The Implementation program consolidates the recommendations in each section found in Part 2. The Implementation is organized into the following categories:

1. Regulatory Implementation Programs

    1.1 Ordinances – New or Amendments.
    1.2 Regulations – New or Amendments.

2. Non-Regulatory Implementation Programs

    2.1 Capital Improvement Program
    2.2 Natural Resource/Water Resource/Open Space Protection
    2.3 Etc.

In addition a responsible party is assigned to each action and a priority is given to each action –

- Immediate is to occur within the next 1-2 years.
- Short term is to occur within the next 2-4 years.
- Long term is to occur within the next 4-10 year.

Regulatory Implementation Programs

Ordinances – New or Amendments

Action	Responsibility	Priority
1. Adopt updated Open Space/Conservation Subdivision Design Ordinance	Planning Board and Selectmen	Immediate
2		

Regulations – New or Amendments

Action	Responsibility	Priority
1. Adopt Open Space Conservation Subdivision Design Regulations.	Planning Board	Immediate
2		

Non - Regulatory Implementation Programs

Capital Improvement Program

Action	Responsibility	Priority
1. Authorize the Planning Board to prepare a 6 year Capital Improvement Program	Selectmen	Immediate
2. Prepare and adopt the Capital Improvement Program for use by the Selectmen and Budget Committee prior to the next annual budget cycle.	Planning Board	Immediate
3. Use the CIP for annual budget preparation.	Budget Committee and Selectmen	Immediate
4. Update the CIP annually.	Planning Board	Ongoing

Natural Resource/Water Resource/Open Space Protection

Action	Responsibility	Priority
1. See Regulatory Implementation Actions		
2		

Part 4 Appendix

Consolidated Master Plan Sections

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

Appendix

(Consolidation of All Chapters)

Prepared by

Town of Madbury Planning Board

And

Strafford Regional Planning Commission

Appendix
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1. Introduction

New Hampshire law (RSA 674:2) describes the purpose and structure of a Master Plan as follows:

The purpose of the Master Plan is to:

- *Set down as clearly and practically as possible the best and most appropriate future development of the area under the jurisdiction of the Planning Board, to*
- *Aid the Board in designing ordinances that result in preserving and enhancing the unique quality of life and culture of New Hampshire, and to*
- *Guide the Board in the performance of its other duties in a manner that achieves the principles of smart growth, sound planning and wise resource protection.*

The Master Plan shall be a set of statements and land use and development principles for the municipality with such accompanying maps, diagrams, charts and descriptions as to give legal standing to the implementation ordinances and other measures of the planning board.

Each section of the Master Plan shall be consistent with the others in its implementation of the vision section.

The Master Plan shall be a public record subject to the provisions of RSA 91-A (i.e. pertaining to assess to public records and meetings.)

The Master Plan shall include, at a minimum, the following sections:

(a) A vision section that serves to direct the other sections of the plan. This section shall contain a set of statements which articulate the desires of the citizens affected by the Master Plan, not only for their locality but for the region and the whole state. It shall contain a set of guiding principles and priorities to implement that vision.

(b) A land use section upon which all the following sections shall be based. This section shall translate the vision statements into physical terms. Based on a study of population, economic activity, and natural, historic, and cultural resources, it shall show existing conditions and the proposed location, extent, and intensity of future land use.

> *The Master Plan may also include the following sections: transportation, community facilities, economic development, natural resources, natural hazards, recreation, utility and public services, cultural and historic resources, regional concerns, neighborhood plans, community design, housing and implementation.* (See RSA 674:2III.)

Thus, a Master Plan is a long range, comprehensive, general description of what a town wants to be and how it will achieve it. It is a commitment to do something. It is adopted so it reflects public policy. It is used to make decisions about community development and preservation issues. The issues may range from water resource protection, residential development, and transportation improvements to town facilities and services. The Master Plan is the basis for land use and development regulations, zoning and subdivision ordinances, capital improvement programming, town center development and beautification, open space or land conservation, and other programs and projects to improve the quality of life in a community.

The Town of Madbury has an adopted Master Plan that is periodically updated.

The following is the status of the Master Plan sections and action by the Town Planning Board.

Demographics	Approved 2001
Water Resources	Approved 2001
Historic Resources	Approved 2001
Natural Resources	Approved 2002
Community Development/Vision	Approved September 2001/June 4, 2003
Land Use	Approved June 4, 2003
Housing	Approved June 4, 2003
Town Facilities and Services	Approved June 4, 2003
Transportation	Approved June 4, 2003

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

2.1 The Vision for Madbury

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire

by

Strafford Regional Planning Commission
Dover, New Hampshire

The Vision for Madbury

Introduction

The Master Plan's Vision for Madbury describes what kind of town citizens of Madbury want. The Vision describes the overall character in terms of its natural, social and built environment.

The Vision for Madbury

The Vision for Madbury is to be a quality residential community that preserves and maintains the Town's historic and rural character.

Public opinion in Madbury, as discerned from community expressions including public hearings, conversations among residents, and a Planning Board survey, clearly favors this vision. Since the Town does not offer suitable locations for significant retail or industrial development, no significant commercial center is anticipated. The scenic vistas of farms and open meadows, forests and wetlands, stonewalls and historic architecture, are what give Madbury its unique character and citizens want to preserve these.

To achieve this vision, ten policies listed in order of priority on the following pages were adopted by the Planning Board and represent the official position of the Town of Madbury. Further detail and support for these policies are found in Master Plan chapters as well as specific recommendations to implement these policies.

Policy One

Protect water resources in Madbury from contamination, depletion and disfigurement using watershed management principles. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

The protection and use of water resources are critical concerns to the Town of Madbury. With virtually all residents dependent upon private wells for domestic use, the quantity and quality of available groundwater must be protected from contamination and depletion. Other Town water resources, such as swamps, ponds, streams and wetlands are important as they are hydrologically related to groundwater, and they provide ecological, scenic, and recreational value to residents.

In general there is a direct relationship between land use and water quality. It is the responsibility of the Town to take reasonable and prudent precautions to protect all water resources from incompatible land uses, thus protecting the health and general welfare of the community.

Madbury provides a substantial volume of water to other municipalities in the region. The Town must take appropriate steps to insure that sufficient water supplies exist for use by Madbury residents, as well as the native wildlife and plant communities. The Town needs to examine and address the issues of water supply, watershed management (aquifers, surface), pollution, and potential aquifers/gravel areas.

Policy Two

Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

The protection and sustainable management of the Town's natural and historic resources is central to this Master Plan. This focus will work to preserve the Town's rural sense of place. This policy reflects a strong desire among town residents to preserve the Town's open space and rural atmosphere as expressed during the June 2000 Master Plan survey of residents

Policy Three

Acquire additional interests in land for conservation, water supply, open space, public recreation, and Town facilities.

Effective methods to ensure the preservation of environmentally and historically significant properties are the acquisition of easements and purchase of land by the Town, and donations of easements and land to the Town. Through the acquisition of easements and land, develop a greenbelt linking Town facilities, schools, trails, open space, and wildlife corridors.

Policy Four

Insure a safe and secure community.

The health and safety of local residents should be protected by volunteers and personnel capable of responding to all types of emergencies, and through the provision of municipal services.

Policy Five

Keep the property tax stable.

Property taxes are substantial. Increases in the tax rate can have a significant effect on Town residents. Municipal expenditures and the local tax base must be closely monitored for their effects on residents.

Policy Six

Accommodate the service and infrastructure needs of residents without placing an undue burden on taxpayers.

Volunteers provide the backbone of most Town services. Town population and the technical and legal complexity of Town affairs continue to increase. The Town needs to take steps to maintain the quality of services by the continued use of volunteers, employees, and contractual services.

Policy Seven

Insure future economic development that does not harm the environment or abutting properties.

Economic development should be accomplished in a manner that has a minimal impact on the natural resources, residents, local road network, and other Town services. The Town will take steps to insure economic development is an overall improvement to the community as a whole.

Policy Eight

Plan and implement a safe, attractive and efficient transportation network.

The transportation network consists of roads, trails, and paths for motorized vehicles, pedestrians, bicyclists, and equestrians. This system serves the needs of not only Madbury residents, but residents of other communities. The primary purpose of the transportation network is to provide internal links within the community for the residents, but must recognize that traffic flows through the town between the surrounding towns and should be accommodated in a safe and efficient manner.

While working towards a local road network that is both safe and efficient, every effort should be made to preserve the historic and scenic atmosphere of the town's roadways using techniques appropriate for rural traffic.

Policy Nine

Focus Madbury's civic and social activities within the present civic district.

The area around the Town Hall serves as the civic and social center of the Town of Madbury. Concerted effort should be made to retain the traditional character of the town center, provide a sense of place, and enhance community identity.

Policy Ten

Allow a diversity of housing so that people of all ages and income may live in Madbury.

Recognizing the difficulties many people face in finding adequate, safe, and affordable housing, the Town should promote strategies for the provision of fair and equitable housing opportunities.

Conclusion / Next Steps/ Implementation

The policies serve as principles to achieve a quality residential community. Achieving them will require implementation (i.e. action to achieve results.) These actions are described in the Master Plan.

In part this means setting and meeting current or new principles and standards for development. For if "quality" is defined as conformance to a standard, then continually improving quality means continually setting and achieving higher standards for excellence in planning, design, development, service and operations.

Citizens drive the standards: their aspirations, expectations, goals and principles.

Setting standards and monitoring progress will enable the Town to:

- Retain and improve the quality of life.
- Promote economic opportunity.
- Promote health and safety.
- Promote educational opportunity.
- Promote environmental protection.

- Enable sustainable development.

The Master Plan will describe these standards. Some exist in current ordinances and regulations. Others need to be prepared and adopted over time. Achieving them will result in achieving the vision of a quality residential community.

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

2.2 Water Resources

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire

by

Strafford Regional Planning Commission
Dover, New Hampshire

Water Resources

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Water Resources

1. Policy Statement

Vigorously protect water resources in Madbury from contamination, depletion, and visual disfigurement. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

The protection and use of water resources are critical concerns to the Town of Madbury. With virtually all residents dependent upon private wells for domestic use, the quantity and quality of available groundwater must be protected from depletion and contamination. Other Town water resources, such as swamps, ponds, streams, and wetlands are important because they are hydrologically related to groundwater, and provide ecological, scenic, and recreational value to residents.

In general there is a direct relationship between land use and water quality. It is the responsibility of the Town to take reasonable and prudent precautions to protect all water resources from incompatible uses, thus protecting the health and general welfare of the community.

Madbury provides a substantial volume of water to other municipalities in the region. Appropriate steps should be taken by the Town to insure that sufficient water supplies exist for use by Madbury residents, as well as native wildlife and plant communities. The Town needs to examine and address water supply issues, watershed management, pollution, and potential aquifers/gravel areas.

Guidance for policies, regulations, and actions that affect Madbury's water resources derives from the following water resources management objectives.

a. *Protect public health, safety, and welfare*
b. *Maintain high environmental quality*
c. *Ensure that growth does not compromise (degrade) environmental quality*
d. *Direct development to environmentally suitable areas*
e. *Assure adequate water supply for residents*
f. *Preserve water quality and quantity for future residents*
g. *Educate residents about water resource issues*
h. *Participate in inter-municipal water resources management efforts*
i. *Comply with applicable local, state, and federal regulations*

2. Description of Surface Water Resources

2.1. **Watersheds.** Madbury's surface water flows through three watersheds: the Bellamy River Watershed in the northwestern portion of town, the Oyster River Watershed in the southeastern portion of town, and the Little Bay Watershed of the Great Bay Estuary. All three watersheds drain into the Piscataqua River Basin that includes the Lamprey, Swampscott, and Cocheco watersheds. Two-thirds of the 930 square mile Piscataqua Basin lies within New Hampshire and the remainder in southern Maine. Table 1.1 (Appendix 1) summarizes the watershed characteristics of the Bellamy River, Oyster River, and Little Bay. The Bellamy River Watershed comprises over 57% (4,512 acres) of Madbury's land area, while the Oyster River watershed comprises about 42% (3,287 acres). The surface water runoff boundary between the Oyster and Bellamy Rivers generally flows west to east across Madbury. Similarly, 1998 stratified drift aquifer maps indicate that most of Madbury's stratified drift aquifer follows the watershed boundary, with virtually all of the aquifer occurring within the Bellamy River Watershed. [1] A fraction of a percent of Madbury's land falls within the coastal Little Bay Watershed.

2.2. **Rivers.** The Bellamy River originates at Swains' Lake (also known as Union Lake) in Barrington and flows in a southeasterly direction toward the Bellamy Reservoir in Madbury. Below the reservoir dam the Bellamy continues flowing to the southeast through Dover until being impounded again at the Sawyer Mills. Below the Sawyer Mills dam the river becomes tidal and empties into Little Bay at the Scammel Bridge.

The Oyster River originates near Creek Pond in Barrington and flows in a southeasterly direction toward Durham, at which point it flows to the east. The river is tidal below the Mill Pond dam in Durham, and from there flows southeast into Little Bay. Three minor drainages of the Oyster River flow out of Madbury: in the south central portion of town at Beard's Creek, in the eastern portion of town as the Gerrish/Johnson Creek drainage, and in the southwestern portion of town east of Dube Hill. The Gerrish/Johnson Creek drainage flows directly into tidal waters separately from the rest of the Oyster River Watershed.

2.3. **Lakes and Ponds.** Table 1.2 (Appendix 1) summarizes Madbury's surface water bodies. The Bellamy Reservoir is the largest standing body of water in Madbury. It was created in the early 1960's to serve as the primary water supply for Portsmouth in exchange for the federal government's taking of Portsmouth's previous water supplies for Pease Air Force Base. Water from the Bellamy Reservoir currently provides water to seven communities in the Seacoast region including Madbury, Newington, Rye, New Castle, Greenland, and Durham in addition to Portsmouth. The majority of Barbadoes Pond is located in Madbury. It is approximately 16 acres, and is 48 feet at its deepest point. Its median depth is 20 feet, and its shoreline is about 3,280 feet. NH DES rates Barbadoes Pond as mesotrophic, meaning that it contains moderate nutrient levels that result in moderate algal growth. Hoyt Pond flows into Gerrish/Johnson Creek. Table 1.3 (Appendix 1) summarizes the characteristics of Barbadoes Pond, the Bellamy River, and Hoyt Pond.

Several smaller bodies of water are used for fire fighting, recreation, and aquatic habitat. Additional information on smaller ponds and water bodies is available through the Madbury Conservation Commission.

Recommendation: In order to ensure that these resources are protected for future uses, the town should create a report documenting and mapping smaller water bodies and their uses.

2.4. **Dams.** There are currently 23 state-registered dam sites in Madbury. A list of state dam permits is provided in Appendix 3. The Bellamy Reservoir dam, approximately 200 meters to the west of Mill Hill Road, is the largest dam in town. The dam is 38.5 feet tall, and creates a water body of approximately 324 acres. Dams are permitted and inspected by the New Hampshire Water Resources Board. The Board is responsible for regulating all structures in waterways that are four or more feet high. Dams are currently used for two purposes in Madbury. Primarily, dams are used to impound surface water. Secondarily, dams serve as a means of controlling floodwaters and alleviating the destruction that floods can cause. Madbury's impounded surface water is an important resource that provides a water supply source, aquatic habitat, and a variety of recreational opportunities to the Seacoast Region. There are no hydroelectric sites in Madbury.

2.5. **Wetlands.** Wetlands are a significant part of Madbury's water resources. Table 1.4 (Appendix 1) summarizes Madbury's wetland areas by size. Wetlands are defined by three characteristics: hydrology, hydric soils, and wetlands vegetation. Hydrology, the presence of water, is one characteristic. If water is present on the surface or in soils for a sufficient period of time, the soil is classified as hydric soil. The third defining characteristic is wetlands vegetation. [2] Soil in wetlands lacks oxygen, affecting the ability of vegetation to survive. Wetlands vegetation is adapted to saturated soil conditions with low oxygen and have a competitive advantage there. If greater than 50% of the plant life in a given area is wetlands vegetation then that area is considered to be wetland. Some wetland plants are considered indicator species since their presence serves as an immediate indication that the area is a wetland. An example of an indicator species is the cattail, which may be prevalent in saturated soils but will not grow in an upland soil. [3] Wetlands vegetation traps sediments, and their root systems help to ensure the stability of the underlying soil, thereby preventing erosion. Wetland plants also have some ability to remove pollutants such as organic material, bacteria, and excess nutrients like nitrates and phosphates, improving water quality.

2.5.1. **Location and acreage of wetlands.** The Town of Madbury's wetlands were delineated using soil type data from 1973. In Madbury 2,285 acres of soil are classified as hydric, comprising approximately 30% percent of the town's land area. [4] The northwestern corner of Madbury, due north of Route 9 and bordering the Bellamy Reservoir, has a high concentration of hydric soils. [5]

Strafford County is overdue for an updated soil survey from the Natural Resources Conservation Service. The 1973 survey is the most current comprehensive soil survey available to the town. This information is available on the NH GRANIT geographic information system database.

Recommendation: Protection of water resources through the use of a wetlands conservation overlay zone applied to salt marshes, wetlands, and surface waters (ponds, first order streams, headwaters) is a priority of the Town to be enforced by the Planning Board.

2.6. **Floodplains.** Floods are naturally occurring events on most surface waters. Floodplains are areas adjacent to rivers, streams, and surface water bodies that are susceptible to flooding during periods of excessive runoff. On any given stream or river, the flow that is equaled or exceeded, on the average, once in 100-years is called the 100-year flood, and any land area, outside of the channel banks, that is covered during the l00 year flood is the floodplain. Floodplains store water in times of flooding and limit damage in adjacent areas. Floodplains are an integral part of the riparian structure of many surface waters. The extent, condition and use of floodplains may have a significant effect on flood stages of downstream and upstream locations. Madbury has an estimated 1,100 acres within the 100-year floodplain along the Bellamy River. [6]

If developed areas lie in the floodplain, property and safety are threatened. Restricting development in the floodplain is the preferred method of minimizing flood damage. Currently Madbury does not allow new development within floodplains. This policy, combined with wetland preservation, should minimize flooding risks in Madbury.

Recommendation: Continue prohibition of construction within the 100-year floodplain.

2.7. **Salt Marshes.** Salt marsh habitat protection is critical to the protection of the Great Bay Estuary ecosystem. The biological productivity of the oceans is primarily a function of its estuarine ecosystems. These areas provide critical habitat for several commercially valuable fisheries. Madbury's salt marshes are an important component of regional, state and national resources. [7]

Recommendation: Use best management practices, careful monitoring of activities, and restoration for land uses within the Little Bay watershed to prevent pollutants from entering the Great Bay estuary.

2.8. **Surface Water Uses**. The owners and operators of Madbury's public drinking water supplies as identified by NH DES are listed in Appendix 2.

2.8.1. **Local Consumptive Uses**

2.8.1.1.**Fire Protection.** The use of water for fire protection is a consumptive use. A well at the fire station provides water to fill tanks in the fire trucks, and fire hydrants are used to supplement supplies at various points in town. When more water is needed and no hydrants are nearby, water may need to be pumped directly from surface waters using a hose. Emergency water uses, such as for fire fighting, are necessary for the protection of public health.

2.8.2. **Regional consumptive uses.** Table 1.6 (Appendix 1) summarizes regional use of Madbury's water resources.

2.8.2.1.**Portsmouth Water Department:** The Portsmouth Water Department (PWD) has drawn water from the Bellamy Reservoir since the early l960s when the federal government took over Portsmouth's previous supply at the site of Pease Air Force Base. Water withdrawn from the Bellamy Reservoir by the PWD services the communities of Portsmouth, New Castle, Newington, Rye, Greenland, Durham, and Madbury. A filter plant rated at 3.5 million gallons

per day treats water from the reservoir in Madbury then pumps it to Portsmouth. [8] With the closing of Pease Air Force Base in the early 1990's, the federal government returned its Pease water supplies to Portsmouth. Legal research would clarify whether this affects Portsmouth's ownership rights on the Bellamy Reservoir. At the start of 2001, the Portsmouth Public Works Department reported that the water treatment plant on Freshet Road receives an average of 2.25 million gallons per day (MGD) from the reservoir. This leaves an average of 1.5 to 2.0 MGD for downstream flows. State regulations only state: "Unless the flows are caused by naturally occurring conditions, surface water quantity shall be maintained at levels adequate to protect existing and designated uses." [9] There are no quantified minimum flow amounts that govern water withdrawal rates along the Bellamy River.

2.8.2.2.**Dover Water Department:** The Dover Water Department has approval from NH DES to withdraw an average of 720,000 gallons per day from the Bellamy River in Dover and uses this water to recharge the Griffin and Ireland wells on the Pudding Hill Aquifer. Because of seasonal conditions, the Bellamy withdrawal rates fluctuate seasonally. The maximum withdrawal rate of approximately 2.2 million gallons per day occurs during periods of high snowmelt runoff in the spring. [10] [11]

2.8.2.3.**Durham/UNH Water Use:** The University of New Hampshire and Durham draw water from the Oyster River in Durham. Further research into Durham's historical and projected future use of the Oyster River is needed.

2.8.3. **Functioning ecosystems.** Madbury's aquatic ecosystems provide essential services and contribute to the maintenance of regional biodiversity. Ecosystem functions are defined as the capacity of natural processes and systems to provide goods and services that accommodate human needs. These are generally grouped into four functions: regulation, habitat, production and information. Aquatic ecosystems are important *regulators* of water quantity and water quality: floodplains store water when rivers over-top their banks, reducing flood risk downstream and wetlands are natural filtering systems which remove toxins and excessive nutrients from water. Aquatic ecosystems provide critical *habitat* for a wide variety of species. Sustaining the functions of ecosystems requires the maintenance of many biological processes that are the result of complex interactions between soil, water and a multitude of plants, animals and microorganisms. Aquatic ecosystems provide *resources* such as drinking water, fish and game as well as opportunities for recreation, aesthetic experience and reflection. Recreational uses include fishing, hunting, birdwatching, photography, and boating. Maintaining wetlands and capitalizing on these uses can be a valuable alternative to more disruptive uses and degradation of aquatic ecosystems. Protection of aquatic ecosystems is a priority of the Town.

2.9.**Water Quality.** Knowledge of the quality of water resources varies significantly throughout town. The Town currently has little data regarding water quality in major bodies of water such as the Bellamy Reservoir and Bellamy River. Maintaining high water quality is a vital component of protecting aquatic ecosystems and regional drinking water supplies.

Results from well surveys conducted in 1989 and 1990 were compared with state drinking water standards for public water supplies. Of the 63 wells surveyed, 30% passed both the primary and secondary drinking water standards set by the Environmental Protection Agency (EPA). 43%

passed primary standards, and 62% passed secondary standards. The leading reason for failing to meet standards was high fecal coliform levels. [12]

Recommendation for further research: Pursue follow up testing of wells to determine the current state of Madbury's groundwater resources.

3. Groundwater Resources

3.1. **Stratified Drift Aquifers.** Stratified drift formations consist of well-sorted sand and gravel deposits that are typically laid out in layers by historic glacial outwash streams and rivers. Depending on the depth and the coarseness of the material, these deposits generally provide good sources of groundwater because of their capacity to store groundwater and transmit over large areas. The largest withdrawals of groundwater in Madbury are from surficial deposit aquifers. The Pudding Hill, Barbadoes Pond, and Johnson Creek aquifers are proven sources of water. Portsmouth and Dover extract large amounts of water from each of these. The cities of Dover and Portsmouth have municipal wells in drift deposits that occur wholly or partially in Madbury. Specifically, they draw water from the aquifers at Pudding Hill, Barbadoes Pond, and Johnson Creek. The approximate boundaries of area aquifers are best represented on the 1992 map "Stratified-Drift Boundaries, Data Collection Location, and Altitude of the Water Table in the Bellamy, Cocheco, and Salmon Falls River Basins." [13] Madbury has 5.5 square miles of stratified-drift aquifers, representing 46% of the Town's area. [14] Table 1.5 (Appendix 1) summarizes characteristics of known aquifers in Madbury.

3.2.**Bedrock Wells.** Bedrock formations are composed of fractured rock or ledge, with groundwater stored in the fractures. Generally, bedrock wells have a lower yield than stratified drift aquifers. This is primarily because stratified drift has higher transmissivity rates than the New Hampshire bedrock. [15]

3.2.1. **Radon.** Radon is an odorless, colorless, tasteless gas produced through the decay of naturally occurring radioactive minerals in soils and bedrock. Radon gas can dissolve in ground water and later be released into the air during normal household activities such as showering. Exposure to elevated levels of radon increases the risk of developing lung cancer. Typically, radon enters dwellings through soil, but it can also enter buildings via water supplied from wells. According to the State Radon Potential Map, much of Madbury lies in an area of relatively low risk of radon exposure.

A 1994 report found that radon concentrations within the town were highly variable, and that deeper bedrock wells had lower radon concentrations. In general, groundwater in the western third of Madbury has higher radon concentrations than that in the eastern two-thirds of town. All but one of the wells in Madbury contained radon concentrations at levels well below levels of concern. Overall, the study concludes that there is little need for concern with regard to radon concentrations in private wells within Madbury. [16]

3.2 Groundwater Use

3.2.2. **Local use.**

Most households and businesses in Madbury rely on groundwater as their primary source of water, and the majority of groundwater users have wells that draw from bedrock. The Bunker Lane Mobile Home Park and one private dwelling receive water from the Portsmouth Water Treatment Facility. In 1990 the US Census estimated a total of 528 residential dwellings in Madbury. According to building permit data collected between 1991-2000, about 95 houses were built since 1990, bringing the total number of homes in town to 623 in 2000. Since there are approximately 60 manufactured homes in the Park, a fair estimate of the number of privately owned wells in town is 560.

DES has kept data on new wells since 1984. The following is a breakdown of well construction in Madbury as of 2000: [17]

Drilled in Bedrock = 159
Drilled in Gravel = 8
Dug = 0
Driven Point = 0
Wash Well = 0
Undifferentiated = 3 Total wells added between 1984-2000 = 170

The Town of Madbury currently operates four wells that are classified by NH DES as public/community water supplies: one at Town Hall, one on the west side of Route 155, one at the fire station, and the last at the Moharimet Elementary School. The town well on the west side of Route 155 pumps up to a reservoir on top of Hicks Hill. Little information on this town system is available.

3.2.3. **Regional groundwater use.**

3.2.3.1. **Portsmouth** has four wells in the Johnson Creek aquifer and withdraws roughly 0.75 MGD from them.

3.2.3.2. **Dover** draws water from the Barbadoes Pond Aquifer. Dover has two wells in Pudding Hill aquifer and withdraws roughly 1.7 MGD. Further research into Dover's historical and projected future use of the Barbadoes and Pudding Hill aquifers is needed.

4. Potential Surface Water and Groundwater Supplies

There are two locations considered to have potential as aquifers in Madbury. The first is related to the Freshet Creek Aquifer. The second occurs along the northwest border of town. An expansive area, primarily in Barrington, may have low potential to yield significant quantities of groundwater. This could be a significant aquifer, possibly connected to the Hoppers. Well

report data from Barrington indicates that the depth to bedrock at the Barrington/Madbury border along NH Route 9 is over 100 feet. Depth to bedrock is less than 10 feet along Route 9 near the Bellamy Reservoir, and the bulk of the formation is in Barrington. One area of limited potential is also identified, and this is on the north side of Hicks Hill. There is a minor drift deposit, but its small area limits its aquifer potential. [18]

There may be a significant fault at the border between the Eliot and Berwick formations. The presence of a fault does not necessarily indicate a large water-bearing zone. However, this fault may provide open fractures and spaces capable of storing groundwater. [19]

Overall, Madbury's ground and surface water supplies offer limited potential as future water sources for the town. Madbury's overburden aquifers are currently operating at maximum sustained yield, as are most stratified drift aquifers in the Seacoast Area. [20] Bedrock wells are the most common source of water in Madbury and probably will continue to supply water for current and an unknown number of additional future wells. However, bedrock wells are vulnerable to over use and will not offer an infinite supply of water. Bedrock wells have not yet reached a point of maximum yield, but once they do this may eventually restrict development in Madbury.

Until the Town has additional information on the status and potential of its groundwater resources, management of groundwater resources depends upon appropriate development. The Town can help to ensure plentiful and safe groundwater supplies for its future by protecting groundwater supplies through aquifer recharge protection ordinances and by advocating and participating in conservation of water resources.

Recommendation for further research: Studies are needed which conclusively confirm or deny the existence of potential aquifers, to identify sustainable yield rates from known aquifers, to examine the potential for artificial recharge of groundwater, and to establish a system of monitoring groundwater resources.

5. Potential Threats to Water Resources

Madbury's water resources are threatened by point-source pollution, non-point source pollution, and unsustainable use. As residential and commercial growth continues throughout the Seacoast region, dependence on the area's limited water resources increases. Over the next decade, water resource use will become a predominant planning concern of many Seacoast municipalities. Many area communities are operating near or at their current supply of water, and as growth continues pressure builds to utilize all available water. Between 1999 and 2002, The City of Portsmouth is developing a 20-year Water System Master Plan that will review supply and demand of the seven communities that rely on the City's water. The US Geologic Survey is interested in examining Seacoast region groundwater and determining the current and future status of water availability and sustainable yield. Currently, Madbury's groundwater is vulnerable to contamination from several non-point sources of pollution described below.

Recommendation: Establish an aquifer protection overlay district or similar zoning tool to protect groundwater resources.

The NH DES groundwater hazard inventory for Madbury is listed in Appendix 4.

5.1. **Point Source Pollution.** New Hampshire Code defines a point pollutant source as, "…any discernible, confined or discrete conveyance from which pollutants are or may be discharged, including but not limited to, pipes, ditches, channels, conduits, wells, containers, rolling stock, concentrated animal feeding operations or vessels." [21] Point sources of pollution are identifiable discharges of pollutants into the environment at a specific point, such as a factory discharging chemicals out the end of a pipe. Historically, Madbury's has faced few threats to water supplies from point sources of pollution. The Town should continue to prevent point-source pollution from contaminating water resources.

5.2. **Non-point Source Pollution.** New Hampshire Code defines a non-point pollutant source as: "A source of pollutants which is diffuse in nature and discharges pollutants over an area into the environment." [22] Because of Madbury's current lack of significant industrial and commercial development, non-point pollution is the predominant threat to the town's water resources.

Recommendation for further research: Develop a system whereby the Town can effectively monitor non-point pollution over time.

5.2.1. **Underground storage tanks.** Underground storage tanks may leak and go undetected, resulting in contamination of groundwater. Appendix 5 provides a list of Madbury's past and present underground storage tanks. As of October 2000, there is one underground storage tank registered in Madbury with NH DES. This 8,000-gallon composite tank was installed in October of 1998 by the City of Portsmouth to store hazardous substances at the city's Water Treatment Plant.

Underground storage tanks are regulated under the *Control of Nonresidential Underground Storage and Handling of Oil and Petroleum Liquids* regulations. These rules affect any existing facility with one or more tanks greater than 1,100 gallons, and all new or substantially modified facilities with a combined site capacity of greater than 1,100 gallons. Currently there are no tanks of this kind in Madbury. [23]

5.2.2. **Sand and gravel excavation.** Sand or gravel pit sites are frequently located in thick drift deposits that are prime aquifer recharge areas. In order to protect groundwater resources, excavations should stay above the water table and efforts should be taken to ensure that fuel, oil, or other liquids do not leak or spill into the ground. The risk of contamination increases as the depth of excavation nears the water table because there is less overlying material to filter out contaminants.

Pike Industries has a permit to use hydro-mining techniques to remove gravel at a site next to Barbadoes Pond. The project includes below water table mining, meaning that groundwater is extremely vulnerable to contamination. Pike Industries also operates an asphalt paving (hot top) facility at the site. The project could contaminate groundwater. [24] At the site, soil is stripped off, removing an important filter for groundwater. The excavation site is above a known aquifer, and

regular monitoring is needed to ensure that groundwater is not contaminated. In November 1988, this project was estimated to disturb 65 acres of land adjacent to Barbadoes Pond. [25] When finished, the disturbed area will be approximately 100 acres, with a 50-acre, 40-foot deep pond leftover.

Recommendation: Modify ordinances to leave 4-8 feet of sand and/or gravel above the estimated seasonal high water table at gravel operations.

5.2.3. **Scrap-Metal Recycling.** Another non-point pollution threat is the New England Metals operation, which is situated in an excavation site above the Pudding Hill Aquifer. Madbury Metals is a scrap metal processor, converting metal wastes into marketable scrap metal. Incidental wastes that are accepted with the metal wastes such as motor oil, brake fluid, and car upholstery could contaminate the Pudding Hill Aquifer. Currently, the NH DES oversees the operation of this facility. However, the town has more of a vested interest in the site and should more actively monitor its environmental impacts.

Recommendation: Madbury should amend its zoning ordinance to control the use of excavation sites. Various types of controls are available, and could be implemented during the excavation permit application process under RSA 155-E.

Recommendation: Protect the Pudding Hill aquifer through the use of best management practices and monitoring of activities for existing development located within the Commercial and Light Industry zone.

5.2.4. **Road salt**. The salting of roads in winter is a non-point source of pollution. Best management practices for minimizing pollution include covering salt piles, loading salt trucks on paved areas, and the use of modern salt application equipment. [26] Excessive use of road salt can unnecessarily contaminate water. Careful judgment when applying road salt minimizes water contamination. Salt contaminated wells have been found in Madbury along Route 9, but the source of this contamination is unknown.

Recommendation for further research: Study the impacts of road salting on Madbury's ground and surface water supplies.

5.2.5. **Dover Municipal Landfill**. At this time the primary external threat to Madbury's water resources is the Dover Municipal Landfill on Tolend Road in Dover, an Environmental Protection Agency (EPA) Superfund site. The landfill was opened in 1954 and closed in 1980 and is split north/south between the Cocheco River Watershed and the Bellamy River Watershed, respectively. The EPA has monitored two contamination plumes from the site since the 1980's with test wells around the site's perimeter. There is evidence that the eastern contamination plume has already reached the Cocheco River. The EPA's Remedial Investigation of the landfill, released in December l988, indicated that another contamination plume might be headed toward the Bellamy Reservoir. Models from the investigation projected that the southern contamination plume from the landfill would reach the Bellamy Reservoir between 2000 and 2010, a process that could be accelerated if withdrawal levels from the Bellamy Reservoir increase. Increasing

the withdrawal rates from the Bellamy Reservoir may be an option Portsmouth is considering in its 20 year Water System Master Plan.

The Bellamy Reservoir is Madbury's most important water resource. The Town should be regularly updated regarding the spread of the Dover Landfill contamination plumes. One inexpensive and convenient way to do so would be for the Water Board to obtain copies of laboratory analyses performed in and around the Tolend Road site. Or, if possible, the town could be added to the laboratory's receivers list in order to directly acquire the data. It is important for the town to be updated regarding water quality in the Bellamy Reservoir as well.

Recommendation: Devise a system whereby the Town receives regular updates on the status of Tolend Landfill contamination plumes and their effects on the water quality of the Bellamy Reservoir and nearby groundwater.

5.2.6. **MtBE.** MtBE is the abbreviation for the compound methyl tertiary butyl ether. MtBE is a manmade material and its presence in water indicates that contamination exists in the recharge area of a well. MtBE is a gasoline additive originally meant to replace lead as an octane enhancer and currently used to reduce ozone and carbon monoxide emissions from automobiles. MtBE, a volatile organic compound (VOC) is classified by the EPA as a possible human carcinogen, and occurs in groundwater as a result of contact with gasoline. As of May 2001, the State Legislature is considering banning the use of MtBE as a gasoline additive statewide. In the meantime, minimizing threats of MtBE contamination in groundwater depends on eliminating gasoline spills and leaks through proper storage, handling, and disposal of gasoline. A 2000 report on VOCs in Madbury was based on a survey of seventy-four wells in Madbury. Sixty-seven of the seventy-four wells surveyed (90.5%) had no detectable VOCs. However, seven wells were contaminated with low concentrations of VOCs: six with MtBE and one with tetrachloroethene (PCE). The report recommends taking action to reduce exposure to MtBE at two locations: at the Mill Hill Trailer Park and at one private well on Pudding Hill. In addition, the report recommends that all seven wells should be monitored on a quarterly basis for two years to determine long-term VOC concentrations. [27]

5.2.7. **Septic Systems.** A conventional septic system consists of a settling or septic tank and a soil absorption field. A typical system accepts both greywater (wastewater from showers, sinks, and laundry) and blackwater (wastewater from toilets). Septic failure is defined as "the condition produced when a subsurface sewage or waste disposal system does not properly contain or treat sewage or causes or threatens to cause the discharge of sewage on the ground surface or into adjacent surface or groundwater." [28] The most common type of failure of these systems is from clogging of the absorption field, insufficient separation distance to the water table, insufficient percolation capacity of the soil, and overloading of water. Septic failure can result in nutrients such as phosphorus draining into ground and surface water. In surface water, excess phosphorus levels can result in rapid plant and algal growth, decreasing dissolved oxygen levels and fish populations. Septic systems in new developments need to meet state regulations. Close adherence to zoning ordinances, subdivision regulations, percolation test and pit test requirements is the most effective way to minimize septic-related water pollution.

5.2.8. **Erosion & Sedimentation.** Erosion is a process by which soil is carried by water or wind. When water carries soil into a waterbody, it not only contributes to filling in the waterbody but also contributes nutrients that cause algal blooms and aquatic weeds to grow. Erosion at construction sites is a leading cause of water quality problems due to removal or disturbance of vegetative cover. Limiting and phasing vegetation removal during construction can reduce soil erosion. Sedimentation occurs when water carrying eroded soil particles slows long enough to allow soil particles to settle out. The smaller the particle, the longer it stays in suspension. Erosion control should be encouraged in order to protect the quality of Madbury's public waters.

The New Hampshire Comprehensive Shoreland Protection Act (CSPA) was passed to protect New Hampshire's lakes, ponds, rivers, and estuaries. The CSPA requires that any excavation or earth moving in protected shoreland must have appropriate erosion and sedimentation controls. [29]

5.3 Instream flow. The State is developing an instream flow rules process for State-designated protected rivers. This process is still in the early stages of development but will eventually require that rivers reach-specific assessment of designated uses (fish, boating, waste assimilation, etc.) and their flow needs. Water use will then be managed through conservation, impoundment management and water use restrictions or alternative supplies to maintain that flow need. Because the Bellamy River does not have State-designated protected status, the proposed Instream Flow Rules will not immediately apply. However, the process may be applied statewide eventually.

DES recently issued a 401 certification (water quality) for Durham's withdrawal from the Lamprey River. The certification limits downstream flow depending on the amount of water flowing in the river. This method is likely to be the State practice for issuing 401 certifications in the near future. Calculations that represent current flow rates are used to identify withdrawal restrictions and cessation. There are no known flow restrictions for the Bellamy Reservoir or the river at this time. The lack of a permit or certificate leaves the qualitative standards in DES' Water Quality Standards as the primary rule affecting flow. State regulations only require that "Unless the flows are caused by naturally occurring conditions, surface water quantity shall be maintained at levels adequate to protect existing and designated uses." [30]

5.4 Regional Water Concerns. If water consumption rates parallel the rapid population and housing growth of recent years, the Seacoast region may soon experience water supply shortages. Currently there are no regional water resource plans that address the potential for a shortage. Because other communities rely on Madbury for water resources, regional cooperation and coordination of water use is critical. Water use and distribution should be equitable and sustainable. Equitable water use and management would provide Madbury with the opportunity to access the water resources within the town and be included in decisions regarding the town's resources. Water use should be sustainable, allowing for current water resource needs to be met without compromising the ability of future generations to meet their water resource needs. Effective water resource management requires regional coordination with equal voice given to all stakeholders. As the host of the Bellamy Reservoir and significant aquifers, Madbury holds a stake in the sustainable management of its water resources.

Between 1999 and 2002 Portsmouth is developing a 20-year Water System Master Plan which projects future growth of water demands on the Portsmouth water system. As of 2000 approximately 33,000 users are serviced by the Portsmouth water system. A preliminary draft of the Plan estimates over 12,000 new residents within the service area of the PWD by the year 2020. Portsmouth may look to increasing their withdrawal from the Bellamy Reservoir to provide for this growth. It is important for Madbury to contribute to the development this plan since it may have a direct impact on the Town's water resources. Issues regarding the sustainability of continued water resource development need to be addressed by this plan.

5.4.1. Regional Coordination

Regional coordination and management of water resources is essential since activity in Barrington, Dover, Durham, Lee, and Portsmouth will affect the same resources that are utilized by Madbury. Madbury and Dover share several important aquifers, and Madbury and Barrington share what is possibly an extensive drift aquifer. There are no significant, known aquifers shared with Lee or Durham.

Consistency in zoning and land use regulations along municipal boundaries is important for efficient resource management. Equal measures of protection on both sides of municipal borders should be provided to aquifers and watersheds. Dover's primary and secondary groundwater protection zones provide partial protection to aquifers which Dover and Madbury share. Madbury has the opportunity to aid in the protection of these important resources by instituting similar groundwater protection standards.

Recommendation: Negotiate, when needed, mutually beneficial municipal agreements that protect aquifers crossing municipal boundaries.

Recommendation: Coordinate water resources database management with state and Town boards to further the protection and management of the water resources of the Town.

Recommendation: Protect aquifers existing completely within the Town and cross-boundaries with other municipalities.

6. Assessment of Growth in Demand for Water

6.1. **Local projections.** Table 1.7 (Appendix 1) summarizes regional population growth estimates from 2000 through 2020. 1,509 people lived in Madbury in 2000, according to the 2000 Census. NH OSP projects the town population to be 1,733 by 2010 and 1,934 by 2020. [31] Madbury averaged 9 new housing starts per year over the 1990's. Currently, there are an estimated 493 dwellings in Madbury and 99% of these have their own well. Therefore, continued development at this rate would result in 180 new homes and 180 new wells by the year 2020. [32] There are no current data available on Madbury's per capita water use. Assuming a generic consumption rate of approximately 100 gallons per capita, Madbury's total annual residential consumption in 2010 would be approximately 63 million gallons. At full build-out conditions, the Town could reach a total population of about 5,700 people around the year 2130. This hypothetical maximum population estimate is based on current buildable land according to current zoning ordinances and septic specifications. An alternative build out estimate based on minimum lot sizes allowed by

current zoning ordinances is a maximum of 1,816 dwelling units in the year 2146. The maximum population and housing units in town could change due to alterations in zoning and septic regulations. [33] Build out projections can be combined with knowledge on local per capita water use and recharge to develop an understanding of Madbury's water resource needs over time.

There is some question as to what the sustainable yield is from aquifers in Madbury. With regional water use on the rise, Madbury's water resources are likely to be increasingly sought after. Careful planning would help ensure that Madbury's future water needs are met while balancing regional water demand.

There are several commercial and industrial establishments in Madbury, but with the possible exception of New England Metals (formerly Madbury Metals) and Pike Industries, none are intensive water users. No major commercial or industrial growth is expected in the foreseeable future.

Recommendation for further research: Study Madbury's per capita water use and groundwater recharge and estimate the effect that future population growth in town would have on groundwater supplies. Combine the results of this study with build out results to develop an understanding of Madbury's water resource needs vs. availability in the future.

6.2. **Regional projections.** The City of Portsmouth is projecting water use over the next 20 years in its Water Systems Master Plan. Otherwise, there is currently not a regionally based water resource plan that projects supply and demand into the future. Given the rapid growth in population and housing over recent years, a regional water budget is critical to sustainable water resources management in Madbury. It is in Madbury's interest to advocate for the development of a regional water resources management plan involving other municipalities, watershed planning agencies, regional planning commissions, the US Geological Survey (USGS) and NH DES.

Recommendation: Support the efforts of watershed associations, regional planning commission, and municipalities to coordinate water protection and management within the Bellamy and Oyster River watersheds. Incorporate actions, regulations, and policies from watershed management plans through the Planning Board, Conservation Commission, and Water District.

7. Community Infrastructure

7.1 Septic Systems. **Minimum lot size in Madbury's Residential and Agricultural District is 80,000 square feet. Of this area, 25% or less of the lot may be rated as undevelopable due to steep slopes, hydric soils, or other factors. The Town minimum lot size standard does not include hydric A soils or surface water. Therefore, lots with hydric A soils or surface water will have a larger minimum lot size. Adequate lot size helps to ensure proper function of septic systems. Since Madbury relies exclusively on septic systems, strict adherence to septic system regulations is critical to protecting both drinking water and in the Bellamy River, Oyster River, and Great Bay ecosystems.**

7.2. Solid Waste Facilities. There are no active solid waste facilities in Madbury. However, an unlined town landfill is located on the south side of Pudding Hill road near the intersection with Evans Road. There is potential at this site for contamination of ground and surface water. Transmissivity is an important factor in groundwater pollution. The more quickly water passes through an area, the wider the spread of contamination plume and the more quickly this spreading occurs. The landfill lies above the southwestern edge of the Pudding Hill Aquifer in an area classified by the USGS as having a transmissivity rate between 500 and 1000 square feet per day. Although this is not the highest rating, this rate does indicate that contamination plumes in groundwater could spread quickly. The town landfill is also located near the headwaters of Gerrish Creek, which feeds directly into the Oyster River and the Little Bay Estuary through Johnson Creek. Both the Pudding Hill Aquifer and Gerrish Creek are important resources to Madbury as well as other communities in the region.

Recommendation for further research: Identify alternatives to monitoring groundwater in the Pudding Hill Aquifer as well as Gerrish Creek in order to detect potential contamination.

8. Existing Programs and Policies

8.1 Existing ordinances and regulations

8.1.1 Erosion and sedimentation prevention. Madbury's Subdivision Regulations stipulate that new housing developments take steps to prevent erosion and sedimentation due to stormwater runoff. [34]

8.1.2 Surface water flows. All land areas within 300 feet of the Bellamy Reservoir, 100 feet from the Bellamy and Oyster Rivers, and 50 feet from all other brooks contain specific restrictions such as the maintenance of a 50 foot buffer of natural vegetation, limitations on forestry, and structure setbacks which are aimed at preserving water quality and conserving habitat. [35]

8.1.3 Flood storage capability. Madbury has adopted a Wetland Conservation Overlay District as part of the zoning ordinances to protect wetland areas. Since most floodplains are within wetland areas, by protecting wetlands the town is providing partial protection from flood events. [36]

8.1.4 Prevention of wetland encroachment. Madbury's Wetland Conservation Overlay limits construction or disturbances allowable in wetland areas. [37]

8.1.5 Prevention of excessive nutrient levels. The 80,000 square feet minimum lot size requirement for residential-zoned areas reduces non-permeable surface expansion and helps ensure that adequate distance separates septic systems. The Town restricts the proximity of new sewage systems and leach fields to groundwater and wetlands. [38]

8.1.6 Protection of wildlife and fisheries habitat. The Wetland Conservation Overlay District and Shoreland Protection District call for the protection of existing wildlife habitat. Shore-based

pollution of surface water is minimized, thereby helping to protect the Great Bay and Little Bay Estuaries in addition to town surface water. [39]

8.2 Programs outside of Madbury

8.2.1. NH Estuaries Project and Coastal Program. Recently the NH Estuaries Project (NHEP), administered by NH OSP, identified and recommended various water quality and habitat protection goals and action plans that are considered necessary to protect the aquatic and shoreline resources of the Great Bay Estuary and other coastal waters. [40]

8.2.2. Watershed planning initiatives. Watershed planning initiatives provide a regional perspective on water resource management and protection. Watershed planning is one way in which members of different communities can come together to solve water resource related issues. Madbury has extensive water resources and the participation of Madbury's citizens in watershed planning initiatives is important.

8.2.2.1. Oyster River Watershed Association. The Oyster River Watershed Association (ORWA), formed in 1999, is a volunteer-run organization co-founded by the Strafford Conservation District and Strafford Regional Planning Commission. ORWA's mission is to protect, promote, and enhance the ecological integrity and environmental quality of the Oyster River Watershed through land protection and education.

8.2.2.2 Bellamy River Watershed. There is no similar watershed planning initiative in the Bellamy River Watershed as of June 2001. However, an initiative similar to the ORWA is under consideration. The Town's participation in an association of this kind is vital if the management and monitoring of the Bellamy River Watershed is to involve all stakeholders and work toward sustainability of the resource.

Recommendation: Madbury should become an active and vocal stakeholder in Bellamy River Watershed planning and management.

8.3 Other State or Regional Protection Programs. At the State level, NH DES administers several programs designed to protect surface water quality. Some of the programs most pertinent to Madbury include the Non-point Source Pollution Assessment Program, the Site Terrain Alteration Permit Program, the Protection of the Purity of Surface Water Supplies rule (Env-Ws 386) and the Surface Water Classification System. Each program is summarized below:

8.3.1 Protection of the Purity of Surface Water Supplies. [41] This program, commonly referred to as the State Watershed Rule, enables a water supplier or municipality to develop watershed protection requirements for a surface water supply particularly where watersheds extend into other municipalities. Once approved by NH DES, the protective provisions are then adopted as part of NH DES's administrative rules, with the water supplier remaining as the principal enforcer. Currently, there are 30 out of 57 active surface water sources statewide that have adopted some level of protection under this rule. The requirements generally include the use of buffer zones with widths typically ranging between 75 to 200 feet, various land use restrictions and some prohibit boating or swimming. This rule enables municipalities to broaden

the use of storm water treatment devices, buffer zones, infiltration measures for ground water recharge, or other land use restrictions to protect the quality of the water supply where such measures would not otherwise be required by other state or local environmental regulation.

8.3.2 Surface Water Quality Standards. [42] NH DES has established water quality standards that are applicable to all surface waters. These standards are usually numerical limits for various parameters, including E. coli bacteria, nutrients, turbidity, temperature, pH, dissolved oxygen, and various metals and other toxic substances. Certain activities that have the potential to degrade water quality and to cause instream concentrations to exceed these standards are prohibited. These standards are tied to two water use classifications. Class A waters are considered to be the highest quality and are generally acceptable for use as public drinking water sources after filtration and disinfection. Discharge of any sewage or wastes is prohibited in Class A waters. Class B waters are considered to be the second highest quality and are generally acceptable for bathing and other recreational purposes, and for use as water supplies after adequate treatment. The upper Bellamy River Watershed is the only water body designated as Class A water in Madbury. The other water bodies in Madbury are considered to be Class B waters. The State periodically assesses whether these criteria are being met and reclassifies surface water bodies.

8.3.3. Site Alteration ("Site Specific") Program. NH DES has jurisdictional review and a permitting process for all land development activities that will disturb an area of more than 100,000 square feet, or 50,000 square feet in locations within 250 feet of a designated public water body, to insure that adequate erosion control and storm water management measures will be implemented to treat runoff before it leaves the proposed site. The selection and the design of the various treatment devices available should be done in accordance with state standards. [43]

8.3.4 River Protection and Management Act. [44] Under this program river segments may be nominated by communities or citizens, then designated by NH DES to receive additional protection against discharges, land use activities along the shoreline, flow alterations and water withdrawals. Of the twelve river segments currently protected under this program, there are none that pass through Madbury.

Instream flow is one of the key protection measures provided by this act. The act gives NH DES the authority and responsibility to maintain flow to support instream public uses in rivers that have been designated by the Legislature for special protection under RSA 483. Instream public uses are defined as including navigation, recreation, fishing, conservation, maintenance and enhancement of aquatic life, fish and wildlife habitat, protection of water quality and public health, pollution abatement, aesthetic beauty, and hydropower production.

NH DES recently issued a 401 certification (water quality) for Durham's withdrawal from the Lamprey River. The certification limits downstream flow depending on the amount of water flowing in the river. This method is likely to be the state practice for issuing 401 certifications in the near future. Calculations that represent current flow rates are used to identify withdrawal restrictions and cessation. The Bellamy River 401 certification will likely be modeled similarly to the Lamprey River model.

8.4 Water Law and Water Rights. The legislature, Governor, and Public Utilities Commission have the power to transfer water rights. The City of Portsmouth owns the water rights to the Bellamy Reservoir, and that no one else is authorized to take water from the reservoir. According to state law, Portsmouth must supply adequate flow downstream of its dam, however there are no standards set for adequacy. Any surface water user must report to the NH DES if withdrawal exceeds 600,000 gallons in a 30-day period or 20,000 gallons per day averaged over seven consecutive days. Riparian landowners have the right to reasonable use of the public waters of New Hampshire. Although Madbury owns several lots on the Bellamy Reservoir, the town has no riparian rights due to a sanitary easement owned by Portsmouth. Easement and flowage rights were transferred to the city of Portsmouth by a contract with the United States of America on January 27, 1954. [45]

Recommendation for further research: Determine whether Madbury may or may not secure a right to Bellamy surface water.

Appendix 1: Tables

Table 1.1: WATERSHED SUMMARY

Watershed	Bellamy River	Oyster River	Little Bay
Area	33.86 sq. miles	30.98 sq. miles	1.78 sq. miles
Origin	Swains Lake, Barrington	Near Creek Pond, Barrington	-none-
Terminus	14 miles east to Little Bay at Clements Point, Dover	13 miles east to Little Bay at Durham Point	2 unnamed streams enter the Bay in Madbury at Royalls Cove
Drainage area	Barrington, Madbury, Dover, Lee	Barrington, Lee, Madbury, Durham, Dover, Nottingham.	Dover, Madbury, Durham, Newmarket, Stratham, Greenland, Portsmouth, Newington
Impoundments	4 dams: Swains Lake, Barrington; Bellamy Reservoir, Madbury; 2 locations in Dover.	2 dams in Durham.	-none-
Other features	Mallego Brook & tributaries; Bumford Brook & tributaries; Pierce Brook & tributaries; Kelly Brook; Knox Marsh Brook; Winkley Pond; Barbadoes Pond.	Turtle Pond; Caldwell Brook; Chelsey Brook; Beards Creek & tributaries; College Brook; Johnson Creek; Gerrish Brook & tributaries; Hoyt Pond; Bunker Creek; Smith Creek; Longmarsh Brook; Hamel Brook; Horsehide Brook.	Eight minor streams.
Maximum elevation	514 feet at Sunnyside Hill, Barrington.	601 feet at Bumfagging Hill, Barrington.	120 feet at an unnamed hill along the Madbury/Dover border.
Major surface waters	Bellamy River, Swains Lake, Bellamy Reservoir.	Oyster River, Wheelwright Pond, and Durham Reservoir.	Little Bay.
Classification	Class A, B*	Class A	Class B

SOURCES: NH GRANIT digital Watersheds layer. Watersheds delineated by NHDES; 1990 Madbury Master Plan; *Strafford Region Natural Resources Inventory,* SRPC, 12/98. * The portion of the watershed downstream from Dover's point of withdrawal is Class B as defined in RSA 149:3. Above this point the Bellamy is rated Class A.

Table 1.2: SURFACE WATER BODIES

Water Body	Watershed	Elevation	Area (acres)	NH DES Water Quality	Primary Consumer	Consumption Rate	Threats
Barbadoes Pond	Bellamy	132 ft.	16 a		Pike Industries		Hydromining
Bellamy Reservoir	Bellamy	125 ft.	323.9 a	Class A	Portsmouth	2.25 Mgal/day	Dover landfill
Bellamy River	Bellamy	125 to 90 ft.	36.6 a	Class A	Dover	.72 Mgal/day	Depletion
Hoyt Pond	Oyster	60 ft.	2 a		none		
Other water bodies	-	-	17 a	Class A	UNH		

SOURCES: *Strafford Region Natural Resources Inventory*, SRPC, December 1998; Dover Master Plan, 2000.

Table 1.3: WATERBODY CHARACTERISTICS

Characteristic	Barbadoes Pond	Bellamy Reservoir	Hoyt Pond
Area:	16 acres	323.9 acres	2 acres
Length:	-	12.8 miles	-
Elevation:	135 feet ASL	125 feet	40 feet
Average Depth:	-	-	6 feet
Maximum Depth:	48 feet	-	10 feet
Color:	colorless	brown	brown
Bottom:	100% sand	mucky	90% clay
Emergent Vegetation:	abundant	common	scant
Submerged Vegetation:	common	common	scant
Shore:	sand & wooded	gravel & rocky	-
Watershed	Bellamy R.	Bellamy R.	Oyster R.

SOURCES: Inventory of Lakes, Ponds, and Reservoirs in Strafford County, Strafford County Conservation District, date unknown, but after 1963; Biological Inventory of Lakes and Ponds in Sullivan, Merrimack, Belknap, and Strafford Counties, NH Fish & Game Department Survey Report No. 8b, 1963; Water Resources Chapter, Regional Master Plan, SRPC, 1990; and *Strafford Region Natural Resources Inventory*, SRPC, December 1998.

Table 1.4: WETLAND AREA SUMMARIZED BY WETLAND SIZE

Acres	Number of Areas	Total Area (Acres)	Average Size (Acres)
200 +	2	529	264.5
100 to 199	2	314	157
50 to 99	14	930	66.4
20 to 49	12	346	28.8
5 to 19	15	135	9
0 to 4	15	31	2
Total	60	2285	87.95

SOURCE: *Wetlands of Madbury*, 1988, D. Allan.

Table 1.5: SUMMARY OF THE SAFE SUSTAINED YIELD FOR LOCAL AQUIFERS

Town	Aquifer Number	Surficial Area (Sq. M)	Gallons Per Day	Storage Volume	Induced Infilt gpd	Sust. Yield mgd
Dover	DO-1	0.23	82,874	82,784		0.16
	DO-2	0.86	309,539	309,539		0.62
Madbury	MA-1	0.20	71,896	71,896	55,584	0.20
	MA-2	1.10	395,922	395,922	72,800	0.72

SOURCE: US Army Corp of Engineers, NE Division, "Groundwater Assessment, Southeastern New Hampshire Water Resources Study," 1981 in *Regional Master Plan, Water Resource Chapter,* SRPC, 1990.

Table 1.6: REGIONAL WATER SYSTEM SUPPLY/DEMAND SUMMARY

		Current Supply Capacity (mgd)		Max Daily
Water System	Wells	Surface Water	Total	Demand (mgd)
Dover Water Department	3.29	0.00	3.29	3.60
Durham/UNH Water Department	0.50	1.55	2.05	1.70
Pease Trade Port	1.25	0.00	1.25	0.20
Portsmouth Water Department	2.28	4.00	6.28	6.10

Table 1.7: REGIONAL GROWTH STATISTICS

	2000	2005	2010	2015	2020
Barrington	7,475	7,438	7,648	8,056	8,510
Dover	26,884	28,562	29,205	30,389	31,704
Durham	12,664	12,438	12,737	13,285	13,894
Lee	4,145	4,452	4,606	4,913	5,254
Madbury	**1,509**	**1,684**	**1,733**	**1,828**	**1,934**

SOURCE: 2000 US Census; 1997 NH OSP Population Projections.

Appendix 2: PUBLIC DRINKING WATER SUPPLIES

Report produced 10 January 2001 NHDES Water Supply Engineering Bureau

PWSID	SYSTEM NAME	ADDRESS	TOWN	SYS TYP	SYS ACT	SRC TYP	SRC ACT	SOURCE DESCRIPTION	WD	POP SERV
0651010-011	CITY OF DOVER WATER DEPT	RIVER ST	DOVER	C	A	E	A	GRIFFIN WELL TREATMENT PLANT, MAST RD	0	26000
1455010-001	MOHARIMET SCHOOL	RTE 155	MADBURY	P	A	G	A	BRW 1, 650' SOUTHWEST OF SCHOOL	775	500
1455010-002	MOHARIMET SCHOOL	RTE 155	MADBURY	P	A	G	A	BRW 2, 800' SOUTHWEST OF SCHOOL	200	500
1456010-001	ELLIOTT ROSE COMPANY/ MADBURY	RTE 155	MADBURY	P	I	G	A	BRW 1, 120' SW OF SW CORNER OF HOME	280	15
1456010-002	ELLIOTT ROSE COMPANY/ MADBURY	RTE 155	MADBURY	P	I	G	I	BRW 2, 300' W OF SW CORNER OF HOME	0	15
1457010-001	OLD STAGE CAMPGROUND	OLD STAGE RD	MADBURY	N	A	G	A	BRW, LOCATED NEXT TO PUMPHOUSE	360	150
1457020-001	TENNIS COOP INC	GARRISON CIR	MADBURY	N	A	G	A	BRW, 60' S OF BUILDING ENTRANCE	0	125
1457030-001	NEW ENGLAND SPORTS ACADEMY	282 KNOX MARSH RD	MADBURY	N	I	G	A	BRW, 120' E OF BUILDING	280	150
1458010-001	MOLLY OS II	316 ROUTE 108	MADBURY	N	I	G	I	WELL	0	75
1458010-002	MOLLY OS II	316 ROUTE 108	MADBURY	N	I	G	A	BRW, 15' ESE OF SW BLDG CORNER	720	75
1459010-001	COTTAGE BY THE BAY	PISCATAQUA RD	MADBURY	N	A	G	A	BRW 300' WNW OF NW CNR BLDG	440	200
1951010-001	PORTSMOUTH WATER WORKS	FRESHET RD	PORTSMOUTH	C	A	E	A	TREATMENT PLANT (FINISHED)	0	33000
1951010-005	PORTSMOUTH WATER WORKS	FRESHET RD	PORTSMOUTH	C	A	G	I	MADBURY 1 (NOT OPERATIONAL)	0	33000
1951010-006	PORTSMOUTH WATER WORKS	FRESHET RD	PORTSMOUTH	C	A	G	A	MADBURY 2	0	33000
1951010-007	PORTSMOUTH WATER WORKS	FRESHET RD	PORTSMOUTH	C	A	G	A	MADBURY 3	0	33000
1951010-008	PORTSMOUTH WATER WORKS	FRESHET RD	PORTSMOUTH	C	A	G	A	MADBURY 4	0	33000
1951010-009	PORTSMOUTH WATER WORKS	FRESHET RD	PORTSMOUTH	C	A	S	A	BELLAMY RESERVOIR	0	33000

NOTES:

PWSID System-Source ID number
TOWN Town served by the source
SYS TYP System Type:
"C" = Community public water systems which serve at least 15 service connections used by year-round residents or regularly serve at least 25 year-round residents
"P" = Non-transient, Non-community systems which are not community systems and which serve the same 25 people or more over 6 months per year
"N" = Transient public water systems serving 25 people or more per day for 60 days or more per year, but not the same people every day –
(Examples include restaurants and hotels with fewer than 25 employees)
SYS ACT Active status of the System ("A" = active; "I" = inactive)
SRC TYP Source Type ("S" = surface water; "G" = groundwater; "E" = entity/treatment facility)
DESCRIPTION Description of the source ("BRW" = bedrock; "ART" = artesian; "GRW" = gravel; "GPW" = gravel packed; "INF" = infiltration; "PH" = pump house)
WD Well depth in feet
POP SERV Population served by the System

Appendix 3: DAM PERMITS

Source: New Hampshire Department of Environmental Services, 3/7/2001.

Dam #	Name	River	Hazard Classification	Height (feet)	Impounded Area (acres)	Type	Basin	Owner
148.01	BELLAMY RIVER	BELLAMY RIVER		5.5	0	CONCRETE	PISC	TOWN OF MADBURY
148.02	FIRE POND			3		EARTH	PISC	TOWN OF MADBURY
148.03	BEARD CREEK	BEARDS CREEK		6.5	2	EARTH	PISC	RONALD TUVESON
148.04	BELLAMY RIVER	BELLAMY RIVER		2.5	0.2	EARTH	PISC	UNH KINGMAN FARM
148.05	FIRE POND	UNNAMED STREAM	AA	8	0.38	EARTH	PISC	NICHOLAS ENGALICHEV
148.06	FARM POND	NATURAL SWALE	AA	7	0.75	EARTH	PISC	G. DREW & H. ARMITAPE
148.07	FARM POND	NATURAL SWALE	AA	10	0.21	EARTH	COAS	ARNOLD REDFEARN
148.08	HOYT POND	GERRISH BROOK	AA	12	0.4	EARTH	PISC	NH FISH & GAME
148.09	FARM POND	NATURAL SWALE	AA	5	0.48	EARTH	PISC	JESSE GANGWER
148.10	FARM POND	UNNAMED STREAM	AA	5	0.35	EARTH	PISC	JOSEPH MORIARTY
148.11	CONSERVATION POND	NATURAL SWALE		3	0.4	EARTH	PISC	RUTH MURRAY
148.12	FARM POND	NATURAL SWALE	AA	9	0.32	EARTH	PISC	JONATHON E BERRY
148.13	BELLAMY RESERVOIR DAM	BELLAMY RIVER	C	38.5	333	EARTH/CONC	PISC	CITY OF PORTSMOUTH
148.14							COAS	
148.15							PISC	PATRICIA HALE
148.16	WILDLIFE POND	NATURAL SWALE	A	8.5	5	EARTH	PISC	JESSE GANGWER
148.17	FARM POND	NATURAL SWALE	AA	8	0.25	EARTH	PISC	UNIVERSITY OF NH
148.18	FARM POND	NATURAL SWALE	AA		2.7	EARTH	PISC	WILLIAM F HOPKINS JR
148.19	JOHNSON BROOK	JOHNSON BROOK		8.5	1.5	EARTH	PISC	CITY OF PORTSMOUTH
148.20	FARM POND	NA	AA	10	0.3	EARTH	PISC	ROSE LAWN FARM
148.21							COAS	
148.22	FARM POND	NATURAL SWALE	AA	5.5	2	EARTH	PISC	TOM SHIRLEY
148.23	CORNWELL WILDLIFE POND	UNNAMED WETLAND	AA	5.9	0.33	EARTH	COAS	KATHERINE CORNWELL

Appendix 4: GROUNDWATER HAZARD INVENTORY

SOURCE: *Site Remediation and Groundwater Hazard Inventory, Madbury*. 10/24/00. <http://www.des.state.nh.us>

Site #	Site Name	Site Address	Permits	Project Type	Project Manager
198403036	Madbury Brush & Stump Dump	Pudding Hill Road	0	Stump/Brush dump	Unassigned
198705022	Madbury Metals, Inc.	Rte. 155	2	Unlined landfill	Permits-Management
			2	Groundwater Release Detection Permit	Permits-Release Dept.
198801010	City's Water Treatment Plant	Freshet Road	0	Unlined landfill	Unassigned
			0	Special projects	Locker
198809005	Oyster River School District - Elem. Sch.	Rte. 155	0	Underground injection control	Closed
198903053	Kingman Farm	Rte. 155	0	Sludge application projects	Closed
199191013	Carbone Property - Formerly Garrison Motors	191 Littleworth Road	0	Leaking Underground storage tank	Closed
199410032	B & B Printing	314 Route 108	0	Underground injection control	Closed
199411014	Elliot Rose Co.	Rte. 155	0	On-premise use facility containing fuel oil	Closed
199610011	Martel Dump Site	Pudding Hill Road	0	Unlined landfill	Rydel
199712010	Robert Gaetjen	65 Nute Road	0	On-premise use facility containing fuel oil	Unassigned
199803002	Pike Industries, Inc.	Route 9	0	Registered above-ground storage facility	Willis
199906053	Madbury Alum Drying Beds	Freshet Road	1	Sludge application projects	Permits-Discharge
199906058	Mrs. Robert Jones Residence	1 Freshet Road	0	On-premise use facility containing fuel oil	Closed
200001047	Madbury Wells 2 & 3	Freshet Road	0	Underground injection control	Closed
200003004	New England Metal Recycling	290 Knox Marsh Road	0	Registered above-ground storage facility	Willis

Appendix 5: UNDERGROUND STORAGE TANK REGISTRATION LISTING

SOURCE: NH Department of Environmental Services web site, 10/24/00.

Name	Owner	Permit #	Location	Tank #	Capacity	Tank Type	Substance Stored	Installed	Date Closed	Closed Type
Madbury Metals, Inc.	Madbury Metals, Inc.	0-1122342	Knox Marsh Road	1	10,000 g	Steel	#2 Heating Oil	Oct. 1974	Oct. 1993	Removed
				2	10,000 g	Steel	#2 Heating Oil	Aug. 1979	Oct. 1993	Removed
Madbury Water Treatment Plant	City of Portsmouth	0-113635	Freshet Road	1	5,000 g	n/a	#2 Heating Oil	Jan. 1960	Nov. 1989	Removed
				2	8,000 g	Steel	Hazardous Substances	Jan. 1980	Sep. 1998	Removed
				3	**8,000 g**	**Composite**	**Hazardous Substances**	**Oct. 1998**		
Susan Warner Smith		0-114265	Littleworth Road	1	550 g	Steel	Gasoline	n/a	May. 1992	Removed
Town of Madbury		0-112539	Town Hall Road	1	2,000 g	Steel	#2 Heating Oil	Mar. 1985	Aug. 1998	Removed

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Biological Inventory of Lakes and Ponds in Sullivan, Merrimack, Belknap, and Strafford Counties, NH Fish & Game Department Survey Report No. 8b, 1963.

Campbell, The Home Water Supply, Garden Way Publishing, Charlotte, VT, 1983.

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Current Estimates and Trends in New Hampshire's Housing Supply, Update 1996. NH Office of State Planning.

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Douglas, Ellen M. *Volatile Organic Compounds in Private Drinking Water Wells: A Town-Wide Survey for Madbury, New Hampshire*. August 2000.

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NH Office of State Planning Population Projections, July 24, 2000.

Soil Survey of Strafford County NH, US Geological Survey, 1973.

Strafford Region Natural Resources Inventory, SRPC 1974.

Strafford Regional Master Plan, Water Resources Chapter, SRPC, December 1990.

Endnotes

[1] *Strafford Region Natural Resources Inventory*, SRPC, December 1998.
[2] *NH Department of Environmental Services Factsheet # WB 7,* http://www.des.state.nh.us/factsheets/wetlands/wb-7.htm (1/31/2001).
[3] *NH Department of Environmental Services Factsheet # WB 7,* http://www.des.state.nh.us/factsheets/wetlands/wb-7.htm (1/31/2001).
[4] In *Wetlands of Madbury,* David Allan, 1988, wetlands were delineated using soil type data from the *Soil Survey of Strafford County, NH* (USGS, 1973).
[5] *Strafford Region Natural Resources Inventory*
[6] *Strafford Region Natural Resources Inventory*
[7] *Wetlands of Madbury*
[8] From *Portsmouth Water and Sewer Rate Study,* June 1995.
[9] NH Env-Ws 1703.01, Water Use Classifications
[10] Dover Master Plan, 2000
[11] *Dover Master Plan*, 2000
[12] Nerney, Scott R. *1989 & 1990 Well Water Quality Surveys.* April 1992.
[13] This map is part of the report *Geohydrology and Water Quality of Stratified-Drift Aquifers in the Bellamy, Cocheco, and Salmon Falls River Basins* by T.J. Mack and S.M. Lawlor of the USGS. Additional information is also available from a similar report on the Oyster River Basin.
[14] Medalie, L. and Moore, R., USGS. *Ground-Water Resources in New Hampshire: Stratified Drift Aquifers.* 1995, in *Strafford Region Natural Resources Inventory* p. 21.
[15] Transmissivity is defined as the rate at which water passes through a unit width of an aquifer.
[16] *Radon Concentrations in the Groundwater, Madbury, New Hampshire*, November 1994, Ellen Douglas for the Madbury Water District.
[17] According to Rick Chormann at DES, 4/2000.
[18] From *Geology and Near Surface Aquifer Potential of Madbury,* NH, AMI, Inc., 1988, and Cotton, John E. *Availability of Groundwater in the Piscataqua and Other Coastal River Basins, Southeastern New Hampshire*. Water Resources Investigations 77-70, USGS, 1997.
[19] *Geology and Near Surface Aquifer Potential of Madbury*
[20] According to Tom Mack, Geohydrologic Section Chief for the United States Geologic Survey's NH-VT District, 3/2001.
[21] NH Code of Administrative Rules, Pln 401.33.
[22] NH Code of Administrative Rules, Pln 401.25
[23] NH Env-Wm 1401.26, Leak Monitoring for New Tanks
[24] From *Opinion on the Effect of the Proposed Iafolla Below Water Table Mining Proposal*, Thomas Ballestero, a former director of the New Hampshire Water Resources Research Center and current faculty member at UNH.
[25] *Fact Sheet,* Iafolla Industries.
[26] *NH Department of Environmental Services Factsheet: Sodium and Chloride in Drinking Water, # WD-WSEB-3-17,* http://www.des.state.nh.us/factsheets/ws/we-3-17.htm (1/23/2001).
[27] In August 2000 Ellen Douglas, P.E. completed the report *Volatile Organic Compounds in Private Drinking Water Wells: A Town-Wide Survey for Madbury, New Hampshire,* for the Madbury Water District.
[28] New Hampshire Revised Statutes Annotated (RSA) 485-A: 2
[29] In accordance with the Alteration of Terrain Program (RSA 485-A: 17 and Env-Ws 415).
[30] Paragraph (d) of Env-Ws 1703.01 Water Use Classifications
[31] NH OSP Population Projections, 1997
[32] *Madbury Build-Out Study*, SRPC, March 1999.
[33] *Madbury Build-Out Study*
[34] Madbury Subdivision Regulations, Article V, Sect. 18
[35] From the Madbury Shoreland Protection Overlay District, Article X, Sect. 4 and 5

[36] Wetland Conservation Overlay District, Article IX, Sect. 3
[37] Wetland Conservation Overlay District
[38] Building Regulations and Subdivision Regulations
[39] Wetland Conservation Overlay District and Shoreland Protection District
[40] The NHEP Management Plan (draft) draws from various studies and monitoring activities and identifies numerous action plans to improve or protect resources.
[41] Env-Ws 386
[42] Env-Ws 430
[43] Information on state standards can be found in *NH Storm Water Management and Erosion Control Handbook for Urban and Developing Areas in New Hampshire* (referred to as the "Green Book").
[44] RSA 483
[45] The 1998 *Bellamy River Water Rights Report* by Holly Gallagher, EIT provides documentation of Madbury's current water rights on the Bellamy River according to state law and contractual agreements.

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

2.3 Natural Resources

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire

by

Strafford Regional Planning Commission
Dover, New Hampshire

Table of Contents

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   - 5.1 Tables
   - 5.2 Maps – Soil Potential Ratings
   - 5.3 Soils Descriptions
   - 5.4 Slope Classifications

Natural Resources

1. Introduction

This chapter deals with natural resources, including topography, landscape features, habitat and the conservation, protection and use of these resources, and their inherent interrelationship with water resources.

Madbury's landscape is highly variable. One area of town is distinct from another area due to its unique combination of soil type, slope, groundwater availability, vegetation, presence of streams, wildlife, and scenic qualities, and the use of these resources. A detailed appraisal of these resources and their use is vital if Madbury is to be protected from flood damage, erosion, surface and groundwater pollution, depletion or destruction of wildlife habitats, loss of scenic landscapes, and the overall economic and social costs of environmental degradation.

2. Policy Statements

Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

The protection and sustainable management of the Town's natural and historic resources is central to this Master Plan. This focus will work to preserve the Town's rural sense of place. This policy reflects a strong desire among town residents to preserve the Town's open space and rural atmosphere as expressed during the June 2000 Master Plan survey of residents.

Acquire additional interests in land for conservation, water supply, open space, public recreation, and Town facilities.

Effective methods to ensure the preservation of environmentally and historically significant properties are the acquisition of easements and purchase of land by the Town and donations of easements and land to the Town. Through the acquisition of easements and land, develop a greenbelt linking Town facilities, schools, trails, open space, and wildlife corridors.

The Madbury Conservation Commission has highlighted the following types of landscape as priority areas for protection, preservation, and long-term resource management in the best interests of the environment and community:

- Wetlands
- Wildlife corridors
- Agricultural areas

3. Survey of Resources

3.2 Soils. The surficial materials that contribute much to the present day landscape of New Hampshire's coastal area are primarily the result of the last of four continental glaciers that appeared more than 12,000 years ago. This glacier deposited a layer of poorly sorted, highly variable, primary glacial soil or till. A variety of soil types (see Appendix 3) based on what the glacier left behind have developed since the glacial period ended. The particular characteristics of each soil type, such as drainage capabilities and structural stability, play a central role in determining both what biological communities develop on and what uses would be compatible with the land where these various soils occur**.**

In 1987 the Strafford County Conservation District adopted the *Soil Potential Ratings* system that classifies soils on the relative ease or difficulty of placing a septic system (particularly the absorption field), dwellings, and roads on a given soil/slope complex. These ratings provide a realistic and legally defensible approach to determination of land use potential, so the rating system is particularly useful as a land use-planning tool.

Refer to the Soil Potential Map (see Appendix 2). The map is revealing in several respects:

Overlaid with the areas of already developed land, the soil potential map shows that a significant portion of the land with the highest development potential has already been developed. The reasons are readily apparent. It is less expensive to build roads and buildings on land of this character, and the early settlers knew where the best land was when they laid out the major roads in town.

With much of the high potential land already used, future development will occur on increasingly marginal land. Careful planning will be needed, along with appropriate development restrictions, to ensure environmentally sound development of these lands. The Planning Board should pay particular attention to subdivision and site plan regulations designed to control erosion and sedimentation that result from construction related activities in marginal areas.

Thirdly, there are several large contiguous areas of soil with "low" and "very low" potential. These areas are prime candidates for open space and conservation land.

3.2 Topography. The undulating topography of New Hampshire's seacoast region generally corresponds to the underlying bedrock, although a number of hills are composed of glacial deposits. One such glacial "drumlin" is Hicks Hill, at 331 feet above sea level the highest point in Madbury. Madbury has few areas of high relief, though, so those few that do exist might be prominent features of the landscape and, therefore, scenic resources (see Section 3.3 below).

Madbury's topography combined with the town's abundance of water resources has led to the ecological development of many wetlands. Wetlands indeed cover more than 30% of the land area.[1] Madbury's wetlands are often flanked by glacial terraces or outwash plains that tend to be very sandy and flat and that are anywhere from 30 to 80 feet higher than the low areas. This topological arrangement of features

potentially offers views of wetlands from above, a vantage point that is not necessarily common outside of mountainous areas.

Topography takes on practical significance when the topographical characteristic of slope is considered in analyzing the suitability of a site for development. For example, flat land is appropriate for such uses as highways, large commercial and industrial buildings, and agriculture. On steeper slopes, many of these uses are not suitable. In addition, development and service costs increase. Development on steep slopes also increases the potential for greater erosion and pollution of waterways through runoff. Madbury has taken steps to prevent these negative consequences by discouraging development on slopes greater than 10% and limiting roadways to no more than an 8% grade. Appendix 4 gives descriptions of ranges of slope and discusses suitable uses in each.

3.3 Scenic Resources. Madbury possesses a rich rural character and scenic value. Forestland dominates the scenic landscape, though present and former agricultural lands, such as the Kingman Farm, also have a significant presence, especially along main roads and highways where Madbury has high visibility to visitors. Abundant wetlands and ponds, rivers, and streams in their natural states further enhance the scenic experience. Stonewalls and mature trees along roads add a distinctly New England flavor to the landscape.

Besides the presence of these scenic resources, their distribution is an important aspect of scenic value. Madbury has large, contiguous undeveloped areas that are important for wildlife and plant conservation and for ecological function as well as for landscape character. These areas could be particularly valuable in establishing a greenbelt(s) in Madbury.

The concept of "view sheds" or scenic vistas potentially comes into play where Madbury's topography is accented by particularly steep and tall hillsides that are prominent elements of distant views. Substantially visibly exposed bedrock ledge might be part of some of the scenic hillsides. These hillsides add further variety and rural ruggedness to the character of Madbury's landscape and should be considered as potential scenic resources.

3.4 Flora. Mixed forest of softwoods (coniferous) and hardwoods (deciduous) predominate Madbury's vegetation (Appendix 1, Table 1.2). The softwoods are typically white pine and hemlock, while red oak and sugar maple are typical hardwoods. Fields and pastures, as well as fields reverting to woodland are dispersed throughout town, with the largest such areas located on the Kingman farm, the former Elliot property, and the Rose Lawn Farm.

3.5 **Woodlands.** Madbury presently hosts eleven certified tree farms encompassing approximately 642 acres.[2] In addition to the certified tree farms, at least 110 acres of privately owned woodland, though not certified, are managed,[3] and fifty acres of public woodland in the vicinity of the Moharimet School are managed.

There are several significant forested areas in Madbury. These areas should be maintained in their present state for aesthetic, historical, and recreational purposes. These are areas which retain to some degree their natural character, and which exhibit native plant and animal communities or valuable individual members of such a community, or any other features of unique or unusual scientific, educational, geological, ecological or scenic value.[2] The following woodlands may, therefore, qualify for preservation measures.

- Bellamy River hardwoods
- Banks of Johnson Creek
- Bellamy Reservoir islands
- Madbury landfill site
- Town-owned land along Gerrish Brook

3.6 Rare and Endangered Species and Areas of Ecological Interest.

Madbury is the site of several rare plant species. These species have been designated[i] as imperiled in this state because of rarity or because of their characteristics demonstrably making them acutely vulnerable to extirpation from the state. Species known to exist in Madbury that meet the above criteria are listed below:

- Three-sided Mercury (*Acalypha virginica*)
- Missouri Rock-Cress (*Arabis missouriensis*)
- One-sided Rush (*Juncus secundus*)
- Fringed Gentian (*Gentiana critina*)
- Pale Green Orchis (*Platanthera flava* var *herbiola*)
- Small Whorled Pogonia (*Isotria medeoloides*)
- Exserted Knotweed (*Polygonum exsertum*)

Of the above-cited plant species, the Small Whorled Pogonia is of global concern. This orchid is one of the rarest plants in eastern North America.[3] The largest populations, some containing over 200 individual plants, are found in Maine and New Hampshire where over 80% of the known world population occurs. Madbury is close to the center of New Hampshire's Small Whorled Pogonia population. Also of particular concern in New Hampshire are the Exserted Knotweed and Pale Green Orchis, flagged in the NH Natural Heritage Inventory as *Very High Importance* and *Extremely High Importance* species respectively.

The rare species discussed above have been sited at locations in Madbury that include: near the western end of Hayes Road, at the end of Fitch Road, on Hicks Hill, at the Kingman Farm, near the old railroad depot, on Pudding Hill, and behind the Bunker Lane Mobile Home Park. The precise locations of these plant communities may be available upon request from state DRED staff.

Besides the particular plant species listed above, Madbury has several rare and endangered natural terrestrial communities. These communities are defined based on the floral communities present in combination with the physical environment,

especially soil and bedrock characteristics. The four communities identified within Madbury, each located at only one site, are:

- Central New England Mesic Transitional Forest on Acidic Bedrock or Till
- Rich Appalachian Oak-Hickory Talus Forest/Woodland
- Southern New England Lake Sediment/River Terrace Forest
- Southern New England Stream Bottom Forest

The species and communities listed above and others similarly imperiled could be located and mapped by field survey prior to development of an area to allow protective measures to be taken.

3.7 Fauna. Faunal occurrence in Madbury is less defined, especially because no threatened or endangered species are listed in the NH Natural Heritage Inventory (NHI). Anecdotal evidence points to the presence of the usual list of species to be expected in a largely wooded, coastal New Hampshire community like Madbury: larger mammals, such as deer, bear, moose, coyote, and fox; woodland and wetland birds; freshwater fish; smaller mammals, such as beaver, fisher, skunks, raccoons, and rodents; and various reptiles. Although the NHI does not list threatened or endangered faunal species as occurring in Madbury, the possibility still exists that they have just not been located yet. The rare and endangered ecological communities discussed in the previous section could be habitat for species specifically adapted to those habitats. Knowing what species of animals occur in Madbury is important, and performing an inventory of habitat and organisms can provide an excellent knowledge base for planning involving natural resources. (See especially 4.1.3 and 4.3.2 below for discussions of contiguous lands preservation and habitat protection.)

4. Resource Conservation and Protection

This section presents actions recommended by the Madbury Planning Board and Conservation Commission to address natural resource conservation and protection in the Town.

Recommendation: The Madbury Conservation Commission should take steps necessary to successfully undertake a conservation projects for land protection.

4.1 General land protection measures

4.1.1 Land ownership and easements. The Town can directly address natural resource conservation and protection through conservation easements and land ownership. Easements and municipally owned land exist in Madbury, and the Conservation Commission has addressed the need to maintain and acquire new easements and land for resource protection.[2] Also, a database of town owned easements and land (and privately protected land and easements) would allow the Town to evaluate quickly the bearing that any proposed land use would have on

resource conservation and protection policies or intentions. Statewide, the tracking of easements especially is neither standardized nor nearly complete, so progress made in this direction in Madbury would both benefit the Town and serve as a model for other communities. The significance of the latter advantage is not to be downplayed, because natural resources do not conform to political boundaries. Effective, long-term resource conservation and protection requires attention over the entire geographic range of the resources.

Of particular interest due to their potential impact on water resources are lands contiguous with the Bellamy and Oyster Rivers and their tributaries. Besides the value of resources contained within the boundaries of these lands, these lands have value as ecological transition areas between water bodies and the surrounding environment. Some of these critical lands may receive a measure of protection from existing federal, state, or local shore land protection regulations or ordinances, but acquisition of new easements or land should routinely be considered to optimize natural resource conservation and protection.

Recommendation: Develop a parcel-level plan for the Town to acquire and maintain new land and conservation easements to meet stated conservation goals.

Recommendation: Put particular emphasis on lands along the Bellamy and Oyster Rivers when considering lands for acquisition or easement.

Recommendation: Construct and maintain a database of protected land and easements that includes both Town-owned and private protected lands and conservation easements.

4.1.2 Preservation of agricultural resources. Agricultural lands are a prominent component of both natural and cultural resources in Madbury, and protecting these lands is crucial to the desired preservation of Madbury's rural atmosphere and landscape. Traditional agriculture typically produces a mosaic of visual resources and ecological communities. Croplands, woodlots, hedgerows, wetlands, and stonewalls serve as habitat for both flora and fauna. Maintenance of careful agricultural practices also preserves the quality and availability of the rich agricultural soil types.

Although agriculture usually replaces mature, native land cover types, the variety of ecological communities that result can be important for maintaining populations of the species they contain on a region-wide basis. Agricultural operations tend to create habitats that are in the quickly changing, earlier stages of ecological succession. These early stage habitats support a different assemblage of species than are found in the later stage communities. Clearing, burning, active/fallow field rotation, wall building, woodlot forestry, and hedgerow maintenance are examples of agricultural operations that have ecological and visual effects contributing to rural character.

One contemporary reality that Madbury must consider when planning for agricultural resource protection is the existence and growth of nearby residential areas. Agricultural operations can have negative impacts on these areas in terms of odors,

noise, and physical disturbance of the habitat around the homes that residents may consider unacceptable. Madbury is a small town geographically. This restriction makes the isolation of large, commercial agricultural operations from residential areas challenging.

One fine example of an agricultural resource is the Kingman Farm, owned by UNH and located along NH Route 155 in central Madbury. This farm represents the rich agricultural heritage of Madbury and is a critical resource from a conservation perspective. Although the Town cannot know the intentions of UNH toward the Farm, UNH will likely maintain its multiple-use status. Experimental agricultural research performed by UNH maintains the traditional agricultural character of the land and addresses, for example, forage, soil sampling, and woodlot forestry. Conservation of The Kingman Farm also has open space merits that could contribute fundamentally to future open space planning in Madbury. Finally, the Farm is a crucial environmental education resource for communities and for UNH, serving as an outdoor classroom for students from elementary school through college and for community members in general.

Protecting The Kingman Farm and its resources must include protection of lands that abut it, for these lands have direct ecological, visual, and other impacts. Just as agricultural land use can negatively impact surrounding lands, the reverse can be true. The Town should attempt to evaluate and restrict uses on land adjacent to The Kingman Farm to avoid negatively impacting the Farm.

In a similar manner, the Town should seek to protect other agricultural lands throughout the town. In recent years agricultural land has fallen at an increasing rate to residential subdivision. Once the agricultural use of land has been so converted, a return to agricultural use is unlikely. One of the most acute losses associated with the conversion is the loss of agricultural soil availability. Suitable agricultural soil types are limited in supply. Madbury has a long agricultural history, and such soil types have likely been largely developed for agriculture already. The Town might not have much new agricultural soil to use.

Recommendation: Discourage agricultural uses of land that are incompatible with neighboring residential development.

Recommendation: Encourage continuance of traditional, low-impact agricultural practices.

Recommendation: Protect the Kingman Farm, working as closely as possible with UNH to make known how important it is to the conservation planning efforts of the Town.

Recommendation: Madbury's land use regulations should go as far as is practical toward discouraging development on the Town's Important Farmland Soils. Very large lot zoning should be considered for areas of Prime Farmland Soils.

Recommendation: The Town should develop a long-term program for securing development rights on important farmland. Development rights could be acquired by the Town or by non-profit land trusts.

Recommendation: Carefully scrutinize development regulations in order to insure that they encourage rather than hinder compatible agricultural operations, horticulture, agricultural experimentation, so-called "alternative farming", and the local marketing of local produce.

Recommendation: Protect lands that abut the Kingman Farm to minimize impacts on the farm from surrounding areas.

4.1.3 Contiguous lands protection. The previous section discusses the values in conserving and protecting agricultural lands; however, agriculture, like many other types of use, tends to fragment the geographically continuous native land cover. Many wildlife and plant species respond positively to this disturbance, hence the enhancement effects of agriculture discussed previously. Many other species do not. Movement of individuals between different areas, reproductive processes, and other characteristics of the organisms can be affected. The New Hampshire Fish and Game Department, in its recent publication about protecting significant wildlife habitat,[3] discusses the ecological principles underlying habitat fragmentation:

> *Ecologists have learned by studying island systems that the size of an island and the distance from the mainland influence the number of species it can maintain. Small islands that are distant from the mainland support fewer species than larger ones. Natural habitats that become isolated through development become islands of habitat. The smaller and more isolated they are, the fewer species they can support.*

Madbury, for instance, is natively an area of continuous forest, and many of the species of forest birds are adapted to this forest cover. As varying land uses increasingly fragments the forest, these bird species, for example the wood warblers and forest thrushes, drop out of the community. Habitat fragmentation is a major part of the habitat loss factor that helps drive the reduction in biodiversity worldwide.

Another effect of habitat fragmentation is the opening of the native species communities to invasion by non-native species. Species invasion is, in fact, second only to habitat loss as a reason for biodiversity reduction. The resulting changes in species communities can have far-reaching ecological consequences in terms of ecosystem function, which include disruptions to nutrient and water cycling and to services to the human population.

Protection, therefore, of parcels of land that are contiguous, especially where they contain similar cover types, is crucial to mitigating the effects of habitat fragmentation. One important aspect of assembling a network of contiguous lands is to insure that there are adequate wildlife corridors with few human interactions (other that lawns and roads). These corridors provide important and undisturbed avenues of movement for wildlife and even plant dispersal.

Recommendation: Plan for protection of contiguous lands for the benefit of wildlife and plant communities.

Recommendation: Establish adequate wildlife corridors as part of the process of assembling a network of contiguous lands.

4.1.4 Open space planning. Although many may equate "open space" land with large, open fields, open space in a planning context means any land that is in a relatively undeveloped state. Open space can hold many important values for a community, including ecological, aesthetic, historical, cultural, or fiscal. For example, a sizable tract of open forestland could simultaneously serve as a recreation area for hikers, habitat for native plants, a segment of a contiguous land network, and a wildlife corridor. Open space in general helps balance the demands of development with the livability and quality of life in a community. Open space planning in Madbury could be a central process for maintaining the rural character of the Town.

One of the best ways for a community to incorporate open space considerations into its overall natural resource planning is to develop an open space plan. Such a plan identifies open space parcels throughout the town, evaluates them in terms of a set of relevant characteristics and in light of available funds, and usually classifies them in terms of their suitability for purchase, easement, or other protection.

Another way to incorporate open space into a community is through conservation subdivision. A conservation subdivision of a given parcel of land is designed to place the same number of housing units as would be allowed under a conventional subdivision into a portion of the parcel area, with the remaining area of the parcel left as open space. Housing demand is thereby balanced with conservation needs.

Recommendation: Create an open space overlay map for properties > 10 acre, and use this overlay as base data for developing an open space plan. Investigate the Town of Newmarket Open Space Plan as a model for development of a similar plan for Madbury.

Recommendation: Promote conservation subdivisions that create quality open spaces that protect resources in the existing landscape.

Recommendation: Make necessary changes to Town ordinance, subdivision regulations, and site plan regulations to support conservation subdivision.

4.1.5 **Policy-related measures.** Natural resource conservation and protection measures often require a substantial amount of funds to implement and sometimes to maintain. One of the most important sources of funds for these efforts in Madbury is the current use penalty tax. The funds can be used for planning, research, and monitoring, as well as for land purchase. Regular monitoring of activities or physical and biological parameters of the landscape that affect natural resources is an extremely important component of natural resources conservation. Existing regulations tend to do little good without monitoring and enforcement. In this way current use penalty taxes are tied

directly to effective regulation. The Madbury Conservation Commission understands the need to have multiple funding sources, relying not just upon revenue from current use penalty taxes: it is important to maintain or increase the 50% of current use penalty taxes currently applied to conservation activities.

Recommendation: Continue to apply 50% or greater of current use penalty tax revenue to conservation efforts.

Recommendation: Monitor impervious surface and shore land protection status, as these activities are important for conservation and are given some degree of defensibility by existing regulation.

Recommendation: Use the Town's capital reserve or issue bonds for resource protection.

4.1.6 **Development.** Development in Madbury has been slow and steady and mostly in the form of residential growth. Commercial and industrial activities are limited and the Planning Board sees only limited growth in this respect in the near future. A backdrop to future development in general is the fact that much of Madbury's land that is most suitable for development has already been built upon, so future development will occur on increasingly marginal land. Growth promotion and planning efforts might change the development environment in the future; however, the Town should carefully consider how it manages growth so that development does not threaten the natural resources of Madbury.

Recommendation: Limit incompatible uses within priority conservation areas.

Recommendation: During the subdivision review process, the Planning Board should pay particular attention to preventing erosion and sedimentation that could result from construction related activities in marginal lands.

Recommendation: The Town should consider adopting a Soil Type Lot Size system for determining the size of building lots. Madbury's Zoning Ordinance requires a building lot to be a minimum of 80,000 square feet, regardless of soil conditions.

Recommendation: There are several, large, contiguous areas of soil with low and very low potential for supporting development. These areas should be protected from residential development and are prime candidates for open space and conservation land.

4.2 Resource Stewardship

4.2.1 Town lands and easements database. As discussed in 4.1.1 above, a current database of Town-owned land and easements can be central to proper stewardship of those lands. This database can assist in identifying further lands to purchase or put under easement, according to the objectives of overall plans, such as open space or greenbelt initiatives. In Madbury, the lands in such a database should include Land and Community Investment Program and future Land and Community Heritage Investment Program purchases, the Town Forest, the Hicks Hill and Bolstridge properties, and, of course, any other lands as they come under town ownership or

easement. Maintenance of the database is crucial for expeditious and effective purchase and management.

Recommendation: (see 4.1.1 above) Develop and maintain a database of Town-owned land and conservation easements to assist in planning efforts. The database should include LCIP/LCHIP lands, the Town Forest, the Hicks Hill and Bolstridge properties, and all new land and easement acquisitions.

4.2.2 Access and use. In its role as a land steward the Town faces questions about land access and use—how to balance these with resource conservation and protection. Maintenance of adequate access and at least some traditional uses is important. Madbury is rich in rural recreational opportunities, such as hunting and fishing, hiking, and biking. These opportunities promote a clean environment, quality of life, health, and connection between the land and the townspeople. For the same reasons, the Town may wish to develop new access and uses.

At the same time, all access and use of land will unavoidably impact the resources on that land. Stewardship necessarily includes regular, critical evaluation of impacts and responsive adjustment of management strategies. The Town may find that it needs to consider restricting access or uses of the Town land to allow more control over management and its outcomes. Although management needs to address recreational and other demands of the townspeople, such considerations should not be at the expense of maintenance of natural resource conservation and protection.

Recommendation: Protect areas for hunting and fishing.

Recommendation: Provide for and proactively manage a Town greenbelt and trail system with trails that protect resources and that is sensitive to property owners.

Recommendation: Provide for recreational activities along roads and trails, such as biking, hiking, rollerblading, cross-country skiing, and jogging.

Recommendation: Encourage regional transit where possible to help to promote clean air and water.

Recommendation: Determine compatible uses and access levels for Town land and allow access and uses accordingly.

4.2.3 Formalize stewardship plans with owners or easement holders. Privately held lands and easements often constitute a significant portion of the inventory of protected lands in a town. Where possible, negotiation with owners or easement holders to formulate appropriate stewardship plans and to formalize those plans in writing can play an important role in the town-wide protection of natural resources. Formal plans both establish responsibility for ongoing stewardship and ensure defensible authority for stewardship actions taken.

Recommendation: Conservation Commission should evaluate private lands or easements for their contribution to overall resource protection goals and negotiate with owners and easement holders to formulate appropriate, written stewardship plans.

4.3 Habitat and species protection

4.3.1 Transition zones for habitat and buffers. The narrow areas between different land cover types, ecological systems, major landscape features, or land uses can hold great value as habitat and as buffers. Some examples of such "transition zones" include hedgerows, strips of woodland, riparian areas of both running and still waters, and forest edge bordering open areas. Many species of wildlife and plants are particularly adapted to the structure and ecological function of these zones, using them as foraging, breeding, or movement habitat or as dispersal areas. Often, the transition zones are areas of early ecological succession that occur along the edges of patches of fragmented land. Although fragmentation is a major contributor to habitat loss—and, therefore, to biodiversity reduction (see 4.1.3 above)—transition zones are an important component of the ecological landscape, especially in New England where there is a long history of agricultural land use. In contrast, one type of transition zone that is often characterized by relatively mature types of cover is the riparian area along woodland streams. Proximity to water is a crucial habitat characteristic for a majority of wildlife species, and whole communities of plants are adapted to, and therefore require, riparian micro environmental conditions.

Another important function of transition zones, especially those with substantial canopy and understory cover, is buffering between potentially conflicting land uses. For example, a sizable wooded buffer between cropland and residential development can physically block dust transport from field to residential area while combating soil loss. In addition, the spatial separation contributes to minimization of potentially objectionable odors spreading from cropland to residences. (See 4.1.2 above.)

Recommendation: Identify, protect, and maintain existing, significant transition zones, such as hedgerows, woodland buffers, riparian areas, and forest edge.

Recommendation: Balance protection and maintenance of transition zones with the need to protect unfragmented habitat components of the landscape.

Recommendation: Include transition zones in conservation subdivision process as high value areas.

4.3.2. Rare and endangered species and areas of ecological interest. Rare and endangered species and areas of ecological interest have been identified in Madbury (see 3.4.2 above). Protecting these resources successfully requires detailed knowledge about their locations and distributions. Compilation of this information typically involves the gathering of both existing and new data. Existing information can be found in many forms from various sources, some directly usable and some needing interpretation in the context of protection goals. Some examples of potential information sources are the New Hampshire Fish and Game Department; the New Hampshire Department of Resources and Economic Development; the New Hampshire Department of Environmental Services; the New Hampshire GRANIT GIS System; the Regional Planning Commissions; local environmental consultants; and local land trusts and environmental organizations that may already have performed some useful data collection.

Developing new information may be more time-consuming and potentially more expensive than using existing data alone, but existing data can often be inadequate for attainment of conservation goals. As mentioned earlier, protecting particular species or important ecological communities requires that one knows where and how these resources are located, and one excellent tool for acquiring this information is the Natural Resources Inventory (NRI). Just as a wholesaler may annually examine the stock in the warehouse, recording the identity, number, and shelf location of items, a town can inventory the natural resources found within the town boundaries.

The NRI can directly locate resources targeted for protection; however, the NRI results often prove most useful at a more general scale, giving clues as to where to look more closely to find the important species and communities. Madbury accomplished an NRI in 1975[ii] and was included in a regional NRI in 1998.[iii] A new NRI may be in order for Madbury, and The Upper Valley Land Trust and UNH Cooperative Extension in 1992 produced an excellent publication to use as an information source and guide to the NRI process.[4]

Another recent (2001) publication from the New Hampshire Fish and Game Department[4] thoroughly details the process of identifying and protecting wildlife habitat. Survival of wildlife species depends on availability of suitable habitat, so species protection efforts must include habitat protection. A similar process to that in the aforementioned publication could be applied to plant and ecological community protection, as well. Without knowledge of where the species and communities of concern are located, Madbury cannot know fully the impacts of development or existing land uses on these resources.

Recommendation: Add a survey for rare and endangered species and areas of ecological interest to the Town's subdivision application for lots > 10 ac. The survey(s) should be conducted at a time of year when species and ecological communities are most likely to be found, if present.

Recommendation: Perform a wildlife habitat analysis for Madbury, following the procedure detailed in the wildlife habitat guide by NH Fish and Game referenced above.

Recommendation: Perform a new Natural Resources Inventory of Madbury, using the NRI report and guide by Auger and McIntyre referenced above.

Recommendation: Emphasize the value of wildlife and their habitats within town through education activities for all ages.

4.4 Wetlands and watershed resources

Wetlands are foci of biological activity, ecological interactions, and ecosystem function. Their extreme value accordingly demands a high level of protection, and many federal, state, and local regulations and programs have been established for that purpose throughout the country and, indeed, the world. Wildlife and fish and other aquatic organisms rely on wetlands to provide habitat in all parts of their life cycles. A critical note here is that many organisms require wetlands for breeding, migration,

or other seasonal activities but spend much of their time in surrounding areas engaged in other mandatory activities. Consequently, wetlands, though crucial in and of themselves, need also to be considered as a part of a larger, contiguous landscape of habitats.

Wetlands also provide ecological and ecosystem services, such as filtration and groundwater recharge, to the human population. Human health depends upon clean water sources, so maintenance of wetland function is of foundational importance. Madbury has just over 300 acres of wetland, which accounts for approximately 4% of the land area of the Town. This spatially limited occurrence of wetlands in the town underscores the need to emphasize wetland protection.

On a larger scale than individual wetlands, watersheds comprise a hierarchically organized geographic structure for water availability and movement through the landscape. Most surface water within or precipitation that falls within the boundary of a watershed eventually flows out of the watershed at a single point and into the basin of another watershed (or eventually into the ocean). In this way water quality, quantity, and speed are exported from a watershed. Similarly, within a watershed water moves from one area to another. Proper protection of water resources must therefore include the landscape scale of the effects of watershed structure on water resources. Madbury straddles the boundary between the Oyster River and Bellamy River Watersheds. Consequently, anything that affects surface water characteristics within town boundaries potentially affects all downstream areas in two watersheds, both of which contain critical wetland habitat and extremely important water sources for people in Madbury and in surrounding communities.

Recommendation: Consider placing mandatory conservation easements on wetlands within subdivisions. Use the Town of Lee as a model.

Recommendation: Consider providing stricter protection of the ecological services of wetlands, such as filtration.

Recommendation: Officially designate prime wetlands for Madbury.

Recommendation: Preserve areas surrounding wetlands, particularly prime wetlands and other high value wetlands with legal standing.

Recommendation: Continue to bar development in floodplains

Recommendation: Protect water supplies around wells and rivers, possibly through establishment or upgrade of ordinances, such as wellhead protection districts, well recharge areas, aquifer protection districts, and substantial riparian setbacks for water conservation.

Recommendation: View development in light of the Town's role as a watershed steward, considering the critical combination of water and land resources.

Appendices

Appendix 5.1 Tables

Table 1.1:Soil Potential Groups

"Soil Potential Ratings" refers to a soils classification system adopted by the Strafford County Conservation District in 1987 (see Soil Potential Ratings for Development, by the SCCD, July 1987). This system classifies soils on the relative ease or difficulty of placing a septic system (particularly the absorption field), dwellings, and roads on a given soil/slope complex. The key difference between the Soil Potential system and the older Soil Limitations system is that the former takes into account common engineering techniques typically used to overcome restrictive soil conditions.

Potential	**Description of Soil Performance**	Acres	% of Acres
Very High	At or above local standards due to favorable soil conditions. Installation and management costs are low. Few limitations	**1102**	**15%**
High	Cost of measures to overcome soil limitations are slightly higher than those with very high potential.	**712**	**9%**
Medium	Cost of measures to overcome soil limitations are significant.	**2347**	**31%**
Low	Cost of measures to overcome soil limitations are very high.	**274**	**4%**
Very Low	Soil has severe limitations. Cost of measures to overcome these limitations are extremely high or prohibitive.	**3093**	**41%**
	Total	**7528**	**100%**

Table 1.2: LAND COVER SUMMARY FOR TOWN OF MADBURY

Land Cover type	Acres
(No data)	4
Residential/Commercial/Industrial	189
Transportation	401
Row Crops	7
Hay/Pasture	548
Orchards	15
Beech/Oak	556
Paper Birch/Aspen	0
Other Hardwoods (not Paper Birch/Aspen)	673
White/Red Pine	525
Spruce/Fir	0
Hemlock	122
Pitch Pine	1
Mixed Forest	2743
Alpine (Krumholtz)	0
Open Water	459
Forested Wetland	159
Open Wetland	147
Tidal Wetland	2
Disturbed Land	107
Bedrock/Vegetated	0
Sand Dunes	0
Other Cleared	870
Tundra	0
	7531

Source data for this table are from the New Hampshire Land Cover Assessment, conducted by the GRANIT staff of the Complex Systems Research Center at the University of New Hampshire, released January 2002. Summary data presented in the table were derived from digital raster land cover data in a GIS system at Strafford Regional Planning Commission.

Appendix 2: Maps

Map 2.1 SOIL POTENTIAL RATINGS

[Map inserted in document following this page]

Appendix 3: Soils Descriptions

The surficial materials that contribute to the present day landscape of New Hampshire's coastal area are primarily the result of the last of four continental glaciers that appeared more than 12,000 years ago. This glacier was a mass of ice about one mile thick when it advanced across New Hampshire from the northwest, then melted and retreated. As it moved across the earth's surface, the glacier deposited a layer of poorly sorted debris called till. This material is made up of a mixture of sand, silt, clay, gravel and boulders, and is usually 15 to 40 feet thick. Glacial till often contains a hardpan layer that may cause drainage problems. Where this layer is absent, till will usually provide an adequate building site.

As the glacier began to melt and retreat, debris from the ice was transported and deposited in a seemingly random fashion. The resulting sand & gravel deposits are among the more common surficial materials that were laid down close to the melting ice. They consist of stratified sands, gravel and boulders, and vary in thickness up to 190 feet. These materials are relatively coarse since there was little sorting by the melting water. Pudding Hill is an example of such a deposit.

Because of their high permeability, high bearing capacity, and ease of excavation, the sand & gravel deposits often provide excellent building sites. However, there are competing demands for this resource. Their drainage and load bearing characteristics make this material highly desirable for the construction of highways. The pressure to excavate these deposits is enormous. In addition, sand & gravel deposits may hold large quantities of water, known as aquifers, enough to provide municipal water supplies. Obviously, a rational policy of land use regulation must be enacted in order to protect these aquifers.

Similar to these coarse sands and gravels are the outwash sands and fine gravels. These types of deposits were better sorted by the melting water, and are therefore composed of finer particles than the sand & gravel found on Pudding Hill. Closely associated with this type of outwash are the sandy shore deposits that formed along the shorelines of the ancient sea that covered much of the Seacoast area during the latter stages of the glacial period. These deposits range in depth from 1 to 50 feet.

As the ice sheet continued to retreat, the great quantity of melting water combined with the ancient sea to bring the coast fifteen to twenty miles inland from its present location. Fine sand, silt and clay were deposited to a maximum thickness of 75 feet. These marine clays are easily recognized by their blue-gray color. Marine clays are generally poorly drained, and in many instances are highly unstable, particularly when wet. Thus, these deposits are generally unsuitable for building sites requiring on-site septic systems and development requiring stable foundations.

Most surficial materials remain today much as they did after the retreat of the glacier. The only surficial deposits that have accumulated recently are the poorly drained swamp deposits in low- lying areas, and alluvium that has been deposited along streams.

Soil Types

Soils form the upper organic layer of earth materials that developed from the interaction of climate, vegetation, slope, and surficial geology. The present characteristics of each soil type are highly dependent on its position in one of the major surficial deposits. For example, the Hinckley and Windsor soils are located in the level portions of sand and gravel deposits.

Soil conditions are a major factor in determining suitable locations for urban uses as residential development and recreation. Listed below is a description of each soil condition category, along with recommendations relative to potential development.

Wetland Soils include all those that are poorly drained and very poorly drained. Generally, the water table is at or near the ground level for most of the year. Wetlands are best left undeveloped because they serve as flood buffers, natural drainage ways, wildlife habitat, pollution filters, and aquifer recharge areas.

Highly Erodible Soils are located in marine clay deposits, often adjacent to tidal rivers such as the Oyster River. Development on these soils is generally not recommended because of the high potential for erosion and stream pollution. They are best left in vegetative cover. Where construction is necessary, proper erosion and sediment controls should be utilized.

Seasonally Wet Soils were formed in association with parent materials similar to those of the wetland soils, although they are generally better drained. This group includes all moderately drained soils. Development of seasonally wet soils should be avoided where at all possible. Wet basements and submerged leach fields can be expected, and groundwater pollution is possible. Waste disposal should be discouraged in these soils.

Shallow to Bedrock Soils are located on thin deposits of glacial till. Bedrock in these areas is typically 30 inches or less below the ground surface. In these soils, high-density development is unwise due to the high costs of constructing foundations and sewer facilities. The only type of development that is suitable for this soil type is large lot residential.

Clays and **Sands Over Clay Soils** are typically found near the ground surface. Drainage characteristics range from moderate to very poor. Septic systems generally do not function very well in these clays.

Deep, Well Drained, Stony Soils typically have a hardpan layer at about two feet that restricts the downward lateral movement of water. While deep, stony hardpan soils may be well drained, on-site septic systems should not be used on small lots. In those areas in which a hardpan layer is not present, most types of development face few limitations.

Sand & Gravel includes all well drained and excessively well-drained soils that have formed in thick sand and gravel deposits. These soils have the best potential for development since they offer few restrictions to construction. However, these soils may percolate so well that septic effluent reaches the groundwater. Therefore, high-density development should be discouraged in order to protect any aquifers that may be in the vicinity.

Appendix 4: Slope Classifications

0 to 3% Slope

Land in this category is generally suitable for most large buildings, highways, residential use, and public recreation facilities such as ball fields. Flat sites may present such problems as inadequate drainage and insufficient gravity flow for sanitary sewers. Flat areas may be located in the floodplain. One indication of a particular site being situated in the floodplain is the conspicuous absence of historic buildings.

3% to 8% Slope

Land in this category is generally suitable for single family housing on small and medium sized lots, apartment buildings, and secondary roads. Unless associated with poor soil conditions, this slope generally permits good drainage, and provides an interesting and variable landscape without the excessive cost of grading, retaining walls, and other problems associated with steeper slopes. Assuming soil conditions are adequate to assure proper septic operations, a more intensive form of development than found elsewhere could probably be justified. However, in a town that desires to retain its rural and agrarian character, it must be remembered that these soils are usually the best farmland.

8% to 15% Slope

Land in this category is suitable for single family housing on large lots. Development costs and the potential for erosion begin to increase. Particular care should be given to proper drainage and septic system installation. This slope is usually too steep for most high intensity and high density uses. Where this slope is used for such purposes, the result is often severe soil erosion and sedimentation that can damage adjacent property, cause water diversion and flooding, destroy wildlife habitats, and leave large scars on the landscape. In addition, slopes in excess of 10% generally make the construction of good roads difficult.

15% to 25% Slope

Land in this category causes the cost of development to become a major factor. Runoff and erosion control are essential. Although there seems to be a trend these days to site homes on hillsides, on slopes greater than 15%, such areas can only be developed at great expense.

Over 25% Slope

Land in this category has very high development costs and environmental impact. Such factors as shallow-to-bedrock drainage problems, runoff, and erosion severely limit construction on these slopes.

Endnotes

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[1] Department of Resources & Economic Development, New Hampshire Natural Heritage Inventory. 2002. *Rare Plants, Rare Animals, and Exemplary Natural Communities in New Hampshire Towns*. Online document, regularly updated at http://www.nhdfl.com/formgt/nhiweb/, version date 8 February 2002, Source: te_spp_by_town.pdf .

[2] Strafford Regional Planning Commission. 1975. *Madbury Natural Resource Inventory.*

[3] Strafford Regional Planning Commission. 1998. *Strafford Region Natural Resources Inventory.*

[4] The Upper Valley Land Trust and UNH Cooperative Extension. 1992. *Natural Resources: An Inventory Guide for NH Communities*

[5] NH Fish and Game Department. 2001. *Identifying and Protecting New Hampshire's Significant Wildlife Habitat: A Guide for Towns and Conservation Groups*.

Historic Resources

1. Introduction

The aesthetic value of a community's historic architecture is widely recognized. Less obvious, but no less important, is the sense of psychological well being our architectural heritage may foster. In an era of ever quickening change, mobility, and standardization, Madbury's historic landscape provides a unique identity, a sense of time, place, and continuity. That Madbury's Master Plan should appropriately address such aesthetic values is clearly set forth in the landmark U.S. Supreme Court decision of Berman vs. Parker (1954) in which the court declared:

"The concept of the public welfare is broad and inclusive. The values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well balanced as well as carefully patrolled. "

The DeMerritt House
Cherry Lane
c. 1723

2. Early History

The following is excerpted verbatim from Eloi Adams' Madbury: Its People and Places (1968):

> *"The first mention of Madbury is found in a record of March 19,1693, when forty acres of land were granted to Francis Pitman on the northeast side of the path going to Madbury. That same day, thirty acres were laid out to Stephen Willey on 'ye north side of ye mast-Path which comes from Madbury.*
>
> *The name 'Madbury' was first applied to a section north of the center of the town. It was named for Modbury in Devonshire, England, which was for centuries the county seat of the Champernowne family. A member of this family, Captain Champernowne of the Dover Combination of 1640, took a grant of a large timber lot on the west and northwest of the town, cut the trees into huge masts for ships, and hauled them to the Piscataqua River where they were floated to Portsmouth and the sea. Captain Champernowne liked the place so much he named it for his home in England.*
>
> *The name 'Modbury' was later corrupted to 'Madberry' and 'Madburry' , finally becoming 'Madbury'. There is no other town in the United States with the same shape or name as Madbury.*
>
> *The town is as old as Dover, having been an original part in 1623. Madbury became an entity in 1735, when John and Judah Tasker gave an acre of land to the inhabitants on which to build a meetinghouse...*
>
> *The first meetinghouse in Madbury was erected in 1735 near where now stands the fire station. The church was a fine specimen of early American architecture, with a high pulpit and sounding board, and high back pews with doors. The meetinghouse was torn down about the middle of the nineteenth century, and some of the material was used in the building of the present town hall. No other relic remains, except the keys that for years were in the possession of Maj. John DeMerritt, who later gave them to Eloi A. Adams.*
>
> *By act of the legislature passed May 31, 1755, Madbury was erected as a parish by its present name. It was empowered to raise money for the separate support of the ministry, schools, and paupers, but remained as before with respect to province taxes, highways, etc., until May 20, 1768, when it was invested with full town privileges...*
>
> *At the time Madbury was incorporated as a parish (1755), the population numbered nearly 700."*

A town wide survey of Madbury's historic architecture was undertaken between 1979 and 1983. The survey documented 81 buildings that were constructed prior to 1940.

The survey identified thirteen surviving pre-Revolutionary houses in Madbury. Most of these thirteen houses were built in the **Georgian** style. The **Georgian** style is of Italian Renaissance derivation; it gained popularity in England and America in the early 1700s at the beginning of the reign of King George I, hence its designation, "**Georgian**."

The **Georgian** style is characterized by heavy classical ornamentation of Roman origin, symmetrical fenestration, and a massive center chimney. The majority of Madbury's surviving buildings from this period are one and one-half story capes, featuring a center entry flanked by a pair of windows on each side of the front door.

Madbury can boast four outstanding examples of Georgian-era buildings: the c.1750 Huckins House at 33 Nute Road, the c.1723 Powder Major DeMerritt House at 6 Cherry Lane (depicted in the photo below), the c.1750 Jonathan Ham House on Freshet Road, and the c.1740 William Dam House on Pudding Hill Road. The latter is a good example of the two and one-half story version of **Georgian.** Another notable early structure is the old Jabre Farm (site #59) on Pudding Hill Road; this house is said to be the oldest in town.

All of Madbury's surviving **Georgian** style houses are rather restrained and conservative in their use of architectural ornament. Such outward austerity is typical of rural New Hampshire, in sharp contrast to the flamboyance of wealthy merchants in nearby Portsmouth and other coastal ports. Madbury's architecture seems to reflect the prevailing Yankee ethic that material success could be had but not flaunted.

"Powder Major" John DeMerritt House Cherry Lane c. 1723

3. Federal Period

The years following the Revolutionary War through the first decades of the nineteenth century were a time of national and regional advances in transportation, commerce, agriculture, industry, and architecture. Large, self-sufficient farms dominated Madbury's landscape during this era. These farms developed on land that had been cleared by intensive logging during the eighteenth century.

The Hayes/Raynes farm on Old Stage Road is an excellent example of a farm from this period. This complex included a tannery, a shoe shop, a brickyard, a sawmill, a blacksmith shop, and probably many other structures.

Chesley House
Perkins Road
1800

The first decades of the nineteenth century brought many changes to Madbury. America's Industrial Revolution commenced, and Madbury's farmers geared up to meet the challenge of feeding mill workers in nearby factory towns. Gradually, the self-sufficient farms of the eighteenth century gave way to commercial or specialty farming, as Madbury became an important food supplier to area mill towns such as Dover.

The survey noted seventeen surviving buildings which exhibit features of the **Federal** style, usually dating from the 1790's through the 1830's. Like **Georgian**, the **Federal** style is of Roman origin. But the **Federal** style is lighter, more delicate, and more graceful than the **Georgian**. Typically, the **Federal** style building has a shallow pitched hipped roof, and long slender chimneys near the sidewalls.

Four of Madbury's seventeen buildings dating to this period are particularly good examples of **Federal** architecture: The c.1810 Torr House at 42 Cherry Lane (moved here from Dover in 1974), the c.1810 John DeMerritt Homestead at Madbury Road & Route 155, the c.1815 Kingman Farm off Route 155, and the c.1800 Chesley House on Perkins Road.

A typical **Federal** feature is the elliptical shaped fanlight above the front door, as exemplified by the DeMerritt apartments, shown in the photos to the right and below.

DeMerritt Apartments
Madbury Road & Rt. 155
1810
(right)

John DeMerritt Homestead
Madbury Road
c. 1810

The Kingman Farm and the Chesley House are Madbury's only three story buildings dating to the **Federal** period. Note that the ceiling heights in these two houses become progressively shorter in the upper stories, a feature which is typical of **Federal** style buildings.

Kingman Farm
Route 155
c. 1815

4. Mid-19th Century

When the Boston & Maine Railroad laid the line from Exeter to Dover (via Madbury) in 1841, local farmers immediately realized far greater marketing opportunities. Easy access to the railroad allowed Madbury farmers to ship perishable foods, especially dairy products, to Boston and other more distant markets. From 1830 to 1860, Madbury farmers were particularly prosperous.

Throughout most of the nineteenth century, Madbury's economy was based primarily on lumbering and agriculture. The trend towards commercial farming continued during this period, and provided the capital for a major building campaign that significantly altered the local landscape. Madbury's numerous and excellent examples of Greek Revival style farmhouses date from this era.

In 1858, the town voted to tear down the old meetinghouse that had stood since 1735 in the vicinity of the present fire station. In its place, the present Town Hall was erected in 1861.

Madbury Town Hall
Town Hall Road
c. 1861

During the 1820's, the people of Greece fought a war to free themselves from 400 years of domination by the Ottoman Empire. The Greek cause had much sympathy in rural America, as it came to symbolize a struggle between democratic values versus the interests of Old World monarchies and wealthy urban residents. Rural New Hampshire's partisan sympathies are reflected in the architecture of this period. Buildings were consciously designed to emulate ancient Greek temples.

The Survey noted twenty-one houses in Madbury dating to the 1830s & 1840s, the period in which the **Greek Revival** style enjoyed its greatest popularity in America. Sixteen of these twenty-one buildings exhibit features that are distinctively **Greek Revival.** Five of these houses represent particularly good examples of the style: the c.1828 Hayes House at 42 Nute Road (right), the c.1847 Tibbetts House at 77 Hayes Road, the c.1840 Town House on Madbury Road, the c.1830 DeMerritt House on Evans Road, and the c.1840 Nathaniel Meserve House, also on Evans Road.

Hayes House
Nute Road
c. 1828 (right)

The front doorway of the Meserve House (left) also typifies the **Greek Revival** style Madbury buildings of this period. The classical entablature above the door is supported on both sides by Ionic pilasters. Pilasters are essentially two-dimensional versions of ancient Greek columns. Other typically Greek features include the sidelights (windows) that flank the front entry, and the triangular shaped pediments above the windows along the front of the house (below).

Nathaniel Meserve House
Evans Road
c. 1840 (above; right)

In the mistaken belief that ancient Greek temples were originally white, many rural New England houses began to emulate this color scheme during the mid-19th century. A number of Madbury houses continue this tradition to the present day.

5. Late 19th Century

The central role of agriculture in the economy of nineteenth century Madbury is revealed by a close inspection of federal census returns. In 1870, for example, 84% of the Town's 149 adult males referred to themselves as farmers or farm laborers. Of the remaining 24 men, five were carpenters, ten worked in shoe manufacturing (probably in Dover), five were without occupation, and the other four reported miscellaneous jobs: bookkeeping, stone cutting, printing engraving, and one who worked in a bleachery.

The 1860s marked the high point of the agricultural boom in Madbury. A decline in agriculture then began, caused in large part by two national events: the Civil War and the opening of the transcontinental railroad.

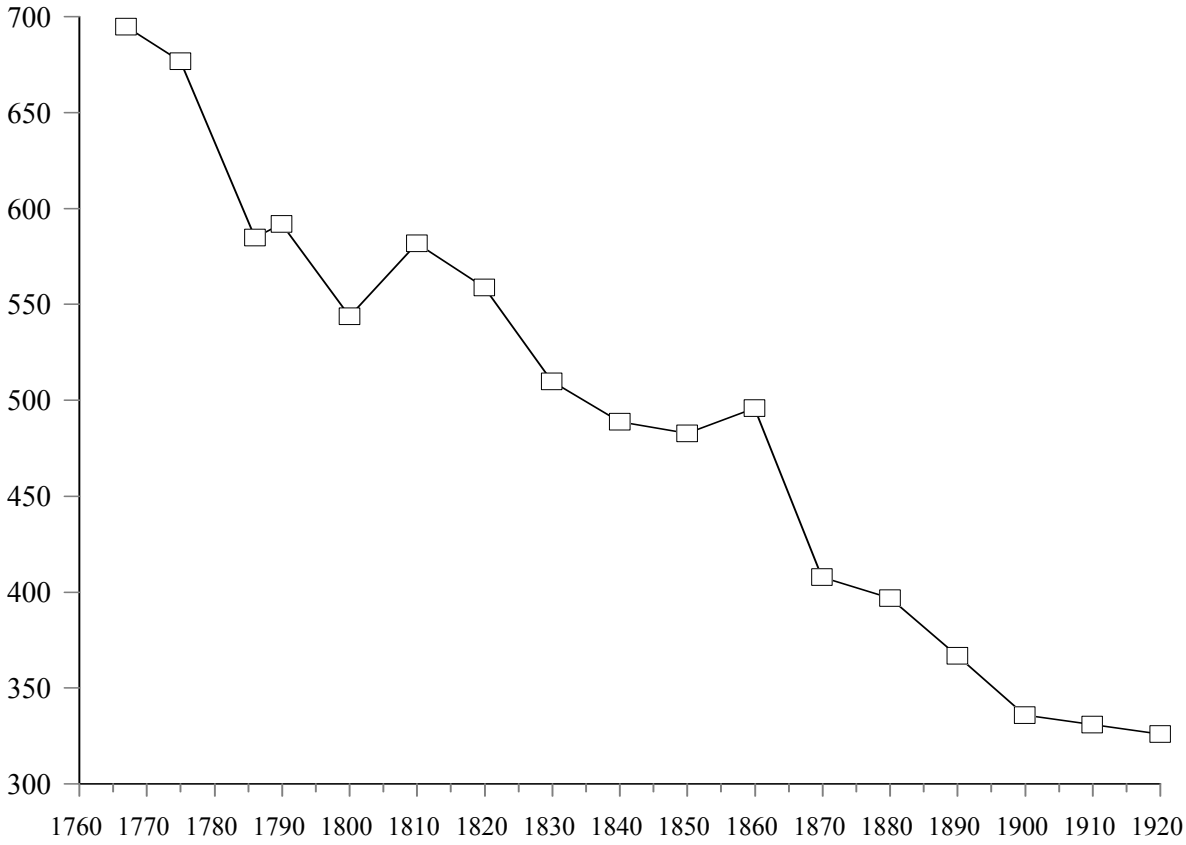
Tibbetts House sheds (no longer standing)
Town Hall Road
c. 1800

Madbury's economy apparently suffered during the nationwide post-Civil War economic recession. As times got hard, many New Englanders took the transcontinental railroad and relocated on newly opened land in the west. It is not known how many people from Madbury actually moved west, but it is known that the population declined dramatically during the 1860s and 1870s. The western railroads not only took local people away, they also brought in cheaper farm products from the Midwest. Certainly, Madbury is typical of many New England towns that were unable to match this competition.

The steady loss of population, and thus a good part of the workforce, created another shift in the local agricultural economy. Farmers began switching from produce that required daily labor, such as dairy products, to seasonal crops. By 1880, the number of cows declined substantially from the previous census, while the value shown for orchard products more than doubled.

Population History

Madbury's population peaked at 695 residents during the middle of the eighteenth century; by 1920, it had plummeted to 326.



The survey noted seventeen surviving buildings from the latter half of the 19th century, commonly referred to as the **Victorian** period, in reference to Queen Victoria who reigned from 1837 to 1901. In Madbury, the **Greek** style remained very popular, as exemplified by the 1861 Town Hall, the c.1860 Hayes House on Mill Hill Road, and the c.1860 Cockins House on Freshet Road.

Also making a local appearance during this period was the **Italianate** style. A typical **Italianate** feature is a large door hood over the front entry supported by heavy wooden brackets, as exemplified by the c.1870 Church House off Route 155, and the Tuttle House on Hayes Road, depicted in the photo below.

Tuttle House Hayes Road c. 1840

Madbury has one building in the **Second Empire** style, the Hanson House at the corner of Pudding Hill Road and Route 155. This style takes its name from the French Second Empire (Napoleon III: 1852-1870) during which time much of present day Paris was built. The style's trademark, the mansard roof, was popular in part due to a unique function: it could serve as an additional story as well as a roof. The c.1800 Hanson house, originally a one and one half story **Federal** era cape, was expanded upward toward the end of the century with a mansard/second story addition.

Hanson House
Pudding Hill Road
c. 1800

6. 20th Century

The early twentieth century saw an even greater decline in Madbury's farm economy, accentuated by the destruction by fire of several large barns and the old DeMerritt house.

One important boost to the local economy at the turn of the century was the establishment of the Rose Farm by W.H. Elliot. Elliot built his first greenhouse in 1901. Aided by easy access to the railroad, he intended to grow American Beauty roses and transport them to distant markets, but because this type of rose was unsuccessful, he switched to the Killarney rose instead.

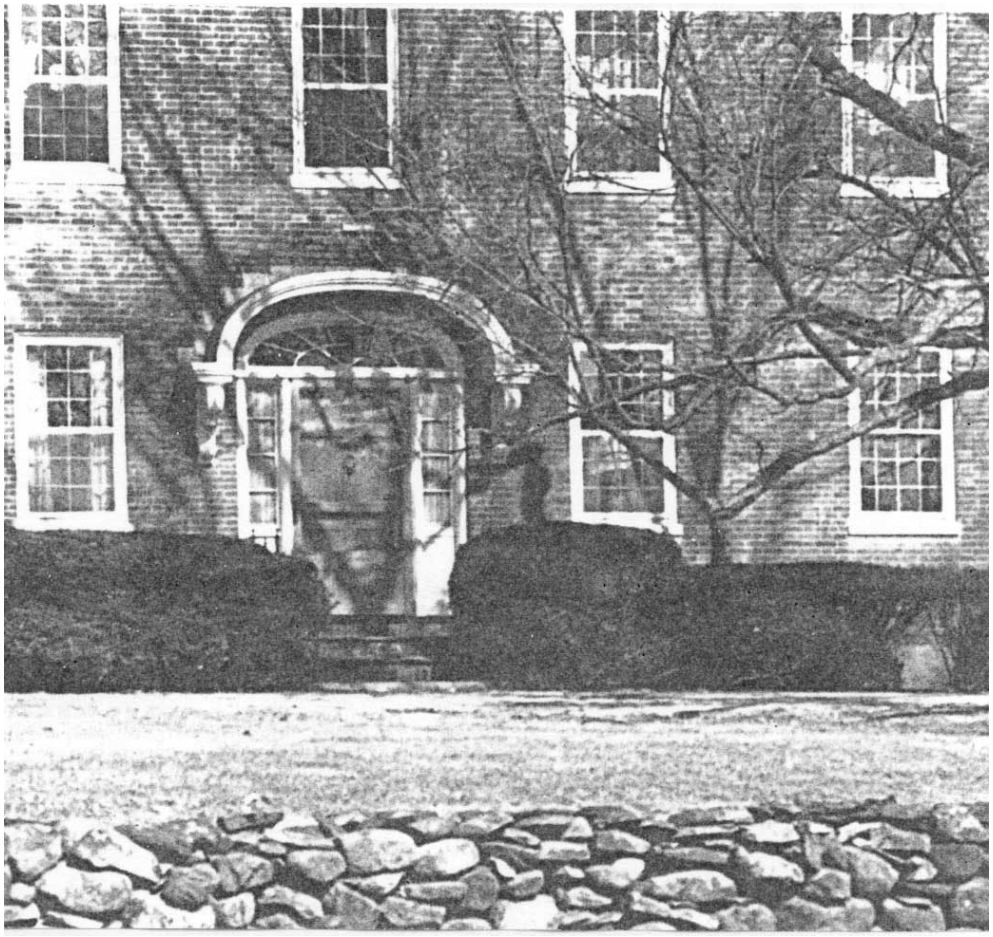
Elliott Greenhouse
Route 155
c. 1901

The Elliot greenhouses provided many jobs, especially at the nearby railroad depot. Glass and greenhouse supplies, in addition to several carloads of coal, came to the Madbury Station each week. The roses were shipped to destinations throughout the northeast United States.

The advent of the automobile dramatically affected Madbury's landscape. The town's quiet back roads, open spaces, stonewalls, and picturesque old farmhouses make Madbury an inviting place to live. At present, the vast majority of the town's workforce is employed outside of Madbury. The ease of commuting has led to the subdivision and development of Madbury's former farmland.

Despite these dramatic changes, for the most part Madbury retains the historic character of a rural New England village. In many parts of town, the landscape is one of fine old houses surrounded by open fields and forests. To a remarkable extent, Madbury's architectural heritage has been preserved, lending a sense of continuity to the town's past and present.

Towards the end of the 19th century, America rediscovered its own pre-industrial history. The Georgian and Federal style, after being ignored for nearly a century, regained a popularity that has yet to abate.



Miles House
Madbury Road
c. 1800

The house was extensively remodeled in the 20th century.

Colonial Revival features are found in approximately a dozen early 20th century buildings scattered throughout town. Madbury's most prominent example of this enthusiasm for the Colonial Revival is the c.1800 Miles House at 173 Madbury Road, a building that was extensively remodeled in the 20th century (photo above).

The exposed roof rafter ends on the front porch of the 1935 Fullington House at 254 Littleworth Road are typical features of the **Bungalow** style. This style was popular during the early decades of the 20th century, as these buildings were relatively inexpensive (Do-It-Yourself plans sold for $15) and easily constructed. The name "bungalow" is a corruption of the Hindustani "bangla", meaning seasonal shelter "belonging to Bengal". The 20th century American version of "bangla" oftentimes incorporated the lightness of Japanese construction, and the decorative motifs of the **Colonial Revival.**

**Fullington House
254 Littleworth
Road
c. 1935**

Table 1: Madbury Historic Building Survey

SOURCE: Madbury Cultural Resource Survey, Inventory, & Plan, July 1983
Note: In most cases dates are estimates.

Date Built	Building Type	Address
1693	Georgian	Pudding Hill Road
1723	Georgian/Federal	6 Cherry Lane
1740	Georgian	Pudding Hill Road
1750	Georgian	259 Littleworth Road
1750	Georgian	38 Huckins Road
1750	Georgian/Federal	241 Littleworth Road
1750	Georgian	56 Old Stage Road
1750	Georgian	50 Old Stage Road
1750	Georgian	40 Mill Hill Road
1750	Georgian	54 Nute Road
1750	Georgian	33 Nute Road
1750	Georgian	Route 108
1750	Georgian	Freshet Road
1779	Georgian/Federal	82 Old Stage Road
1780	Georgian/Greek	Freshet Road
1790	Georgian	Route 155
1790	Georgian	Drew Road
1800	Georgian/Federal	25 Town Hall Road
1800	Federal	65 Cherry Lane
1800	Federal	173 Madbury Road
1800	Federal/Mansard	Pudding Hill Road
1800	Federal	Perkins Road
1800	Georgian	Freshet Road
1810	Federal	42 Cherry Lane
1810	Federal	Rt. 155 & Madbury Road
1815	Cape	Madbury Road
1815	Federal	Kingman Farm, Rt. 155
1820	Federal/Greek	34 Huckins Road
1820	Federal	Perkins Road
1823	Federal	Town Hall Road
1826	Federal/Greek	61 Hayes Road
1828	Greek Revival	42 Nute Road
1830	Greek Revival	271 Littleworth Road
1830	Federal/Italianate	221 Littleworth Road
1830	Cape	8 Cherry Lane
1830	Federal/Greek	Evans Road
1830	Greek Revival	Perkins Road
1840	Greek Revival	98 Old Stage Road

Date Built	Building Type	Address
1840	Greek Revival	22 Mill Hill Road
1840	Greek Revival	Hayes Road
1840	Greek Revival	40 Town Hall Road
1840	Vernacular	Madbury Road
1840	Greek Revival	Madbury Road
1840	Greek Revival	Fire Dept., Madbury Road
1840	Greek Revival	Evans Road
1840	Greek Revival	Route 108
1842	Greek Revival	242 Littleworth Road
1845	Greek Revival	Perkins Road
1847	Greek Revival	77 Hayes Road
1850	Italianate	225 Littleworth Road
1850	Greek Revival	29 Town Hall Road
1850	Greek Revival	115 Hayes Road
1850	Italianate	Perkins Road
1850	Greek Revival	Route 108
1854	Greek Revival	75 Cherry Lane
1855	Greek Revival	25 Huckins Road
1860	Greek/Italianate	35 Lee Road (Route 155)
1860	Greek Revival	Freshet Road
1861	Greek Revival	Town Hall
1870	Greek/Italianate	22 Lee Road (Route 155)
1870	Greek/Italianate	Elliott Rose, Route 155
1880	Vernacular	70 Cherry Lane
1890	Vernacular	33 Mill Hill Road
1890	Vernacular	Hayes Road
1890	Vernacular	Town Hall Road
1895	Vernacular	Elliott Rose, Route 155
1900	Vernacular	255 Littleworth Road
1900	Vernacular	Town Hall Road
1900	Vernacular	35 Town Hall Road
1900	Vernacular	Piscataqua Road
1901	Greenhouses	Elliott Rose, Route 155
1910	Bungalow	Route 155
1910	Vernacular	Pudding Hill Road
1910	Vernacular	Piscataqua Road
1917	Country Gothic	Union Church, Town Hall Rd.
1919	Vernacular	Elliott Rose, Route 155
1925	Vernacular	Piscataqua Road
1930	Bungalow	254 Littleworth Road

7. Recommendations

Given Madbury's relatively flat terrain and its proximity to estuarine transportation routes, it seems probable that the town hosts a number of prehistoric **archeological** sites. Known historic sites (post-1623) include a number of eighteenth and nineteenth century mill sites. Particular care should be taken that archeological sites are not disturbed during real estate development activities.

Recommendation: Identify and map archeological sites.

Pinehurst Farm
Hayes Road
c. 1790

Union Congregational Church
Town Hall Road
c. 1917

There are numerous eighteenth and nineteenth century graveyards scattered throughout town. The **gravestones** therein constitute a valuable and irreplaceable historic resource. The Planning Board supports and endorses the on-going inventory of Madbury's historic sites. These sites include isolated gravesites, Indian burial grounds, early garrisons, mill sites, the former brick plant on the Bellamy River, old schools, the railroad station, the post office, and the meetinghouse.

Recommendation: Inventory, stabilize, and protect gravestones.

Madbury's **scenic roads** are a valuable historic resource. Two roads, Nute Road and Cherry Lane, are designated scenic roads. Work in the vicinity of scenic roadways should be carefully monitored, with particular attention paid to the preservation of large trees and stonewalls.

Recommendation: Preserve the historic character of Madbury's scenic roads.

In light of the developmental pressure currently being felt throughout the region, every effort should be made to preserve the town's historic landscapes. Specific locations that deserve priority status are Town Hall Road from Route 155 to Cherry Lane, the vicinity of Long Hill Road, Hicks Hill, and the area near Royall's Cove and Piscataqua Road, also known as **Madbury Beach**.

Recommendation: Identify historic resources in critical need of protection, and pursue a program for acquiring conservation easements.

Elliot Greenhouses
Route 155
c. 1910

The **National Register of Historic Places** is the nation's official list of historically significant buildings, structures, sites, and districts. Although National Register listing imposes no restrictions on private property owners, it does offer the townspeople some measure of protection from undesirable proposals that are licensed or funded by the federal government, such as State/Federal highway project, for example. The town should consider nominating appropriate sites to the National Register.
One candidate for listing as a district is the center of town, encompassing the Town Hall, the DeMerritt House, Elliot Rose, Hicks Hill, Boody Rock, Union Church, Kingman Farm, a graveyard and the town cemetery. The town should consider taking steps to maintain the rural character of the **Civic District** by developing local historic design standards.

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

2.5 Land Use

Prepared by

Town of Madbury Planning Board
Madbury, New Hampshire

With support from

Strafford Regional Planning Commission
Dover, New Hampshire

Table of Contents

Land Use

1. Introduction

This chapter articulates how Madbury residents want their community to develop over the coming years, describes the forces driving and constraining that development and makes recommendations for shaping that development to be consistent with the characteristics that are important to the people of Madbury.

Public opinion in Madbury, as discerned from community expressions including public hearings, conversations among residents, and a Planning Board survey, clearly favors maintaining the historic, rural character of the town. Madbury serves as a bedroom community and aspires to preserve and enhance the qualities that make it a good bedroom community. Since the town does not offer suitable locations for significant retail or industrial development, no significant commercial center is anticipated. The scenic vistas of farms and open meadows, forests and wetlands, stonewalls and historic architecture, are what give Madbury its unique character. The Town desires to establish land use policies and regulations that preserve and enhance that character.

2. Natural and Water Resources

Existing: The Natural Resources and Water Resources chapters describe the resources of the Town in some detail and provide recommendations for the protection of these resources. Salient features of the Town include large undeveloped areas that provide valuable wildlife habitat and protect the regionally significant water resources in town. Large forest areas and a few remaining large tracts of agricultural land preserve the rural character of the town in fact and in perception.

Influences: Demand pressure for creation of single-family housing will cause existing large tracts to be subdivided into small residential house plots with new roadways. Existing wildlife habitat will become fragmented and thus not viable for many species. The reality and perception of rural character will disappear if large tracts are broken up and dotted with homes. Water supply capacity would be reduced by the destruction of vegetative cover and the increasing area of impermeable surfaces. Water pollution threats could be created by increasing numbers and density of septic systems.

Policy (1): Protect water resources in Madbury from contamination, depletion and disfigurement using watershed management principles. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

Policy (2): Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

Objective: Development will be primarily residential with every effort made to preserve open spaces essential to the town's rural character and natural resources. Water resources will be protected by preserving forests and minimizing propagation of impermeable surfaces. Careful attention will be given to septic system design and performance.

Recommendation: See Open Space/Conservation Subdivisions and Conservation Easements in Strategies section below.

3. Agriculture

Existing: A handful of operating farms and stables in town provide a vital component of the rural character of the town. The University of New Hampshire (UNH)-owned Kingman Farm is both a major component of the town's rural appearance and a significant recreational resource for the area.

Influences: Existing niche agriculture may survive but that is uncertain. Farmland is likely to be converted to residential housing. Recreational "farm" uses, especially stables, may expand due to demand. UNH's interest in maintaining an agricultural research facility cannot be assumed and its use of the land is not constrained by local zoning ordinances.

Policy (2): Preserve Madbury's rural atmosphere and landscape. Protect and manage... agricultural resources... for the benefit of present and future generations.

Objective: Existing agricultural lands will be used for viable agricultural activities consistent with a residential community and water resource protection. Agriculturally significant land not actively in use for agriculture will be conserved as open space.

Recommendation: Learn what agriculture-related activities are economically viable in Madbury and review zoning ordinances to make them compatible with appropriate activities.

Recommendation: Review zoning ordinances for appropriate constraints on agricultural businesses. Agricultural uses should not conflict with the dominant use: residential, and should not threaten the regional water supplies in town.

Recommendation: Initiate the following regarding the UNH Kingman Farm:

Organize a Town committee to work with UNH to discuss current and future uses of the Kingman Farm.

Develop strategies for the Town's acquisition of the property should UNH choose to sell or donate all or part of the property.

Consider zoning the property for agricultural uses only, to reflect its current and historical use.

4. Residential Development

Existing: The Strafford Regional Planning Commission (SRPC) reported nearly 500 residential dwellings in Madbury in its 1999 study[1]. The region currently enjoys relative economic prosperity and a reputation for high quality of life including educational, cultural, economic and recreational opportunities. Recent development has been mostly detached single-family residences for middle and upper middle class income households. Homebuyers appear to be attracted by the same rural character of the town that is gradually eroded by the development these buyers encourage.

Influences: The town is likely to continue to experience high demand for residential development. Directed only by current market forces and with current regulations, upper middle-income single-family detached house construction will predominate. Houses will be sprawled across the remaining developable land. This is the dominant development pressure in Madbury.

The SRPC's report quantified the potential number of dwellings that might be built in Madbury under existing regulations at 1816 units, more than three times the Town's current number. With a long-term average housing growth rate of just over 3%, a growth projection of about 15 dwellings per year is very believable. It is also consistent with recent experience.

The narrow selection of housing units in Madbury may become a problem for its population. The predominant large 3-4 bedroom single family home on 2 acres of land is well suited for raising children in our society. These homes, however, do not fall within the financial capabilities of many first-home buyers or retirees. As our demographics change in the foreseeable future, more of our residents will need retirement homes. Our

[1] Madbury Build Out Study by Strafford Regional Planning

younger adults will need starter homes. If the Town wishes to become a lifelong home to its residents, alternate housing forms must be permitted and encouraged

Four major considerations limit the type, rate and extent of residential development in Madbury:

1. Preserving the town's rural character that makes it so desirable for this use.
2. Respecting practical taxation limits in funding the public school system.
3. Protecting the water resources in the town.
4. Limiting septic system capacities to safe, sustainable levels in a town with no public sewer system and no prospects of building one.

Policy (1):	Protect water resources in Madbury from contamination, depletion and disfigurement...
Policy (2):	Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.
Policy (5):	Keep the property tax stable.
Policy (10):	Allow a diversity of housing so that people of all ages and income may live in Madbury.
Objective:	Residential development will continue. The rural character of the town will be preserved and its water resources protected. Infrastructure and services will be expanded as needed to meet demand and at a rate sustainable with stable property tax rates. Appropriate housing will be available to all members of the community.
Recommendation:	See Open Space/Conservation Subdivisions and Conservation Easements in Strategies section below.
Recommendation:	Investigate incorporating shared wall housing or accessory housing units within appropriate residential developments having access to shared water or sewage facilities.
Recommendation:	Investigate allowing limited mixed densities (single and multifamily dwellings) in residential subdivisions that may provide more affordable housing opportunities.
Recommendation:	Modify zoning ordinances to reflect existing densities and characteristics of particular regions in town.

5. Civic District

Existing: The Civic District has been the center of Town government since the construction of the Town Hall in 1860 and as early as 1735 with the construction of the first meeting house in the vicinity of the current firehouse on Madbury Road. The Town now owns close to 140 acres in the vicinity, and the school district controls 50 acres. While not all of that land would be available for civic buildings and uses, there is excellent potential to develop a true town center.

The Town is constructing a new facility at this writing, which should meet the Town's needs for safety services space for the next decade and more. The Moharimet School has reached its intended maximum size. The Madbury Congregational Church is thriving. Demerritt Park has been developed into high quality playing fields and another field is being developed nearby for casual recreational use. The Madbury Cemetery was recently established to provide an essential function previously unavailable in town.

Influences: Madbury faces the need to expand town services and facilities due to increased population and expanded service demands.

Policy (9):	Focus Madbury's civic and social activities within the present civic district.
Policy (4):	Insure a safe and secure community.
Policy (6):	Accommodate the service and infrastructure needs of residents without placing an undue burden on taxpayers.
Objective:	The Town's civic district becomes a vital center for community life. Possible future public service facilities include a library, additional elementary school space, expansion of Town Offices, and recreational facilities.
Recommendation:	Work closely with the school district and community service organizations to ensure that Town and school facilities and programs enhance and support one another in order to maximize the public benefit.

6. Recreation

Existing: The Town provides high quality playing fields for organized sports in Demerritt Park. A newly developed field is available for informal group activity. The Town owned lands and UNH-owned Kingman Farm in the center of town have become very popular hiking and biking areas.

Large tracts of undeveloped land and old roads are available to hunters, hikers, and bicycle riders. The Bellamy Reservoir, controlled by Portsmouth, is open to fishermen, snowmobilers and (non-motorized) boaters.

Influences: With population growing regionally and open space disappearing, the remaining relatively large tracts of agricultural land will be of increasing interest for recreational use. Private lands near the co-operative high school are of interest for sports fields.

Recent public health alarms about the pervasive lack of exercise and related overweight condition in our society bring new importance to recreational resources.

Policy (3):	Acquire additional interests in land for conservation, water supply, open space, public recreation, and Town facilities.
Objective:	The Town's open spaces will be preserved and remain available for recreation. Civic facilities for recreation continue to improve and expand.
Recommendation:	See Open Space/Conservation Subdivisions and Conservation Easements in Strategies section below.
Recommendation:	Enhance public recreational facilities in the civic district. Develop hiking paths and nature trails in the civic district that utilize adjacent conservation land.
Recommendation:	Incorporate the open lands in the civic district with the Bellamy Greenway to link these uses.

7. Services and Service Facilities

Existing: As a result of zoning regulations, the majority of residential development has occurred along existing Town roads on the lands that can sustain it. There have been only nine subdivisions where the developer put in a new road, and eight of those are cul-de-sacs. As a result, residential developments to this point have not had a severe impact on town services (other than schools) since most of the development occurred along existing roads.

Influences: Housing and population growth, rising service expectations and decreasing availability of volunteers will necessitate expansion of town funded services including police, fire, recreation, code enforcement, public works, etc.

Policy (4):	Insure a safe and secure community.
Policy (5):	Keep the property tax stable.
Policy (6):	Accommodate the service and infrastructure needs of residents without placing an undue burden on taxpayers.
Policy (8):	Plan and implement a safe, attractive and efficient transportation network.

Objective:	Public services will expand to keep pace with demand. Town property taxes will remain stable by careful financial planning and growth management.
Recommendation:	Use and maintain the Capital Improvement Program (CIP).
Recommendation:	Investigate the feasibility and fairness of imposing impact fees on new development.
Recommendation:	Investigate the long-term cost benefits of bonding funds for the acquisition of conservation lands and open space.
Recommendation:	Investigate the cost benefits of sharing services with adjacent communities.

8. Commercial Development

Existing: Commercial activity is quite limited, occurring mainly on the state roads through town. Despite the relatively high speeds used on these roads, they retain their rural appearance with minimal development in Madbury.

Several homes located along these routes have witnessed the encroachment of traffic as these roadways have been widened over the years. As these areas become less desirable for residential use, their conversion to business or professional offices becomes more attractive.

Industrial facilities are limited. One plot near the Bellamy River, accessed from a Dover industrial park, is unused. A metal recycling business occupies an old gravel pit threatening an important aquifer. A gravel mine near Barbadoes Pond has expanded its long history of operation with the introduction of hydro-mining.

Influences: Limited demand for commercial space could lead to development along the state routes in town. The high traffic volumes on these roads might support retail or commercial service activities. Commercial development along these corridors could adversely impact the town's rural character severely. New development (either residential or commercial) without good access management strategies would have a detrimental effect on the efficiency of these roadways. As neighboring towns grow to larger populations the commuter traffic grows between those towns and areas of industrial and commercial development, the traffic on the state roadways will continue to increase and with it will come demands to change these roads.

The availability of high-speed communications throughout town makes more home occupations feasible, creating new demand for home based business space.

In the absence of public water and sewer service, demand for industrial space development is unlikely.

Policy (1):	Protect water resources in Madbury from contamination, depletion and disfigurement...

Policy (2): Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

Policy (7): Insure future economic development that does not harm the environment or abutting properties.

Policy (8): Plan and implement a safe, attractive and efficient transportation network.

Objective: Access to state highways will be managed to provide safe travel with increasing traffic volumes.

Recommendation: Adopt access management standards to ensure the preservation of road efficiency.

Office and professional service activities might be compatible and sustainable uses of these highway corridors. These corridors will maintain their rural landscape and architectural values, possibly by conversion of existing structures. Curb cuts will be minimized. Appropriate office use would have relatively low impact on the community and adjacent properties.

Recommendation: Identify appropriate areas for non-industrial commercial development.

Recommendation: Do not re-zone long strips of land along these roadways where eventual development would result in inefficient sprawl.

Recommendation: Develop site plan design standards that will enhance and support the adaptive re-use of existing structures and developed areas while maintaining the rural landscape and architectural scale of development.

Home-based occupations may become more common without compromising the quality of life in residential areas.

Recommendation: Develop performance standards for home-based businesses that prevent negative impacts on surrounding properties and the community.

Recommendation: Continue to support home occupation in all districts.

Recommendation: Review regulations to ensure support for the marketing of farm products, local arts and crafts and traditional enterprises.

Industrial development will not threaten water resources in any way. Existing gravel mining operations will be monitored for potential adverse impacts to water resources and

quality of life for neighbors. The metal recycling activity that threatens an important aquifer should be discontinued if that opportunity should arise.

Recommendation: Limit or prohibit industrial development that could adversely affect the Town's water resources.

9. Economic Viability

Given the present state tax structure, the Town must concern itself with the balance of taxable resources and non-discretionary spending. With the schools representing the dominant property tax burden, the Town is forced to consider the tax consequences of attracting a high proportion of school-aged children into the Town.

10. Strategies for Promoting Recommended Land Uses.

10.1 Provide knowledgeable review of subdivision proposals.

Our volunteer Planning Board lacks the expertise necessary to recognize all the planning issues presented by subdivision proposals.

Recommendation: Consider budgeting additional professional support services for the Planning Board.

10.2 Create incentives for developers to work to preserve existing resources within developments.

Recommendation: Revise the current cluster subdivision ordinance into an open space/conservation subdivision.

Recommendation: Structure development constraints and incentives to encourage the preservation of natural habitat, recreational space, scenic features, and water resources.

Recommendation: Adopt a natural resource review of each subdivision application that comes before the Planning Board.

10.3 Secure conservation easements and related land rights interests.

Recommendation:	Identify and inventory parcels that are critical to the protection of our natural resources and watersheds.
Recommendation:	Target key parcels for long-term protection.
Recommendation:	Expand conservation land fund with annual funding allocations from Town government.
Recommendation:	Identify protection methods and tools that would be most appropriate for the resources.
Recommendation:	Consider creating Bellamy and Oyster River Greenbelts through the acquisition of conservation easements on lands not currently protected.

10.4 Review enforcement policies and practices.

Recommendation:	Investigate bonding of subdivision performance by developers
Recommendation:	Review budgets for subdivision review staff and building and construction review services.

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

2.6 Transportation

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire

by

Strafford Regional Planning Commission
Dover, New Hampshire

Table of Contents

Transportation

1. Introduction

The Transportation Chapter of the Master Plan describes for the Town's current and future transportation needs. In conjunction with the Capital Improvements Program and the site plan and subdivision regulations, this chapter inventories the existing facilities and their condition, assesses relevant data, establishes policies and recommends future projects and standards.

Residents of Madbury greatly appreciate the town's historic and rural character. Yet with growth pressures increasing every year, careful planning and decision-making regarding all aspects of transportation must be executed to ensure the character is maintained. The development and design of transportation facilities such as roads and bridges, driveway access points, sidewalks, and bike paths will have a major impact on how the character of Madbury's community is maintained. This chapter also aims to assess transportation in relation to housing development, land conservation, safety, recreation and the economic and financial stability of a community so that the needs of the community can be met without sacrificing its quality of life.

2. Community Development/Vision Policies and Transportation Recommendations Summary

The Madbury Planning Board has established ten policies to guide Town decision making for the next ten years. These policies were adopted in Community Development/Vision chapter of this Master Plan. Listed below are the policies relevant to transportation issues and associated recommendations.

Policy 1: Protect water resources in Madbury from contamination, depletion and disfigurement using watershed management principles. Act as stewards for municipal and regional water supplies located within the Oyster River, Bellamy River, and Little Bay watersheds.

Supporting Recommendation

1. Protect wetlands and other environmental resources in the development of transportation projects, with appropriate mitigation when impacts are unavoidable. All too often, wetlands are destroyed or created through careless road design.

Policy 2: Preserve Madbury's rural atmosphere and landscape. Protect and manage open space, wetlands, forests, fields, agricultural resources, scenic vistas, and historic resources for the benefit of present and future generations.

Supporting Recommendations

1. Develop and implement transportation infrastructure projects in an environmentally sound manner so as to protect the cultural, historic and recreational resources and avoid negative impacts such as habitat fragmentation;

reduction in water quality or quantity; reduction in air quality; increase in noise and vibration; or decreasing aesthetically valuable resources such as scenic views.

2. Follow the street naming guidelines developed by the by the 1976 Bicentennial Committee. These are names that, due to their historical association with Madbury, are recommended for any future roads[1].

3. Avoid over-specification of roadways. Gold Post Road in Dover, situated off of Drew Road just over the Madbury line, is a fine example of how not to build a road. This 1,000' long cul-de-sac serves only seven homes. The road is straight and is an extraordinary 32' in width. This excessive expanse of pavement is not in keeping with the rural character that Madbury strives to maintain.

4. Encourage or require that parking lots do not front the street or that they have substantial vegetative buffers so as to aid in the maintenance of the rural and historic character..

5. Preserve narrow and curved roads and rural character of the Town's roads while not compromising public safety.

6. Create a prioritized list of roads that could potentially be designated as Scenic Roads and consider designating additional roads as scenic.

7. Preserve the scenic qualities of Madbury's historic roadways by permitting the removal of stonewalls or large trees only when there are no other feasible alternatives to assuring the public safety. Any proposed road widening or straightening should be very carefully reviewed with consideration given to the natural, historic and cultural resources that would be impacted by development or change.

(Note: Policy 3 is not related to transportation and See below for Policy 4)

Policy 5: Keep the property tax stable.

Policy 6: Accommodate the service and infrastructure needs of residents without placing an undue burden on taxpayers.

Supporting Recommendations

1. Maintain and preserve existing roads versus developing new roads.

2. Accommodate the needs of pedestrians and bicyclists in Madbury by using natural paths that do not place an undue burden on taxpayers.

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[1] These names include: Adams, Barbadoes, Boody, Canney, Colprit, Crosby, Davis, Dugan, Elliot, Emerson, Felker, Fernald, Grey Bonnet, Hooper, Hyde, King Phillip, Kingsman, Laton, Long Hill, Locke, Mallego, Morrow, Roberts, Royall's Cove, Sanders, Tare Cab, Tasker, Tibbetts, Twombly, Wingate, and Young.

3. Avoid over-specification of roadways. Gold Post Road in Dover, situated off of Drew Road just over the Madbury line, is a fine example of how not to build a road. This 1,000' long cul-de-sac serves only seven homes. The road is straight and is an extraordinary 32' in width. This excessive expanse of pavement is more costly for maintenance when the taxpayers assume responsibility.

4. Support the development of Park-and-Ride lots throughout the region that are integrated with local and intercity bus and rail routes.

5. Ensure that benefits and burdens of transportation facilities and services are equitably shared throughout the community.

Policy 7: Ensure future economic development that does not harm the environment or abutting properties.

Supporting Recommendations

1. Review existing Town highway access or driveway standards and adopt new standards to help maintain the safety, capacity and scenic value of the roadway.

2. Concentrate new development in areas where transportation infrastructure already exists.

3. Review all driveway permit applications at Planning Board meetings and incorporate the information provided about driveway permit requests by the NHDOT District Office into the local planning process. As noted above, each District Office sends a copy of each driveway permit application that has been submitted to the Office to the respective Town Office. It is recommended that the Board bring these applications to the Planning Board meetings, identify any concerns, and communicate those concerns to the District Office.

4. Draft and sign a Memorandum of Understanding to better coordinate access management between the Town and NHDOT. Use the NHDOT draft as a model (see Appendix).

Policy 4: Ensure a safe and secure community.

Policy 8: Plan and implement a safe, attractive and efficient transportation network.

Supporting Recommendations

Encourage projects that aim to decrease through traffic on local roads and in residential neighborhoods by maximizing the use of primary transportation corridors.

1. Monitor traffic volumes. Every two years the Strafford Regional Planning Commission collects traffic volume data roads of regional significance for its member communities and NHDOT. Though the resources for this are limited, the Commission strives to accommodate its member communities' requests.

2. Prohibit the extension of dead-end streets to the town line. Such streets could eventually be extended into another municipality, possibly leading to an undesirable traffic flow that is beyond Madbury's control.

3. Minimize the number of curb cuts on existing and future roads. Fewer curb cuts reduce traffic obstructions caused by entering and turning traffic, and provide a generally safer situation.

4. Adopt an Access Management Plan for Routes 9, 108 and 155 to specify/clarify the Town's policy on the development of access points. Send the Access Management Plan to the NHDOT District Office.

5. Continue to support the efforts of COAST and Wildcat Transit to increase public transit, reduce traffic congestion, and protect air quality.

6. Support efforts to educate residents about railway safety.

7. Implement projects to increase the safety of cyclists along all roads in Madbury. Specific attention should be paid to the routes that connect Dover and Durham, such as Knox Marsh Road/Route 155 and Madbury Road.

8. Establish a strategy for improvement of areas of concern and actively promote their implementation.

3. Roads

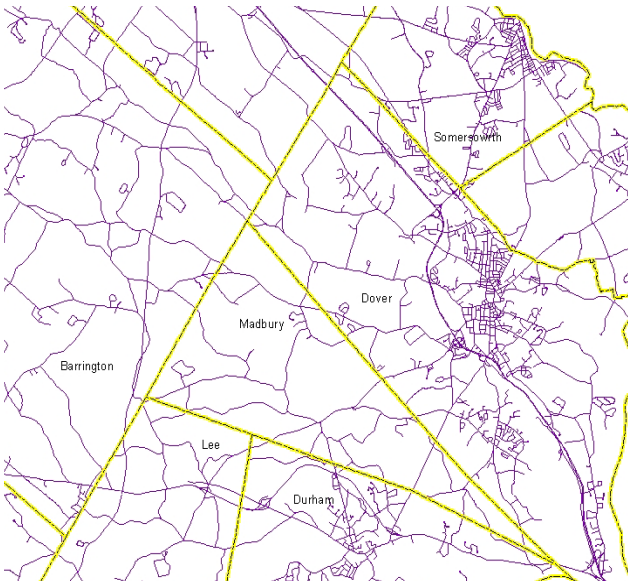
3.1. Road Classification

Roads in New Hampshire are classified into six administrative classes and four main functional classes. For a complete description of administrative and functional classes and an inventory of the roadways in Madbury with their respective functional, administrative and system class, see Appendices 1 and 2.

3.1.1. State Highways

There are seven State highways in Madbury.

- Route 108 runs north-south in the eastern part of the town connects Durham & Dover. This section of road is also known as Durham Road and as NH College Road.
- Route 155, also known in the southern section as Lee Road and from Town Hall Road north as Knox Marsh Road, runs northeast/southwest between Durham and Dover.
- Route 9 runs east/west between Dover & Barrington in the northern part of Madbury. This section of road is also known as Littleworth Road.
- Route 4, traverses a few feet of Madbury at Cedar Point, near the Spaulding Turnpike, in the eastern part of Town.



Principal Transportation Routes in Madbury and neighboring communities

- Madbury Road, which connects Route 4 in Durham and Route 155.
- Town Hall Road, which runs westerly from Route 155 near Demeritt Park and
- Mill Hill Road which runs northerly to Old Stage Road.

These state roads are among the most widely used roads in Madbury.

3.1.2. Town Roads

According to 2002 NHDOT road data there are twenty-eight public roads in Madbury covering a total length of 48 miles. This is an increase of nearly 19 miles from the 30.2 miles cited in the 1990 Master Plan. Since 1990 new roads added to the Town include Champernowne and Madbury Woods. The majority of the new roads are local roads.

3.1.3. Scenic Roads

In accordance with RSA 231:157 and 158, the Town Meeting of any community may designate any public road (other than Class I or II highway), as a scenic road. Once designated as a scenic road, any repair maintenance, reconstruction, or paving cannot involve or include the partial or complete destruction of stone walls or the removal of large trees (trees with a circumference of 15 inches or more at a height of four feet above the ground) without the written consent of the Planning Board or a municipal body appointed by the Town Meeting. Such consent can only be issued after a duly advertised public hearing has been held.

Despite its restrictions, scenic road designation does allow for the removal of obstructions and the trimming of trees and shrubs within three feet of the traveled right of way that might interfere with safe travel. Such carefully planned roadside maintenance can occur without written consent. In addition, the Board of Selectmen may provide written consent for the removal or cutting of trees without a hearing if an emergency situation exists. Finally, a scenic road designation does not affect the rights of adjacent property owners to work on their properties, nor does it affect the Town's ability to receive state aid for road maintenance and improvements under RSA 235. Scenic road designation does help preserve the rural appearance and scenic qualities of the road and ensure that a road's special features will be protected from unintentional damage due to routine maintenance or repair practices. Thus, it is an important road control to consider when determining which roads can and should be expanded or developed.

At the present time, Madbury has two roads that have been officially designated as scenic roads in accordance with RSA 231:157-158; These are Nute Road and Cherry Lane. Both of these roads were unpaved at the time of designation, but have since been paved. Evans Road is currently the only road in Madbury that still has an unpaved section. Though there are no plans at this time to designate any other roads in Madbury as scenic roads, the scenic character of all the narrow, winding roads in Madbury is greatly appreciated, as is the narrow and curvy character of these roads.

Recommendations

Preserve narrow and curved roads and rural character of the towns' roads while not compromising public safety.

Create a prioritized list of roads that could potentially be designated as Scenic Roads and consider designating additional roads as scenic.

Preserve the scenic qualities of Madbury's historic roadway by permitting the removal of stonewalls or large trees only when there are no other feasible alternatives to assuring the public safety. Any proposed road widening or straightening should be very carefully reviewed with consideration given to the natural, historic and cultural resources that would be impacted by development or change.

3.2. Road Use

The interrelationship between population growth, employment patterns and land use affect patterns of transportation use. Madbury is located in the seacoast region of southeastern New Hampshire, one of the fastest growing regions in New Hampshire and New England. Much of this growth can be attributed to the area's proximity to the Boston metropolitan area and to the substantial growth in consumption and employment opportunities in the Portsmouth/Newington, Dover, and Rochester labor market areas. Vehicle miles and vehicle trips traveled in the region have grown at a pace that is faster than either population or growth. The projected regional growth and the likelihood of continued dispersed land use ensures that towns must expect a continued rise in the demand for travel in the region.

3.2.1. Demographic Impacts

Demographic changes will play an important role in the future of transportation systems in Madbury. The Town's population grew from 1405 to 1509, or 7.4%, between 1990 and 2000. Its neighbors of Durham, Dover, and Lee grew at a slightly higher rate than Madbury compared to Strafford County. Though the mean number of vehicles per household decreased slightly (2.2 in 1990 to 2.0 in 2000) due to the increase in the number of households, the number of automobiles in use by Madbury residents can be estimated at 1070. To view Census data relative to transportation in Madbury, see appendix 3.

3.2.1.1. Commuting Trends

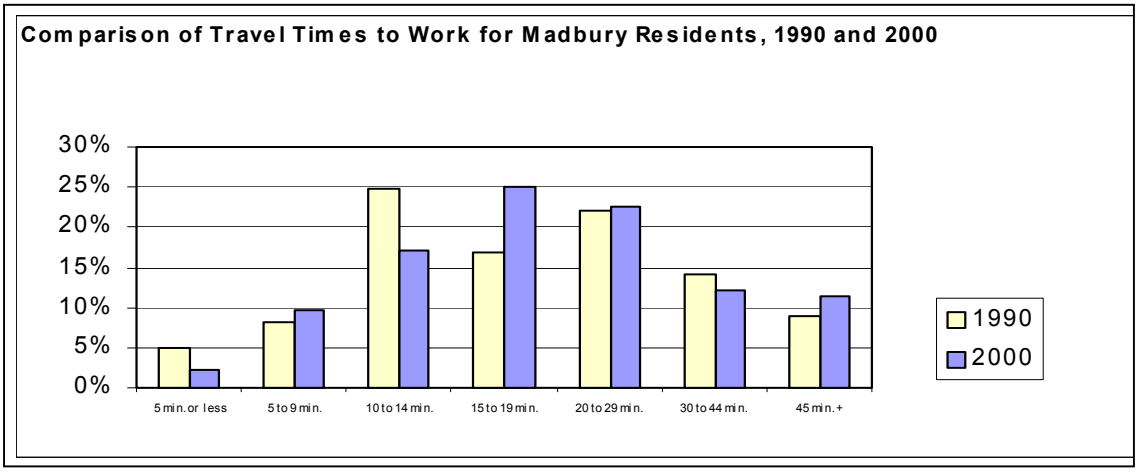
Madbury and is connected by roadways to its neighboring communities of Barrington, Durham, Dover and Lee. Its shape of an obtuse triangle makes it a town that is often traveled through, to or from other locations in the seacoast area and beyond and is often used as a travel route to/from Concord.

All municipalities in the Seacoast region have been greatly impacted by development that has occurred from 1990 to 2000 and once released, the Census 2000 local-level journey to work data need to be incorporated into this Plan. According to the 1990 data, among commuters starting and ending their trips within the Seacoast region[2], the most common commute is north to south along the Route 16 corridor. This trend is likely to increase given: the number of employment opportunities in Portsmouth, the Pease International Tradeport, and Newington is growing much more rapidly than the number of housing units in those locations; relatively slower growth of employment opportunities in the Dover-Somersworth Rochester area; and swift growth in the number of housing units in and around these locations that makes housing more affordable north of the Newington-Dover Bridge. The result is a geographical jobs-housing imbalance that increases travel demand on this corridor. Impacts from this can be seen in housing development and traffic volumes in Madbury.

[2] Defined here by the 36 municipalities in Rockingham, Strafford and Carroll Counties that make up the Seacoast Metropolitan Planning Organization

Madbury's road network serves a great many more commuters than those who reside or work in Town. According to the 1990 Census journey to work data, there are 803 Dover residents who work in Durham and 701 Durham residents who work in Dover, Rochester or Somersworth. Thus, it can be hypothesized that a majority of these commuters traverse Madbury to reach their place of employment. At least some of the 207 Barrington residents who work in Durham are likely to commute through Madbury and, though no accurate number is currently available, the hundreds of UNH students residing in Dover and environs contribute to the traffic on Madbury's roadways[3]. Additionally, Routes 155 and 9 through Madbury are commonly used by motorists to travel to the State capital City of Concord. This is a destination for many who are not employed in Concord, but travel to it regularly for business, administrative, or recreational purposes.

Madbury, at one time a virtually self-sufficient agricultural community, has evolved into



a commuter suburb. Relatively few jobs are located in Town so most Madbury residents must work elsewhere. With a total of 149 jobs, Madbury has the second fewest number of jobs per town in Strafford County[4]. According to Census 1990 journey-to-work data, out of the 622 residents of Madbury who, at that time worked outside of the home, 73 commuted within Madbury, 181 commuted to Dover, Rochester or Somersworth, 117 commuted to Durham, 24 to Portsmouth Newington, 27 to Maine, and 9 to Massachusetts. Though travel times to work for Madbury residents have generally increased over the past ten-year (see chart right), it is not clear whether the commute distance or the congestion has increased. Journey to work data, due to be released by the U.S. Census in summer 2003, will shed light on this.

[3] Students attending the University of New Hampshire are issued their own P.O. box for the duration of their study period. As a result, the University has no accurate method of tracking exactly where its students live.

[4] Economic and Labor Market Information Bureau*, 2000 County Profile: New Hampshire's Counties, Cities, Towns, and Unincorporated Places- a Labor Market Information Report*. New Hampshire Department of Employment Security, 2000.

3.2.2. Traffic Volumes in and near Madbury

The NHDOT's Bureau of Transportation Planning Traffic Research Section monitors traffic volumes in 79 locations throughout New Hampshire and publishes the data in monthly Automatic Traffic Recorder Reports. In addition, both NHDOT and Strafford Regional Planning Commission conduct traffic counts at additional locations for special projects and also try to respond to local community requests for traffic volume data. The tables in Appendix 4 provide a historical look at permanent recorder traffic volumes for locations in or near to Madbury for from 1980 to 2000.

The tables show that there has been significant growth in traffic volumes between 1980 and 2000 at locations throughout the region. This growth was especially rapid during the 1980s, with many locations experiencing a near doubling of traffic volumes. From 1990 to 1995 traffic volume growth stabilized. This coincides with slower population and economic growth during that same period. The data collected in Madbury show that while traffic volumes in Madbury have not increased as significantly as other locations in the region, the increases along the major routes in Madbury such as US 4 at the Madbury-Durham Town Line and NH155 north of Town Hall Road, have been substantial. Cross comparison between location and year are difficult because data collection efforts have not been consistently executed on an annual or even biannual basis. Regardless, the data provide insight into regional traffic growth on the primary roadways in the region.

In addition to volume, type and speed of traffic are also key factors that need to be taken into consideration when planning Madbury's future. Excessive truck and automobile traffic can create noise, vibration, and safety problems that threaten the peace and quiet, that the majority of Madbury residents wish to preserve. Particularly vulnerable are the older structures in town, many of which are situated relatively close to the road. Higher than permitted speed of traffic on many of Madbury's roads, and especially at locations that are considered dangerous (see Areas of Concern section below), has also become an increasing concern of the town, though no speed counts have recently been collected.

Recommendations

Monitor traffic volumes. Every two years the Strafford Regional Planning Commission collects traffic volume data on regionally significant roads for its member communities and NHDOT. Though the resources for this are limited, the Commission strives to accommodate its communities' requests.

Prohibit the extension of dead-end streets to the town line. Such streets could eventually be extended into another municipality, possibly leading to an undesirable traffic flow that is beyond Madbury's control.

Encourage projects that aim to decrease through traffic on local roads and in residential neighborhoods by maximizing the use of primary transportation corridors.

3.3. Bicycle and Pedestrian Facilities along Madbury Roads

Madbury has no sidewalks. Madbury residents have repeatedly expressed a desire to preserve the rural character of the town's roadways and curbs and raised sidewalks are seen as not consistent with the desired rural character. In most instances, roadside drainage swales are significantly less expensive to install than granite or concrete curbing, and sidewalks add to the town's long-term maintenance burden. Many people in Madbury, however, do use the roads for walking, cycling, skateboarding or rollerblading.

Pedestrian on Town Hall Rd

Most Madbury roads do not have a significantly wide shoulders. Regardless, Routes 155 and 108, Madbury Road, Knox Marsh Road, Mill Hill Road and French Cross Road have been defined on the NHDOT Regional Bicycle Map for the Seacoast Region as Regional Bike Routes.

Rollerbladers and vehicles using the Town Hall Rd.

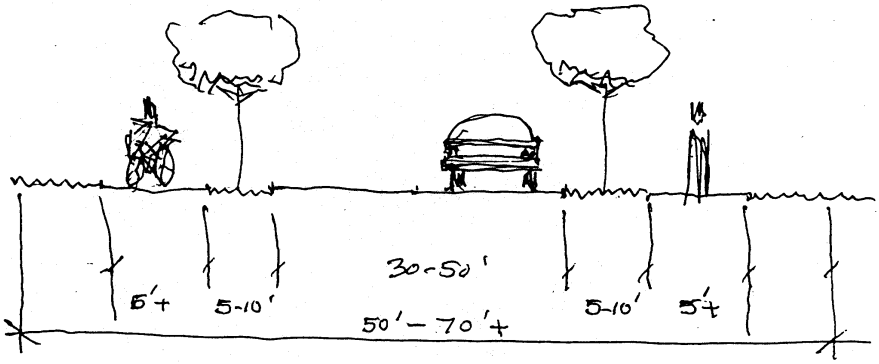
Recommendations

Accommodate the needs of pedestrians and bicyclists in Madbury by using natural paths that do not place an undue burden on taxpayers.

Implement projects to increase the safety of cyclists along all roads in Madbury. Specific attention should be paid to the routes that connect Dover and Durham, such as Knox Marsh Road/Route 155 and Madbury Road.

Amend road standards to allow the provision of additional right of way for trees and walkways.

Expanded right-of way for walkways.



- Maintain rural character.
- No curbs.
- Walkways or Bikeways asphalt or natural material.

4-15-03/GRM

3.4. Road and Bridge Conditions and Areas of Concern

As of spring 2003, the majority of the roads are in good condition. Most of the work currently scheduled by the Town involves regular maintenance, resurfacing, and shoulder improvements. There are several specific locations of concern, however. The photographs presented here illustrate several of the areas of concern described below.

Areas of concern: Dangerous Road Segments

- Very sharp turn on Freshet Road
- The north end of Old Stage Road where it intersects with Littleworth Road is dangerous due to limited site distance. and several points of incoming and outgoing traffic.
- Intersection of Pudding Hill Road /Knox Marsh Road and Bridge has very limited visibility
- Intersection of Town Hall and Mill Hill Road (currently State maintained)
- Intersection of Town Hall Road and Route 155

Recommendation

Establish a strategy for improvement of these areas of concern and actively promote their implementation.

Intersection of Old Stage Road and Littleworth Road

Limited visibility from Pudding Hill Road of oncoming Route 155 traffic.

Limited visibility from Town Hall Road of oncoming Rte 155 traffic makes this an extremely dangerous intersection.

Areas of Concern: Bridges

Madbury currently has two bridges listed on the NHDOT 2002 Municipal Red List Bridge Summary[5]. These are: the NH155/Knox Marsh Rd Bridge over B&M Railroad (identified as structurally deficient and in poor condition) and the Perkins Road Bridge over the B&M Railroad (identified as structurally deficient, in poor condition, and of low capacity). These are areas of concern to the Town. However, both of these bridges are under State control.

The railroad bridge on Perkins Road, with its steep approach, narrow width and limited sight distance.

View south of Perkins Road Bridge over B&M Railroad

View west of limited sight distance and dangerous intersection at the Perkins Bridge/ Evans Road-Perkins Road split

View east of limited site distance on Perkins Road Bridge

The railroad bridge on Rte155/Knox Marsh Road with its intersection with Pudding Hill Road, has limited sight distance. This bridge is currently scheduled for improvements, with construction to begin in 2004 (see 3.5 below).

View west onto the Rte155/Knox Marsh Road Bridge of steep dip that makes for limited sight distance

View west of limited visibility from intersection of Pudding Hill Road looking west onto Route 155

View east from Pudding Hill Road onto Route 155/Knox Marsh Road

Recommendation

Establish a strategy for improvement of the Perkins Road Bridge and actively promote its implementation.

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[5] The NHDOT Municipal Red List Bridge Summary is a statewide inventory of structurally deficient bridges. It contains bridges that are regarded by the NHDOT to be functionally deficient and as such, are inspected more often than those not on the list.

3.5. Programmed Projects

The following project is currently programmed in the Statewide Transportation Improvement Program[6]. Preliminary engineering has begun and construction is due to begin in 2003.

NH 155 (Knox Marsh Road) Bridge Replacement and Intersection Reconfiguration

The intersection of Pudding Hill Road and Route 155 (Knox Marsh Road) was identified in the 1990 Madbury Master Plan as a dangerous intersection that needs improvement and redesign of the intersection was recommended. As a result of the Town's effort to bring its concern to the attention of the NHDOT, the project was accepted for inclusion into the State Transportation Improvement Program. The project, which aims to the improve the safety of the Pudding Hill Road -Route 155 intersection and the bridge that spans the B&M railroad, will reconfigure Pudding Hill Road and replace the NH 155 Bridge, which is poor condition. Currently, Pudding Hill Road curves dangerously sharply approximately 300 feet before it intersects with Route 155. From Pudding Hill Road, visibility of traffic traveling west-east, over the bridge is particularly poor, creating a hazardous situation for all motorists. Once the bridge is replaced and the sharp curve on Pudding Hill Road is eliminated, a new entrance to Pudding Hill Road will be created. Construction on both the bridge and Pudding Hill Road is scheduled to begin in 2004 and to be completed in early 2005. The total cost of construction of Pudding Hill Road, the replacement of the bridge, and improvements to Route 155 is estimated at $3.6 million. Eighty-percent of the project will be funded by the federal government, and the remaining 20 % will be paid by the State.

Picture Limited visibility of extremely sharp turn on Pudding Hill Rd makes a dangerous situation

Picture: Sharp turn on Pudding Hill Road. Stop sign and intersection of with Route 155 just beyond the right edge of this phot.

Picture 0 View of limited visibility from intersection of Pudding Hill Road looking west onto Route 155.

[6] Funding has been allocated and preliminary engineering or construction date has been set.

3.6. Project Implementation, Standards and Regulations

Many small New Hampshire communities are interested in preserving their rural character. Planning boards across the state have translated this goal into policies that strive for the preservation of open space, scenic vistas and cultural and natural resources, the prevention of noise, air and light pollution, mitigation of soil erosion and waste runoff, or the increase in safety for bicyclists, pedestrians and motorists. It is in this goal that transportation and land use work hand-in-hand with one another.

The linkage between land use and transportation design can be seen in the land use-transportation cycle. As land along a road is developed, demand for road capacity increases. When capacity is increased, land along the road becomes more commercially attractive and new developments get built along the road. As this form of development intensifies, the growing number of curb cuts (access points or driveways) begins to slow the movement of people and goods safely, quickly and efficiently. The new development attracts more traffic, creates more opportunities for conflicts, and decreases the road's level of service. Eventually this will increase the demand for more road capacity leading to still more road development.

The Town of Madbury is dedicated to breaking this cycle, discouraging sprawling development, inefficient land use, and traffic congestion in order to retain its rural character and achieve the goals set forth in the ten policies listed above.

Recommendations

Ensure the protection of wetlands and other environmental resources in the development of transportation projects, with appropriate mitigation when impacts are unavoidable. All too often, wetlands are destroyed or created through careless road design.

Develop and implement transportation infrastructure projects in an environmentally sound manner so as to protect the cultural, historic and recreational resources and avoid negative impacts such as habitat fragmentation; reduction in water quality or quantity; reduction in air quality; increase in noise and vibration; or decreasing aesthetically valuable resources such as scenic views.

Review existing Town road and driveway standards and develop new standards that would help maintain the safety, capacity and scenic value of the roadway.

Designate compact growth areas and limit the amount of development that can occur along less developed/rural arterials.

Discourage strip development and the proliferation of single lot commercial/industrial uses and access points.

New roads should respect the natural contours of the land. In addition to the aesthetic values thus preserved, such roads are generally easier to drain and less expensive to build.

Avoid over-specification of roadways. Gold Post Road in Dover, situated off of Drew Road just over the Madbury line, is a fine example of how not to build a road. This 1,000' long cul-de-sac serves only seven homes. The road is straight and is an extraordinary 32' in width. This excessive expanse of pavement is not in keeping with the rural character, which Madbury strives to maintain. The wider the road, the more costly the maintenance will be when the taxpayers assume responsibility.

Dead-end streets should not be laid out or extended to the town line. Such streets could eventually be extended into another municipality, possibly leading to an undesirable traffic flow that is beyond Madbury's control.

Follow the street naming guidelines developed by the by the 1976 Bicentennial Committee. These are names that due to their historical association with Madbury, are recommended for any future roads.

Walkways should be required within proposed commercial developments in order to assure safe pedestrian access.

Concentrate new development in areas where transportation infrastructure already exists.

3.6.1. Access Management

Access management is a set of planning strategies that aims to maintain the functionality of a road, enhance safety by controlling the flow of traffic, and maintain rural character. Basically, this involves limiting the number to places where vehicles turn and enter the roadway, reduce the number of cars that decelerate in the travel lanes, and remove turning vehicles from travel lanes.

Benefits of managing access include safer roads, fewer accidents, reduced travel times, increased capacity, reduced road improvement costs, improved quality of life for all. The results can be positive for citizens and roadway users, developers, businesses, government, and community character. By managing access to parcels of land, towns can help maintain the functionality of roads, enhance safety by controlling traffic, and thereby maintain rural character.

Access management techniques range from improving the design and placement of driveways, signage and landscaping, and parking. Access management strategies can be modest or aggressive and can be executed on a regional or local level. When implemented, these strategies should ideally fit each community's needs for roadway corridor protection.

3.6.2. Driveways

There seems to be a misconception in many communities that the NHDOT has total control over access to state highways. Although it is true that NHDOT has jurisdiction over access to State highways, it this is limited. Though NHDOT cannot deny access to properties that abut State highways by withholding driveway permits, it is important to remember that planning boards do have the authority to enact policies and regulations that are stricter than the State's and that driveway permits issued by the NHDOT do not

override local regulatory requirements. In addition, boards have the authority to review and possibly modify or reject a development's access even if access permits are granted by the state (which are reviewed based on safety issues such as sight distance, drainage, and maximum geometric standards for commercial driveways).

Whatever the Town's intention, however, it is critical that it communicates them clearly with the NHDOT District Office that issues a permit. By making the Town's intentions know to the NHDOT District Office by creating an access management plan and providing copies of it, along with the Town's site plan and subdivision regulations, the Town has more control their future.

Recommendations

Review all driveway permit applications at Planning Board meetings and incorporate the information provided about driveway permit requests by the NHDOT District Office into the local planning process. As noted above, each District Office sends a copy of each driveway permit application that has been submitted to the Office to the respective Town Office. It is recommended that the Board bring these applications to the Planning Board meetings, identify any concerns, and communicate those concerns to the District Office:

Draft and sign a Memorandum of Understanding to better coordinate access management between the Town and NHDOT. Use the NHDOT draft as a model (see Appendix 5).

Adopt an Access Management Plan for Routes 9, 108 and 1555 to specify/clarify the Town's policy on the development of access points. By sending this document to the NHDOT District Office, it will have a clearer understanding of the goals and intentions of the Town.

Minimize the number of curb cuts on existing and future roads. Fewer curb cuts reduce traffic obstructions caused by entering and turning traffic, and provide a generally safer situation.

Encourage or require that parking lots do not front the street or that they have substantial vegetative buffers so as to aid in the maintenance of the rural and historic character.

4. Public Transportation Services and Facilities

4.1. Bus

There are two public providers of transportation offering year-round fixed route bus services with stops either in or within a few mile radius of Madbury. These are the Cooperative Alliance for Seacoast Transportation and Wildcat Transit. In addition to these public providers C&J Trailways and Vermont Transit also operate services to locations out of the Seacoast area, such as Boston, Massachusetts in Maine and Vermont.

Madbury is directly served by Wildcat Transit Route 3, which connects Dover and Durham via NH Routes 108 & 155. Bus stops in Madbury are located by Knight's Garage on Route 155 and by the Demerritt apartments at Madbury Road & Route 155. Two other bus stops near Madbury are at the Olde Madbury Apartments on Route 155 in Dover, and at the intersection of Route 4 and Madbury Road in Durham. Between 6AM and 10PM, Wildcat Transit buses travel Routes 108 & 155 approximately once per hour on weekdays, totaling over 30 trips per day. Weekend service is also provided, though trips are less frequent. Results of the most recent COAST Route Ridership and Productivity Analysis (1997) show that out of the seven bus routes in the region, the Route 3 between Durham and Dover through Madbury, has the highest levels of ridership (nearly 25 passengers per hour). Weekday passenger counts during October 1996 on the Route 3 Durham-Dover through Madbury averaged 396. No figures that indicate what percentage of these bus riders embarked or disembarked in Madbury are available. [7]

In April of 1999 COAST passengers asked by volunteers and staff of the Strafford and Rockingham Regional Planning Commissions to complete a survey as they rode the bus. The purpose of the survey was to obtain information about the passengers and their impressions of the COAST so as to better meet the passengers' needs and to increase ridership. No particular reference to Madbury was made in this survey and because all routes were evaluated together, it is not possible to ascertain the responses of riders of Route 3. Regardless, the survey highlights particular areas of concern such as, lack of bus shelters and need for increased frequency of the bus routes. As a result, COAST identified their long-range goals as expanded frequency and hours of operation of fixed route service, establishment of a east-west Portsmouth-Durham-Concord route, establish paratransit zone feeder service (whereby the bus can travel, on special request, outside its regular route to pick up/drop off), and improve amenities, such as shelters and benches, at bus stops in their planning document *COAST 2000 Vision for Growth.*

4.2. Rail

Madbury is bisected by the Boston & Maine's main railroad line that connects Boston and Portland. Amtrak began passenger service between Portland, Maine and Boston, Massachusetts in January 2002 with four daily round trips being offered. The service runs on the Main Line West, passing through New Hampshire between Rollinsford and Plaistow with station stops in Dover, Durham and Exeter. In February 2003, NNEPRA,

[7] Productivity Analysis of COAST Bus Routes 1 Thru 7 A, by the Strafford Regional Planning Commission, June 1997

in response to a request by the Town of Durham and UNH officials, increased Downeaster service to include a stop seven days per week at the Durham rail station. Starting the first week in February, the first southbound train on Tuesday, Wednesday and Thursday, the #680 that passes through Durham at 7:20 am, allows passengers to depart in Durham. The "drop off only" policy was put into effect as there is currently insufficient parking at the Durham rail station to support commuter parking. The expanded service could help ease the crunch caused, in part, by a lack of housing and parking spaces at UNH. Now students and University employees and others interested in visiting Durham could potentially live along the rail line and take the train to campus.

The Downeaster rail service is supported by the State of Maine and managed by the Northern New England Passenger Rail Authority (NNEPRA). According to NNEPRA, the Downeaster has met or exceeded daily ridership projections. The town of Madbury supports this work as it contributes to decreasing the amount of congestion in Madbury and the region as a whole.

4.3. Air

Boston's Logan Airport and Manchester Airport (host to nine airlines, with non-stop service to over twenty destination) are the closest full service, national/international airports to Madbury. In addition, daily airline service is available from the Pease International Tradeport in Portsmouth through Pan Am and Boston and Maine airlines.

Recommendations

Ensure that benefits and burdens of transportation are shared equitably throughout the community.

Continue to support the efforts of COAST and Wildcat Transit and other transit operators to increase public transit, reduce traffic congestion and protect air quality.

Support efforts to educate residents about railway safety.

Support the development of Park-and-Ride lots throughout the region that are integrated with local and intra-city bus and rail routes.

5. Appendices

5.1. Appendix 1: Road Classification

5.2. Appendix 2: Road Inventory

5.3. Appendix 3: Census Transportation Data

5.4. Appendix 4: Traffic Volumes

5.5. Appendix 5: Draft Memorandum of Understanding

Appendix 1: Road Classification

New Hampshire Administrative Classification of Highways

Class	Description
I	Shall consist of all existing or proposed highways on the primary state highway system
II	Shall consist of all existing or proposed highways on the secondary state highway system
III	Shall consist of all existing or proposed recreational roads leading to, and within, state reservations designated by the legislature
IIIa	Shall consist of all new boating access highways from any existing highway to any public water in this state. All Class IIIa highways shall be limited access facilities as defined in RSA 230:44
IV	Shall consist of al highways within the compact sections of cities and towns listed in RSA 229:5
V	Shall consist of all other traveled highways which the town has the duty to maintain regularly, and shall be known as town roads;
VI	Shall consist of all other existing public ways, and shall include all highways discontinued as open highways and made subject to gates and bars, and all highways which have not been maintained and repaired by the town in a suitable condition for travel thereon for five' successive years or more.

New Hampshire RSA 229:5, 2002

New Hampshire Functional System Hierarchy

Functional Classification	Description
Prin.Arterials: Interstate	The Interstate system of all presently designated routes currently rural in character. These corridors are used basically for Statewide and Interstate travel.
Prin.Arterials: Other	The other principal arterial system provides an integrated network of highways between cities and larger towns and usually has no stub connection except at coastal cities or international boundaries.
Minor Arterials: Rural	These are the feeder highways that serve a variety of traffic. They may serve as links between larger towns and some smaller cities. They also serve as traffic generators to and from urban or urbanized areas but are rural.
Major Collector	These routes provide for service to local centers of government but are of a lesser importance than those highways serving cities and larger towns. They also serve as traffic generators to schools, shipping and receiving points, while these routes do not serve a statewide condition, they are important to the count or region where they exist.
Minor Collector	Roads that do not serve an arterial function, but merely connect other elements of the road network. They often serve as short-cuts for through traffic, or as collectors for neighborhood levels of population. This system should be consistent with the population of the area because it is the last system before the local road system. It also provides service to the remaining smaller communities.
Local (rural)	This provides access to adjacent land, also for travel of relatively short distance. This mileage will constitute the bulk of the rural public road mileage.

Appendix 2 MADBURY ROAD INVENTORY

	Survey Date	Street Name	Route	Access Control	Section Length	System Class	Func. Class	GLC	Surface Type	Pavement Width	Number of Lanes	Lane Width	Shoulders	Shoulder Right	Shoulder Left	Rural or Urban
	Public Roads															
1	3/28/1996	BELLAMY BRIDGE RD	4	3	0.06600	11	14	01	51	24.0	2	12.0	2	4.0	4.0	3
2	3/28/1996	LITTLEWORTH RD	9	3	1.57700	11	07	01	61	24.0	2	12.0	2	4.0	4.0	1
3	3/28/1996	LITTLEWORTH RD	9	3	0.72400	11	07	01	61	24.0	2	12.0	2	8.0	8.0	1
4	3/28/1996	LITTLEWORTH RD	9	3	1.03000	11	07	01	61	24.0	2	12.0	2	4.0	4.0	1
5	3/28/1996	NH COLLEGE RD	108	3	1.55100	11	16	01	61	24.0	2	12.0	2	4.0	4.0	3
6	5/14/1996	DOVER LEE RD	155	3	1.48100	22	07	01	61	22.0	2	11.0	5	4.0	4.0	1
7	5/14/1996	DOVER LEE RD	155	3	1.06200	22	07	01	61	24.0	2	12.0	2	4.0	4.0	1
8	5/14/1996	DOVER LEE RD	155	3	1.21200	22	16	01	61	24.0	2	12.0	2	4.0	4.0	3
9	3/28/1996	MADBURY RD	0	3	1.20700	22	07	01	61	24.0	2	12.0	2	4.0	4.0	1
10	1/1/1990	TOWN HALL RD	0	3	2.06000	22	09	01	51	18.0	2	9.0	5	2.0	2.0	1
11	1/1/1990	MILL HILL RD *	0	3	0.40200	22	09	01	51	18.0	2	9.0	1	0.0	0.0	1
12	1/1/1987	MILL HILL RD *	0	3	1.77000	55	09	03	51	18.0	2	9.0	2	4.0	4.0	1
13	1/1/1988	CHERRY LANE	0	3	0.96600	66	00	03	20	6.0	1	6.0	1	0.0	0.0	1
14	1/1/1989	CHERRY LANE	0	3	2.26900	55	09	03	40	18.0	2	9.0	1	0.0	0.0	1
15	1/1/1989	HAYES RD	0	3	1.60900	55	09	03	51	18.0	2	9.0	1	0.0	0.0	1
16	1/1/1989	HAYES RD	0	3	2.44600	55	09	03	51	20.0	2	10.0	1	0.0	0.0	1
17	1/1/1986	NUTE RD	0	3	0.54700	55	09	03	40	18.0	2	9.0	1	0.0	0.0	1
18	5/21/1996	WHITE POND RD	0	3	1.07800	55	09	03	40	12.0	2	6.0	1	0.0	0.0	1
19	1/1/1993	NUTE RD	0	3	2.38300	55	09	03	51	18.0	2	9.0	1	0.0	0.0	1
20	10/13/1995	HUCKINS RD	0	3	0.25700	66	00	03	20	6.0	1	6.0	1	0.0	0.0	1
21	10/13/1995	HUCKINS RD	0	3	0.32200	55	09	03	40	10.0	1	10.0	1	0.0	0.0	1
22	10/13/1995	HUCKINS RD	0	3	0.94200	55	09	03	51	18.0	2	9.0	1	0.0	0.0	1
23	1/1/1987	FRENCH CROSS RD	0	3	0.49900	55	09	03	61	18.0	2	9.0	1	0.0	0.0	1
24	7/16/1996	OLD STAGE RD	0	3	1.44800	55	09	03	51	18.0	2	9.0	1	0.0	0.0	1
25	1/1/1993	PUDDING HILL RD	0	3	1.75900	55	19	03	51	18.0	2	9.0	1	0.0	0.0	3
26	1/1/1993	PUDDING HILL RD	0	3	0.20300	55	19	03	40	16.0	2	8.0	1	0.0	0.0	3
27	6/7/1995	PERKINS RD	0	3	0.35500	55	09	03	51	18.0	2	9.0	1	0.0	0.0	1
28	6/7/1995	PERKINS RD	0	3	0.01100	55	19	03	40	10.0	1	10.0	1	0.0	0.0	3
29	1/1/1993	FRESHET RD	0	3	2.59100	55	19	03	51	18.0	2	9.0	1	0.0	0.0	3
30	1/1/1987	PERKINS RD	0	3	1.38400	55	19	03	51	16.0	2	8.0	1	0.0	0.0	3
31	1/1/1987	PERKINS RD	0	3	0.59500	55	19	03	51	18.0	2	9.0	1	0.0	0.0	3
32	1/1/1987	PUTNEY RD	0	3	0.35400	55	19	03	61	18.0	2	9.0	1	0.0	0.0	3
33	6/7/1995	BEECH HILL RD	0	3	0.09100	55	09	03	61	22.0	2	11.0	2	4.0	4.0	1
34	7/16/1996	CREEK RD *	0	3	0.96600	66	00	03	20	6.0	1	6.0	1	0.0	0.0	3
35	7/16/1996	CREEK RD *	0	3	0.80500	55	19	03	51	18.0	2	9.0	1	0.0	0.0	3
36	6/7/1995	JENKINS RD	0	3	0.54300	55	19	03	51	18.0	2	9.0	1	0.0	0.0	3
37	6/7/1995	JENKINS RD	0	3	0.66000	66	00	03	20	6.0	1	6.0	1	0.0	0.0	3
38	7/18/1996	BACK RIVER RD	0	3	0.66600	55	17	03	51	22.0	2	11.0	1	0.0	0.0	3
39	7/12/1996	EFFINGHAM RD	0	3	1.06700	55	09	03	40	10.0	1	10.0	1	0.0	0.0	1
40	6/7/1995	BEAUTY HILL RD	0	3	0.48200	66	00	03	20	6.0	1	6.0	1	0.0	0.0	1
41	6/7/1995	LONG HILL RD	0	3	0.15500	55	09	03	40	6.0	1	6.0	1	0.0	0.0	1
42	6/7/1995	0	0	3	0.64300	66	00	03	20	6.0	1	6.0	1	0.0	0.0	1
43	6/7/1995	0	0	3	0.96300	66	00	03	20	6.0	1	6.0	1	0.0	0.0	1
44	6/7/1995	0	0	3	0.72700	66	00	03	20	6.0	1	6.0	1	0.0	0.0	3
45	6/7/1995	0	0	3	0.14000	55	19	03	40	14.0	2	7.0	1	0.0	0.0	3
46	6/7/1995	0	0	3	0.04300	55	19	03	51	18.0	2	9.0	1	0.0	0.0	3
47	1/1/1987	GARRISON LN JABRE	0	3	0.95000	55	19	03	61	20.0	2	10.0	1	0.0	0.0	3
48	1/1/1983	MOHARIMET DR	0	3	0.27400	55	09	03	61	28.0	2	0.0	1	0.0	0.0	1
49	5/21/1996	YOUNGS RD	0	3	0.43500	55	09	03	30	8.0	1	8.0	1	0.0	0.0	1
50	1/1/1983	MOHARIMET DR	0	3	1.73800	55	09	03	61	20.0	2	10.0	1	0.0	0.0	1
51	1/1/1986	0	0	3	0.74000	55	09	03	61	22.0	2	11.0	1	0.0	0.0	1
52	1/1/1986	0	0	3	0.53100	55	09	03	61	22.0	2	11.0	1	0.0	0.0	1
					48.77900											

Access control: Refers to the level of control for access points to the highway

Code 1= Full Control (interstate)

Code 2 = partial control (found on some state highways

Code 3 = no control

Surface Type

20 = Unimproved Road

80 = Brick, block or combo

72 = Reinforced Portland Concrete

62 = Composite

61= High flexible (bit. concrete)

40 = Gravel

System Class: The State's roadway system and class description

11=State maintained primary system

22= State maintained secondary system

55= Regularly maintained Town street and roads outside Compact

66 = Town or city streets not regularly maintained

Functional Class

00 = Non-public Road (eg. Class VI)

01 = Pricipal Arterial (Insterstate)

02 = Principal Arterial (other)

06 = Minor Arterial

07 = Major Collector

08 = Minor Collector

09 = Local

GLC:

Identifies the level of government that has responsibility for the facility. Where more than one code could be used for a section, the lowest numerical code shall be reported. Note: GLC relates to ownership of the road, not who maintains it.

01= State Highway Agency

03 = Town or municipal highway agency

Appendix 3: Census Transportation Data

	Census 2000 Transportation Related Data, Madbury and Strafford County											
	Madbury						Strafford County					
	1990		2000		Change 1990 to 2000		1990		2000		Change 1900 to 2000	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total population	1405	100.0%	1509	100.0%	104	7.4%	104233	100.0%	112233	100.0%	8000	7.7%
Total households	489	100.0%	535	100.0%	46	9.4%	37688	100.0%	42531	100.0%	4843	12.9%
Mean # of persons per hhld	2.87		2.82		-0.05		2.6		2.5		-0.1	
Mean vehicles per hhld	2.2		2.06		-0.14		1.77		1.8		0.03	
Mean hhld income (dollars)			72321						52937			
Median hhld income (dollars)			57981						44803			
Method of Travel to Work												
Workers over 16 years	713	100.0%	803	100.0%	90	12.6%	52535	100.0%	58403	100.0%	5868	11.2%
Drove alone	584	81.9%	652	81.2%	68	11.6%	38678	73.6%	46894	80.3%	8216	15.6%
Carpooled	67	9.4%	76	9.5%	9	13.4%	8012	15.3%	6100	10.4%	-1912	-3.6%
Public trans (inc. taxi)	0	0.0%	2	0.2%	2	0.0%	651	1.2%	556	1.0%	-95	-0.2%
Bike/walk	22	3.1%	7	0.9%	-15	-68.2%	3255	6.2%	2627	4.5%	-628	-1.2%
Motorcycle or other	3	0.4%	7	0.9%	4	133.3%	406	0.8%	446	0.8%	40	0.1%
Worked at home	37	5.2%	59	7.3%	22	59.5%	1533	2.9%	1780	3.0%	247	0.5%
Travel time to work												
Workers who didn't work at home	676	100.0%	744	100.0%	68	10.1%	51002	100.0%	56623	100.0%	5621	11.0%
5 min.or less	34	5.0%	16	2.2%	-18	-52.9%	2703	5.3%	2112	3.7%	-591	-21.9%

5 to 9 min.	55	8.1%	72	9.7%	17	30.9%	6817	13.4%	6732	11.9%	-85	-1.2%
10 to 14 min.	168	24.9%	127	17.1%	-41	-24.4%	8748	17.2%	8568	15.1%	-180	-2.1%
15 to 19 min.	114	16.9%	187	25.1%	73	64.0%	7377	14.5%	8851	15.6%	1474	20.0%
20 to 29 min.	149	22.0%	168	22.6%	19	12.8%	11090	21.7%	12960	22.9%	1870	16.9%
30 to 44 min.	96	14.2%	90	12.1%	-6	-6.3%	8510	16.7%	9607	17.0%	1097	12.9%
45 min.+	60	8.9%	84	11.3%	24	40.0%	5757	11.3%	7793	13.8%	2036	35.4%
Mean travel time to work (min.)	19.8		24.2		4.4		21.5		24.1		2.6	
Time leaving home to go to work												
Workers who didn't at home	676	100.0%	744	100.0%	68	10.1%	51002	100.0%	56623	1	5621	11.0%
5:00 a.m. to 6:59 a.m.	194	28.7%	181	24.3%	-13	-6.7%	16194	31.8%	16017	0.2828709	-177	-0.3%
7:00 a.m. to 7:59 a.m.	225	33.3%	299	40.2%	74	32.9%	13631	26.7%	16658	0.2941914	3027	5.9%
8:00 a.m. to 8:59 a.m.	124	18.3%	99	13.3%	-25	-20.2%	7701	15.1%	8565	0.1512636	864	1.7%
9:00 a.m. to 9:59 a.m.	26	3.8%	49	6.6%	23	88.5%	1836	3.6%	2634	0.0465182	798	1.6%
10:00 a.m. to 11:59 a.m.	42	6.2%	21	2.8%	-21	-50.0%	1661	3.3%	2092	0.0369461	431	0.8%
12:00 p.m. to 11:59 p.m.	55	8.1%	82	11.0%	27	49.1%	8938	17.5%	8603	0.1519347	-335	-0.7%
12:00 a.m. to 4:59 a.m.	10	1.5%	13	1.7%	3	30.0%	1041	2.0%	2054	0.036275	1013	2.0%

Appendix 4: Traffic Volumes

Madbury: Location		Year 1988/1989		Year 1995/1996		Year 1998/1999
Route 108 at Dover line	S	12250				
French Cross Road at Dover line	S	1725				
Town Hall Road by Demerritt Park	S	1271				
Madbury Road at Durham line	S	5985				
Littleworth Road west of reservoir	S	6211				
Route 9 at Dover-Madbury TL	S	6517	N	8598	N	281052
Route 155 at Dover city line	S	9995	N	11000	N	12000
Route 155 in Lee north of Route 4	S	5259				
Back River Road north of Durham TL			N	2400	N	2871
Freshet Road west of Drew					N	341
Jenkins Road east of Drew					N	413
Mill Hill Road over Bellamy River			N	910	S	1063
Town Hall Road east of Cherry Lane					N	1452
S=SRPC data; N=NHDOT data						

Regional: Location	Location of Recorder	1980	1990	2000		% change 1980-1990	% change 1990 – 2000*	% change 1980 - 2000*
Dover	Dover Pt. Rd/S of Eliot Park	9985	15949	14829		60%	-7%	49%
Dover	Spaulding Turnpike Toll	12458	24139	35663		94%	48%	186%
Durham	US 4 E of NH108	na	15330	18951		na	24%	na
Exeter	NH 101 East of NH 88	8581	16161	35368*		88%	119%	312%
Lee	NH125 N of US 4	5458	10033	13860		84%	38%	154%
Milton	NH 16 at Wakefield T/L	3609	6426	8212		78%	28%	128%
Newington	General Sullivan Bridge	30162	55267	72753		83%	32%	141%
Northwood	US4 at Nottingham T/L	na	7971	9641		na	21%	na
Rochester	Spaulding Turnpike Toll	7278	15694	23617		116%	50%	224%
Stratham	NH108 W of Bunker Hill Rd	12968	22158	21702		71%	-2%	67%

*Count from Exeter NH 101 in amount of 35368 is 2001 data. 2001 data used because year 2000 not available

Source: NHDOT

Appendix 5: Draft Memorandum of Understanding

D R A F T

(November 15, 2001)

MEMORANDUM OF UNDERSTANDING

FOR

COORDINATING HIGHWAY ACCESS MANAGEMENT

BETWEEN

NEW HAMPSHIRE, DEPARTMENT OF TRANSPORTATION

AND

TOWN OF _____

This Memorandum of Understanding ("MOU") is made between the State of New Hampshire, Department of Transportation (hereinafter referred to as "DEPARTMENT") and the Town (or City) of _____ (hereinafter referred to as "TOWN" (or "CITY") and entered into on _____(date)_____.

The Parties to this agreement witness that:

WHEREAS, the DEPARTMENT has the statutory responsibility and permitting authority, under RSA 236, to issue driveway access permits on state highways; and

WHEREAS, the TOWN, has the statutory authority under RSA 674 to enact zoning and building ordinances, subdivision, and site plan review regulations to regulate the use and development of property adjoining the highway; and

WHEREAS, the DEPARTMENT and the TOWN mutually recognize the necessity to plan and coordinate future land use and access to highways that will experience further development on adjacent land, in order to preserve highway capacity and public safety, and;

WHEREAS the DEPARTMENT and the TOWN mutually recognize and agree that the preservation of the safety and capacity of state highways is in the public interest,

THEREFORE, BE IT RESOLVED, that the following provisions of this Memorandum of Understanding are agreeable to all parties;

Article I: Statement of Purpose

The DEPARTMENT and Town of _____ enter into this agreement to promote the coordination and management of land use and access to state highways within the Town. For the purposes of this agreement, access management shall include coordination in the planning, design, limitation, control, and determination of access points to facilities, and in the issuance of driveway access permits.

Article II: Scope of Understanding:

The provisions of this Understanding shall apply to all state highways or segments of state highways located within the TOWN.

Article III: Joint Responsibilities

1. It shall be the joint responsibilities of the DEPARTMENT and the TOWN to develop and adopt agreed upon procedures for the joint review of site plan approval and driveway access permits.

2. The TOWN and the DEPARTMENT may establish an Access Management Technical Review Committee for the purpose of conducting the joint review of development site plans and review of driveway access permit applications to determine their conformance to state and local access management plans and standards.

Article IV: Responsibilities of the TOWN

1. The Town shall develop, adopt, and enforce access management standards on state highways that conform with best practices for access management. These standards may take the form of zoning ordinances, site plan review regulations and requirements, roadway construction standards, or a combination of these, and shall be applied to all subsequent development and redevelopment of land accessing state highways. Such standards may be developed with assistance from, and in consultation with, the DEPARTMENT. Copies of all such standards, and subsequent amendments thereto, shall be provided to the DEPARTMENT to be kept on file at the Central and District Offices.

2. Where appropriate and necessary as determined by the Town, the Town may develop, in cooperation or consultation with the DEPARTMENT, adopt, and amend site or parcel-specific access management plans for specific highway corridors or segments. Such plans shall define the number, as well as, general location and design of future access locations to be permitted on specific parcels or sites. The Plans, and any subsequent amendments thereto, shall be forwarded to the DEPARTMENT to be kept on file at the Central and District Offices.

3. The Town shall notify the DEPARTMENT District Engineer upon receipt of any development proposal or change of use that will require a state driveway access permit and solicit input regarding access design.

4. The Town shall require that driveway access(es), including type, design, number, and location, be permitted only in accordance with its adopted access management standards and any applicable site-specific access plans.

5. In the event that waivers or variances to the adopted access management standards or plans are proposed, the Town shall inform the DEPARTMENT of such waivers or variances prior to local approval of the plans. Notice will be made prior to the issuance of the local approval and with sufficient time to allow for comment from and consultation with the DEPARTMENT.

Article V: Responsibilities of the DEPARTMENT

1. The DEPARTMENT shall provide information, technical assistance, and advice to the TOWN in the development of local access management standards and site or parcel level access management plans.

2. The DEPARTMENT shall agree to abide by the adopted site specific access management requirements of the Town to the extent that they are consistent with safe and efficient highway design and with applicable regulations of the Department. Accordingly, the DEPARTMENT shall not approve driveway permits that do not conform to local access management standards or plans, except with the consent of the TOWN.

3. The DEPARTMENT District Engineer shall notify the TOWN upon receipt of any application for driveway access permit and shall transmit a copy of such application to the Planning Board of the TOWN.

4. The DEPARTMENT District Engineer shall withhold final action on any driveway access permit application for a proposed development until the TOWN Planning Board has formally approved the access plan for that development.

5. The DEPARTMENT District Engineer shall notify the TOWN if there is intent to issue a driveway access permit that is not in conformance with the adopted access management standards or parcel-specific plan. Such notice will be made prior to the issuance of the permit and with sufficient time to allow for comment from and consultation with the Town.

Article VI: Effective Date and Amendments to Memorandum of Understanding

1. This MOU shall become effective upon execution by the DEPARTMENT and the TOWN and shall remain in effect until terminated under provisions of Article VII, or until superseded by a new agreement.

2. This MOU may be amended from time-to-time as facts or circumstances warrant or as may be required by state or federal laws, administrative regulations, or other orders or guidelines having the full force and effect of law.

Article VII: Termination of MOU

The DEPARTMENT or TOWN may terminate this Memorandum by giving ninety (90) day written notice of such termination to the other party.

IN WITNESS WHEREOF, the parties have hereto caused this Memorandum to be executed by their proper officers and representatives.

FOR THE TOWN OF_____:

Planning Board
by_____ **Date**_____
Chair

Board of Selectmen
by_____ **Date**_____
Chair

FOR STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION:

by_____ **Date**_____
District Engineer

by_____ **Date**_____
Commissioner

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

2.7 Town Facilities and Services

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire

by

Strafford Regional Planning Commission
Dover, New Hampshire

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Town Facilities and Services

1. Policy

Accommodate the service and infrastructure needs of residents without placing an undue burden on taxpayers.

Volunteers provide the backbone of most Town services. Town population and the technical and legal complexity of Town affairs continue to increase. The Town needs to take steps to maintain the quality of services by the considered use of volunteers, employees, and contractual services.

2. Municipal Facilities and Services

2.1 Civic District or Town Center

The Civic District or Town Center was established to create a sense of place for the Town. It includes the land occupied by the Town Hall and adjacent lands, Town Library (the former Police Station Building), Town Cemetery, Demerritt Park, Moharimet Elementary School and adjacent Town owned land. (See attached Civic District Map). The area features architecturally unique buildings, but lacks overall unified site planning and architectural appearance. In addition, it lacks pedestrian and/or bicycle linkage between the facilities and between the Town Center and the adjacent residential neighborhoods. Improvements could significantly upgrade the unique character of the area and its identity as the "center" of and a source of pride for the residents.

2.2 Town Hall

Madbury Town Hall, located in the Civic District on Town Hall Road, was constructed in 1861. An addition to the building was made in 1985, providing offices for the town clerk, assessor, tax collector, building inspector and a meeting room. The original meeting room is used for the annual town meeting and meetings by municipal bodies. It can accommodate 150 people. A renovated small meeting room and two new offices are being discussed as part of an addition to the eastern side of the building.

Part-time employees provide Town municipal office services.

Town Hall served as a shelter for emergency situations before the new Public Safety Building was opened. It is equipped with kitchen and bathroom facilities and the hall space. It can continue to be used as a backup shelter.

The Town may require additional office and storage space as the Town grows.

2.3 Town Library

The Madbury Town Library was established two years ago. The collection of 550 books is stored in the large storage closet in the main Town Hall meeting room with another 3000 stored in the "annex". There is an active group of enthusiastic residents involved in the library programs. The library provides story hours for young children, after school activities for elementary school children and adult reading. A small, very interested group is actively building resident participation in library funding and activities. A capital reserve fund has been set up for a library building. At the 2003 Town Meeting, the Town approved the Library's use of the former police station building after the police move to the new facility. In the future, the committee would like to appoint a director, hire librarians, expand the collection, install a computer, offer programs, and participate in statewide library operations once a permanent place for the library is secured and provide the usual library services to be expected of a small community.

2.4 Public Safety Building (Police and Fire Departments)

The Police and Fire Departments are located in a new building on Route 155. The single story building contains 11,000 square feet. The Town started planning for a new public safety complex several years ago and paid for the facility via a capital reserve fund. The department offices will occupy either end of the building and share a common entry. The building also contains a meeting room, a training room, shower and locker rooms and a full kitchen. It includes updated communications and computer processing equipment, a "sally port" for interior police car access and interior parking for the fire trucks and other emergency vehicles and equipment. The building will be an emergency shelter, equipped with backup generator, water and gas supply and shower facilities. The complex can accommodate approximately 200 people in an emergency situation with the fire trucks and cars removed.

The new building is expected to meet the needs of both departments for several years.

2.5 Police Services

Per State law, police services are the primary responsibility of the State Police until Madbury's population reaches 3,000. Then the Town can decide if it wants to assume full responsibility for police services. However, since expectations for police services have increased substantially over the last five years, the Town already has assumed greater responsibility. Now, ten part-time Town personnel provide police services. These include the Police Chief, a volunteer, a full time Deputy Chief (35 hours per week), a secretary, and approximately seven part-time officers who patrol the community. As the Town grows, it is anticipated the Town will accept a larger responsibility for police services. The Selectmen foresee having a full-time officer on duty as well as a full-time Deputy Chief in the next couple of years, if the budget allows. The Town is continuing to increase the budget for additional patrol time and ultimately to have an officer on duty twenty-four hours a day, seven days a week.

This should enable maintaining and hopefully improving the current approximately twelve to fifteen minutes response time.

Currently the Department has five cars: a 2002 police cruiser, a 1998 cruiser in good condition, a 1992 cruiser, and an older four wheel drive Blazer. The plan is to upgrade a vehicle every two to three years. One vehicle upgrade will be proposed for FY 2004 in the amount of $35,000.

2.6 Fire Protection Services

Madbury's Volunteer Fire Department provides fire and safety services. It is compromised of approximately thirty members: five honorary members and approximately twenty-five active members. The new station has six bays with large doors, which is expected to meet the needs of the department for the next several years. The building has large meeting rooms to ease daily operations. At some point in the future, the building could be modified so that firemen can live there.

The Department is requesting the purchase of a new engine for fiscal year 2003 at Town Meeting. Most of the funding is available in capital reserve. A small portion would be bonded. The new engine will have a 1500 gpm pump and a 1200-gallon tank. Due to the limited amount of water supply within the community and the number of buildings, the Town may need a larger tank vehicle in five to ten years. There is no immediate need.

Water for fire protection is available in fire hydrants and fire ponds located throughout the Town. The Town bought the Hicks Hill reservoir in May 1998, along with the site where the new safety complex was built. The pump system for the reservoir is old and may need to be updated. The Town has a well to provide the needs of the new public safety building. The reservoir provides water for fire protection. The Town added another hydrant on the new Public Safety Building site. Two hydrants on Perkins Road are no longer maintained. Irrigation farmers own them privately. The hydrant at the fire pond on Moharimet Drive is still in place. The Town added a pond and dry hydrant on Nute Road, at the former Chase residence. At the Valleyview Estate, off Old Stage Road, a new pond and hydrant were added. Two cisterns have been added recently: a 30,000-gallon cistern at Moharimet School, and a 15,000-gallon cistern on Champernowne Way. The Town added two hydrants: one on Evans Road, the second on Route 155 near the railroad bridge. There is access to the hydrant at the intersection of Pudding Hill/ Mast Road and Freshet Road, where the Dover Water Treatment Plant is located. At the Portsmouth Water Treatment Plant, the hydrant at the lower gate was replaced. There are two more hydrants within the treatment plant

Madbury belongs to Seacoast Chief Association, which has a "haz-mat" or hazardous materials team to deal with hazardous accidents.

The Department's vehicles include:

1. 1989 Ford/KME Engine is in good condition. It has a 1000-gallon-per-minute (gpm) pump and a 1200-gallon tank. It carries 1200' of 4" hose, 200' of 21/2" hose and 600' of 13/4" hose.
2. 1978 Dodge 4 X 4 Utility Truck carries EMS and forestry equipment.
3. 1978 Ford Engine's front mounted pump is capable of 750 gpm. The truck carries 1200' of 2.5" hose, and 600' of 1.5" hose. It will retire upon replacement.
4. 1965 Mercedes UNIM06 4 X 4 is a forestry vehicle with a 400-gpm pump that can deliver 200 gallon water.
5. 1942 4 X 4 Forestry Vehicle in fair condition. Its front mounted pump delivers 500 gpm. It is on reserve status only.

2.8 Parks and Recreational Facilities and Services

The Town has a Recreation Committee composed of seven members. Its main duty is to maintain and oversee the development of fields. It has not addressed recreational activities.

Demerritt Park, located at the intersection of Town Hall Road and Route 155, is well used by residents of Madbury, Durham and Lee for public recreation. It covers 12.2 acres connected by ball fields. The Town upgraded the playing fields over the last several years and added water to the fields (baseball and softball fields) in Demerritt Park. The fields consist of a full size soccer field, a softball field and a Little League sized baseball field. Use of these fields is essentially limited to organized team sports.

In addition, the Town has established a recreational field along Route 155 on land the Town purchased years ago. The Town is leveling a large area for multi-functional activities: practice for soccer, pickup baseball games. It is a large leveled area of 27 acres, which amounts to the size of two full-sized soccer fields and a parking area. No water is planned for the field in the near future. It is an open place with no formal designation of soccer field or baseball field. It forms with the playing fields in the Moharimet Elementary School a large complex that will be open to the students next year.

Between Demerritt Park and Boodey Rock (across the street from Town Hall) there is a cleared area and a platform for picnic use.

Trails are located in the woods behind the Town Hall. They are used by hikers, bikers and dog walkers, and for winter activities. The Town's Conservation Commission over-sees these trails. The trails are connected to the University Kingman Farm trails.

The Hayes Hill Playground (near Moharimet Circle) is a 2-acre field used for recreational activities. It is maintained by the neighborhood.

As of now, the Town plans no addition or expansion of recreational facilities.

Organized recreational programs for children in Madbury, Durham and Lee are provided by Oyster River Youth Association (ORYA); a private nonprofit organization, located in Durham. ORYA has provided recreational programs with parental volunteers for over thirty years. In addition ORYA employs two full-time and one part-time employee. Ninety (90) % of ORYA's funding comes from the program fees charged to the participants, and 10 % comes from annual appropriations from the three member towns. Each town contributes a fair share of facilities to the programs and ORYA organizes the teams, hires coach etc. Current programs include theater, dance, and sports except football. Now there are approximately 325 children from Madbury involved in the programs. Overall 2,400 children from the three Towns participate in the programs.

In summary, park and recreation facilities appear adequate for the next several years, except for the possible need for some neighborhood parks.

2.9 Public Works

Madbury hires contractors for road construction and maintenance; the only public works necessary for the Town since the Town does not have public water or a public sewer system. The Town does not anticipate establishing a public works department in the near future. Eventually the Town may be required to have a public works facility with trucks and full-time employee to plow and repair the roads. The Town has some land available that could be used for a public works facility if it is necessary.

2.10 Town Owned Land

The Town of Madbury owns several tracts of land, totaling approximately 350 acres, or 5% of the Town's area. (See Appendix) These lands serve various purposes including parks, recreation and open space/conservation.

In addition, the Town holds a conservation easement on 123.8 acres referred to as the Fernald Easement on Nute Road.

Some conservation lands and easements require monitoring as shown on the table. The Town has established a Capital Reserve Fund for the acquisition of land and/or easements deemed useful.

2.11 Town Cemetery

The Town purchased 5.72 acres for Madbury Memorial Park in 1991. In 1993 Madbury filed the current cemetery plan with the Registry of Deeds. Since 1994 the Town has been doing some site development work, leveling lands, putting in drainage, a well and a water line. The layout, shaped like a wheel when seen from above, consists of two parts. One part is for burial use, with 384 gravesites and 29 memorial posts in place. The other part will be used as a memorial garden, where people can have a quiet place for rest and meditation. The Town has planted some native trees donated by residents of Madbury around the cemetery boundary. In the next few years, the Town will investigate the feasibility of a complete irrigation system installation and will continue landscaping and lighting improvements on the site.

2.12 Solid Waste Disposal

Madbury has a solid waste transfer station located on Pudding Hill Road. It is open three times a month from April through November. A part time contractor works on those days. (During other months, residents may contract privately for transfer station type waste disposal services.)

The same transfer station contractor picks up household wastes and recyclable paper and plastics on a weekly basis. These wastes are taken to the transfer station where they are sorted and removed from the site.

The Lamprey Regional Solid Waste Cooperative (LRSWC) transfers the waste from the transfer station to the Turnkey Landfill in Rochester. Waste Management, Inc. operates this landfill. LRSWC pays the tipping fee and then bills the Town.

Most scrap metal brought to the transfer station is transferred to a privately owned metal recycling company.

2.13 Lamprey Regional Solid Waste Cooperative (LRSWC)

LRSWC is a political entity set up years ago to dispose of solid waste. It has 14 member communities from the region including Madbury. It now employs one part-time office person and two part-time truck drivers. Madbury is one of four active members that use a truck owned by LRSWC to transfer solid waste to the Turnkey Landfill in Rochester.

The cost of solid waste disposal in Madbury for 2002 was approximately $55,000. The cost is expected to increase over 5% annually. Through the LRSWC the Town pays a reduced rate of $57 per ton to Waste Management. In addition, LRSWC charges $2.15 per mile for truck usage. LRSWC's contract with Waste Management expires in 3 years.

3. Other Public Facilities and Services Located in /or Serving the Town

3.1 Pubic Education

The Oyster River School District's Moharimet Elementary School is located in Madbury on 25 acres between Route 155 and Town Hall Road in the Town Center/Civic District. It opened in 1989.

The Oyster River Middle School and the Oyster River High School, that serve Madbury's students, are located in Durham.

The Oyster River School Cooperative District was established in 1954. From its small beginning serving 661 students in one facility, the District has grown to nearly 2400 students educated in four schools. While the district is made up of three towns, Durham, Lee, Madbury, it is a single political unit that votes by official ballot rather than the traditional "town meeting" form of government according to RSA 40:13. All of the

registered voters in the three communities make up the legislative body that elects a seven-member school board to govern the district.

Operations at the elementary school have a major impact on the Town and the Town Center/Civic District and visa versa. Close cooperation ranging from facility needs, after hour use, recreational use, and possible joint use of the library facilities could reduce property taxes.

School operations also impact local property taxes. The 2003 local school district tax rate is $12.00 / $1,000 of property assessed value.

3.2 Ambulance Services

Ambulance services are provided by the Durham Ambulance Corps, a private non-profit organization, founded in 1968. It provides 24-hour emergency ambulance service to Durham, Lee, and Madbury, and the Durham Campus of the University of New Hampshire. The Corps works closely with Madbury Fire Department and Fast Squad (below). The organization transfers patients to Wentworth Douglas Hospital in Dover, Exeter Hospital, and Frisbee Hospital in Rochester, and Portsmouth Regional Hospital. The organization is funded through patient bills, appropriations from the communities, and donations. It is staffed with a full-time administrative manager and 40-55 volunteers (including four paramedic certified volunteers) consisting of residents and UNH students. The Corps operates the two McGregor Memorial Ambulances: a 1996 Type III Road Rescue Ambulance on a Ford E-350 chassis, and a 2000 Type III Road Rescue Ambulance on a Ford E-450 super-duty chassis

In 2001 Durham Ambulance Corps responded to a record 974 calls, a 4.3% increase from 2000. There were 360 calls to Durham (36.96%), 290 calls on the UNH campus (29.77), 226 calls in Lee (23.20%), 49 calls in Madbury (5.03%), and 49 calls for mutual aid to other communities (5.03%).

3.3 First Aid Services

Madbury First Aid & Stabilization Team (FAST Squad) is a volunteer organization, working closely with the Madbury Fire Department and Durham Ambulance Corps to provide first responders to emergency and medical calls prior to the arrival of the ambulance. Currently there are ten members including two paramedics, eight state licensed Emergency Medical Technicians. All squad members belong to the Durham Ambulance Corps.

The FAST Squad's annual budget is $1,800, approximately half of which is raised locally through private contributions and fundraising efforts on Madbury Day. During the last several years, the FAST Squad responded to between 50 to 60 calls annually. Both the Fire Department and the Ambulance Corps provide insurance coverage for their members.

4. Conclusion

Madbury's Town facilities and services appear adequate for the short term. However, there will be a continuing need to reserve capital for police and fire safety equipment, Town Hall expansion, Town Library improvement and possible park/recreation and conservation improvements and acquisitions.

5. Recommendations

1. Prepare a specific Town Center Development Plan to guide unified site planning and architectural design appearance and provide improved pedestrian and bicycle linkage between the facilities and the adjacent residential neighborhoods. Ensure the improvements protect and enhance the Town's traditional rural New England character and appearance.

2. Annually review growth and development as part of the capital improvement programming and the annual budgeting process to ensure that public facilities and services are adequate to meet community needs.

3. Earmark capital improvement funds for the acquisition of public safety vehicles and equipment.

4. Explore opportunities to share public facilities and services with adjacent communities, the school district, and other public entities to reduce costs (e.g. property taxes) and increase benefits.

5. Maintain an inventory of public lands including their use and resource value and consider additional acquisition, disposition and/or swap opportunities.

6. Designate a location for possible future public works facility.

7. Easements should be monitored as required and the summary table kept up to date.

6. Appendix

Table of Town Owned Properties

TOWN OF MADBURY, NH Master Plan: Update - Town Properties							March 31, 2003				
							MONITORING				
PROPERTY	LOCATION	ACRES	MAP:LOT	PAGE #	OWNER	RESTRICTIONS	REQUIRED	DESIRED	LAST	NEXT	Primary Type of Protection
NORTH CORNER LOTS	GREEN HILL ROAD	45	1:31,31B, 41 & 44	2	TOWN	NONE	NONE	5 years			Fee Ownership
BELLAMY RIVER WETLAND PRESERVE	MOHARIMET DRIVE	13.5	4:23	6	TOWN	NONE	NONE	YEARLY		2/03	Fee Ownership
HAYES HILL PLAYGROUND	MOHARIMET DRIVE	2.35	4:22	8	TOWN	PLAYGROUND	NONE				Fee Ownership
FERN WAY PROPERTY	FERN WAY	18	2:14	10	TOWN	CONSERVATION	LCIP	YEARLY	9/02	4/03	Fee Ownership
BOLSTRIDGE FOREST	HAYES, TOWN HALL & CHERRY LANE	90	5:14	12	TOWN	CONSERVATION	NONE	3 Years		5/04	Fee Ownership
TIBBETTS PROPERTY	TOWN HALL ROAD	49.18	6:04	16	TOWN	CIVIC	NONE	3 Years			Fee Ownership
TOWN CEMETARY	CHERRY LANE	5.72	6:4A	18	TOWN	CIVIC	NONE				Fee Ownership
DEMERRITT MEMORIAL PARK	TOWN HALL, 155	12	6:01	19	TOWN	PARK OR RECREATION	NONE				Fee Ownership
TOWN HALL PROPERTY	TOWN HALL ROAD	25	7:13,13A,13B,14, 21,22	20	TOWN	CIVIC / CONSERVATION	NONE	3 Years			Fee Ownership

Property	Location	Acres	Map: Lot	PAGE #	OWNER	RESTRICTIONS	MONITORING				Primary Type of Protection
							REQUIRED	DESIRED	LAST	NEXT	
HICKS HILL	155 & TOWN HALL RD	23.15	7:3B	24	TOWN	NONE	NONE	3 Years			Fee Ownership
WENTWORTH	155	7.97	7:17A	26	TOWN	NO BUILDING	LCIP	YEARLY	9/02	4/03	Fee Ownership
FIRE STATION	MADBURY ROAD	1	8:16	28	TOWN	CIVIC	NONE				Fee Ownership
PUDDING HILL LANDFILL & FOREST	PUDDING HILL RD	57.67	8:04	29	TOWN	NONE	NONE	3 Years	6/95	10/04	Fee Ownership
GERRISH BROOK NATURAL AREA	GARRISON LANE	6.74	9:60	32	TOWN	NONE	NONE	3 Years	10-02	10/06	Fee Ownership
JABRE FARM PLAYGROUND	GARRISON LANE	3.45	9:60L	35	TOWN	PLAYGROUND	NONE		10/02	10/06	Fee Ownership
CHASE PROPERTY	NUTE ROAD		2:16A,B	6.51	TOWN	CONSERVATION	NONE	3 Years	9/97	2/03	Fee Ownership
TOTAL		**350.54**									

Source: Town Conservation Commission

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

2.8 Housing

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire

by

Strafford Regional Planning Commission
Dover, New Hampshire

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Housing

1. Policy

Allow a diversity of housing so people of all ages and income may live in Madbury.

Recognizing the difficulties many people face in finding adequate, safe, and affordable housing, the Town should promote strategies for the provision of fair and equitable housing opportunities.

2. Regional Context

New Hampshire is the eighth fastest growing state in the nation with the Seacoast as the hub for much of the growth. Increasing demand has placed housing in short supply in the region and has driven prices up. The large student and faculty population at the University of New Hampshire in neighboring Durham contributes to the high demand in Madbury. There are few starter homes for first time owners and elderly housing opportunities in Madbury. Also there is lack of municipal sewer and water services to accommodate additional development. These are strong factors influencing the housing market and severely limiting housing options for the low and middle-income ranges.

The U.S. Census 2000 data indicates that the four types of households that are most rapidly increasing in New Hampshire are:

- Singles, people who are not married with no children.
- Startups, young couples who are buying first homes and /or having children.
- Seniors, people over 65 years of age.
- Single parents, unmarried people with children.

Madbury needs to be creative in formulating land use policies that will help provide life-cycle housing for their current and these future residents.

3. Housing Resources

Madbury has been characterized as a bedroom community for several years now, as there is little commercial or industrial development in town. Residential use accounts for over 90% of development in town.

Table 1 — 2000 Housing Distribution by Unit* Type

	Single Family		Multi Family		Mobile Homes		Un-captured Percentage	Total Units
Barrington	2051	74%	225	8%	472	17%	1%	3147
Dover	5718	48%	5462	46%	393	3%	3%	11924
Durham	1828	62%	1054	36%	0	0%	2%	2923
Lee	1056	69%	260	17%	150	10%	4%	1534
Madbury	**391**	**72%**	**72**	**13%**	**71**	**13%**	**2%**	**543**
Madbury Area	10653	54%	7011	35%	1015	5%	6%	19528
Strafford County	22160	49%	13285	29%	4659	10%	12%	45539
NH	311857	57%	131420	24%	31152	6%	13%	5470024

Source: U.S. Census Bureau

* The term *Unit* in Table 1 and 3 refers to one living unit, e.g. a duplex = 2 units, a triplex = 3 units

Of the 543 housing units in Madbury that were surveyed by the US Census in 2000, 72% were single family homes, 13% were multi-family homes, 13% were mobile homes, and the remaining 2% were not captured (Table 1). These figures correspond, somewhat, with those of the surrounding communities and Strafford County. A significant aspect of Madbury's housing distribution is the percentage of single-family homes in the town (72%). When compared to the area (55%) and the county (49%) single-family home percentages an approximately 20% difference is realized. 26% of Madbury's housing stock is multi-family and mobile homes, which is significantly lower than the percentages of multi-family and mobile homes in the Madbury Area (40%) and in the County (39%).

Although there are a fair number of rental housing units in town, these units are priced substantially higher than those in neighboring communities to the west, as well as the region and the state (Table 7).

The age of the housing stock in Madbury is older because the town was settled in the eighteenth and nineteenth century. Thirty-five percent of the homes were built before 1970 (Table 2) and many of these have historic significance that contributes to the overall

character of the town. Forty-eight percent of the homes were built between 1970 and 1989, which matches the numerous housing starts occurring in the southeast corner of the state at the same time.

Table 2	Age of Housing Stock						
	Prior to 1970	%	1970-1989	%	1990-2000	%	Total
Madbury	192	35%	261	48%	90	16%	543

Source: U.S. Census Bureau

However, Madbury's housing growth rate was slower than the state and region's rate during the same period. Madbury had an annual housing growth rate of 2.7% between 1980 and 1988 that dropped to a rate of 1.4% in the eight-year period between 1990 and 1998 (Table 3). This slow down was probably due to the lack of easily developable land or a limited availability of suitable land. In contrast, Barrington grew at a 5.3% annual rate of growth from 1990 through 1998, up from 3.7% in the previous decade.

Table 3	Housing Growth 1980-1998				
	Units Added 1980-1988	Average Annual Growth 1980-1988	Units Added 1990-1998	Average Annual Growth 1990-1998	Total housing units
New Hampshire	106,042	3.40%	62,626	2.50%	547,024
Strafford County	8,648	3.10%	4,679	1.95%	45,539
Barrington	553	3.70%	558	5.30%	3,147
Dover	2,440	3.10%	945	0.86%	11,924
Durham	417	2.30%	302	2.00%	2,923
Lee	520	6.50%	204	2.00%	1,534
Madbury	**131**	**2.70%**	**77**	**1.50%**	**543**
Madbury Area	4061	3.50%	2086	1.40%	20,071

Source: U.S. Census Bureau

3.1. Home Ownership and Rentals.

Of the 543 housing units in Madbury that were surveyed by the U.S. Census in 2000, 412 (72.2%) were owner occupied, while 122 (22.8%) were renter occupied.

3.2. Housing Costs.

Madbury's housing costs have increased 70% between 1989 and 2002 (Table 4). This is only exceeded by Dover (95%) and Barrington (83%). As mentioned earlier**,** Madbury's geographic location has had a great influence on housing costs. While there is a steady demand generated from being adjacent to the University of New Hampshire, since the region is within commuting distance of the Greater Boston Metro Area, this has also contributed to the increasing housing costs in town.

According to the Multiple Listing Service (MLS) data on housing sales, the average 2002 sale price of a house in Madbury was $246,050, which is comparable to the average sale price in Madbury area communities of $237,083.

The MLS reported that the average purchase price of a house in Madbury during 1989 was $144,463. When compared to the 2002 MLS listing for Madbury of $246,050, there was a 70% increase in average real estate prices over this eleven-year period. A similar trend exists over the same time period for Madbury area communities as well.

Table 4 Housing Sales in Madbury Area 1989 and 2002

	1989 Avg./Sale $	2002 Avg./Sale $	Housing Units* Sold (2002)	% Change in Sale Price 1989-2000
Barrington	$106,970	$196,329	246	83%
Dover	$115,735	$226,645	1004	95%
Durham	$203,262	$281,458	212	38%
Lee	$141,339	$234,932	110	65%
Madbury	**$144,463**	**$246,050**	**36**	**70%**
Madbury Area	$142,353	$237,083	1608	66%

Source: Multiple Listing Service

***** The term *Un*it in Table 5 refers to the contiguous building or structure, e.g. a duplex, triplex, etc. = 1 unit

3.3. Property Taxes.

On a statewide basis in 2001, Madbury is ranked as having the 162nd highest property tax out of 234 municipalities, as shown in NH Department of Revenue Administration's Equalization Survey for 2001, and in Table 4. In Madbury, the average residential tax bill in 2000 was $3,646, or $304 per month (*see* Madbury Capital Improvements Program 1995-2000, page 12).

Madbury's full value tax rate showed a modest increased from $19.31 in 1988 to $22.27 in 2001. This current rate is less than neighboring Durham, and more than Lee, Dover, and Barrington.

Table 5 — 2001 Property Taxes, Madbury Area Communities

	2001 Total Tax Rate	2001 Full Value Tax Rate	Equalization Ratio	2001 State Rank	1988 State Rank
Barrington	22.74	16.74	0.74	65	148
Dover	22.36	19.75	0.89	111	174
Lee	30.25	21.93	0.73	154	182
Durham	42.33	25.84	0.61	192	185
Madbury	**23.18**	**22.27**	**0.98**	**162**	**205**

Source: NH Dept. of Revenue Administration

3.4. Median Rent

Madbury's median rent was $729 per month. This was $106 per month higher than the median rent for Strafford County ($623/mo., Table 6). As is the case with real estate sales, Madbury is not a bargain location for renters. While Madbury's land use policies enable life-cycle housing, market forces are driving prices up.

Table 6	Median Rent for 1990 and 2000	
	1990	**2000**
New Hampshire	$479	$646
Strafford County	$453	$623
Barrington	$456	$624
Dover	$467	$639
Durham	$429	$531
Lee	$599	$788
Madbury	**$504**	**$729**

Source: U.S. Census Bureau

4. Housing Accessibility

Housing in Strafford County is located within a 20-44 minute driving time from work for 39.9% of the workforce, which has not increased much since 1990. This relatively short travel time further contributes to the area's desirability, which, also contributes to housing demand and potential prices increases (see Table 7).

Table 7	Travel Time to Work in Strafford County			
Time	**1990**	**%**	**2000**	**%**
< 5 min.	2703	5.3%	2112	3.7%
5-9 min.	6817	13.4%	6732	11.9%
10-14 min.	8748	17.2%	8568	15.1%
15-19 min.	7377	14.5%	8851	15.6%
20-29 min.	11090	21.7%	12960	22.9%
30-44 min.	8510	16.7%	9607	17.0%
> or equal to 45 min.	5757	11.3%	7763	13.8%
Mean Travel Time	21.5 min.		24.1 min.	
Total Commuters	51002	100%	56623	100%

Source: CTPP 2000

5. Housing Growth by Type.

The growth of housing stock is another key factor affecting the cost of housing, and the number of units added in Madbury has been modest. Madbury's housing growth rate has been much lower than that of the state, the county, and adjoining communities. As shown in Table 3, Madbury's growth rate was 2.7% annually during the 1980s, which was well below the growth in neighboring towns and the region. This slower growth continued during the 1990s with a rate of 1.5%, which was also less than that of the state (2.5%), the county (1.95%), and well below the neighboring Town of Barrington at 5.30%. Between 1980 and 1988 131 housing units were added, as compared to 77 between 1990 and 1998.

Table 8 Housing Growth in Madbury 1990-2000

	Multi-Family	Single Family	Mobile Homes	Dwelling Units Added	% Change 1990-2000
1990	0	8	0	8	-
1991	0	6	0	6	25%
1992	2	5	2	9	50%
1993	2	5	1	8	11%
1994	0	3	2	5	38%
1995	2	6	4	12	104%
1996	0	4	0	4	67%
1997	0	4	1	5	25%
1998	0	12	0	12	104%
1999	0	7	0	7	42%
2000	0	24	3	27	286%
				103 Total Units	

Source: Building Permit Summary 1990-2000, SRPC

6. Housing Affordability

Much of Madbury's housing environment is a product of market conditions that exist in the state and especially the Seacoast. This environment is one that is not hospitable to young people who cannot afford the inflated housing prices present here. The New Hampshire Housing and Finance Authority reports negative growth in a survey from 1990 to 2000 for Householders under the age of 35 by negative 28.2%, and Renters under the age of 35 by negative 13.9%. People who are 35 years of age and younger, among others, simply do not earn a sufficient wage even in 'two-income' households to afford the high housing prices that are present in Madbury and surrounding areas.

In contrast, people making one hundred thousand dollars per year and above are the fastest growing segment of the population, growing by 48% in the 1990-2000 time period (NHHFA). In general, these people are above 45 years of age, with the majority of these individuals being above 50 years old.

Housing is affordable when a person has the ability to pay for it either in terms of rent or mortgage payment given his or her respective income. Typically the rule was that a person could not afford more than one-third of their monthly income. This means that a person with an annual income of $30,000 or $2,500 per month should not invest more than $90,000 in a home or pay $833 dollars per month in rent. The one third allocation was to ensure that the person would have sufficient income to pay for other living expenses such as food, transportation, medical costs, utilities, insurance, etc. and still have some money left over for entertainment, etc.

Thus, if the cost of housing is above this level for this income group, the housing may be considered not affordable for the people in this income group.

In many communities, there is a growing concern that persons such as teachers, police, fire fighters, and others who provide basic services to the community cannot afford to live in the community.

Table 9	**Housing Affordability**		
Income Level	**Affordable Housing Price**	**Income by Household**	**Affordable?**
< $10,000	<$30,000	19	No
$10,000-$14,999	$30,000-$44,997	28	No
$15,000-$24,999	$45,000-$74,997	50	No
$25,000-$34,999	$75,000-$104,997	41	No
$35,000-$49,999	$105,000-$149,997	96	No
$50,000-$74,999	$150,000-$224,997	115	No
$75,000-$99,999	$225,000-$299,997	104	Yes
$100,000-$149,999	$300,000-$449,997	41	Yes
$150,000-$199,999	$450,000-$599,997	22	Yes
$200,000 or more	$600,000 or more	19	Yes
Median Household Income	**Median Affordable Price**	**Total Households**	**Median Housing Cost**
$57,981	**$173,943**	**535**	**$246,050**

As Table 9 shows households with incomes below $74,999 cannot afford to buy a home in Madbury today. This will preclude 349 households or 65% of current households and any others who wish to live in the town.

Housing is built by the private sector where there is a market and it can be built so the builder can make a profit.

If there is no demand or it is too expensive to build the housing and earn a profit (e.g. minimum 10%), then it will not be built. Costs for housing development include land; site preparation / infrastructure improvement; construction (materials and labor); and financing.

In Madbury, land costs average around: $10,000 to $20,000 per acre.

In addition, the average cost of construction is approximately $75 to $100 per square foot. Thus a 40' x 40' two story home totaling 3,200 square feet would cost approximately $240,000 to $320,000 plus land and site preparation costs.

Thus, to provide affordable housing there are many options that a developer or town could work to address. These include:

1. Reduce land costs.
2. Reduce site plan approval costs.
3. Reduce site development costs.
4. Reduce housing construction costs (e.g. materials and/or labor).
5. Reduce housing amenities (e.g. install 2 baths versus 3 baths).
6. Reduce financing costs.
7. Reduce the time and costs between construction completion and occupant payment.
8. Increase the revenue by increasing the number of housing units that can be built on the site.
9. Increase the occupant's ability to pay via lower financing costs, or subsidy.

In addition, if Madbury initiates a program to facilitate affordable housing, it should ensure the housing price remains affordable. This means if a house is sold at an affordable market price, it cannot be re-sold at an above affordable market price. This affordability assurance protection can be accomplished by legally recording a restrictive covenant in the deed or adopting other regulations.

7. Conclusions

Providing a variety of housing opportunities to current and potential residents of Madbury continues to be a town goal as reflected in the Town's Master Plan. The Planning Board's challenge is to accommodate the construction of this variety of housing. Thus far regulations enable the siting of duplexes throughout the town, allowing for accessory apartments, and allowing cluster subdivisions and manufactured housing.

Current development regulations apparently have been successful since the data on housing characteristics indicates there are a variety of housing types in the town. Unfortunately, market demands have driven rents and purchase prices above county and state averages and above the reach of the emerging housing markets of single, senior, startup couples, and singles with children. Thus there is still a gap in meeting the full spectrum of housing needs.

The Planning Board and the community are challenged to find ways to support housing development that can be affordable to a wider variety of income levels. The Town must continue to assess housing needs and evaluate the effectiveness of current regulations in achieving housing goals. The following are recommendations that the Town can utilize over the next ten years in supporting the housing needs of the community:

8. Recommendations

1. As information is provided through Census and NHHFA, and SRPC reports, the Planning Board will examine regional housing needs in relation to the housing growth rate and cost of housing in Madbury. Should Madbury not be aligned with regional market demands, appropriate steps will be taken by the Planning Board to address the provision of life-cycle housing.

2. Madbury's land use regulations will continue to permit mobile homes and manufactured housing throughout town.

3. The zoning ordinance should be amended to include a provision for multi-family housing in a specially designated area of town in which natural resources would not be adversely affected, where the soils can support a large septic system, and where access to transportation is convenient. This zoning amendment should provide for a modest density bonus in exchange for the setting aside of a prescribed percentage of new dwellings for low and moderate-income families.

4. Investigate incorporating shared wall housing or accessory housing units within appropriate residential developments having access to shared water or sewage facilities.

5. Modify subdivision and site plan regulations to reflect existing densities and housing patterns within the town.

6. Investigate allowing limited mixed densities (single and multifamily dwellings) in residential subdivisions that may provide more affordable housing opportunities.

Town of Madbury, New Hampshire

Master Plan: Toward the Year 2010

3.1 Demographics

Prepared for

Town of Madbury Planning Board
Madbury, New Hampshire

by

Strafford Regional Planning Commission
Dover, New Hampshire

Table of Contents

Demographics

1. Introduction

The Demographic Profile chapter of the Madbury Master Plan provides an overview of the Town's population. The selected characteristics should be used as benchmarks to identify where Madbury has come from historically, where it is today, and where it may be heading in terms of future population growth. Data from additional Towns in the 'Madbury area' are incorporated where useful to demonstrate how Madbury compares with nearby communities. For the purposes of this chapter, the 'Madbury area' is defined as those Towns that share a border with Madbury, including Barrington, Dover, Durham, and Lee.

The Demographic Profile is based on the most current data available from the US Census, the New Hampshire Office of State Planning (NH OSP), and other state and federal agencies. Whenever possible, the most recent US Census data is the preferred source of data. Several datasets from the 2000 Census are scheduled to be released in the fall of 2001. As a result, this chapter contains a mixture of data from the 2000 Census, the 1990 Census, and various other sources dated between 1991 and 1999. In order to distinguish between these sources, this chapter is divided into sections based on the age of the source data, beginning with the most recent data available and concluding with the oldest data. Because sections of the chapter are based on old data, this chapter should be regularly revised as updated data becomes available through the US Census, NH OSP, and other state and federal agencies.

2. Demographics Based on 2000 Data

2.1 Population History

The population of Madbury has grown similarly to other small rural Towns in southeastern New Hampshire, particularly since the mid-1970s. Agriculture dominated the Town's early economy through the mid 18th century. Throughout the late 18th and 19th centuries, Madbury's population underwent a slow but steady decline, as local youth were drawn to jobs in the cities and better farmland in the Midwest. The Town's only sharp population declines occurred during the Revolutionary War, and during the Civil War era, when one in five Madbury residents departed. [1] Table 1 lists the Town's population since 1767 at 10-year intervals.

The Town's population decreased to a historic low of 326 residents following World War I. During its first 150 years, the Town's population decreased by one half. Since 1930, the population has increased at every census interval, and the 2000 population of 1,509 is the highest in Madbury's history. Madbury had a population of 695 residents when the Town was incorporated in 1768, and it took 200 years for the Town to reach this figure again in 1970. The Town's population doubled in just 20 years between 1970 and 1990. Figure 1 graphs the Town's population change between 1767 and 2000.

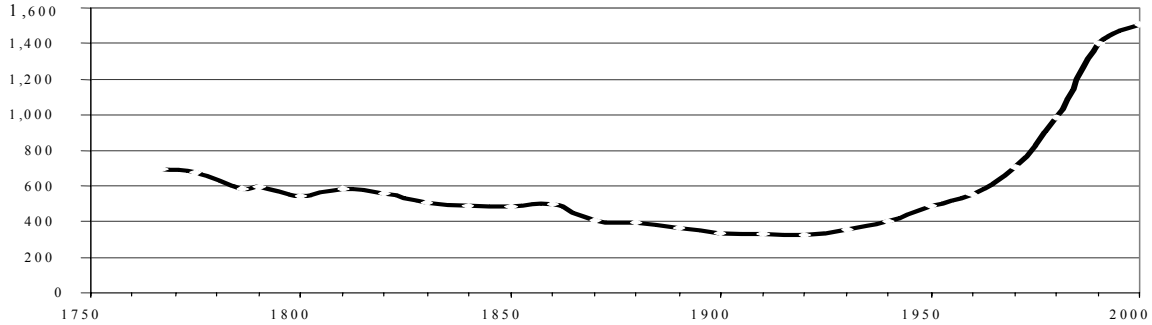
[1] Madbury Master Plan, 1989.

Table 1. Madbury Population History: 1767-2000

SOURCE: NH Office of State Planning; US Census

Year	Population
1767	695
1775	677
1786	585
1790	592
1800	544
1810	582
1820	559
1830	510
1840	489
1850	483
1860	496
1870	408
1880	397
1890	367
1900	336
1910	331
1920	326
1930	358
1940	401
1950	489
1960	556
1970	704
1980	987
1990	1,404
2000	1,509

Figure 1: Madbury Population History

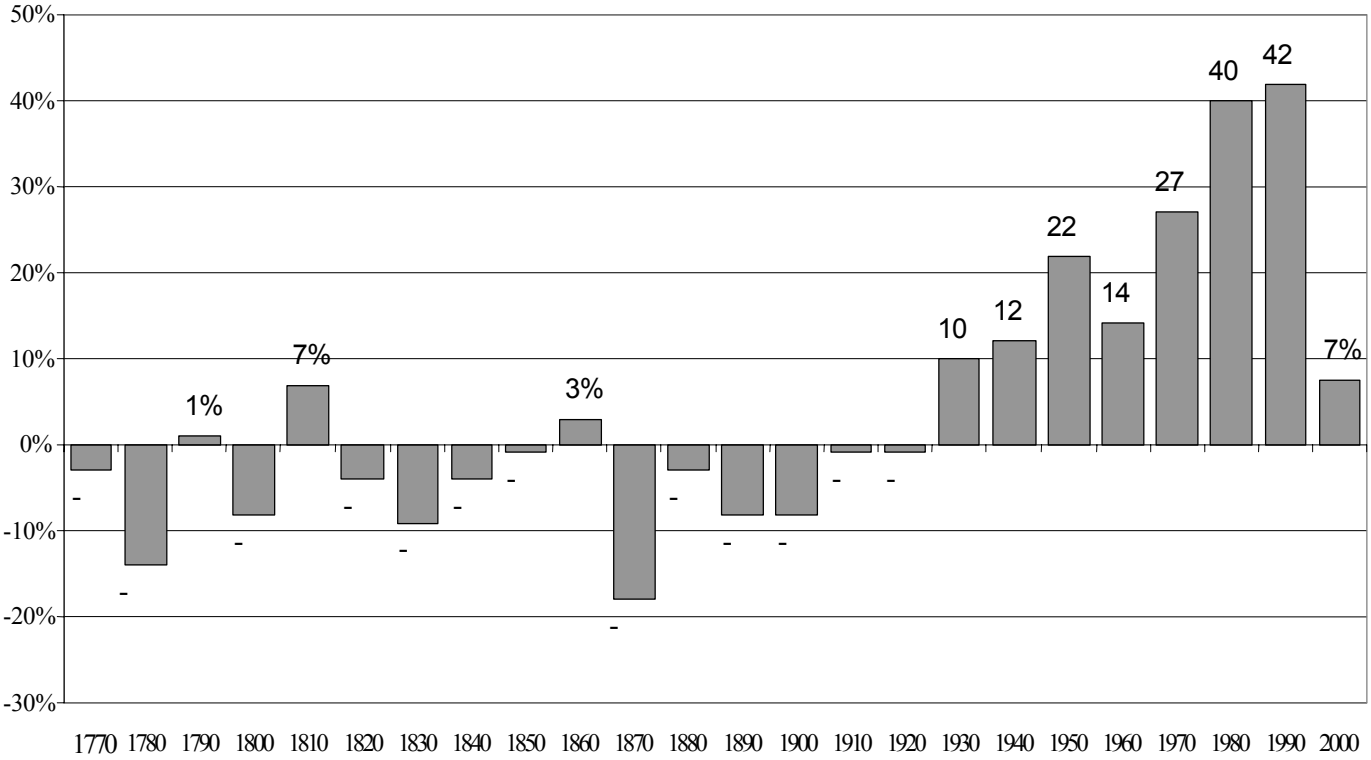


SOURCE: NH Office of State Planning; US Census

Figure 2 graphs Madbury's population change at ten-year intervals since 1767.

- From 1767 to 1930, there were two periods when the Town experienced growth: between 1800-1810 and 1850-1860.
- The Town experienced its greatest period of decline of (–) 18% between 1860-1870.
- Madbury's most rapid period of growth, 42%, occurred between 1980-1990.

Figure 2: Percent Population Change, Madbury: 1767-2000
SOURCE: US Census; NH Office of State Planning



2.2 Population Growth Since 1960

During the Great Depression in the 1930's, and World War II era, Madbury's population grew slightly, however, most of Madbury's growth has occurred during the past four decades. Madbury has become a popular bedroom community, and the Town's population has more than doubled since 1960. Current population density is also given. Figure 4 graphs the population of Madbury area communities since 1960.

2.3 Population Density

Madbury's population density in 2000 was 123.9 persons per square mile. Among its neighbors, Madbury is the least densely populated community. Although Madbury's density in 1960 was comparable to Barrington's and Lee's, both have outpaced Madbury's growth since 1960. In 2000, Madbury's population density remained lower than both the county average of 293.4 persons per square mile and the state density of 133.1 persons per square mile. The City of Dover had the highest population density in the Madbury area, with a density of 925.4 in 2000. Table 2 lists Madbury's population and population density relative to its neighbors between 1960 and 2000, and Figure 3 graphs density.

Table 2. Population History & Persons per Square Mile, Madbury Area: 1960 - 2000

SOURCE: 1960, 1980, 2000 US Census

	1960 Population	1960 Density	1980 Population	1980 Density	2000 Population	2000 Density
Barrington	1,036	21.3	4,404	90.6	7,475	153.7
Dover	19,131	658.6	22,377	770.3	26,884	925.4
Durham	5,504	222.3	10,652	430.2	12,664	511.5
Lee	931	46.1	2,111	104.6	4,145	205.3
Madbury	**556**	**45.6**	**987**	**81.0**	**1,509**	**123.9**
Madbury Area Communities	27,158	201.5	40,531	300.7	52,677	390.8
Strafford County	59,799	156.3	85,408	223.2	112,233	293.4
New Hampshire	606,921	65.4	920,610	99.2	1,235,786	133.1

Figure 3: Population Density, Madbury Area: 1960-2000

SOURCE: US Census; NH Office of State Planning

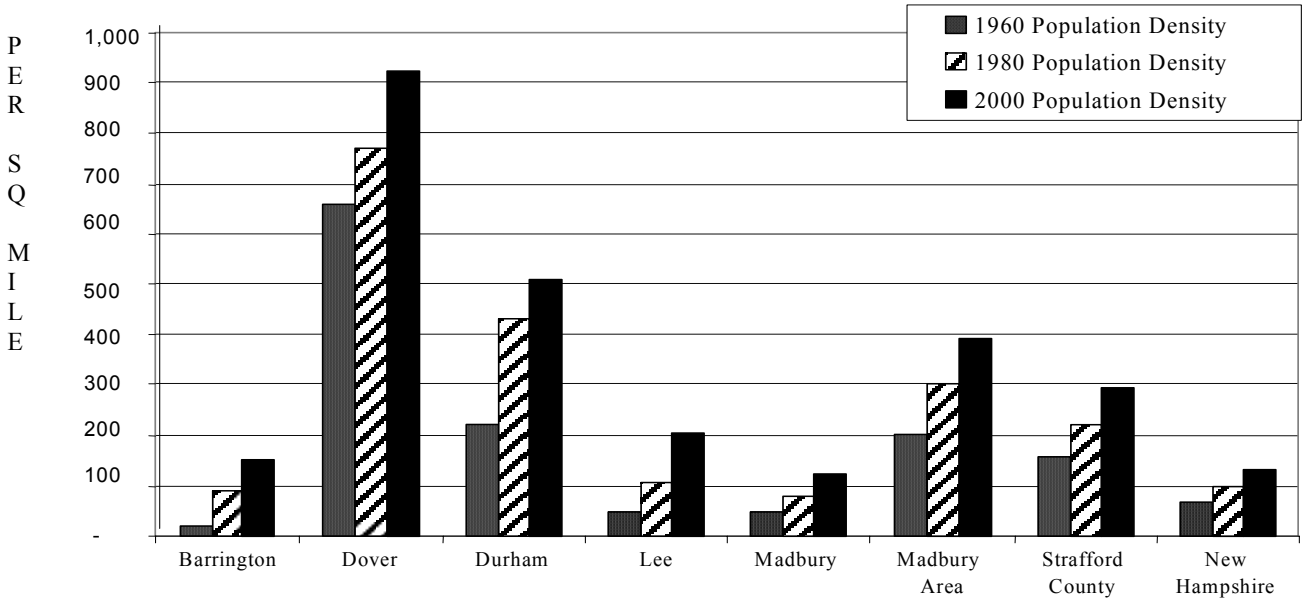


Figure 4: Population, Madbury Area: 1960-2000
SOURCE: US Census; NH Office of State Planning

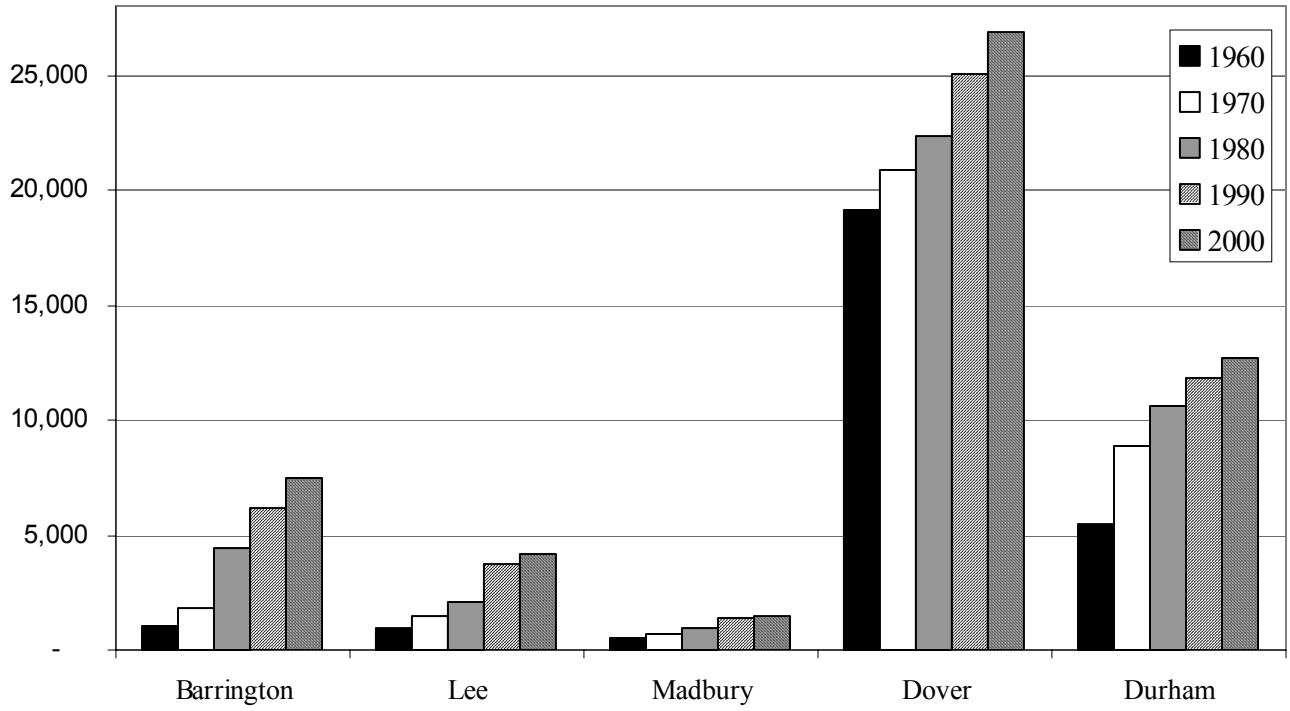


Table 3 lists the population growth rate of Madbury area communities at ten-year intervals between 1970 and 2000. Between 1970 and 1990, Madbury's population grew at an average of slightly more than 4% per year. Madbury's population growth rate between 1990 and 2000 was 7.5%, an average of .75% per year, which represents a significant decrease from the average annual growth rate of 4.2% the Town experienced between 1980 and 1990. The growth rate of the Madbury area also declined sharply from 19.2% between 1980 and 1990 to 8.8% between 1990 and 2000.

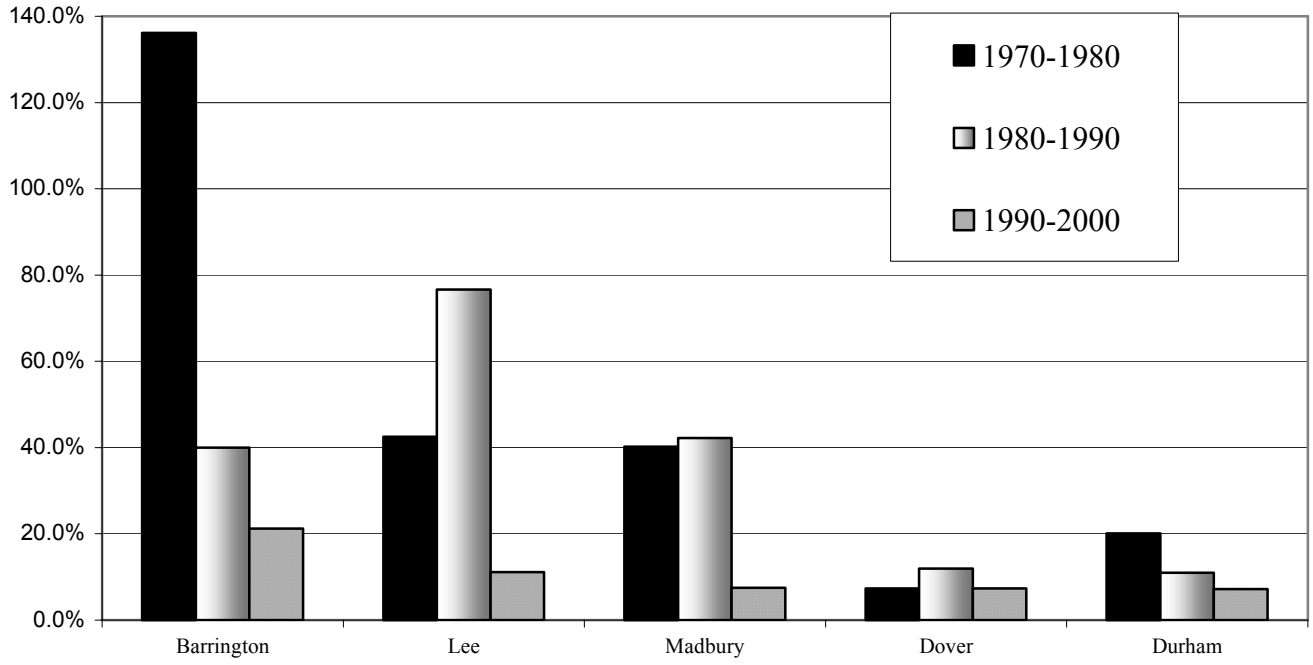
From 1990 to 2000, Madbury experienced the third highest rate of population growth in the Madbury area, behind Barrington and Lee. However, Madbury's rate of growth during that time was closer to the growth rate of Dover and Durham, and was slightly below the county rate of 7.7 %. Figure 5 graphs Madbury's population growth rate relative to its neighbors between 1970 and 2000.

The Town's growth rate over the past ten years was lower than the rest of the state and county, on average: Madbury's population grew by .75% per year during that time, while the average statewide population growth between 1990 and 2000 was 1.14% per year and for Strafford County was .77 % per year.

Table 3: Percent Population Growth, Madbury Area: 1970 – 2000
SOURCE: 1970, 1980, 1990, 2000 US Census

	1970-1980	1980-1990	1990-2000
Barrington	136.1%	40.0%	21.2%
Lee	42.5%	76.6%	11.2%
Madbury	**40.2%**	**42.2%**	**7.5%**
Dover	7.3%	11.9%	7.4%
Durham	20.1%	10.9%	7.2%
Madbury Area Communities	20.0%	18.8%	9.4%
Strafford County	21.3%	22.0%	7.7%
New Hampshire	24.8%	20.5%	11.4%

Figure 5: Percent Population Growth, Madbury Area: 1970 – 2000
SOURCE: 1980, 1990, 2000 US Census



2.4 Natural Increase and Migration

Population growth and change can be attributed to two fundamental components: natural increase and migration. Natural increase refers to the excess of births over deaths in any given time frame, while migration refers to the number of people who have moved into or out of a given geographic area. Madbury's vital statistics for the past several years are provided in order to determine what portion of the Town's population growth is due to the expansion of local families, and how much is due to an influx of new residents. Table 4 lists Madbury's births and deaths since 1981 and Figure 6 graphs this data.

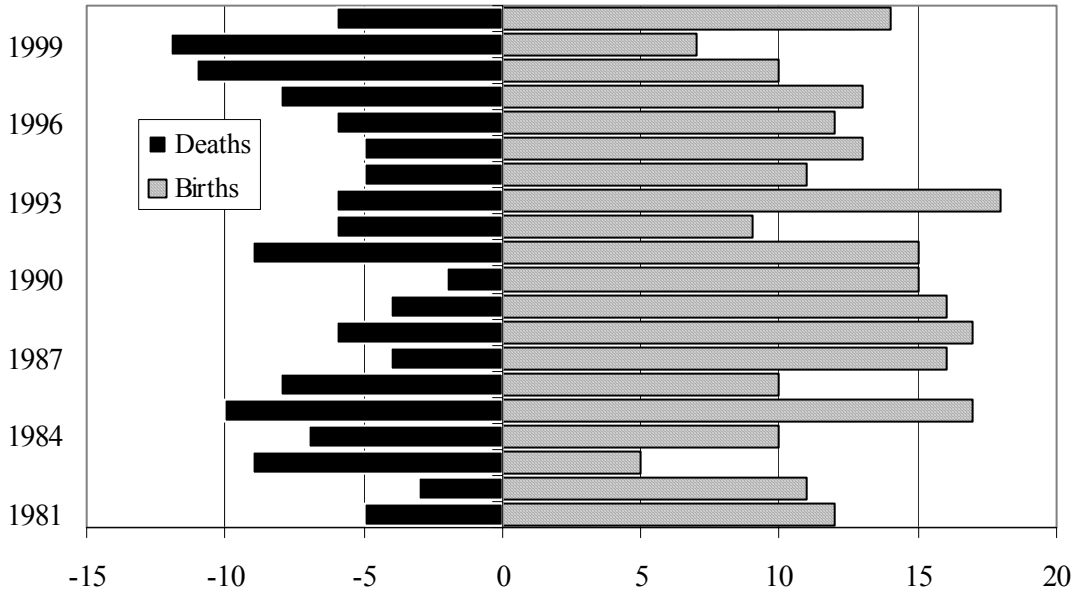
Since 1981, Madbury has experienced an addition of 251 residents through birth, and a loss of 132 residents through death, resulting in a net increase of 119 residents. Madbury's population has grown by 522 residents since 1980 according to the US Census. Therefore, Madbury's natural increase since 1981 has made up approximately 23% of the Town's population growth, with migration accounting for the remaining 77% of Madbury's growth over that span.

Table 4: Births and Deaths: 1981 - 2000
SOURCE: Madbury Town Reports

Year	Births	Deaths	Natural Increase
1981	12	-5	7
1982	11	-3	8
1983	5	-9	-4
1984	10	-7	3
1985	17	-10	7
1986	10	-8	2
1987	16	-4	12
1988	17	-6	11
1989	16	-4	12
1990	15	-2	13
1991	15	-9	6
1992	9	-6	3
1993	18	-6	12
1994	11	-5	6
1995	13	-5	8
1996	12	-6	6
1997	13	-8	5
1998	10	-11	-1
1999	7	-12	-5
2000	14	-6	8
Total	**251**	**-132**	**119**

Figure 6: Births and Deaths: 1981 – 2000

SOURCE: Madbury Town Reports



2.5 Age Distribution

Table 5 and Figure 7 group Madbury's current population by age. Children make up a substantial portion of the Town: nearly one third (31.7%) of the population is aged 19 or younger. The Town's population swells in the middle ages, with 47.7% of the population between the ages of 35 and 54. Madbury's population aged 60 and over remains smaller than the other age brackets. In each age bracket from 60 and over, Madbury's percent of the population is lower than the county's.

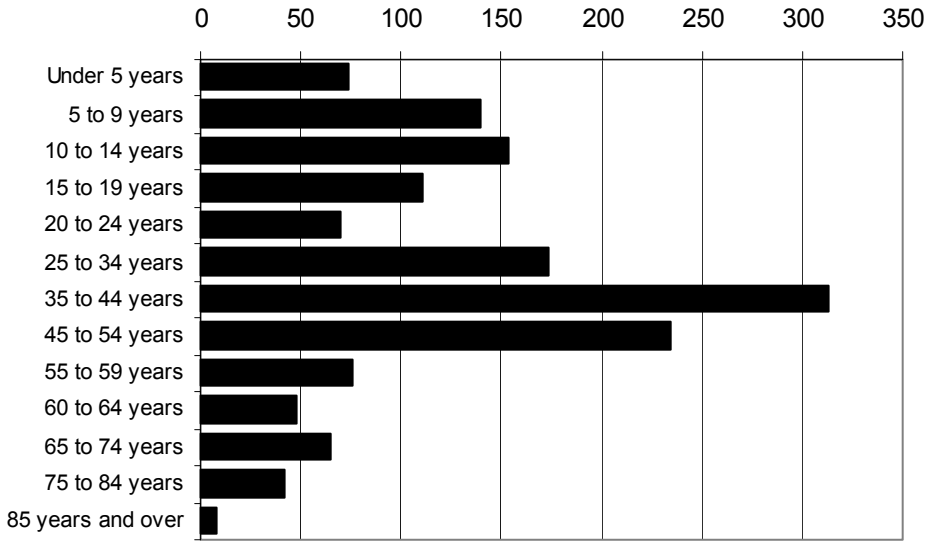
Table 5. Age Distribution in Madbury: 2000 [2]

Age Group	Number of Residents	Percent of Population
Under 5 years	74	4.9
5 to 9 years	140	9.3
10 to 14 years	154	10.2
15 to 19 years	111	7.4
20 to 24 years	70	7.6
25 to 34 years	174	11.5
35 to 44 years	313	20.7
45 to 54 years	234	15.5
55 to 59 years	76	5.0
60 to 64 years	48	3.2
65 to 74 years	65	4.3
75 to 84 years	42	2.8
84 years and over	8	0.5
Total	**1,509**	**100.0**

Figure 7: Age Distribution

[2] Note: Age groupings range from 5 to 10 years. Age groups are defined by US Census data processing guidelines.

SOURCE: 2000 US Census



3. Demographics– Based on Data from 1991-1999

3.1 Projected Population Growth

As of June 2001, the most recent population projections available for Madbury were those issued by New Hampshire Office of State Planning (NH OSP) in 1997. The NH OSP projections were based on a combination of 1990 Census data and OSP population growth estimates made during the mid-1990s. These projections are based on an estimated average annual growth rate of 2.9% through the year 2020. This growth rate is higher than Madbury's actual annual growth rate, .7% per year, between 1990 and 2000 for the Town of Madbury. Therefore, the 1997 NH OSP population projections should be considered a high estimate of Madbury's growth over the coming 20 years. An updated population projection report based on 2000 Census data is due to be completed by NH OSP in 2002. The 2002 NH OSP projections should be incorporated into this chapter when they become available.

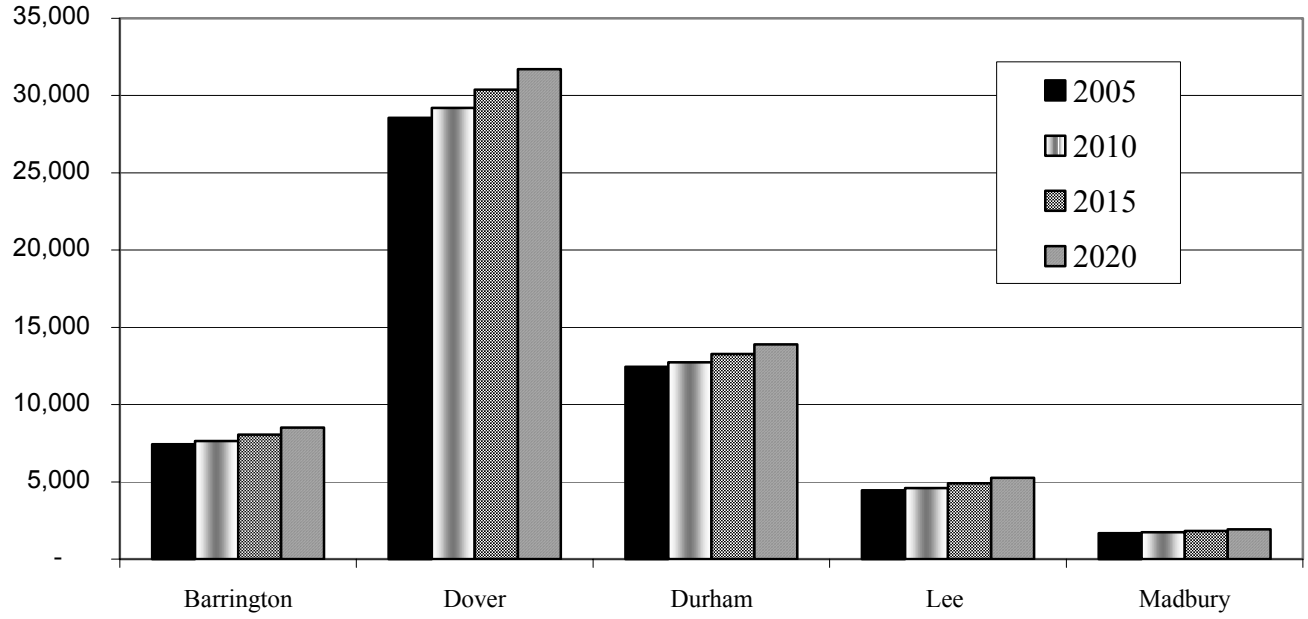
1997 NH OSP population projections estimate that Madbury's population will grow by approximately 100 people every five years through 2020. Additionally, the Town is projected to remain below 2000 residents through the year 2020.

Table 6 lists NH OSP population projections for the Madbury area through 2020. Figure 8 is based on data from Table 6.

Table 6: Madbury Area Population Projections
SOURCE: NH Office of State Planning, October 1997

	2005	2010	2015	2020
Barrington	7,438	7,648	8,056	8,510
Dover	28,562	29,205	30,389	31,704
Durham	12,438	12,737	13,285	13,894
Lee	4,452	4,606	4,913	5,254
Madbury	**1,684**	**1,733**	**1,828**	**1,934**
Madbury Area Communities	54,574	55,929	58,471	61,296
Strafford County	119,450	122,430	128,047	134,249
New Hampshire	1,306,638	1,358,750	1,441,668	1,527,873

Figure 8: Madbury Area Population Projections, 2005 – 2020
SOURCE: NH Office of State Planning, October 1997



3.2 Madbury Build-Out Study

In 1999, Strafford Regional Planning Commission completed the *Madbury Build-Out Study*. 'Build-out' refers to the time and circumstances whereby, based on a set of restrictions, no more building growth may occur. For the purposes of the build-out study, it meant the point at which, under current zoning requirements, no additional house lots could be created in Madbury. The study primarily aimed at predicting the number of residential lots in Town, but as a component of the study, maximum population estimates were conducted as well. The objectives of this study were to:

- Predict how much future growth current (as of 1999) land use ordinances would allow.

- Determine where growth in Town is likely to occur.

In 1997, there were an average of 3.09 persons per residential dwelling, and a total of 493 dwellings in Town. The study found that 1,323 potential new single-family residences could be built based on current zoning laws. The sum of existing dwellings and potential new single-family residences was 1,816 residences. Given an average of 3.09 persons per dwelling, this would equate to a maximum of 5,611 residents in Town. The study also found that Madbury's maximum population would be reached in the year 2128 based on 1997 NH OSP population projections.

Although the population projections from that study were based on 1990 Census data and overestimated population projections, the study is useful as a tool to consider the future growth of the Town under current zoning ordinances, building codes, and conservation lands. This study also projects Madbury's maximum population and housing numbers. The Build Out Study, including maps, is attached to this chapter as Appendix I.

3.3 School Age Population Projections

Table 7 lists school age NH OSP population projections made in the early 1990s based on 1990 US Census data. School age population projections are especially difficult to project beyond five years because of unpredictable shifts in economic and housing factors that may influence the rate at which families with children settle in or leave Town. For sake of comparison between the NH OSP projections and the actual Census figures, the 2000 Census population data are listed in Table 7 above the projected figures for 2000. NH OSP Madbury projections for the year 2000 were considerably different than the actual 2000 Census data. In particular, NH OSP projections for children between the ages of 0 to 4 and 10 to 14 were inaccurate. Projections were more accurate between ages 5 to 9 and 15 to 19. Given the lack of accuracy and the age of the data, Table 7 and Figure 9 are marginally useful at best.

As an alternative to Table 7, Table 8 projects school age populations based solely on following the 2000 US Census data through five year intervals. This method assumes no growth, does not attempt to predict births or migration, and should therefore be considered a low estimate. Based on actual 2000 Census figures, Madbury can expect an increase in the number of students attending Oyster River High School between 2002 and 2005. In 2000 there were 111 children aged 15 to 19 in Madbury. Assuming most children between the ages of 10 and 14 currently living in Madbury remain in Town, the number of high school aged students could increase by over 40 students between 2002 and 2005. It appears that Madbury's elementary and middle school populations could experience a slight decline between 2001 and 2005.

Table 7: School Age Population Projections

SOURCE: NH OSP Population Projections (based on 1990 Census); 2000 US Census.

Year	Ages 0-4	Ages 5-9	Ages 10-14	Ages 15-19	Total
Actual 2000	74	140	154	111	479
Projected 2000	102	133	117	159	511
2005	95	110	143	176	524
2010	99	113	116	203	531
2015	105	103	118	173	499

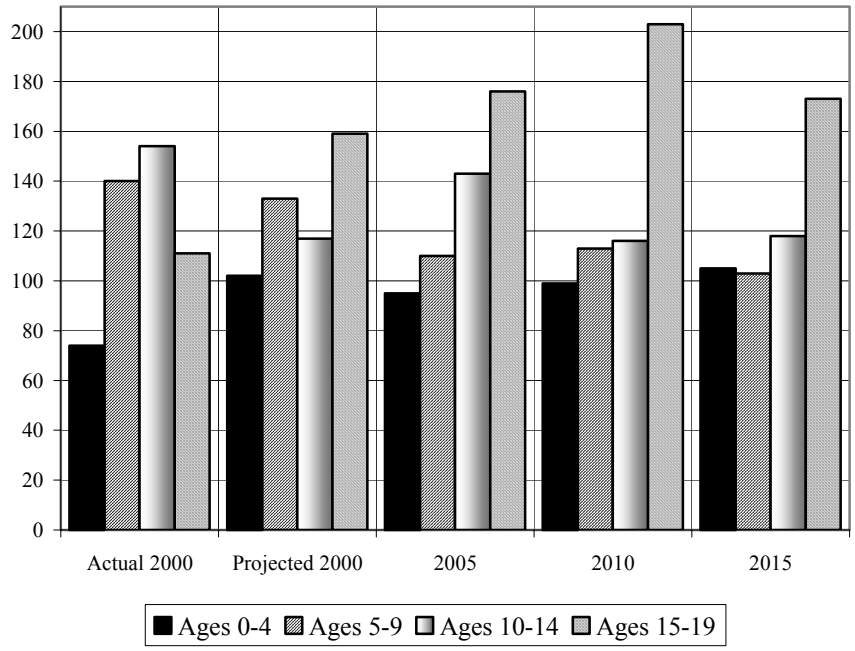
Table 8: Revised School Age Population Projections

SOURCE: Roughly based on 2000 US Census

	Ages 0-4	Ages 5-9	Ages 10-14	Ages 15-19
Actual 2000	74	140	154	111
Projected 2005		74	140	154
Projected 2010			74	140
Projected 2015				74

Figure 9: School Age Population Trends (Based on data in Table 7)

SOURCE: NH OSP Population Projections (based on 1990 Census); 2000 US Census



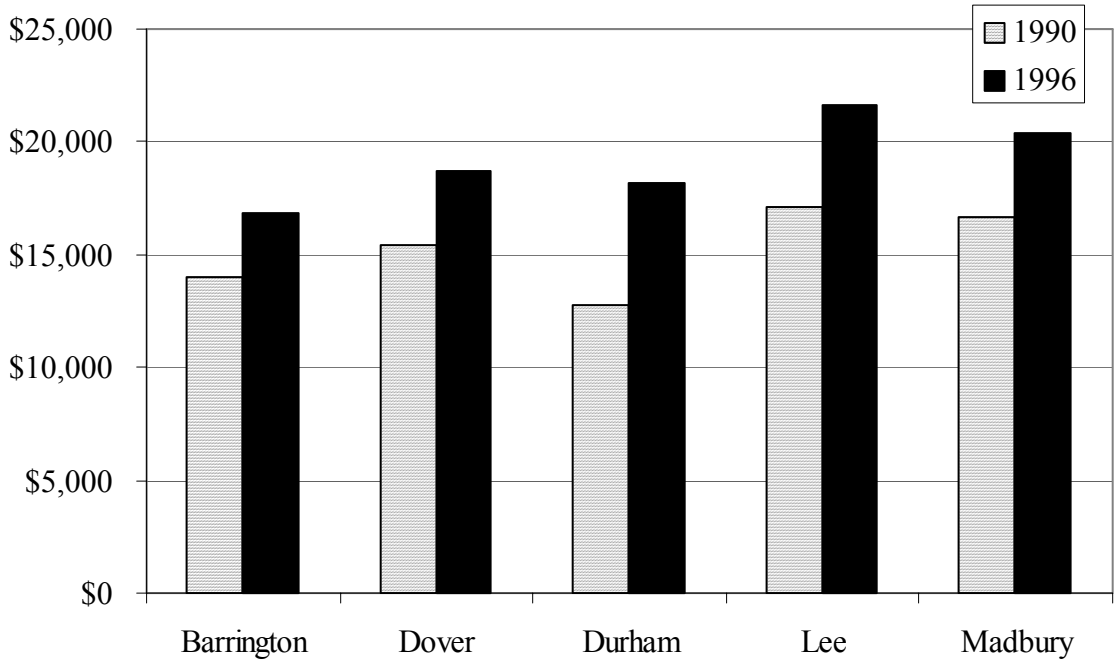
3.4 Per Capita Income

The Department of Revenue Administration ranked Madbury's 1996 per capita income of $20,346, 67th in the state. The Town's per capita income grew by about $3,700 between 1989 and 1996. Madbury continues to follow Lee as the Town with the highest per capita income in the Madbury area. Table 9 compares 1989 per capita income in the Madbury area with 1996 estimates. Figure 10 graphs this data.

Table 9: Per Capita Income, Madbury Area
SOURCE: 1990 US Census; NH OSP, 1997

	1989	1996
Barrington	$14,033	$16,860
Dover	$15,413	$18,706
Durham	$12,774	$18,151
Lee	$17,153	$21,630
Madbury	**$16,695**	**$20,346**

Figure 10: Per Capita Income, Madbury Area
SOURCE: 1990 US Census; NH OSP, 1997



4. Demographics - Based on 1990 Data

4.2 Population Movement

The 1990 Census indicated that the typical Madbury resident has resided at his/her present dwelling for a slightly shorter period than have most residents of Strafford County and New Hampshire. Thirty-six percent of Madbury's residents lived in Madbury between 2 to 5 years as of 1990. Table 10 compares Madbury's duration of residence in 1990 with the county and state figures.

Table 10: Years at Present Residence
SOURCE: 1990 US Census, Table STF3A

	Madbury	County	NH
0 to 1 Year	**16%**	23%	20%
2 to 5 Years	**36%**	32%	33%
6 to 10 Years	**19%**	14%	15%
11 to 20 Years	**16%**	15%	17%
21 Years or More	**13%**	16%	15%

According to the 1990 Census, for the first time since data has been tracked the majority of Madbury's residents were born outside of New Hampshire. Figure 11 compares Madbury residents' place of birth with those of Strafford County and the state.

Figure 11: Place of Birth
SOURCE: 1990 US Census, Table STF3A

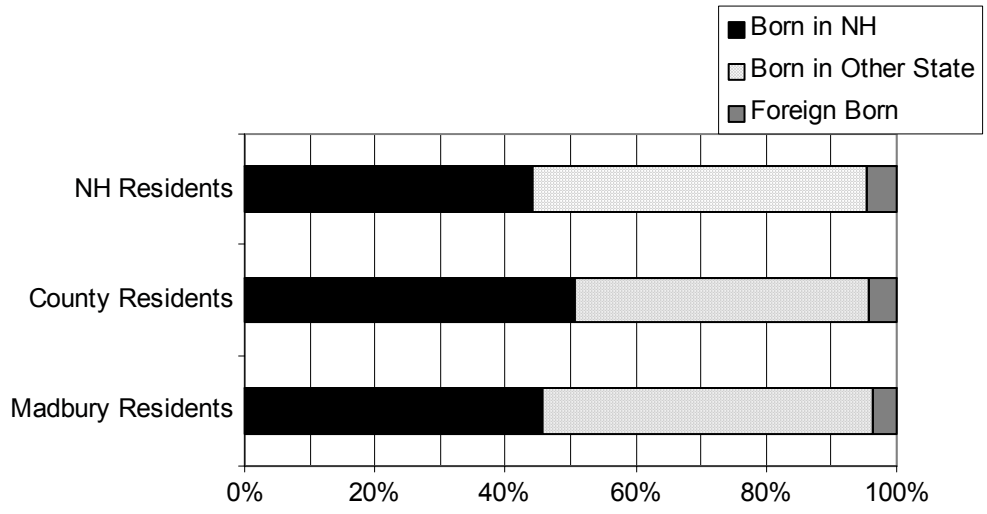
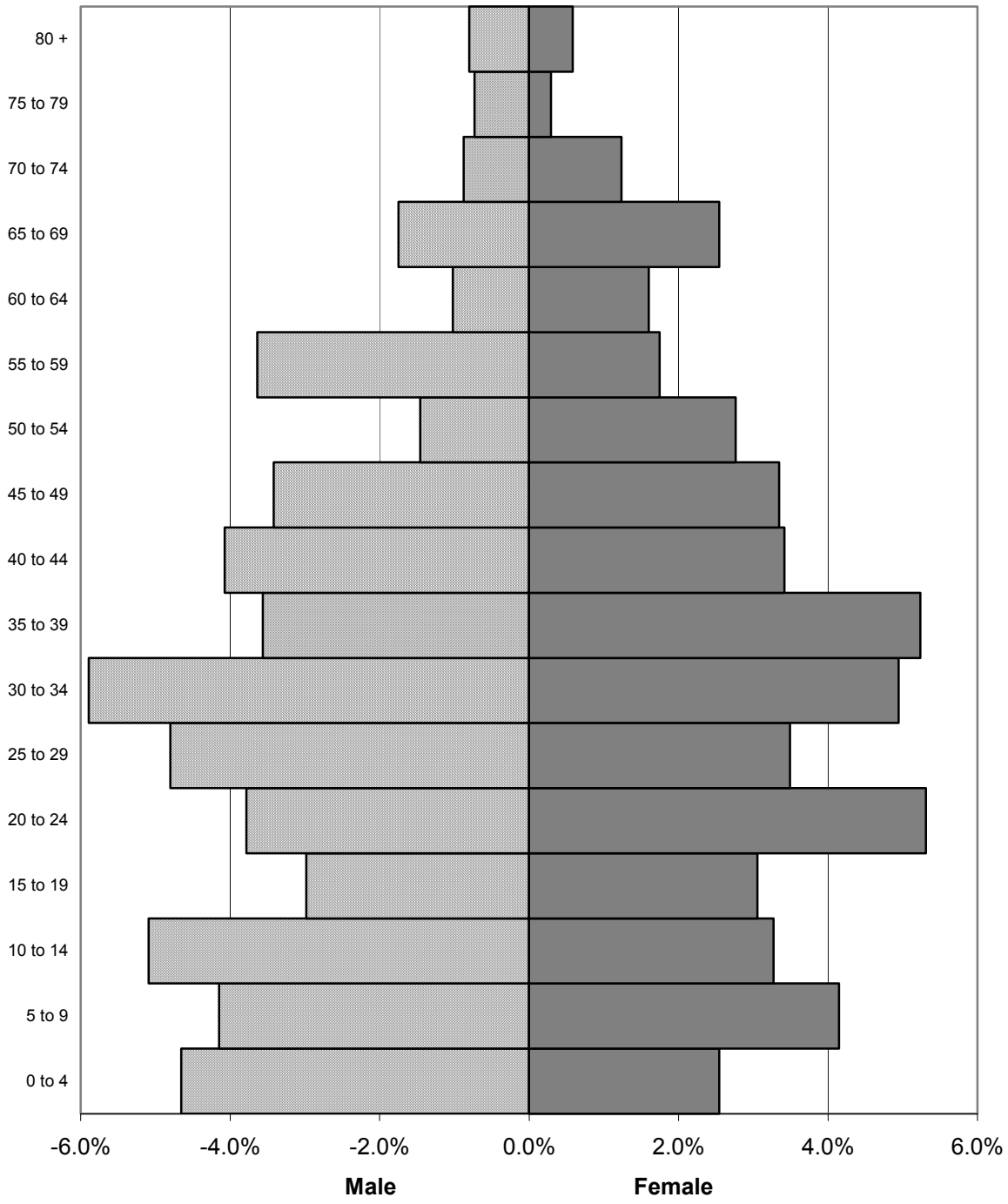


Figure 12: Population Pyramid
SOURCE: 1990 US Census



4.2 Population Characteristics

According to the 1990 Census, the majority of Madbury's residents aged fifteen and over was married as of 1990. However, the percentage of divorced residents continued to increase from 1980 levels. The percent of married adults in Madbury is higher than both the state and county averages. Table 11 lists the marital status of Madbury's residents in 1980 and in 1990 and compares this with state and county percentages.

Table 11: Marital Status, Persons 15 Years & Older
SOURCES: 1980 & 1990 U.S. Census, Table P14

	Madbury 1980	Madbury 1990	County 1990	NH 1990
Single	27%	27%	30%	25%
Married	63%	62%	54%	58%
Separated	0%	1%	2%	2%
Widowed	5%	3%	6%	7%
Divorced	5%	7%	8%	8%

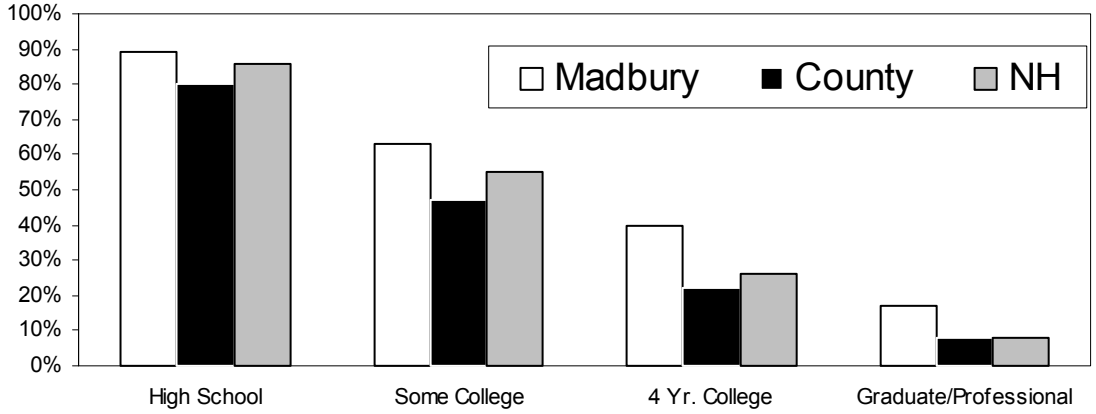
The 1990 Census indicated that the typical Madbury household is more likely to be occupied by a married couple than is the case with the county and state population. Table 12 summarizes the heads of households in Madbury and compares this with state and county percentages.

Table 12: Heads of Households
SOURCE: 1990 U.S. Census, Table 19

	Madbury	County	NH
Married Couple	66%	57%	60%
Single Male	3%	3%	3%
Single Female	8%	9%	8%
Other Arrangement	23%	31%	29%

According to the 1990 Census, Madbury residents reach higher education attainment than Strafford County or the state as a whole. Figure 13 graphs educational background of Madbury's residents.

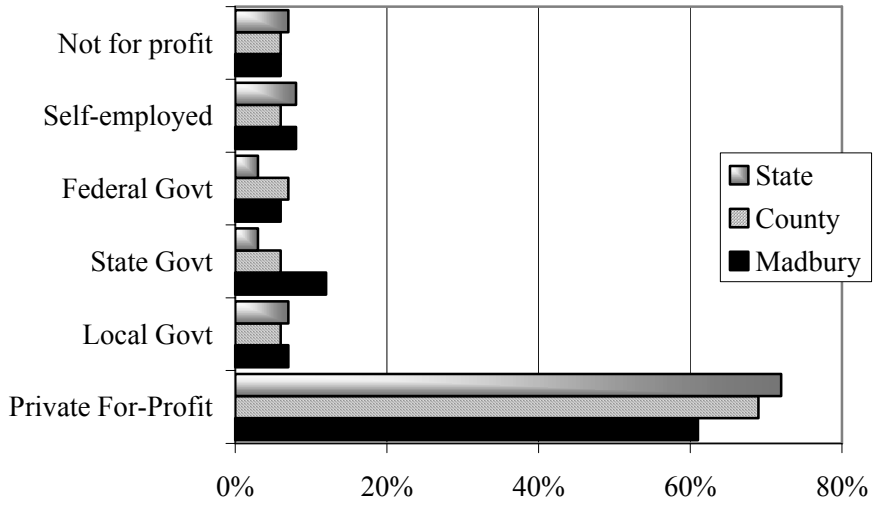
Figure 13: Educational Background
SOURCE: 1990 US Census



4.3 Employment Characteristics

The Employment Class graph below, based on 1990 Census data, shows an unusually high percentage of local residents working for the state government (Figure 14) and in education (Figure 15). This probably reflects the large number of local citizens who work at the University of New Hampshire.

Figure 14: Employment Class
SOURCE: 1990 US Census, STF 3A



According to the 1990 Census, Trade was the most common occupation in Madbury at 21%. The next most frequent industry was Education at 17%, followed by Manufacturing at 15%. Another 10% of Madbury's residents worked in the Construction industry as of 1990 (Figure 15).

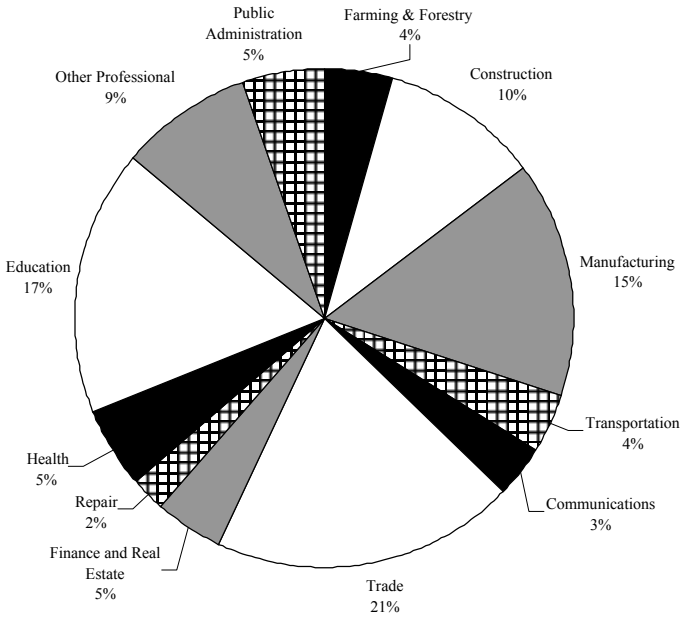


Figure 15: Employment by Industry: 1990
SOURCE: 1990 US Census, STF3A

4.4 Median Household Income

Section II provides more recent information regarding Madbury's income. According to the 1990 Census, Madbury's income is distributed in the higher brackets more often than the Town's neighbors, on average (Table 13).

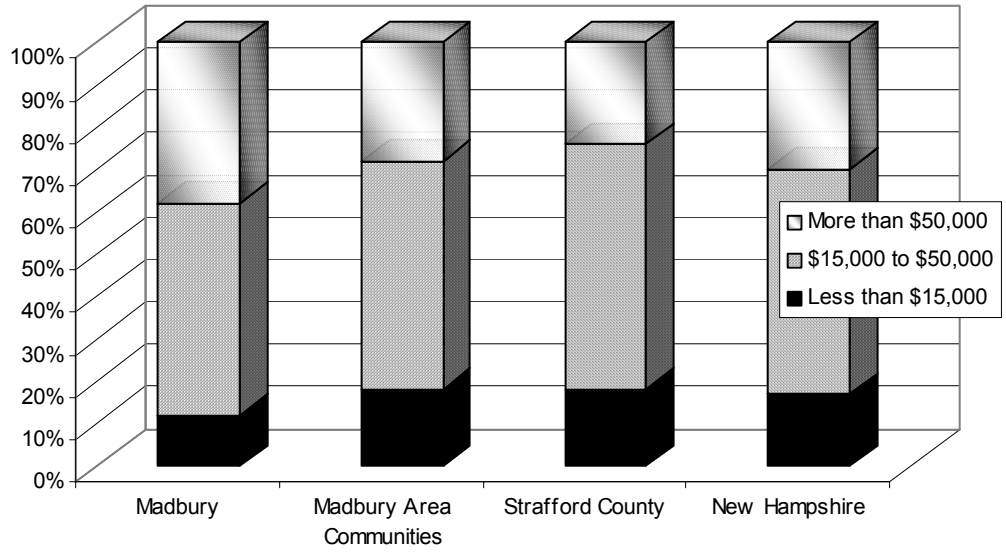
Table 13: Income Distribution Median Household Income
SOURCE: 1990 U.S. Census, STF3A Table 80

	Less than $15,000	$15,000 to $50,000	Greater than $50,000
Barrington	12%	64%	24%
Dover	20%	57%	23%
Durham	22%	33%	45%
Lee	8%	52%	40%
Madbury	**12%**	**50%**	**38%**
Madbury Area Communities	18%	54%	28%
Strafford County	18%	58%	24%
New Hampshire	17%	53%	30%

As Figure 16 represents, in 1990 Madbury had a lower percent of its population under $15,000 than its neighbors, the county, and the state.

Figure 16: Income Distribution

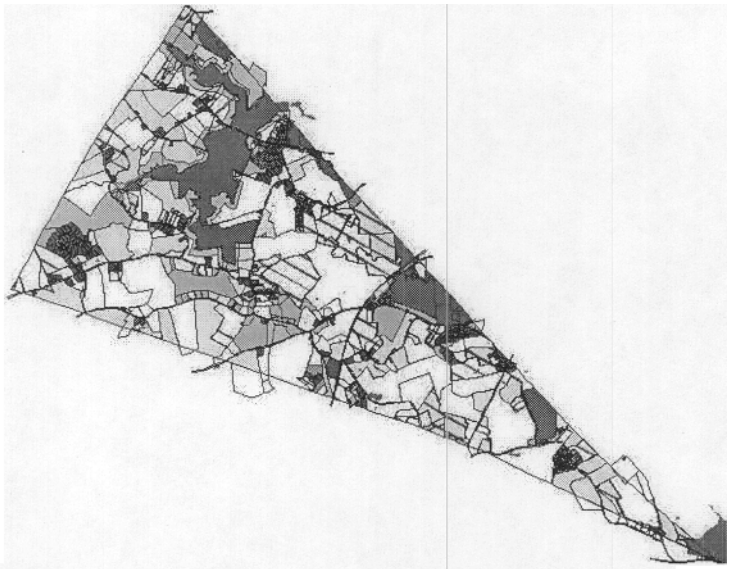
SOURCE: 1990 US Census, STF3A



Appendix I

Madbury Build Out Study

Town of Madbury, New Hampshire
Master Plan: Toward the Year 2010
Demographics



Strafford
Regional
Planning
Commission
259 County Farm Rd, Unit 1
Dover, NH 03820-6019
tel: (603) 742-2523

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New Hampshire Office of State Planning Town of Madbury, New Hampshire

Madbury Build-Out Study

March 25, 1999

Contents

Project Summary

The Town of Madbury, NH was awarded with a grant from the New Hampshire Coastal Program in order to perform a town-wide build-out analysis. Madbury is a rural bedroom community and lacks substantial infrastructure. New residential development would have a significant effect upon the resources of the community. The Madbury Planning Board is interested in predicting how much future growth its current land use ordinances will allow as well as seeing where the growth is likely to occur. Madbury sought the resources of the Strafford Regional Planning Commission (SRPC) to carry out the build-out analysis.

'Build-out' refers to the time and circumstances whereby, based on a set of restrictions, no more building growth may occur. For our purposes it means the point at which, under current zoning requirements, no more house lots may be created in Madbury .It is the point at which lots have been subdivided to the minimum size allowed and there is no more 'developable' land. By analyzing maps and available information an estimate can be generated on the maximum number of houses and people that could exist in Madbury, and an estimate of what year that may be reached.

A build-out analysis methodology was formulated by SRPC with input from the Madbury Planning Board. The strategy was to use SRPC's Geographic Information Systems (GIS) to produce a set of maps produced through GIS analysis. This analysis involved overlaying tax parcel data with spatial data layers representing areas where residential development is not permitted. The maps show potential for development based upon residentially developable areas and upon existing zoning. The study is aimed at predicting the maximum number of residential lots and / or units that may develop in the future. For this study, residential development was restricted to single family residences.

In order to determine the location and extent of where single family residences may potentially be built, the Ordinances and Regulations of the Town of Madbury (3/1998) were used. Restrictions to development as listed in the ordinances and as set by the Planning Board are as follows: areas of poorly drained and very poorly drained soils; areas that fall within the Shoreland Protection Overlay District of Madbury (refer to Ordinance); land sloped greater than 15%; areas of the 100 year floodplain (not in Ordinance but listed by Planning Board). These areas were excluded from potential residential development areas. Other areas that were excluded from potential residential development are the non-residential zoning districts: Civic District, Neighborhood Commercial District, and the Commercial and Light Industrial District. Permanent conservation lands and special parcels were also excluded. Among these are the Bellamy Reservoir parcel and its flowage easements and municipally and state owned parcels. A major component of this study was the update of the GIS parcel layer of Madbury. SRPC had digitized the Madbury Tax Composite map in 1996. This layer was brought up to date and matched to assessing data files. Parcels that had existing houses and that could not be subdivided further were also excluded from the available residential lands. Parcels that cannot be subdivided but do not have existing homes were added to the pool of residential development land.

The sections of the subdividable lots that were developable were divided by the minimum allowable lot size of 80,000 square feet to determine the number of potential lots they could yield. For lots that would not have existing road frontage of 200ft, 10% was subtracted from their areas to allow for subdivision roads. A per parcel tally of potential new lots and/ or homes was determined. From this a build-out number of residences were derived.

The next segment of the build-out study was to estimate the possible build-out population of Madbury. This was determined by multiplying the current average number of persons per

household in Madbury by the sum of the build-out residential units. This was based on existing information and the assumption that the ratio would remain constant.

The final part of the build-out study was to estimate when build-out might be reached. Two methods were used for this. The first was to look at population data, determine a rate of growth and apply that growth rate to reach the pre-determined build-out population (see above). The second method used housing starts data to apply a yearly average to reach the build-out total of residences.

The major product of the study is the set of maps produced to display the build-out and the inputs to the build-out. The Madbury Planning Board will have these maps to assist them in visualizing potential growth areas in Madbury. Future subdivision proposals can be compared to the maps to weigh their effect upon the town.

List of Maps

(Copies of the following maps are available for review at the office of the Town Clerk, Town Library and Strafford Regional Planning Commission.)

1 Zoning
Existing zoning districts

2 Lands Excluded from Residential Development
Parcels owned by State, Madbury, Dover, and Portsmouth, permanent conservation easements, commercial districts. Also shown but not excluded: Managed Forest Lands and UNH Kingman Farm Property.

3 Lots Available for Development
Built and non-built, non-dividable lots, built and non-built subdividable lots, also shown are lots excluded from development

4 Undevelopable Land
100 year floodplain, Shoreland Protection Overlay District, land sloped greater than 15%, very poorly and poorly drained soils.

5 Undevelopable Land with Permanent Conservation Easements
Items from Undevelopable Land map and permanent conservation easements shown in one color

6 Developable, Subdividable Land
The developable portions of subdividable lots are shown classed by how many potential lots they may yield. Frontage and subdivision road areas have not been determined. Undevelopable lands also shown.

7 Number of Potential Additional Homes/Lots Estimated from Each Existing Lot
Developable, subdividable lots shown classed by how many potential lots they may yield. Areas for subdivision roads for parcels that would lack the minimum frontage requirement have been subtracted.

8 Parcels Under Current Use
Current Use parcels are shown color classed on Current Use type: Farm, Forest, or Mixed. Hatched overlay-showing parcels allowing for Recreation under Current Use. To be used in considering for likelihood of development.

Findings

Average Number of Persons per Residential Dwelling in Madbury = 3.09

It was determined from the Town Property database (pro99.dbf) that there are 493 residential dwellings. Of these, 60 are mobile homes and 433 are multi or single-family residences. This data was obtained from the Town's assessing files in February 1999. As determined from the digitized composite tax map (1999), there are 651 ownership parcels in Madbury .The 1997 NH Office of State Planning population estimate for Madbury is 1,523 persons. Using these figures gives estimated persons per dwelling number of 3.09.

Sum of Potential new Single Family Residences = 1,323

GIS overlay analysis using existing data layers determined there to be an estimated 1,323 possible new single-family residences under current zoning requirements. This figure assumes that each new residence will be built upon a lot that is at least 80,000 square feet of developable land. Developable land was determined by extracting areas that are listed as 'undevelopable' by the 'Ordinances and Regulations of the Town of Madbury' (last amended March 10, 1998). Undevelopable areas are: Shoreland Protection District; land sloped greater than 15%; poorly drained and very poorly drained soils. In addition to these, areas of 100-year floodplains were extracted. For areas that would not have adequate existing road frontage (200ft), 10% of the area was extracted for subdivision roads.

NOTE: the site-specific geography of each parcel was not considered. The number reflects raw area estimates. The specific arrangement of existing residences and undevelopable areas per parcel is beyond the scope of this study.

Sum of Existing Dwellings and Potential new Single Family Residences Build-Out Residential Total = 1,816 Residences

It was determined from the Town Property database (pro99.dbf) that there are 493 residential dwellings. GIS overlay analysis using existing data layers determined there to be an estimated 1,323 possible new single-family residences under current zoning requirements. The sum of these represents the Build-Out Residential Total = 1,816 residences. This assumes that all new units are single-family residences with a lot size of 80,000 square feet of developable land.

Total Possible Population = 5,611

The estimated total of new persons, given an average of 3.09 persons per dwelling, is 4,088. Adding this to the existing population (1997 *asp* estimate) of 1,523 equals 5,611 persons.

Estimated Year of Build-Out

Using Population Growth Rate = 2128

Using Housing Starts Data = 2146

Population Growth Rate. It was determined from population projections produced by the NH Office of State Planning that the average yearly growth rate for Madbury will be 1% per year in the period from the year 2000 to 2020. Applying this rate to the 1997 NHOSP population estimate (1,523), it would take 131 years to reach the estimated build-out population of 5,611. If Madbury were to grow by 1% yearly, it would reach a population of 5,608 persons in the year 2128.

Housing Starts Data. Information supplied by the Oyster River School District, Long Range Planning Committee on housing starts for Madbury yields an average of 9 houses per year for the 1990s. Using this average it would take 147 years from 1999 to reach the build-out amount of 1,816 residences. This would occur in the year 2146.

Tables

Build-Out Year Predicted by Population Growth
Madbury Build-Out Study, 1999

Projected Populations per Year using a Growth Rate 1% per year.

Year	Population
1997	1523
2000	1569
2010	1733
2020	1915
2030	2115
2040	2336
2050	2581
2060	2851
2070	3149
2080	3478
2090	3842
2100	4244
2110	4688
2120	5179
2130	5721

The estimated Build-Out population of Madbury is 5,611 persons. It would take 131 years from 1997 to reach this population using a growth rate of 1% per year. The estimated Build-Out year of Madbury is 2128, when the population will reach 5,608.

The estimated build-out population assumes that all developable land has been divided into 80,000 square foot lots for single-family residences, with an average of 3.09 persons per house. The 1% per year growth rate is based upon NHOSP population projections for Madbury for the period of 2000-2020.

Build-out would occur in 2128.

Build-Out Year predicted by Housing Starts
Madbury Build-Out Study, 1999

Housing Starts for Madbury, NH

Source	Year	# Of Starts	
NH Office of Strategic Planning/ NH Office of State Planning	1978 1979 1980 1981 1982 1983 1984	28 24 7 9 2 7 16	Average # of starts: 16.8 per year (1978-1989)
Madbury Town Office	1985 1986 1987 1988 1989	44 29 21 4 11	
	1990 1991 1992 1993 1994 1995 1996 1997	10 6 12 7 8 6 7 7	Average # of starts: 9 per year (1990-1997)

For this study, the 1990s housing starts average of 9/yr is used. The estimated amount of possible new single-family residences is 1,323. Adding 9 houses per year, it would take 147 years to reach this amount.

Build-out would occur in 2146.

Conclusions

The Madbury Planning Board is pleased with the products that it received as part of this study. They feel the maps will be of benefit to them as they review future development proposals. While the maps were produced using the best GIS data available, the Planning Board understands the limitations of the mapped data. The Planning Board will use its own local knowledge and judgment when referring to the maps. Noteworthy are a few cases in which a Planning Board member disagreed with the amount of developable land the GIS analysis had determined for certain parcels. Due to the mapping standards of some of the spatial data layers, these discrepancies will occur.

The scope of work for this study called for the production of only two maps. However, through working with the Planning Board and developing a sound methodology, it was determined that more maps would be more demonstrative to the process. In all, a collection of eight maps was produced. The maps assist the user in visualizing the method used to determine the number of potential additional homes estimated for each existing lot. The last map of the collection, which displays which parcels are under current use, was not an input to the build- out. This map was produced to help the Planning Board predict likelihood of development in certain areas of Madbury.

The scope of work called for the production of a map, which would rank parcels by their likelihood of development. It was later determined by the Planning Board that this map would not be produced. The Planning Board decided that it would be time better spent looking at the build-out maps, than attempting to predict where development will occur. Due to the number of factors involved, this type of prediction is far too complex and too variable to make.

The final products delivered to Madbury are a full sized set of the build-out maps printed on translucent durable film, a full sized set printed on special color inkjet paper, and a half sized set printed on bond paper. Copies of this report will also be provided. SRPC will be giving Madbury copies of parcel base maps, which the Planning Board can use to sketch planning scenarios upon.

In the immediate future, SRPC will set up a desktop computer for the Madbury Planning Board to use. It will be loaded with a simple 'freeware' GIS data browsing software along with the spatial data used in the build-out study. With this capability, the Planning Board can fully utilize the digital products produced in this study.