1993

Adaptive Reuse of Historic Mills in the Blackstone River Valley National Heritage Corridor Uxbridge, Massachusetts

Center for Economic Development

Follow this and additional works at: https://scholarworks.umass.edu/ced_techrpts

Part of the Growth and Development Commons, Infrastructure Commons, Other Architecture Commons, Place and Environment Commons, Regional Economics Commons, Regional Sociology Commons, Urban, Community and Regional Planning Commons, and the Urban Studies and Planning Commons

Retrieved from https://scholarworks.umass.edu/ced_techrpts/118

This Article is brought to you for free and open access by the Center for Economic Development at ScholarWorks@UMass Amherst. It has been accepted for inclusion in Center for Economic Development Technical Reports by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact scholarworks@library.umass.edu.
ADAPTIVE REUSE OF HISTORIC MILLS IN THE BLACKSTONE RIVER VALLEY NATIONAL HERITAGE CORRIDOR UXBRIDGE, MASSACHUSETTS

Spring 1993
Principal Investigator
Julius Gy. Fabos, Ph.D., FASLA

The Center for Economic Development wishes to thank the Research Team
Eric Aaron Nelson, research assistant
Margaret Bryant, editor
The METLAND Research Group

This study was funded in part by the Blackstone River Valley National Heritage Corridor Commission. The Center for Economic Development at the University of Massachusetts, in Amherst, is part of the Landscape Architecture and Regional Planning Department and is funded by the Economic Development Administration of the U.S. Department of Commerce and the University of Massachusetts.
ACKNOWLEDGEMENTS

This study was made possible by the support of the Blackstone River Valley National Heritage Corridor Commission. In particular, we would like to thank James R. Pepper, the Executive Director, and Nancy L. Brittain, the community planner for the Corridor. Mr. Pepper's vision and political skills were invaluable for initiating this project. Ms. Brittain provided essential guidance and a much-needed understanding of the local community, economy, and needs. We would also like to thank Professors Jack Ahern, Mark Lindhult, and our department head, John Mullin, for their valuable advice and comments on the study and report.
The Industrial Revolution in this country began in the Blackstone River Valley of Massachusetts. Today, the stately mill buildings that lie along the rivers and canals of this region are reminders of the area's rich industrial past. Unfortunately, many of these old industrial buildings are abandoned or underutilized. They represent, however, a significant untapped resource for the Blackstone River Valley, and their significance in both economic and historical terms is beginning to be recognized. This report focuses on the process for adaptive reuse of historic mills in the Blackstone River Valley National Heritage Corridor. In particular, mills in Uxbridge, Massachusetts are the focus of the site-level planning and design procedure developed here.

Mills in the Blackstone River Valley have been abandoned or are underutilized for a number of reasons. One potential reason is that the site may have environmental constraints like contamination from past industrial activity. Such sites may not be viable candidates for adaptive reuse if the clean-up requirements are extensive. Other reasons for the mills' underuse stem from the fact that these structures were designed for the industrial activities of another era. There was no need for truck access then, because goods were shipped by water and later by railroad. The industrial processes could take place in multistoried buildings unlike the sprawling industrial complexes of today. Therefore, the reuse of these buildings today must take these design factors into account. The buildings are generally located in the center of town, have limited truck access and parking, and are multistoried. Many of the buildings are historically significant. With the proper design, these features can be great opportunities.

A new era of adaptive reuse has led to the discovery of many new opportunities created by these historic mill resources. Following adaptive reuse, the mills are great locations for incubator
industries and small businesses. The importance of this lies in the fact that 66% of all new firms have less than 20 employees and are involved in manufacturing a product. Renovated and rehabilitated mills are excellent sites for these types of businesses. Appropriate use of these resources can also be less expensive than building new structures to house light industry, retail activities, or multifamily residential units.

Other beneficial effects of adaptive reuse of mill buildings include the boost they provide to community revitalization efforts. The location of mills in the center of town means that they are close to people resources and are part of the community. If centrally located, they are generally accessible to pedestrians and tourists and may be close to other businesses and attractions.

In summary, the Blackstone River Valley has a great opportunity to make use of the resources provided by old industrial buildings and mills that are currently abandoned or underutilized. This study outlines the procedure for adaptive reuse of historic mills and demonstrates it with a case study of Uxbridge, Massachusetts. Three main factors are considered in the planning process: historic significance and educational value; infrastructure support and building/site conditions; and surrounding land use and environmental concerns. The process is carried through to the stage of detailed site-level design, demonstrated by the design of the Stanley Woolen Mill of Uxbridge. This study can be used to inform future adaptive reuse projects and will be a model for efforts in the Blackstone River Valley.

1 This information was obtained from John Mullin, CED director, in May of 1993.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>FOREWORD</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>ix</td>
</tr>
</tbody>
</table>

## CHAPTER ONE · INTRODUCTION

1.1 CONTEXT AND GOAL OF THE STUDY ........................................ 1
1.2 DESCRIPTION OF THE STUDY ............................................... 4
1.3 THE STUDY AREA
    1.3.1 Location ..................................................... 6
    1.3.2 History ..................................................... 6
    1.3.3 Description ................................................ 8
1.4 REPORT ORGANIZATION ................................................................ 8

## CHAPTER TWO · STATE OF THE ART ............................................ 10

2.1 THE CASE FOR ADAPTIVE REUSE ............................................ 10
2.2 PLANNING AND DESIGN FOR ADAPTIVE REUSE
    BASED ON PRINCIPAL FACTORS ........................................... 11
    2.2.1 Historic Significance and Educational Value .................. 14
    2.2.2 Infrastructure Support and Building/Site Conditions ....... 18
    2.2.3 Surrounding Land Use and Environmental Concerns ............ 20
2.3 CASE STUDY: BOOTT COTTON MILLS; LOWELL, MASSACHUSETTS ............. 21
    2.3.1 Historic Significance and Educational Value ................. 22
    2.3.2 Infrastructure Support and Building/Site Conditions ....... 23
2.3.3 Illustration of the Use of Design Guidelines.................................23

2.4 INTERVIEWS WITH INDIVIDUALS INVOLVED WITH
ADAPTIVE REUSE ...........................................................................24

2.4.1 Historic Significance and Educational Value ................................25

2.4.2 Infrastructure Support and Building/Site Conditions......................25

2.4.3 Surrounding Land Use and Environmental Concerns .....................27

2.5 SUMMARY ..................................................................................28

CHAPTER THREE - METHODS FOR PRIORITIZING MILLS
FOR ADAPTIVE REUSE .................................................................29

3.1 PHASE I: TOWN LEVEL ASSESSMENT FOR
ADAPTIVE REUSE POTENTIAL ...................................................31

Step One: Utilization Levels of Mills ..................................................31

Step Two: Identification of Historic Significance .................................31

Step Three: Determining If Mills Are Located in a Historic District ........32

3.2 PHASE II: DISTRICT LEVEL ASSESSMENT FOR
ADAPTIVE REUSE POTENTIAL ...................................................33

Step One: Assessment of Historic Significance and Educational Value ....34

Step Two: Infrastructure Support And Building/Site Conditions ..........37

Step Three: Surrounding Land Use and Environmental Concerns ..........43

Step Four: Composite Suitability Assessment Rating
and Adaptive Reuse Potential Ranking .............................................46

3.3 PHASE III: USE ALTERNATIVES AND SITE SPECIFIC DESIGN ....48

Step One: Generation of Use Alternatives ...........................................48

Step Two: Site Analysis and Assessment .............................................49

Step Three: Develop Alternative Layouts With Parking Requirements ....51

Step Four: Evaluate Proposed Use Alternatives ...................................55

Step Five: Prepare Schematic Design ................................................58

3.4 SUMMARY ...............................................................................59
CHAPTER FOUR - PLANNING AND DESIGN FOR A HISTORIC MILL IN UXBRIDGE

4.1 APPLICATION OF PHASE I: TOWN LEVEL ASSESSMENT FOR ADAPTIVE REUSE POTENTIAL

Step One: Assessment of Utilization Levels of Mills Within Study Area

Step Two: Identification of Historically Significant Mills in the Study Area

Step Three: Determine That Mills Identified As Both Underutilized and Historically Significant Are Located Within a Historic District

4.2 APPLICATION PHASE II: DISTRICT LEVEL ASSESSMENT FOR ADAPTIVE REUSE POTENTIAL

Step One: Historic Significance and Educational Value Assessment

Step Two: Infrastructure Support and Building/Site Conditions

Step Three: Surrounding Land Use and Environmental Concerns

Step Four: Composite Assessment Matrix and Ranking

4.3 PHASE III: SITE SPECIFIC PLANNING AND DESIGN

Step One: Development of Use Alternatives for Stanley Woolen Mill

Step Two: Site Analysis and Assessment

Step Three: Development of Alternative Layouts with Parking

Step Four: Evaluation of Proposed Use Alternatives

Step Five: Schematic Design

4.4 Summary of Case Study

CHAPTER FIVE - CONCLUSION

APPENDIX

REFERENCES
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Regional Greenway Plan</td>
<td>2</td>
</tr>
<tr>
<td>1.2</td>
<td>Municipal Level Master Plan for Uxbridge, MA</td>
<td>3</td>
</tr>
<tr>
<td>1.3</td>
<td>Uxbridge and the Heritage Corridor</td>
<td>7</td>
</tr>
<tr>
<td>2.1</td>
<td>Adaptive Use Development Process</td>
<td>12</td>
</tr>
<tr>
<td>2.2</td>
<td>Mill Space Before Adaptive Reuse</td>
<td>26</td>
</tr>
<tr>
<td>3.1</td>
<td>Adaptive Reuse Model</td>
<td>30</td>
</tr>
<tr>
<td>3.2</td>
<td>Utilization Rate Matrix</td>
<td>32</td>
</tr>
<tr>
<td>3.3</td>
<td>Historic Significance and Educational Value Matrix</td>
<td>36</td>
</tr>
<tr>
<td>3.4</td>
<td>Infrastructure Support and Building/Site Condition Matrix</td>
<td>43</td>
</tr>
<tr>
<td>3.5</td>
<td>Surrounded Land Use and Environmental Concerns Matrix</td>
<td>45</td>
</tr>
<tr>
<td>3.6</td>
<td>Composite Assessment Matrix</td>
<td>47</td>
</tr>
<tr>
<td>3.7</td>
<td>Parking Requirements for Various Land Uses</td>
<td>53</td>
</tr>
<tr>
<td>3.8</td>
<td>Schematic Parking Requirements Matrix</td>
<td>54</td>
</tr>
<tr>
<td>3.9</td>
<td>Floor Plan Layout Example</td>
<td>55</td>
</tr>
<tr>
<td>3.10</td>
<td>Alternatives Evaluation Matrix</td>
<td>57</td>
</tr>
<tr>
<td>4.1</td>
<td>Mill Utilization Rate Matrix</td>
<td>61</td>
</tr>
<tr>
<td>4.2</td>
<td>Adjusted Mill Utilization Rate Matrix</td>
<td>62</td>
</tr>
<tr>
<td>4.3</td>
<td>Map of Town Level Assessment: Case Study Area</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Northern Portion, Town of Uxbridge</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td>Map of Town Level Assessment: Utilization Rates of Rivulet and Crown &amp; Eagle Mills</td>
<td>65</td>
</tr>
<tr>
<td>4.5</td>
<td>Map of Town Level Assessment: Utilization Rates of Bernat, Stanley Woolen, and Waucantuck Mills</td>
<td>66</td>
</tr>
<tr>
<td>4.6</td>
<td>Historic Significance and Educational Value Matrix</td>
<td>68</td>
</tr>
</tbody>
</table>
CHAPTER ONE - INTRODUCTION

The Blackstone River Valley National Heritage Corridor is on the verge of a development revolution that demands appropriate landscape planning and design. This study focuses on one component of the region's planning needs, adaptive reuse of historic mill structures. Adaptive reuse is one way to rebuild the economic health of the Corridor by using the existing old industrial fabric. To reveal opportunities and alternatives at the municipal level, this study examines the issue of adaptive reuse for the town of Uxbridge, Massachusetts. It is one of twenty towns in the Corridor. Uxbridge is chosen for the adaptation, development, and application of a methodology for adaptive reuse.

1.1 CONTEXT AND GOAL OF THE STUDY

The Blackstone River Valley National Heritage Corridor Commission has been involved in efforts to plan a greenway linking Worcester to Providence along the Blackstone River. Previous studies conducted in the Blackstone River Valley have delineated a greenway at the regional scale (Figure 1.1) and at the municipal level (Figure 1.2) for the Town of Uxbridge, Massachusetts (Graduate Studio in Recreation Planning, 1991, 36; Undergraduate Studio in Landscape Planning, 1992, 23-53). This study is the third level of research, addressing site specific assessments and alternatives.

The greenway effort is part of a greater strategy to attract tourism and promote economic revitalization in the Blackstone River Valley. The reuse of the area's historic mill structures will significantly contribute to the character and experience of the region. Therefore, adaptive reuse is a logical component of the tourism and revitalization strategy. The goal of this study is to plan for...
Figure 1.1 Regional Greenway Plan for the Massachusetts Portion of the Blackstone River Valley (Graduate Studio in Recreation Planning, 1991, 36)
Figure 1.2 Municipal Level Master Plan Incorporating the Greenway Concept for Uxbridge, MA (Undergraduate Studio in Landscape Planning, 1992, 51)
the adaptive reuse of underutilized historic mills in an effort to aid economic revitalization and historic preservation and to promote educational interpretation.

1.2 DESCRIPTION OF THE STUDY

The phrase "adaptive reuse," when applied to buildings, embraces a range of meanings. This is because buildings can represent an economic asset, architecture style, or a way of life. They may be connected to a person of historic significance. Two approaches to adaptive reuse are a museum approach and an economic revitalization approach. The museum approach preserves or returns buildings to their original state as an artifact for study and interpretation. Typically, architectural details are returned as closely as possible to their original state. In contrast, under the economic revitalization approach, the interiors of historic structures are renovated to fulfill new functions while their exterior features are maintained. The rationale for a given approach encompasses community identity, economic factors, historic significance, and environmental issues.

Adaptive reuse in the context of this study means the process whereby a structurally sound mill building or complex is renovated to support new economic activities while protecting the historic character of the exterior and the associated landscapes. The aim of renovation is to upgrade a mill building's materials and support systems for new uses while retaining its original appearance. Rehabilitation often involves upgrading and modernizing the interior for new use while preserving the historic appearance of the exterior. Both approaches have implications for public policy. Reuse, whether by restoration or renovation, also requires an understanding of the surrounding context of the site in determining the potential for adaptive reuse. Comprehensive preservation strategies recognize that a mixture of diverse building types (including mills) within a
The Blackstone River Valley's mill buildings are its most prominent heritage symbols. They represent the economic and social history of the valley during the Industrial Revolution and are one of the Blackstone Valley's most pressing preservation challenges. The adaptive reuse of these mills to provide manufacturing facilities, housing, interpretive sites, offices, or other commercial uses is one way to achieve their preservation (Center for Rural Massachusetts, 1989, 42-43).

Historic preservation plays a key role in promoting heritage values by initiating action for the adoption of legislation at either the local or state level. Preservationists survey the cultural heritage and educate the public about its value. As a result, municipalities often designate buildings or districts as historic landmarks and protect them from destruction under a preservation ordinance. When the preservation and zoning ordinances work in concert with one another, they can provide an attractive setting for private investment.

This project represents an opportunity for the METLAND Research Group to work closely with both the Blackstone Valley Heritage Corridor Commission and the Industrial Development Commission of the Town of Uxbridge. Seeking to meet the challenge set before the METLAND Research Group, objectives were generated to reflect the intent of not only the Commission and community, but also the goals of the METLAND Research Group, which are to further the understanding of the role that sound land use planning can have at regional, local, and site levels.
The following objectives have been developed to support the overall goals of this study. They are:

1. To develop a landscape planning model for application at the regional and town level that will identify and assess historic industrial mills and sites for adaptive reuse potential.

2. To apply this model in a case study at the town and district level and to conduct a composite assessment resulting in ranking of the mills for adaptive reuse potential.

3. To develop use alternatives for a selected mill which demonstrate the feasibility and range of adaptive reuse potentials.

1.3 THE STUDY AREA

1.3.1 Location

The Blackstone River Valley stretches for 46 miles between the metropolitan areas of Worcester, Massachusetts and Providence, Rhode Island. It is composed of twelve towns in Massachusetts and eight towns in Rhode Island (Figure 1.3). The Blackstone Valley is strategically located as the next beltway radiating outward from Boston, Massachusetts, and thus it is predicted that the valley will undergo enormous growth.

1.3.2 History

The Blackstone River Valley is said to be the birthplace of the American Industrial Revolution. This period started in the late 1700s at Samuel Slater’s Mill in Pawtucket, Rhode Island. With the development of the canal in the early 1800’s, mills expanded up the Blackstone River. Because the river drops 436 feet along its 46 mile length, it was ideal for the generation of water power. Soon there was a mill at almost every drop of measurable distance along the river. It was said to be the best-harnessed river in the United States. With the development of the
Figure 1.3 Uxbridge and the Blackstone River Valley National Heritage Corridor. The location of Uxbridge plays a key role in its potential for growth since it lies at the midpoint between Providence and Worcester.

Providence to Worcester Railroad, the canal was abandoned as a mode of transportation. In addition to the railroad, improved roadways hastened growth in the valley. However, the transportation improvements may have inadvertently caused an increase in businesses moving to the South to be closer to cotton producers and cheaper labor rates. The area began to decline, and, by the early 1900s, the Blackstone River Valley was experiencing a severe economic downturn.
Paradoxically, this economic downturn caused the historic sites to survive as they were ignored for new economic development. The Blackstone River Valley is now at a pivotal point in its history with the need to establish planned patterns of growth and environmental protection, especially if the new third beltway becomes a reality.

1.3.3 Description

Previous greenway studies have indicated that the town of Uxbridge has a co-occurrence of valuable historic areas, environmentally sensitive areas, and recreational opportunities. Therefore, the town represents a suitable prototypical study area for the Blackstone River Valley region (Graduate Studio in Recreation Planning, 1991, 36; Undergraduate Studio in Landscape Planning, 1992, 23-53). Furthermore, the Blackstone River Valley National Heritage Corridor Commission is interested in this third level of study, as alternatives can begin to be designed and implemented at this smaller scale.

The Town of Uxbridge is centrally located in the Blackstone River Valley. Its southern boundary forms the border between Massachusetts and Rhode Island (Figure 1.3). Uxbridge is 19,100 acres in size.

1.4 REPORT ORGANIZATION

The proceeding chapters are organized into four sections: state of the art, methodology, application, and summary. The state-of-the-art section provides information on applicable research and studies that are relevant to the development of an appropriate methodology for adaptive reuse. The methodology chapter outlines definitive procedures that will guide the planning and design process. The application chapter describes the results of the application of the assessment.
procedures and design alternatives. The summary chapter reviews the findings of the study and points toward new areas of research and application.
CHAPTER TWO - STATE OF THE ART

This chapter introduces the state of the art for adaptive reuse by introducing and explaining of some of the different factors that are considered in this project. In addition, this chapter will provide the reader with insights important to adaptive reuse gained through interviews and a case study highlighting state-of-the-art information. The first step, however, is to make the case for adaptive reuse.

2.1 THE CASE FOR ADAPTIVE REUSE

The United States is a country endowed with abundant natural resources. Land, energy, water, minerals, and timber have been converted to other forms since the founding of this nation. When these elements are hauled, hammered, bolted and transformed to create buildings, one generally ceases to think of them as resources. Buildings become products to be used until other products that are less worn, more stylish, or better located are constructed. However, American buildings are extraordinary storehouses of natural resources: wood, stone, mortar, steel, and the energy used to assemble them. In his book Historic Preservation, Curatorial Management of the Built World, James Marston Fitch argues that, in addition to the assets mentioned above, buildings are more. They are also repositories of cultural and social resources (Fitch, 1987, 11). Our social history is embodied in buildings from county courthouses to downtown storefronts. In the book What Time is This Place, Kevin Lynch writes: "Buildings are the physical shells which form neighborhoods, shape social contacts and mold patterns of doing business. Destroying them can tear our economic and social fabric" (1972, 35).
Reuse can be a significant spur to economic and physical revitalization. Old buildings with successful second lives symbolize a self-regenerating economic market, just as a rundown or abandoned building can signify economic decline (Langenbach, 1977, 5).

Historic mill buildings and their associated neighborhoods are often underutilized resources. Over the last several decades, industrial buildings and mills, particularly those built for the production of textiles, have been vacated as firms have relocated to the South or to new industrial parks. Today, the value and importance of historic buildings as economic and cultural resources are better recognized. In Massachusetts, this is due in large part to the successes of Lowell and other similar cities and towns.

With many of our prime forests cut down, highest quality iron reserves mined, and the most accessible oil fields being pumped dry, raw material costs are rising. From an economic standpoint, reusing an existing structure can be cheaper than new construction. Towns that recognize the importance of historic buildings for preserving community character have designated historic buildings and districts as protection mechanisms. However, the long-term survival of these historic structures is more likely if new uses can be found.

2.2 PLANNING AND DESIGN FOR ADAPTIVE REUSE
BASED ON PRINCIPAL FACTORS

The book, Adaptive Use Development: Economics and Process (Urban Land Institute, 1978), provides the background for the formulation of the principal factors involved in adaptive reuse within this case study. This work focused in part on the area of economic revitalization and resulted in the flow chart for the adaptive reuse process that is represented in part in Figure 2.1. This chart indicates the important factors within the overall development process. The project
feasibility phase of the development process chart addresses:

1. Site and Location Evaluation
2. Structural and Physical Evaluation
3. Architectural and Historical Evaluation

These groups provide the organizational framework for the information presented in this report.

![Diagram of Adaptive Use Development Process]

**Figure 2.1** Adaptive Use Development Process (Urban Land Institute, 1978)
Economic and environmental factors are often the key variables determining whether a structure can be adapted for reuse. The present legal and economic logjam concerning the Massachusetts Hazardous Waste Oil and Hazardous Material Release Act, known as Chapter 21E, often prevents interested parties from undertaking adaptive reuse of historic mill buildings (Murray, 1991, 15; Mullin and Gross, 1990, 12). The combination of recorded pollution sites (Massachusetts Department of Environmental Protection and U.S. Environmental Protection Agency), unrecorded sites, and the high-risk economic consequences of cleanup is forestalling both private and public adaptive reuse initiatives. In some cases, the past activities of the mills pose environmental threats beyond the site boundaries of the mill itself, as contaminants move towards the groundwater and possibly public water supply wells. The issues connected with Chapter 21E sites reinforce the need to target adaptive reuse activities towards those mills that can provide the greatest potential for success. This study can assist by highlighting those mills with strong potential for adaptive reuse, thereby guiding the use of limited funding for economic revitalization and environmental cleanup.

The historic resources the building represents must be recognized if they are to be protected. This chapter explores several principal factors based on existing literature for adaptive reuse. Case studies and interviews with developers who have adapted historic structures for new uses are the main information sources. However, other important factors such as business opportunities, market forces, and availability of financing, influence the potential adaptive reuse of historic structures (Figure 2.1). These considerations fall outside the scope of this study.

This study will consider three principal factors important to the adaptive reuse of historic structures:

1. The historic significance and educational potential of structures and the surrounding landscape

2. Available infrastructure support, including roads and utilities, along with the physical
condition of the building and site

3. Surrounding land uses and environmental concerns

Each of these three principal factors is defined below.

2.2.1 Historic Significance And Educational Value

The historic significance of mill buildings is visually evident from their distinctive architectural features that make them easily identifiable and remembered. As advertising, they are certainly the equal of neon signs or bronze plaques. Distinctive architectural features are beneficial to redevelopment projects that capitalize on historic character and importance (Urban Land Institute, 1978, 16). The set of factors typically considered in evaluating the historic significance of the building are the builder, the style of the building, the year of construction, original and subsequent uses, and whether it is listed on the National Historic Register. The location of mills and their architectural styles express the ideas and sentiments of previous eras. Adaptive reuse preserves meaningful artifacts of cultural heritage for future generations, particularly if set in a landscape that has, for the most part, escaped dramatic alteration. The human scale, richness of materials, and detailed features are attributes of many historic mills that are difficult to reproduce with modern construction methods. Older buildings often possess unique architectural value as a result of craftsmanship and the use of local materials. New structures often lack the same qualities given the current cost of labor and materials.

In addition to preserving individual buildings of historic significance, increasing attention is being given to "heritage landscape preservation" as evidenced by the National Register Bulletin #30, Guidelines for Evaluating and Documenting Rural Historic Landscapes (National Park Service, 1991). One of the goals of the Blackstone River Valley National Heritage Corridor Commission (BRVNHCC) is to protect historic landscapes that visually impart the agricultural and industrial history of the Blackstone Valley. The Blackstone River Valley contains several types of historic landscapes created by the pattern of village centers and open agrarian fields (Center for
Rural Massachusetts, 1989, 5). However these historic landscapes are threatened by suburban sprawl from the expanding urban centers of Worcester, Massachusetts and Providence, Rhode Island (Center for Rural Massachusetts, 1989, 4).

Over 72 structures are identified as significant for their industrial interpretive qualities in the Historic and Cultural Resources Inventory complied by the BRVNHCC, which selected mills for their historic significance and educational potential based in part on an architectural evaluation (Eaton and Grady, 1989, 6). Because the historic character of a structure is important to protect, some municipalities have developed design guidelines and preservation criteria to insure that the character of an individual building or district is protected. This is accomplished by designation of historic districts through zoning by-laws and establishment of site design review boards for new development in historic districts or for rehabilitation of existing buildings. The successful design review process can enhance the process of adaptive reuse of buildings. Guidelines assisting the site design for adaptive reuse projects have been derived from those set forth by the National Park Service (1985) and the BRVNHCC (1989).

Once a building has been selected for adaptive reuse, a series of guidelines prepared by the Department of the Interior sets forth the range and scope of acceptable rehabilitation work. Briefly stated, rehabilitation refers to the process of returning a property to a state of utility to allow efficient contemporary use while preserving those portions and features of the property significant to its historic, architectural, and cultural value. While these standards permit alteration for efficient contemporary use, they also recommend that significant architectural features and spaces not be irreversibly altered by the process of rehabilitation.

The designation primary has been used to identify millyard space associated with the original mill structure and its primary or significant facades, while all other peripheral space is considered secondary. The open spaces shaped by the buildings, both within and around a mill
complex are essential to the understanding of the historic character of the mills. Millyards typically contain both primary and secondary mill spaces. Current uses have filled most of these spaces with parked cars, trucks, and haphazardly placed equipment. Potential new uses may require a more comfortable and attractive environment for building occupants and visitors (Eaton and Grady, 1989, 54-60).

The first group of guidelines (National Park Service, 1985, 7-9), relating to concerns for preserving the architectural significance of historic structures, is as follows:

1. Every reasonable effort shall be made to provide a compatible use for a property which requires minimal alteration of the building, structure or site and its environment, or to use a property for its originally intended purpose.

2. The distinguishing original qualities or character of a building, structure or site and its environment shall not be destroyed. The removal or alteration of any historic material or distinctive architectural features should be avoided when possible.

3. All buildings, structures and sites shall be recognized as products of their own time. Alterations that have no historical basis and which seek to create an earlier appearance shall be discouraged.

4. Changes which may have taken place in the course of time are evidence of the history and development of a building, structure, or site and its environment. These changes may have acquired significance in their own right and this significance shall be recognized and respected.

5. Distinctive stylistic features or examples of skilled craftsmanship which characterize a building, structure, or site shall be treated with sensitivity.

6. Deteriorated architectural features shall be repaired rather than replaced wherever possible. In the event replacement is necessary, the new material should match the material being replaced in composition, design, color, texture and other visual qualities. Repair or replacement of missing architectural features should be based on accurate duplications of features substantiated by physical or pictorial evidence rather than on conjectural designs or the availability of different architectural elements from other buildings or structures.

7. The surface cleaning of structures shall be undertaken with the gentlest means possible. Sandblasting and other cleaning methods that will damage the historic building materials shall not be undertaken.

8. Every reasonable effort shall be made to protect and preserve archaeological resources affected by or adjacent to a project.

9. Contemporary design for alterations and additions to existing properties shall not be discouraged when such alterations and additions do not destroy significant historical, architectural or cultural material provided that such design is compatible with the size, scale,
color, material and character of the property, neighborhood or environment.

10. Wherever possible, new additions or alterations to structures shall be done in such a manner in that if such additions or alteration were to be removed in the future, the essential form and integrity of the structure would be maintained.

The second group of guidelines presented below (Eaton and Grady, 1989, 54-61) relate specifically to mill buildings and the exterior spaces created by the buildings.

1. All effort should be made to protect the historic quality of the mill by preserving, unaltered, the critical exterior features of the mills, including:
   * The front facades of the original mills and connector buildings
   * Courtyards incorporating such facades
   * Prominent towers, cupolas and other highly visible elements

2. Avoid imposing the architectural style of a single period onto building elements from different periods.

3. Give preference to new uses that can take advantage of the physical qualities of the buildings in their historical form and do not demand major additions or significant alteration of building features.

4. Somewhat greater flexibility for alteration can be considered in the interior of the buildings and in secondary courtyard spaces.

5. Buildings originally used for mill operations may be adapted for office, hotel, housing, exhibit, retail, residential, mixed use or may also continue as places for light manufacturing.

6. The exterior appearance of windows should not be changed when interior spaces are subdivided with partitions or ceilings are lowered.

7. Do not alter facades or outdoor space in "primary" millyards.

8. Adopt use programs that preserve and highlight the character of the mill buildings.

9. Functions within "primary" millyards and within built space facing these millyards should relate to and be compatible with public pedestrian access.

10. Every effort should be made to keep primary millyards free of parking to strengthen the historic aspect of these sites.

11. Develop the space within primary millyards and at mill fronts in simple and robust terms recalling the spirit of these spaces at the height of their original use.

12. Exclude parking from the "primary" mill spaces.

13. Millyards considered "secondary" are better suited for enclosures over gathering places like hotel lobbies or shopping arcades. Such alterations should be permitted subject to satisfactory design solutions.
14. Allow greater flexibility for design at "secondary" courtyards and facades.

15. Restore or re-assemble landscape elements from the original periods, where the opportunities for restoring the historic atmosphere are greatest. Preserve elements such as: paving blocks from street surfaces, lighting fixtures, fences, stone walls, gates, fire hose houses and hydrants, and industrial hardware.

16. Create easily visible and inviting pedestrian paths or dramatic interior pedestrian spaces.

17. Add parking and drop-off facilities.

18. Deliveries and services should be organized to avoid conflict with pedestrians. Services can be restricted to certain periods if necessary to avoid conflicts.

The mills of the Blackstone River Valley are important elements of the historic landscape and have the best chance for preservation if adapted for new economic use. The villages surrounding the mills will also survive if job opportunities are generated by the use of the mills and the tourism that often accompanies historic preservation activities. The distinctive mill complexes and villages of Uxbridge are important elements of the historic landscape. Adaptive reuse of the Uxbridge mills within the Heritage Corridor of the Blackstone Valley must protect the historic significance of both the building and the surrounding landscape (Blackstone River Valley National Heritage Corridor Commission, 1989, 32 and 62).

2.2.2 Infrastructure Support And Building/Site Conditions

The second important set of factors influencing the selection of historic structures for adaptive reuse is their supporting infrastructure and physical condition. Adaptive reuse is often cheaper from a construction standpoint than starting from scratch provided that the building is already in reasonably good condition. Building studies have found that renovation costs are typically 30 to 40 percent less than new construction because the bulk of construction occurs inside the existing shell of the building and can continue throughout the calendar year (Advisory Council on Historic Preservation, 1979; Williams, Kellog and Gilbert, 1983, 83-85). In general, interior space in older multi-storied industrial buildings can be easily modified to suit small firms. Also,
water, sewer, and road infrastructure is generally in place and can be upgraded at a significantly lower cost than installing new infrastructure (Williams, Kellog, and Gilbert, 1983, 79-82).

If a building is retained and reused, the costs of demolition, site clearance, and disposal in landfills are avoided. Further savings are derived from sidestepping the excavation, landfill and grading required for new construction. For new construction, approximately 50% of the total project cost goes toward building materials and 50% goes toward labor. In adaptive reuse construction, an average of 75% of the total project costs goes toward labor. The higher labor intensity offers the community two distinct advantages. The first is that there are more jobs at a given project site. The second advantage is that wages paid to employees re-enter and strengthen the local economy in comparison to money paid for building materials that are often exported to support economies in other areas.

The physical condition factors considered in the reuse of historic buildings are the soundness of the foundation, availability and operability of windows, construction of walls, the height of ceilings, solar orientation, insulation, and flexibility of interior layout. In general, with the addition of proper window treatments, insulation, and modern heating, ventilation and air-conditioning (HVAC) units, old buildings can be more energy efficient than new construction (Bunnell, 1977, 44). Mill buildings typically contain indoor spaces that can be added to, easily changed, or rearranged to suit a variety of functions. Therefore, the "flexibility" of the interior space for partitioning to accommodate a variety of uses and business sizes should be evaluated (Murray, 1991, 4). Other factors that are important to evaluate are the availability of infrastructure and external space needed to support a variety of circulation/access activities, such as materials loading and parking.

Several questions need to be addressed when considering adaptive reuse. Is the mill building located near a major highway providing good transportation access for industrial use or
for commuters travelling to office space or retail activities? Are existing water and sewer lines capable of serving industrial, commercial, or residential adaptive reuse or some combination of these uses? Do the existing structures have loading docks necessary to support industrial or commercial adaptive reuse? Is there sufficient space on the site to accommodate parking for industrial, commercial, or residential use in accordance with accepted landscape architectural design norms and the local requirements of current zoning by-laws? Parking space availability can be a major obstacle for adaptive reuse since mills are often located in densely developed village centers, built in an era before cars were the predominant mode of transportation.

2.2.3 Surrounding Land Use And Environmental Concerns

The existing or planned land uses of adjoining properties is an important factor in determining the adaptive reuse potential. Reuse of a historic structure for industrial reuse may conflict with a surrounding land use especially if it is primarily residential. However, a mixed use of office, retail, and apartment space may fit well with the surrounding land use. Often zoning by-laws provide an indication of reuse possibilities that are compatible with surrounding land uses. Environmental considerations, such as the location of the mill in a groundwater protection district, may prohibit the use of the building for commercial users who store or utilize hazardous materials in excess of household quantities (for example, dry cleaning operators). Many underutilized industrial buildings are surrounded by other industrial activities or have poor access to transportation. The surrounding land uses should be considered when new activities for the industrial mill are proposed (Walsh, 1978, 3, 33-34).

The intention of the Blackstone Valley National Heritage Corridor is to promote tourism and educational understanding of the significance of the region. The Blackstone River Valley Study (Graduate Studio in Landscape Planning, 1983) identifies many factors related to surrounding land uses that contribute to site suitability for potential adaptive reuse. These factors affect a project’s ability to meet tourism and recreation goals. Some of the factors to be considered...
for potential adaptive reuse sites include:

1. Proximity to other historically significant sites (within a walking distance of .5 mile)
2. Accessibility (site location on major routes)
3. Support of other activities (location adjacent to recreation areas and town centers)

Land use conflicts exist between fully utilized historic mills still involved in manufacturing operations and the traditional residential areas surrounding them. These disparities in uses are in most cases reflected by the municipal zoning regulations. The historic mill becomes an island of grandfathered industrial activity, sometimes closely surrounded by residential homes (Center for Rural Massachusetts, 1989, 43-44). With adaptive reuse, the opportunity exists to solve these conflicting land uses. Adaptive reuse to serve housing or retail needs preserves historic structures and enables them to continue as viable contributors in the community.

There is need for all concerned in the process of adaptive reuse to become aware of these guidelines. The objective is not to tie the hands of either owners or developers connected with these historic resources. Instead these guidelines enlighten and expand the number of techniques by which adaptive reuse projects can achieve positive financial results for the private sector and preservation of historic landscape resources for public enjoyment and education.

2.3 CASE STUDY: BOOTT COTTON MILLS
LOWELL, MASSACHUSETTS

The Boott Mills were selected for a case study because they have been identified as a successful example of adaptive reuse in previous METLAND research (LaCour, 1991, 50). They are listed on the National Register of Historic Places. In addition, the Boott Mills incorporate many desirable adaptive reuse program elements such as:
Commercial office space
Retail space
Tourist information center
Museum/interpretive space
Outdoor concert/recreation areas

These mills also have many similar physical and locational characteristics to the mills of the Blackstone River Valley such as:

Location within built up areas
Location on rivers
Multi-storied structures
Brick and masonry construction
Present underutilization

2.3.1 Historic Significance and Educational Value

The Boott Cotton Mills were founded in 1835, by Kirk Boott, one of the first industrialists in the city of Lowell, Massachusetts (Lowell Historic Canal District Commission, 1977, 35). Manufacturing cotton and woolen goods, the mills prospered and grew. New structures were added throughout the nineteenth century as the mills' market reached around the world and the complex flourished as one of the city's landmarks. The Boott Mills are one of New England's classic nineteenth-century textile mill complexes. Unlike contemporary "office park" developments, the Boott Mills have great charm and personality all their own. The architecture is richly detailed and impressive. Acres of extensively landscaped courtyards and river frontage enhance the special character of the complex. These historic mills have been adapted for reuse as office space and as an interpretive site because the mills tell the history of Lowell during the Industrial Revolution. The restoration and reuse of the Boott Mills have created a positive environment for business in Lowell as well as a destination spot for tourists.
2.3.2 Infrastructure Support and Building/Site Conditions

Located in downtown Lowell on 5.25 acres of land, the Boott Mills offer more than 700,000 square feet of interior space. The complex includes eight classic brick nineteenth-century mill buildings. The mills have 800 feet of frontage on the Merrimack River and 800 feet on the Eastern Canal. Parking space on site is available to accommodate 1800 cars for tenants and visitors. The limited number of spaces is augmented by nearby public parking garages. The high ceilings and large windows of the mills provided bright and roomy interiors suitable for many uses such as office space. In addition, a favorable location near Route 495, a major highway and transportation link to metropolitan areas in New England, make the site readily accessible to commuters from suburban areas. The route 495 area is now at the edge the expanding metropolitan area of eastern Massachusetts.

The Boott Mills have loading docks located on the outside edge of the site, enabling trucking to be separated from pedestrian courtyards. There are three areas for loading and freight handling with trucks bays greater than 60 feet long. Each loading area is linked to a freight elevator with a capacity of 5000 pounds, so that all tenants have direct freight service. Secure storage bays near the loading docks are set aside for tenants who wish to use them. Trash compactors are located next to the loading bays. The Boot Mills feature a completely reconditioned sprinkler system. The system is served by a dedicated 2,000,000 gallon reservoir and a number of connections that enable the fire department to pump additional water into the system if needed. Smoke, heat, and sprinkler flow alarms are electronically monitored so that security and fire personnel will be alerted if any of the systems are activated.

2.3.3 Illustration of the Use of Design Guidelines

The primary millyards of the Boott Mills are paved and landscaped to create attractive focal points and pedestrian gathering places. Modular concrete and granite pavers reflect the architectural flavor of the buildings, while mature landscape plantings and clusters of trees add...
color, texture, and summer shade. Visual interest is provided by works of sculpture which in themselves enhance the historic surroundings.

There are three main entries within the courtyards. They face due east, west and south taking advantage of solar gain possibilities. Each entrance consists of solid glass doors edged with stainless steel and matte grey-green pewter hardware. The lobby beyond contains rugged brick and exposed timber members which contrast with the stainless steel elevator doors and the polished stone floors. Elevators were installed to provide handicap accessibility. The elevator lobbies are arranged to provide direct access to tenant spaces. A model office space is set up next to the management office, and it illustrates the flexibility of the large airy rooms available in mill structures. An interesting note is that a local office furniture supplier donated the modular office layout where questions of prospective tenants are answered.

2.4 INTERVIEWS WITH INDIVIDUALS INVOLVED WITH ADAPTIVE REUSE

Mr. Robert Baldwin of the Waubaug Mill located in Manchester, New Hampshire and Ms. Marjorie Ring of the Boott Mills in Lowell, Massachusetts were interviewed. Their responses illustrate how the three principle factors important to adaptive reuse can and do affect the reuse of historic mill structures. The interviews are organized by the factors identified as important to the adaptive reuse process in section 2.3.2.

Mr. Baldwin has experience with several adaptive reuse projects in Massachusetts and New Hampshire. Ms. Ring has been responsible for managing the adaptive reuse of the Boot Cotton Mills in Lowell, Massachusetts. The principal concepts derived from those interviews concerning the adaptive reuse of mill buildings themselves are discussed in the following sections.
2.4.1 Historic Significance and Educational Value

Ms. Ring commented that the historic significance of the mill, the surrounding National Park, and related activities created an atmosphere that attracted new users to the mill spaces. The marketability of these mills and exposure to the public at large is of direct benefit to the owner of the mills in seeking new tenants.

While the rehabilitation costs of a mill on the National Register of Historic Places are higher in the short term due to the higher-skilled labor needed to perform rehabilitation work, the marketability of the National Register and the tourist/pedestrian exposure of these structures is much higher than non-historic structures.

2.4.2 Infrastructure Support and Building/Site Conditions

The physical condition of the buildings is an important factor according to Mr. Baldwin. While money can overcome most problems, the goal of a developer is to generate profits. Therefore, when markets are competitive because of an overabundance of available space, buildings that have obvious physical and structural problems should be avoided. Buildings that should be the first focus are those which are marketable with less effort. The potential of other buildings surrounding a successful adaptive reuse project will improve. Mr. Baldwin confirmed research that adaptive reuse is cheaper than new construction. He said that it can cost anywhere from $2 per square foot to $60 per square foot to rehabilitate an industrial mill. The cost depends on the physical condition and the quality of the interior finish materials.

Ms. Ring explained that the rehabilitation of the Boott Mills has been conducted in phases. The Boott Mills are in generally good physical condition. The floors and spaces in better condition receive the first restoration or renovation efforts. This allows the developers to generate profits that they can invest in buildings requiring more rehabilitation work. It also allows developers to respond to market conditions. The Boott Mills created a demonstration space that is used to show
prospective tenants the results of rehabilitation work. The demonstration office space shows what
the rehabilitated spaces can become once they are occupied, and this has been an important sales
tool.

Mr. Baldwin stated that the layout of old industrial mill buildings is their strong point
(Figure 2.2). The large open space plan can easily be adapted to new uses, and the quality of the
interior space, with features like good natural lighting and high ceilings, attracts tenants.

Mr. Baldwin also noted that on-site parking is a primary constraint, for the limited parking
(often associated with old mills built prior to the automobile) severely limits the range of new uses
due to the parking space requirements of local zoning bylaws. Unless there is room for expansion,
new uses are limited to warehousing and some industrial uses that require the smallest amount of
parking per square foot of building floor area. Access also presents a major constraint for adaptive

![Figure 2.2 Mill Space Before Adaptive Reuse](image)
reuse of old industrial mills that are typically located in densely developed areas lacking roads that can accommodate heavy truck and car traffic generated by new uses. On the other hand, adaptive reuse of buildings within or near town centers provides the tenants of rehabilitated buildings with access to stores, restaurants, and other public amenities such as parks.

2.4.3 Surrounding Land Use and Environmental Concerns

Surrounding land uses play a major part in determining new uses for mills according to Mr. Baldwin. The occupants of adjacent properties can halt projects when new uses are proposed that are in conflict with existing uses. Adaptive reuse options are dictated by contextual surroundings and require compatible use for successful projects. Mr. Baldwin stated that, in most cases, the most restrictive adjacent land use is residential. Ms. Ring noted that existing uses around the mill site can create opportunities. The spin-offs from the National Park activities have made the adaptive reuse of the Boott Mills more feasible and marketable. The central location means support services are readily available, and the downtown neighborhoods benefit from a revitalized occupied structure.

Most mills are located by rivers and within the 1% flood plain. Mr. Baldwin said that in Lawrence, Massachusetts and Manchester, New Hampshire these factors did not hinder the adaptive reuse of these mills. The upper stories of these mills can be occupied and fully utilized for water sensitive uses and storage spaces can occupy the bottom floor. Located on the river front, the Boott Mills form an edge to the river, and the surrounding canal system of Lowell brings water close to the building. This is perceived as an opportunity and not as a constraint from the developer's point of view.
Throughout this chapter, issues and state-of-the-art tools and techniques were identified and related to the adaptive reuse of historic industrial mills. The literature review, case study, and interviews revealed the primary factors involved with adaptive reuse of historic industrial mills. The three areas of concern are (1) historic significance and educational value, (2) infrastructure support and building/site conditions, and (3) surrounding land use and environmental concerns. It should be noted that the Massachusetts Executive Office of Community Development's 1980 report on *Removing Obstacles to Building Reuse* recommends that a community tackle a project that can be accomplished "without major structural changes and without drastic changes in use" (Bunnell et al., 1980, 27). This approach allows for expertise to develop locally. Opportunities and constraints presented by larger, more challenging buildings and sites benefit from such knowledge. The method developed in this chapter seeks to develop a similar approach by identifying and ranking mills that have significant potential for successful adaptive reuse. The continuing adaptive reuse of historic industrial mills can benefit from the success of the pioneer project.
CHAPTER THREE - METHODS FOR PRIORITIZING MILLS FOR ADAPTIVE REUSE

This chapter uses the information from chapter 2 to create a method to identify buildings or sites with the greatest potential for reuse. Identifying potential sites that have the greatest chance for successful reuse due to their historic significance, education potential, and compatibility with surrounding land use is a common sense starting point for economic revitalization. Resource assessment techniques developed over the years by the METLAND Research Group assisted in formulating the method of ranking and evaluating adaptive reuse potentials of historic mills. In particular, research bulletins #637 (Fabos and Caswell, 1977) and #653 (Fabos, Greene, and Joyner, 1978) provide the framework for the method presented here.

In addition, the method presented below was designed to fulfill the goals and requirements of the Blackstone Valley National Heritage Corridor Commission (BRVNHCC) as outlined in the introduction section. Preserving the historic mills and the landscape fabric of the Blackstone River Valley through adaptive reuse achieves the larger goals of the BRVNHCC, economic revitalization and historic education. Prior to assessing historic resources, one must first identify existing historic sites and structures at the town level. Therefore, Phase I of the method details the steps taken to identify potential historic sites for adaptive reuse. The Phase II is an assessment of the identified sites and structures according to the three important factors for adaptive reuse: historic significance and educational value; infrastructure support and building/site conditions; and surrounding land use and environmental concerns. Buildings and/or sites identified by Phase II become the focus of Phase III, where prototypical use programs are defined and a schematic design is developed. The flow chart (Figure 3.1) maps out the sequence of phases and steps involved in the method that will be explained in the remaining sections of this chapter.
PHASE ONE - TOWN LEVEL ASSESSMENT FOR ADAPTIVE REUSE

STEP ONE
Determine Mill Utilization Rate Within Town

STEP TWO
Identify Historic Districts and Principal Factors Connected With Adaptive Reuse

STEP THREE
Identify Mills That Are Underutilized, Historically Significant, and Located in a Nationally Registered Historic District

PHASE TWO - DISTRICT LEVEL ASSESSMENT FOR ADAPTIVE REUSE

STEP ONE
Historic Significance and Educational Value

STEP TWO
Infrastructure and Building/Site Conditions

STEP THREE
Surrounding Land Use and Environmental Concerns

STEP FOUR
Composite Assessment And Ranking of Potential for Adaptive Reuse

PHASE THREE - SITE SPECIFIC PLANNING AND DESIGN

STEP ONE: Generation of Use Alternatives

STEP TWO: Site Analysis and Assessment

STEP THREE: Alternative Layouts w/Parking

STEP FOUR: Evaluation of Alternatives

STEP FIVE: Prepare Schematic Design

Figure 3.1 Adaptive Reuse Model
3.1 PHASE I: TOWN LEVEL ASSESSMENT FOR ADAPTIVE REUSE POTENTIAL

Phase I identifies potential historic buildings/sites for adaptive reuse. This first phase is divided into three steps, and these will be described in the following sections.

**Step One: Utilization Levels of Mills**

To determine the level of usage of mills at the town level, information can be derived from the town assessor's records that provides data on current land uses and square footage in use. Information on the level of usage was supplemented by meetings or telephone interviews with owners of the buildings or occupants. The utilization rate of a mill was ascertained by calculating the percentage of the square footage used for manufacturing, commercial, or retail activity. Floor area used for purposes such as warehousing and storage is considered underutilized. Space not in use is listed as vacant. Those mills that are over 50% underutilized or vacant are considered prime candidates for adaptive reuse. Prime candidates for adaptive reuse from a space-available standpoint were further assessed for their potential with respect to historic significance and educational value; infrastructure support and building/site conditions; and surrounding land use and environmental concerns. The information obtained during step one will be organized according to the chart in Figure 3.2.

**Step Two: Identification of Historic Significance**

In order to determine the building with the highest potential for adaptive reuse, historically significant mills were first identified by obtaining the listing of mills on the National Register of Historic Places. This information came from the Massachusetts Historical Commission located in Boston or, when possible, from the local town library. This listing was cross-referenced with a
digital database created by the METLAND Research Group in 1991 for the Blackstone Valley National Heritage Corridor containing location and attribute data for historic structures within the Corridor region.

**Figure 3.2 Utilization Rate Matrix**

<table>
<thead>
<tr>
<th>MILLS WITHIN STUDY AREA W/BLDG. SQ/FT</th>
<th>% &amp; SQ/FT FULLY UTILIZED</th>
<th>% &amp; SQ/FT UNDER UTILIZED</th>
<th>% &amp; SQ/FT VACANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>SQ/FT</td>
<td>SQ/FT</td>
<td>SQ/FT</td>
<td>SQ/FT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTALS</th>
<th>X SQ/FT</th>
<th>Y SQ/FT</th>
<th>Z SQ/FT</th>
</tr>
</thead>
</table>

Step Three: Determining If Mills Are Located in a Historic District

The third step identifies mills that lie within Nationally Registered Historic Districts. Preserving structures for adaptive reuse and economic revitalization within historic districts serves to protect the fabric of the landscape from an interpretive standpoint. Historic district boundaries...
were obtained by combining assessor's parcel data (a digital data layer created by Interdisciplinary Environmental Planning) with Massachusetts Historical Commission district boundaries from the BRVNHCC Historic Resources Inventory (converted to digital format by METLAND).

Overlaying these two layers of data brings together in one data set the diverse themes of historic attributes (age, architectural qualities, and interpretive themes) and assessor's records (square footage, current uses, parcel boundaries). The combined layers can be used to display or map locations of underutilized mills within historic districts.

The resulting map displays the location of the mills within the study area, the utilization rate of the mills within the study area, and historically significant mills within the historic district boundaries. Geographic reference information such as roads, building footprints, and water bodies is also mapped.

Once historically significant underutilized or vacant mills are identified within historic districts, each mill/site is further assessed at the district level to determine its potential for adaptive reuse in terms of historic education, physical condition, infrastructure support, building/site conditions, surrounding land use, and environmental concerns. This further assessment is presented in Phase II.

3.2 PHASE II: DISTRICT LEVEL ASSESSMENT FOR ADAPTIVE REUSE POTENTIAL

Phase II is a more detailed assessment of each underutilized or vacant historic mill identified by Phase I for potential adaptive reuse. This phase considers additional district level data connected with the mills in terms of three important factors influencing successful adaptive reuse identified in the state-of-the-art chapter.
Historic significance and educational value; infrastructure support and building/site conditions; and surrounding land use and environmental concerns, are the three characteristics assessed for each candidate mill. The results are assigned a value or level of significance. Values for each mill are numerically aggregated to provide a composite value reflecting all three characteristics. The aggregate values can then be compared to identify the mill with the greatest overall potential for adaptive reuse.

Step One: Assessment of Historic Significance and Educational Value

The objective of this step is to assess historic qualities of the building/site with respect to their potential for educational activities. Mills illustrate the history of the Industrial Revolution in the Blackstone River Valley, considered the most important historical theme in the Blackstone River Valley (BRVNHCC, 1989, 9). Site visits are conducted to assess the historic significance of mill buildings, based in part on architectural uniqueness and site features such as millyards. The procedures used are based on literature reviews and case studies from the state-of-the-art chapter. Additional materials providing insight into educational potential were criteria established by the BRVNHCC (1989, 9) and The Wheels of Change (Graduate Studio in Recreation Planning, 1991, 61). The factors considered in determining historic significance and educational value are presented in the following assessment sheet.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building is of a scarce style or type of construction</td>
<td></td>
<td></td>
<td>Other buildings display similar architectural attributes</td>
</tr>
<tr>
<td>Building is older than others considered for adaptive reuse activity</td>
<td></td>
<td></td>
<td>Building is younger than others considered for adaptive reuse activity</td>
</tr>
<tr>
<td>Building has suffered little or no alterations to its exterior</td>
<td></td>
<td></td>
<td>Building has significant alterations to its exterior</td>
</tr>
<tr>
<td>Main component of mill is over sixty years old</td>
<td></td>
<td></td>
<td>Main component of mill is under sixty years old</td>
</tr>
<tr>
<td>Building/site is within .5 mile of schools</td>
<td></td>
<td></td>
<td>Building is over .5 mile away from schools</td>
</tr>
<tr>
<td>Building/site is within .5 mile of other historic structures</td>
<td></td>
<td></td>
<td>Building/site is not within .5 of a mile of other historic structures</td>
</tr>
<tr>
<td>Building has potential for public education benefits</td>
<td></td>
<td></td>
<td>Building has limited potential for public education benefits</td>
</tr>
<tr>
<td>Building is highly visible and is a prominent feature of the landscape</td>
<td></td>
<td></td>
<td>Building is not a highly prominent feature of the landscape</td>
</tr>
<tr>
<td>Building is located on a major road thereby increasing potential tourist access</td>
<td></td>
<td></td>
<td>Building is not located on a major road thereby decreasing tourist access</td>
</tr>
</tbody>
</table>

**Totals**

---

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts
Spring 1993
Center for Economic Development
The assessment scoring sheet is completed for each of the buildings under review. The totals for each building are then ranked to determine the relative significance for the historic and educational component of the method. The following list details the rankings according to the number of positive responses:

Positive Responses Totaling 7 - 9.....Rated Most Significant
Positive Responses Totaling 3 - 6.....Rated Significant
Positive Responses Totaling 0 - 2.....Rated Least Significant

The ratings for each mill under consideration are organized by entering an X in the appropriate column of the Historic Significance and Educational Value Matrix (Figure 3.3).

<table>
<thead>
<tr>
<th>IDENTIFIED MILLS WITHIN STUDY AREA</th>
<th>SIGNIFICANCE RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOST SIGNIFICANT</td>
</tr>
<tr>
<td>MILL #1</td>
<td></td>
</tr>
<tr>
<td>MILL #2</td>
<td></td>
</tr>
<tr>
<td>MILL #3</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.3 Historic Significance and Educational Value Matrix
(Number of mills depends on the results of Phase I)
Step Two: Infrastructure Support And Building/Site Conditions

This step assesses the available infrastructure support and the physical condition of the building(s) and site. A ranking scheme similar to that found in the historic significance and educational value section is used. Those mills that can easily be reused for a variety of purposes given available infrastructure support, good physical condition, and site features score a higher aggregated suitability ranking for adaptive reuse potential.

Digital geographic information from MassGIS supplemented data created by the METLAND Research Group. The combination was used to assess spatial relationships such as road and rail access and other factors necessary for successful adaptive reuse. Sewer, water, roads, rails, and utility services were infrastructure factors assessed in step two. Several factors involved in the assessment procedure can only be derived from on-site visits. An infrastructure support and building/site conditions scoring sheet and building/site checklist were created for use on field visits to organize the information and insure completeness.

Information about accessibility, floor space configuration, floor loading capacity, column spacing, elevators, and the general condition of the structure is obtained from site visits as well as from interviews with building owners and managers.

Adaptive reuse of historic mill buildings located in the Blackstone River Valley region involves new uses for buildings that are typically centrally located within a municipality. These buildings often have access to existing public infrastructure. Therefore, established systems need to have adequate carrying capacity for water, sewer, and utilities that could be used for adaptive reuse activities.

The following substeps should be taken to assess the infrastructure support for each mill (identified by Phase I) to meet adaptive reuse needs:
1. Contact the municipality's Department of Public Works and the public utility company serving the area to determine the capacity of town-wide services for water delivery, wastewater treatment, and utilities services such as electricity and gas.

2. Request the present levels of daily service for water and gas with the corresponding pipe sizes for each building.

3. On the basis of previous mill uses, determine the potential difficulty in upgrading infrastructure for a variety of uses. Those buildings/sites that are connected to active infrastructure or could be easily upgraded should be considered as having significant potential for adaptive reuse. Those buildings/sites that do not have infrastructure support should be considered less significant for potential adaptive reuse activities.

4. Determine road and railroad access for transportation of raw materials and goods and services.

The checklist that follows can be used to assess the building/site conditions that will determine the potential for adaptive reuse. This checklist should be completed during a site visit. Attention should be paid to both interior conditions and the exterior of the mill building. Site condition features such as parking, access, and the possibilities for expansion should be recorded.

________________________________________________________________________________________

BUILDING/SITE CONDITIONS CHECKLIST

Building name: ________________________________________________________________

Street address: ______________________________________________________________

City, state: ________________________________________________________________

Contact name: ______________________________________________________________

Company name: ______________________________________________________________

Present owner or occupant(s): _________________________________________________

Number of buildings on property: ______________________________________________

Total square feet: ____________________________________________________________
Total land included in the property: ________________________________

Previous use: ________________________________________________

Zoning: ______________________________________________________

Surrounding areas zoned: _______________________________________

Is the property for sale? ________________________________________

Is the property for lease? ______________________________________

Site Evaluation

Utilities on site: ______________________________________________

Natural gas: Public water: Sewer: ________________________________

How much on-site parking?: ____________________________________

How many additional square feet are available for parking?: ______

How much abutting land is available or potentially available?: ______

Physical/Structural Observations

Number of floors: easy access: limited access: ____________________

Type of construction: _________________________________________

Age: _________________________________________________________

Rate the structure's fire resistance: _______________________________

Sprinkler system: _____________________________________________

HVAC systems: _______________________________________________

Number of elevators: Condition: _________________________________

Location of elevators: _________________________________________

Capacity: ____________________________________________________

How many loading docks are there?: Location: ___________________

Is there access for the physically impaired?: ______________________

For each of the following, estimate conditions as whether they may be used as is, repaired, or replaced:

Roof: ________________________________________________________
Walls: ______________________________________________________________
Floors: ______________________________________________________________
Stairs: ______________________________________________________________
Ceilings: ______________________________________________________________
Elevators: ____________________________________________________________

Estimate the following:
Ceiling height: _______________________________________________________
Floor loading capacity: _________________________________________________
Column spacing: _______________________________________________________

It is useful to remember that the observer is investigating these buildings for the purpose of assessing the potential for adaptive reuse activity. Research has revealed that the strength of these structures is their inherent ability to accommodate diverse reuse activities. Therefore, the assessment procedure is designed to determine flexibility or structures that do not preclude one type of adaptive reuse activity over another.

Once the site visit is completed and needed information is gathered using the building/site conditions checklist, the infrastructure support and building/site conditions scoring sheet is completed.
<table>
<thead>
<tr>
<th><strong>Infrastructure Support and Building/Site Conditions</strong></th>
<th><strong>Suitability Assessment Sheet</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The town's infrastructure has capacity to support adaptive reuse activity at the site</td>
<td>The town's infrastructure does not have capacity to support adaptive reuse activity at the site</td>
</tr>
<tr>
<td>The building is served by sewer/water/gas</td>
<td>The building is not served by sewer/water/gas</td>
</tr>
<tr>
<td>Site/building within .5 mile distance from major roads</td>
<td>Site/building over .5 mile distance from major roads</td>
</tr>
<tr>
<td>Site/building has direct access to railroad</td>
<td>Site/building has no railroad access</td>
</tr>
<tr>
<td>Building/site located on major road for easy truck access</td>
<td>Building/site located on minor road with difficult truck access</td>
</tr>
<tr>
<td>The building has operable elevators</td>
<td>The building does not have operable elevators</td>
</tr>
<tr>
<td>The building has loading docks</td>
<td>The building does not have loading docks</td>
</tr>
<tr>
<td>Site has large areas that could easily support parking lot expansion</td>
<td>Site does not have areas that could easily support parking lot expansion</td>
</tr>
<tr>
<td>The building's interiors do not show signs of water damage or leaks from the roof</td>
<td>The building's interiors show signs of water damage or leaks from the roof</td>
</tr>
<tr>
<td>The building has working plumbing, heating, &amp; electrical systems</td>
<td>The building's plumbing, heating, &amp; electrical systems do not work</td>
</tr>
</tbody>
</table>
Building has good natural interior lighting  
Building has poor natural interior lighting  

Totals

The assessment scoring sheet is completed for each of the buildings under review. The totals for each building are then ranked to determine the relative suitability in terms of available infrastructure and the condition of the building and site. The following list details the rankings according to the number of positive responses:

Positive Responses Totaling 9 - 11.....Rated Most Suitable
Positive Responses Totaling 5 - 8......Rated Suitable
Positive Responses Totaling 0 - 5......Rated Least Suitable

The ratings for each mill are organized by placing an X in the appropriate box in the Infrastructure Support and Building/Site Condition Matrix (Figure 3.4)
### INFRASTRUCTURE SUPPORT & BUILDING/SITE CONDITIONS MATRIX

<table>
<thead>
<tr>
<th>IDENTIFIED MILLS WITHIN STUDY AREA</th>
<th>SUITABILITY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOST SUITABLE</td>
</tr>
<tr>
<td></td>
<td>SUITABLE</td>
</tr>
<tr>
<td></td>
<td>LEAST SUITABLE</td>
</tr>
<tr>
<td>MILL #1</td>
<td></td>
</tr>
<tr>
<td>MILL #2</td>
<td></td>
</tr>
<tr>
<td>MILL #3</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3.4** Infrastructure Support and Building/Site Conditions Matrix

### Step Three: Surrounding Land Use and Environmental Concerns

Landscape planning techniques developed by the METLAND Research Group were used to identify the functional and environmental constraints and opportunities connected with adaptive reuse. The factors assessed are presented below.

#### Surrounding Land Use and Environmental Concerns Suitability Assessment Sheet

<table>
<thead>
<tr>
<th>Building/site not listed on the MA Chapter 21 E Program</th>
<th>+</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building is listed on the MA Chapter 21E program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of building is outside of 1% flood plain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building (whole or part) is inside of 1% flood plain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts 43
Center for Economic Development Spring 1993
<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of building/site is inside water resource district</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All or part of building/site is outside water resource district</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All of the site is outside wetland 100 ft. buffer zone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part of the site is inside wetland 100 ft. buffer zone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building/site is not visibly adjacent to mining or landfill operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building/site is visibly adjacent to mining or landfill operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current use of building/site is compatible with present zoning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current use of building/site is not compatible with present zoning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surrounding land uses/zoning do not include residential areas thereby not restricting possible new uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surrounding land uses do include residential areas that will restrict possible new uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site has adjacent vacant land which could easily support parking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site has no adjacent vacant land which could easily support parking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site is directly adjacent to amenities such as parks and recreation areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site is not directly adjacent to parks and recreation areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site is within .5 mile of shops, stores, schools, or downtown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site is over .5 mile from from shops, stores, schools, or downtown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The assessment scoring sheet is completed for each of the buildings/sites under review. The totals for each building/site are then ranked to determine the relative suitability in terms of surrounding land uses and environmental concerns. The following list details the rankings according to the number of positive responses:

Positive Responses Totaling 7 - 10.....Rated Most Suitable
Positive Responses Totaling 3 - 6.....Rated Suitable
Positive Responses Totaling 0 - 2.....Rated Least Suitable

The ratings for each mill are organized by entering an X in the appropriate box in the Surrounding Land Use and Environmental Concerns Matrix (Figure 3.5).

<table>
<thead>
<tr>
<th>IDENTIFIED MILLS WITHIN STUDY AREA</th>
<th>SUITABILITY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOST SUITABLE</td>
</tr>
<tr>
<td></td>
<td>SUITABLE</td>
</tr>
<tr>
<td></td>
<td>LEAST SUITABLE</td>
</tr>
<tr>
<td>MILL #1</td>
<td></td>
</tr>
<tr>
<td>MILL #2</td>
<td></td>
</tr>
<tr>
<td>MILL #3</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.5 Surrounding Land Use & Environmental Concerns Matrix
Step Four: Composite Suitability Assessment Rating and Adaptive Reuse Potential Ranking

Once the matrices for historic significance and educational value; infrastructure support and building/site conditions; and surrounding land use and environmental concerns are completed, the results are combined to form a composite suitability assessment. The composite rating provides a rank-ordering of underutilized industrial mill buildings for potential adaptive reuse. The purpose of the rank-ordering is to identify the mill building which is the most likely candidate for a successful adaptive reuse project. In a town with numerous underutilized mill buildings, the successful redevelopment of one mill may stimulate the local economy. It may also trigger the renovation and restoration of other mills and buildings with less positive characteristics.

The rankings from each of the three individual matrices are given numerical scores in the following manner:

- Most significant or most suitable receives a numeric score of 3
- Significant or suitable receives a numeric score of 2
- Least significant or least suitable receives a numeric score of 1

The resulting ratings, expressed numerically as 1, 2, or 3 for each mill, are entered into the Composite Assessment Matrix (Figure 3.6), thus providing a summary of the three primary factors used to assess the potential for adaptive reuse. The scores for each mill are then summed to form a total composite score. This method of deriving composite ratings assumes that each of the factors has equal or similar importance, and therefore each is given equal weight.
The Composite Assessment Matrix records the results of ranking the mills for their potential for adaptive reuse based on the assessments of the three primary factors identified in chapter 2. The site with the highest ranking for adaptive reuse potential is the site that will proceed to Phase III.
3.3 PHASE III: USE ALTERNATIVES AND SITE SPECIFIC DESIGN

Phase III addresses the process of site planning and design for a historic mill adaptive reuse project. Starting with the generation of adaptive reuse alternatives and the detailed site analysis of the mill identified by Phase II, this process continues with evaluations of these alternatives based on physical space requirements as well as the three key factors identified as critical for successful adaptive reuse (historic significance and educational value; infrastructure support and building/site conditions; and surrounding land use and environmental concerns). These factors inform the development of a conceptual schematic design, illustrated by diagrams, charts and plans.

Step One: Generation of Use Alternatives

In this step, alternative uses, programs, and activities are developed for the site identified by Phase II. The new uses of the mill are those that would best complement the historic nature of the building such as interpretive activities or retail outlets offering woolen goods and local handmade merchandise. Typical zoning and site design standards for parking, vehicular circulation, and pedestrian circulation are used to evaluate the mill for modern office space. New uses for the mill structures should adhere to both the land use management plan (BRVNHCC, 1989) and the design guidelines (Eaton and Grady, 1989) for the Blackstone River Valley. They should not generate extensive signage or traffic that could detract from the historic qualities of the building. Therefore, as an example, eateries should be designed for "sit down" eating, not "fast food" that generates traffic and litter problems. Three prototypical levels of adaptive reuse conversion for mill buildings are explained below.

Use Alternative One: Continued Use with Self-Guiding Information Center

Alternative one is primarily a continuation of the original mill's function or activities, such as light manufacturing space. This alternative allows the retention of existing jobs. Alternative one combines manufacturing space with a self-guiding interpretive/information center and design studio
space. Studios can occupy space determined to be difficult or too expensive to develop for public access. The self-guiding interpretive display not only provides historic information about the mill but also informs visitors about other local attractions.

Use Alternative Two: Partial Conversion With Interpretive Center

With the partial adaptive reuse of alternative two, the interpretive center/display is integrated with the utilization of the historic mill building for retail stores, office space, business incubator start-up space, as well as light manufacturing and storage. The interpretive center provides historic information about the mill and its surroundings and relates facts about the Industrial Revolution era. The museum could also promote present-day industrial and technological activities and educate the visiting public about current economic opportunities in the Blackstone River Valley region. An on-site food service like a cafe would be an added attraction for visitors and workers alike. Increased tourism will benefit the retail stores.

Use Alternative Three: Full Conversion With Larger-Scale Interpretive Center

Alternative three is a proposal for a fully-converted mill building containing completely new uses. Mill buildings would offer diverse office space, restaurants, retail shops, and other complementary uses. Some studio space and a larger-scale interpretive center is included. This alternative represents adaptive reuse carried to its full extent. A full-service restaurant provides for the office staff and week-long day and night visitors to the retail shops, interpretive center, and surroundings.

Step Two: Site Analysis and Assessment

After generating the three proposed alternatives, a detailed site analysis and assessment is conducted for the mill identified by Phase II. Site analysis can be defined as separating a complex phenomenon into smaller components. The mill targeted for reuse is visited for the purpose of gathering specific information on several features to guide later design efforts. Information sought

Adaptive Reuse of Historic Mills 49  Spring 1993
Uxbridge, Massachusetts  Center for Economic Development
at this time has relevance to the proposed reuse project and affects the schematic design. Analytical observations should remain as objective as possible. For a further discussion of the factors involved with site analysis, Lynch's authoritative work, Site Planning (1962), is recommended. For the purposes of this study, the factors considered are listed below.

**Manmade or Manufactured Elements**
- Circulation/Access
- Utilities
- Zoning
- Structures and Paving Surfaces
- Pollutants

**Natural Elements**
- Sun and Shade
- Wind
- Temperature
- Water and Precipitation
- Vegetation
- Wildlife
- Soils
- Topography

**Qualitative or Aesthetic Factors**
- Views and Vistas
- Predominant Site Features
- Form and Shape

Site assessment uses the factors of the analysis step (such as topography, solar orientation, soils, existing buildings, roads, and canals) to determine suitabilities for various program

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Spring 1993
Center for Economic Development
elements. The goal of the designer is to integrate the adaptive reuse program into a design that retains the historic character of the mill and its surroundings. The resulting site assessment for the selected mill is graphically presented.

Step Three: Develop Alternative Layouts With Parking Requirements

The development of use alternatives at the site level allows the initial examination of feasibility. Additional information such as exterior spatial requirements for parking is needed to evaluate the practicality of the three use alternatives. The conceptual layout of the mill building and grounds results from the combination of each use alternative with the site assessment and the local design guidelines.

Developing different floor configurations for the mill is a tool for exploring alternative functions. Several accepted design rules guide circulation and separation of activities such as manufacturing and tourism uses. Access needs for loading docks and retail parking follow certain "rules-of-thumb" such as the understanding that manufacturing spaces generate truck activity and need loading docks. These activities in turn are visually detracting to the visitor that came to shop or visit the interpretive center, and they could prove dangerous to pedestrians as well. Interpretive centers also have differing requirements in terms of parking and pedestrian access. For example, the interpretive center should be located in a place that is easily accessible to visitors, but it should not interfere with the operations of the mill. Retail merchants would ideally like the customer to be able to drive to their doors, but the historic character of the site is a reason to encourage visitors to walk among the different areas of the building and enjoy the event of being at a historic mill.

Two important references, Guidelines for Historic Structures: Standards for Rehabilitation (National Park Service, 1985) and the Design Guidelines and Standards for the Blackstone River Valley National Heritage Corridor (Eaton and Grady, 1989) inform the development of floor plans.
for the different use alternatives. These plans represent the location of walls and elevators for each floor as well as loading docks and other access points. The floor plans also show the square footage for each floor.

For each alternative, uses that will occupy each floor are laid out in a manner that avoids potential conflicts and provides needed access points. Based on this conceptual plan that outlines the location of each activity, the total square footage amounts are calculated within the building and for the entire site. These amounts will be used to assess the requirements for parking needs.

Each use alternative is examined for its parking requirements. The parking requirements are determined by norms obtained from *Time Saver Standards for Landscape Architecture* (Harris and Dines, 1988). These standards are reproduced in Figure 3.7.
<table>
<thead>
<tr>
<th>Use of site and/or building</th>
<th>Minimum number of parking spaces required&lt;sup&gt;*&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residential</strong></td>
<td></td>
</tr>
<tr>
<td>Single family homes</td>
<td>2.0/dwelling unit</td>
</tr>
<tr>
<td>Multifamily:</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>1.0/dwelling unit</td>
</tr>
<tr>
<td>One and two bedrooms</td>
<td>1.3/dwelling unit</td>
</tr>
<tr>
<td>Three and more apartments</td>
<td>2.0/dwelling unit</td>
</tr>
<tr>
<td>Dormitories, dorms, fraternity</td>
<td>0.5/units</td>
</tr>
<tr>
<td>Hotels and motels</td>
<td>1.0/dwelling unit</td>
</tr>
<tr>
<td><strong>Commercial</strong></td>
<td></td>
</tr>
<tr>
<td>Offices and banks</td>
<td>3.8/1000 s.f. GFA</td>
</tr>
<tr>
<td>Business and professional services</td>
<td>3.3/1000 s.f. GFA</td>
</tr>
<tr>
<td>Commercial recreational facilities</td>
<td>5.0/1000 s.f. GFA</td>
</tr>
<tr>
<td>Bowling alleys</td>
<td>4.0/1000 s.f. GFA</td>
</tr>
<tr>
<td>Regional shopping centers</td>
<td>4.5/1000 s.f. GFA</td>
</tr>
<tr>
<td>Community shopping centers</td>
<td>5.0/1000 s.f. GFA</td>
</tr>
<tr>
<td>Neighborhood centers</td>
<td>6.0/1000 s.f. GFA</td>
</tr>
<tr>
<td>Restaurants</td>
<td>0.3/seat</td>
</tr>
<tr>
<td><strong>Educational</strong></td>
<td></td>
</tr>
<tr>
<td>Elementary and junior high schools and colleges</td>
<td>1.0/teacher and staff</td>
</tr>
<tr>
<td>High schools and colleges</td>
<td>1.0/2-5 students</td>
</tr>
<tr>
<td><strong>Medical</strong></td>
<td></td>
</tr>
<tr>
<td>Medical and dental offices</td>
<td>1.0/200 s.f. GFA</td>
</tr>
<tr>
<td>Hospitals</td>
<td>1.0/2-3 bed</td>
</tr>
<tr>
<td>Convent &amp; nursing homes</td>
<td>1.0/2 bed</td>
</tr>
<tr>
<td><strong>Public Building</strong></td>
<td></td>
</tr>
<tr>
<td>Auditoriums, theaters, stadiums</td>
<td>1.0/4 seats</td>
</tr>
<tr>
<td>Museums and libraries</td>
<td>1.0/200 s.f. GFA</td>
</tr>
<tr>
<td>Public utilities and offices</td>
<td>1.0/two employees</td>
</tr>
<tr>
<td><strong>Recreation</strong></td>
<td></td>
</tr>
<tr>
<td>Beaches</td>
<td>1.0/100 s.f.</td>
</tr>
<tr>
<td>Swimming pools</td>
<td>1.0/20 s.f.</td>
</tr>
<tr>
<td>Athletic fields and courts</td>
<td>1.0/2000 s.l.</td>
</tr>
<tr>
<td>Golf courses</td>
<td>1.0/acre</td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td></td>
</tr>
<tr>
<td>Industrial manufacturing</td>
<td>1.0/2-5 employees</td>
</tr>
<tr>
<td><strong>Churches</strong></td>
<td></td>
</tr>
<tr>
<td>Churches</td>
<td>1.0/4 seats</td>
</tr>
</tbody>
</table>

<sup>*</sup>The data was derived from survey conditions in North America. Special conditions including noise codes and requirements may be quite different and should be used where appropriate. Study of comparable types of land uses nearby or in other similar situations is recommended. Access to and from the site/building via public transportation will affect significantly the number of parking spaces needed for most types of uses.

**Figure 3.7 Parking Requirements for Various Land Uses (Harris and Dines, 1988)**

Calculations based on the floor layouts reflecting the activities for alternatives one, two, and three, are displayed in matrices, an example of which is presented below (Figure 3.8). The findings are used to determine the parking requirements of each alternative based on the chart from Figure 3.7. The results are presented individually for each use alternative.
The floor plans and the parking requirements for each use alternative are drafted for presentation and review. The drawings contain a table with square footage information and on-site parking requirements. An example of this graphic is presented below (Figure 3.9). These floor plans and the information contained in them are used in the next step to evaluate the alternatives.
3.3.4 Step Four: Evaluate Proposed Use Alternatives

In this step, each of the three conceptual use alternatives described above are evaluated based on the site and building features and the design guidelines. The alternatives are also evaluated against the three key factors considered critical to successful adaptive reuse as outlined in Phase II. Each criteria covers more than one key factor or design guideline. These criteria are listed below.

Responds to Historic Significance

Alterations minimally affect the activities of the mill or the surrounding character of the site.

Suggested alternative highlights the character of the mill through educational programs.
Compatibility with Interpretive Center

Activities are complementary in nature to the interpretive efforts involved in the rehabilitation of the mill. Activities/services support visitors to the mill's interpretive center.

Promotes Tourism Activity

The alternative provides a visitor destination-or starting-point for tourism activities.

On-site Support for Activities

Visitor and daily users of the mill can obtain food and services.

Surroundings Support Activities

Linkages to town centers and recreational opportunities are created. The neighborhood is historic in nature, providing support to interpretive activities.

Building Supports Activities

The size and flexibility of the building is fully utilized by the alternative without overwhelming the mill. New uses do not require insensitive conversion of millyards.

Parking Needs Supported by Site

Proposed uses and parking adequately fit within the space provided at the site.

Promotes Environmental Quality

The adaptive reuse program is responsive to past and possible future environmental degradation.
Program Provides Development Flexibility

The mixture of uses allows the mill to respond to changing market and economic factors without making future large-scale spatial changes necessary.

Each of the use alternatives are evaluated against the above criteria, and the results are entered into the Alternatives Evaluation Matrix below (Figure 3.10).

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Alt. #1</th>
<th>Alt. #2</th>
<th>Alt. #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESPONDS TO HISTORIC SIGNIFICANCE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPATIBILITY WITH MUSEUM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROMOTES TOURISM ACTIVITY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON-SITE SUPPORT FOR ACTIVITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SURROUNDINGS SUPPORT ACTIVITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUILDING SUPPORTS ACTIVITIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PARKING NEEDS SUPPORTED BY SITE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROMOTES ENVIRONMENTAL QUALITY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROGRAM PROVIDES DEVELOPMENT FLEXIBILITY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.10 Alternative Evaluation Matrix
The alternatives are given a rating of L=low, M=medium, or H=high, depending on the degree of criteria fulfillment. The use alternative achieving highest overall rating against the evaluation criteria may be the program alternative selected for design development.

**Step Five: Prepare Schematic Design**

The goal of step five is to develop further a conceptual site design for the alternative selected from step four while showing layout, vegetation, and parking. Designs must respond to the site and be based on the data gathered during the site analysis and assessment phase described earlier. The designer must address the contextual and historic qualities of the mill.

The schematic design of the mill should reflect spatial constraints and opportunities of the mill buildings and their surroundings. Circulation patterns for the spatial layout of the activities are a key element of the design. As Lynch states:

"The general [conceptual] site design will show structures, locations of activities [parking, retail], circulation patterns, major plant massings, overall landform, and general levels of finish. Rough cost estimates are generated from the given length or area of typical features or types" (1962, 264).

Figures and sketches at the appropriate scale are developed for the site in the following areas of concentration:

Circulation/Linkage Patterns/Access
Parking
Planting/Grading Design
Details/Signage
Rough Cost Estimates
3.4 SUMMARY

The three phase method described above was designed to identify an underutilized building or mill with the most potential for successful adaptive reuse. In addition, Phase III will assist the Blackstone River Valley National Heritage Corridor Commission and local development commissions and individuals in examining reuse and design alternatives for mills identified as having a high potential for adaptive reuse. The planning, design, rehabilitation, and marketing of these underutilized buildings is a complex undertaking. This procedure is not expected to answer all questions connected with adaptive reuse activities. Instead, it is hoped that it can be used as a starting point for adaptive reuse programs. Reuse programs will expand to incorporate other key elements such as marketing and economics as suggested by the work of the Urban Land Institute (1978). The method described in this chapter can form the foundation of a more extensive assessment procedure for adaptive reuse.
CHAPTER FOUR - PLANNING AND DESIGN
FOR A HISTORIC MILL IN UXBRIDGE

This chapter applies the methodology presented in chapter three to a case study area in Uxbridge, Massachusetts, a town located in the Blackstone River Valley National Heritage Corridor. As stated in chapter two, adaptive reuse can take many forms. Within the Heritage Corridor and especially in Uxbridge, the mills represent valuable resources for economic revitalization and historic preservation efforts. The Blackstone Valley National Heritage Corridor Commission has targeted the Town of Uxbridge for study in the hope of learning and applying the results of this case study not only to assist Uxbridge but also to assist the other cities and towns in the Heritage Corridor.

4.1 APPLICATION OF PHASE I: TOWN LEVEL ASSESSMENT FOR ADAPTIVE REUSE POTENTIAL

Step One: Assessment of Utilization Levels of Mills Within Study Area

Town assessor's records provided information such as square footage of the buildings and parcels. Owners or managers of the buildings were interviewed by phone and in person to obtain additional information on mill utilization rates. The results are presented in Figure 4.1 below.
### MILL UTILIZATION RATE MATRIX

<table>
<thead>
<tr>
<th>MILLS WITHIN STUDY AREA</th>
<th>% &amp; SQ/FT FULLY UTILIZED</th>
<th>% &amp; SQ/FT UNDER-UTILIZED</th>
<th>% &amp; SQ/FT VACANT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BERNAT</strong> (398,789 SQ/FT)</td>
<td>12% 47,854 SQ/FT</td>
<td>11% 43,866 SQ/FT</td>
<td>77% 307,067 SQ/FT</td>
</tr>
<tr>
<td><strong>CROWN &amp; EAGLE</strong> (45,920 SQ/FT)</td>
<td>100% 45,920 SQ/FT</td>
<td>0% 0 SQ/FT</td>
<td>0% 0 SQ/FT</td>
</tr>
<tr>
<td><strong>RIVULET</strong> (103,248 SQ/FT)</td>
<td>100% 103,248 SQ/FT</td>
<td>0% 0 SQ/FT</td>
<td>0% 0 SQ/FT</td>
</tr>
<tr>
<td><strong>STANLEY WOOLEN</strong> (102,614 SQ/FT)</td>
<td>10% 10,261 SQ/FT</td>
<td>18% 18,470 SQ/FT</td>
<td>72% 73,882 SQ/FT</td>
</tr>
<tr>
<td><strong>WAUCANTUCK</strong> (108,200 SQ/FT)</td>
<td>8% 8,656 SQ/FT</td>
<td>10% 10,820 SQ/FT</td>
<td>82% 88,324 SQ/FT</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>29.6% 224,934 SQ/FT</td>
<td>9.6% 73,156 SQ/FT</td>
<td>61.8% 469,673 SQ/FT</td>
</tr>
</tbody>
</table>

**Figure 4.1** Mill Utilization Rate Matrix

The result of the utilization rate figures show a 46% underutilized or vacant floor space average for the mills in the case study area as a whole. If the two mills that are being fully utilized (the Crown & Eagle Mill and the Rivulet Mill) are eliminated from consideration, the remaining historic mills contain an average of 89% underutilized or vacant space (Figure 4.2). While some of the space within these mills is in active manufacturing use, major portions remain vacant and unused.
ADJUSTED MILL UTILIZATION RATE MATRIX

<table>
<thead>
<tr>
<th>MILLS WITHIN STUDY AREA W/ SQ/FT</th>
<th>% &amp; SQ/FT FULLY UTILIZED</th>
<th>% &amp; SQ/FT UNDER UTILIZED</th>
<th>% &amp; SQ/FT VACANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BERNAT (398,789 SQ/FT)</td>
<td>12% 47,854 SQ/FT</td>
<td>11% 43,866 SQ/FT</td>
<td>77% 307,067 SQ/FT</td>
</tr>
<tr>
<td>STANLEY WOOLEN (102,614 SQ/FT)</td>
<td>10% 10,261 SQ/FT</td>
<td>18% 18,470 SQ/FT</td>
<td>72% 73,882 SQ/FT</td>
</tr>
<tr>
<td>WAUCANTUCK (108,200 SQ/FT)</td>
<td>8% 8,656 SQ/FT</td>
<td>10% 10,820 SQ/FT</td>
<td>82% 88,724 SQ/FT</td>
</tr>
<tr>
<td>TOTALS (609,603 SQ/FT)</td>
<td>10.9% 66,771 SQ/FT</td>
<td>12% 73,156 SQ/FT</td>
<td>77.1% 469,673 SQ/FT</td>
</tr>
</tbody>
</table>

Figure 4.2 Adjusted Mill Utilization Rate Matrix

Step Two: Identification of Historically Significant Mills in the Study Area.

The Town of Uxbridge has an excellent base of historic information. The town library has records that assisted in the identification of those mills listed on the National Register of Historic Places. Other sources of information include the Massachusetts Historical Commission records and the Blackstone River Valley National Heritage Corridor Commission Historic Resources Inventory (1989). The latter was digitally mapped by the METLAND Research Group.
Research revealed 7,587,700+ square feet of floor space within historically significant mills in the case study area. The information gathered in this step is graphically represented in the Town Level Assessment Maps (Figures 4.3, 4.4, and 4.5).

**Step Three: Determine That Mills Identified As Both Underutilized and Historically Significant Are Located Within a Historic District.**

The location of Historic District Boundaries was obtained by comparing METLAND digitized land parcels obtained from the Uxbridge assessor's records with National Historic Register listings provided by the Massachusetts Historic Commission. This resulted in the identification of districts containing significant numbers of historic structures. The findings of step three are presented with those of steps one and two in the Town Level Assessment Maps (Figures 4.3, 4.4, and 4.5).

Figure 4.3 shows the five mills that are within the study area. Figure 4.4 is a more detailed view of two of the mills, the Crown & Eagle Mill and the Rivulet Mill. As shown in the figure, both mills are fully utilized and are nationally registered historic structures in historic districts.

Figure 4.5 is a detailed view of the remaining three mills in the study area. The Stanley Woolen Mill, the Bernat Mill, and the Waucantuck Mill have significant amounts of underutilized or vacant space, ranging from 102,614 square feet to 389,789 square feet. Only one mill, the Stanley Woolen Mill, is contained within a historic district. The other two mills are located near historic districts. The Stanley Woolen Mill and the Waucantuck Mill are also both on the National Register of Historic Places.
Town Level Assessment: Case Study Area
Northern Portion, Town of Uxbridge

Figure 4.3: Map of Town Level Assessment: Case Study Area
Northern Portion, Town of Uxbridge

Mills Within Study Area
Town Level Assessment:
Utilization Rates, Mills of Uxbridge

Figure 4.4 Map of Town Level Assessment: Utilization Rates of Rivulet and Crown & Eagle Mills

Rivuletville Historic District

Rivulet Mill
103,248 sq/ft
Fully Utilized
Historic Mill

Rogersonsville
Nationally Registered Historic District

Crown & Eagle Mill
45,920 sq/ft
Fully Utilized
Adaptively Reused Historic Mill

Locus Map
Area of Enlargement

Nationally Registered Historic District

Nationally Registered Historic Mill
Figure 4.5 Map of Town Level Assessment: Utilization Rates, Mills of Uxbridge

- Stanley Woolen Mill
  - 102,614 sq/ft
  - Nationally Registered Historic Mill
  - w/Underutilized or Vacant Space

- Wauccantuck Mill
  - 106,200 sq/ft
  - w/Underutilized or Vacant Space

- Bernal Mill
  - 389,789 sq/ft
  - w/Underutilized or Vacant Space

- Wheelockville Historic District
- Blackstone River
- Rte 16
- Rte 122

Legend:
- Nationally Registered Historic District
- Nationally Registered Historic Mill
- Underutilized or Vacant Mill
- Locus Map
  - Area of Enlargement
4.2 APPLICATION PHASE II: DISTRICT LEVEL ASSESSMENT FOR
ADAPTIVE REUSE POTENTIAL

Step One: Historic Significance and
Educational Value Assessment

This step utilizes Massachusetts Historic Commission National Register nomination forms
along with site visits to assess the mills. Meetings with members of the local Historic Commission
assisted in completing this assessment. The information in the assessment map resulting from
Phase I assisted in completing the historic significance and educational value scoring sheets. The
individual assessment score sheets are contained in appendix A. The totals of the scores for the
historic significance and educational value assessment sheets are:

Bernat Mill ...................... 4
Stanley Woolen Mill .......... 8
Waucantuck Mill.............. 7

The significance rankings of historic significance and educational value for each mill result
directly from these scores, and the findings are presented in the Historic Significance and
Educational Value Matrix below (Figure 4.6).
The findings show that Stanley Woolen Mill and Waucantuck Mill are both rated most significant, scoring highest in historic significance and educational value assessment. Their locations (near schools, major roads, and the town center) along with the architectural and historic attributes (age and uniqueness of style and construction) are reflected in the above assessment.

Step Two: Infrastructure Support and Building/Site Conditions

Information gathered on the visits to the town hall and by interviews with utility companies was used to complete this step. The information gathered about infrastructure support is focused in three areas: sewer, water, and gas service.
Sewer Service

An interview with the Superintendent of Public Works, Larry Bombara, revealed that the sewer system (designed capacity) could function fully if all the mills under study were involved manufacturing operations (heavy water usage activities). The municipal wastewater treatment plant, on River Road in south Uxbridge, opened in 1979 with a designed capacity of 2.5 million gallons per day (M.G.D.). Presently, the average daily flow is .58 M.G.D. Almost 2 M.G.D. of unused capacity is available in the system to accommodate new uses. The pipes joining the mills to the sewer system are all adequately sized. As a result of these findings, the sewer capacity can adequately support adaptive reuse activities ranging from manufacturing to interpretation.

Water Service

Uxbridge is supplied exclusively by ground water from a well field located off of the intersection of High Street and South Main Street. The present town well is delivering 900 gallons of water a minute. The present storage tank has a capacity of 500,000 gallons or a two-day supply. The average daily consumption of water for the calendar year 1990 was 798,579 gallons/per/day. The highest daily consumption took place on 6/18/90 when 1.22 million gallons were drawn from the system. The highest weekly average took place during the week 6/15 through 6/21 in 1990, with the system supplying 8.01 million gallons of water. Uxbridge has preliminary plans to build a 3-million gallon storage tank to extend service to outlying parts of town that are expected to be developed in the future. As a result of these findings, the water supply capacity can adequately support adaptive reuse activity ranging from manufacturing to interpretation.

Natural Gas Service

Natural Gas is supplied to Uxbridge by the Commonwealth Gas Company. The characteristics of the feed lines for the Mills in the case study area are as follows:

| Stanley Mill | 146 Mendon St. | 8" line with 40 lbs. pressure |

Adaptive Reuse of Historic Mills 69
Uxbridge, Massachusetts

Spring 1993
Center for Economic Development
Waucantuck Mill 325 Mendon St. 8" line with 40 lbs. pressure
Bernat Mill 19 Depot St. 8" line with 40 lbs. pressure within 200 feet on Mendon St.

Commonwealth Gas Company has adequate delivery pressure and infrastructure in place to support these mills. As a result of these findings, the natural gas service capacity will adequately support adaptive reuse activity ranging from manufacturing to interpretation.

Infrastructure support and building/site condition information obtained at the district level was assessed. Site visits were conducted utilizing the building/site conditions check list. The completed check lists for Bernat Mill, Stanley Woolen Mill, and Waucantuck Mill are presented in appendix A.

The totals for the infrastructure support and building/site conditions suitability assessment sheet are:

Bernat Mill ......................... 4
Stanley Woolen Mill .................. 8
Waucantuck Mill ..................... 7

The suitability rankings concerning infrastructure support and building/site conditions for each mill result directly from these scores, and the findings are presented in the Infrastructure Support and Building/Site Conditions Matrix below (Figure 4.7).
<table>
<thead>
<tr>
<th>IDENTIFIED MILLS WITHIN STUDY AREA</th>
<th>SUITABILITY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOST SUITABLE</td>
</tr>
<tr>
<td>BERNAT MILL</td>
<td></td>
</tr>
<tr>
<td>STANLEY WOOLEN MILL</td>
<td>X</td>
</tr>
<tr>
<td>WAUCANTUCK MILL</td>
<td>X</td>
</tr>
</tbody>
</table>

Figure 4.7 Infrastructure Support & Building/Site Conditions Matrix

Step Three: Surrounding Land Use and Environmental Concerns

District level information is further assessed for possible environmental pollution on the site, zoning relationships, 1% flood plain boundary location, and other information compiled in the database. Available environmental records from the Massachusetts Department of Environmental Protection in Worcester Massachusetts revealed that the Stanley Woolen Mill is listed as a Massachusetts Chapter 21E (Massachusetts Waste Oil and Hazardous Material Recovery Act) site. The surrounding land use and environmental concerns suitability assessment sheets for each of the mills are presented in appendix A. Totals of the scores for the assessment sheets are:

Bernat Mill ................................6
Stanley Woolen Mill ......................5
Waucantuck Mill ..........................5
The suitability rankings for surrounding land use and environmental concerns for each mill result directly from these scores, and the findings are presented in the Surrounding Land Use and Environmental Concerns Matrix (Figure 4.8).

<table>
<thead>
<tr>
<th>IDENTIFIED MILLS WITHIN STUDY AREA</th>
<th>SUITABILITY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOST SUITABLE</td>
</tr>
<tr>
<td></td>
<td>SUITABLE</td>
</tr>
<tr>
<td></td>
<td>LEAST SUITABLE</td>
</tr>
<tr>
<td>BERNAT MILL</td>
<td></td>
</tr>
<tr>
<td>STANLEY WOOLEN MILL</td>
<td></td>
</tr>
<tr>
<td>WAUCANTUCK MILL</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.8 Surrounding Land Use and Environmental Concerns Matrix

The assessment results from Phase II are graphically displayed in the maps below (Figure 4.9 and Figure 4.10). Figure 4.9 shows that the Stanley Woolen Mill lies adjacent to the Blackstone Heritage State Park and within .5 mile of commercial areas and other historic sites (Figure 4.10). The Waucantuck Mill lies adjacent to a commercial area, but is not within .5 mile of other historic structures (Figure 4.10).
Figure 4.9 District Assessment: Surrounding Land Uses

District Level Assessment: Surrounding Land Uses

- BLACKSTONE CANAL
- Historic Residential Neighborhood
- Stanley Woolen Mill
- Waucantuck Mill
- Proposed Canoe Launch
- BLACKSTONE RIVER
- Bernat Mill
- Woonsocket River

Legend:
- BLACKSTONE HERITAGE STATE PARK
- COMMERCIAL AREAS
- MILL/INDUSTRIAL
- Scale: 1:3000
- North
Figure 4.10 Map of District Level Assessment: Recreational & Interpretive Opportunities

District Level Assessment: Recreational & Interpretive Opportunities

- HISTORIC SITES
- .5 MILE WALKING DISTANCE
- HISTORIC DISTRICTS
- HISTORIC MILLS
- BLACKSTONE HERITAGE STATE PARK

Legend:
- Town Center
- Wauquantuck Mill
- Stanley Woolen Mill
- Proposed Canoe Launch
- Bernet Mill
- Wauquantuck River
- Manford River
- Connecticut Pond
- RTE 122
- RTE 10
- North

Scale:
1:3500
1" = 300'

Map showing various landmarks and areas including historic sites, walking distances, historic districts, historic mills, and a heritage state park.
Step Four: Composite Assessment Matrix and Ranking

The results of the Historic Significance and Educational Value Matrix, Infrastructure Support and Building/Site Conditions Matrix and Surrounding Land Use and Environmental Concerns Matrix are combined to form weighted scores. As outlined in chapter 3, suitability or significance ratings from each of the three individual matrixes are expressed numerically as follows:

- Most significant or most suitable receives a numeric score of 3
- Significant or suitable receives a numeric score of 2
- Least significant or least suitable receives a numeric score of 1

The resulting rating expressed numerically as 1, 2, or 3 for each matrix is aggregated through addition of the scores, and the total is entered into the Composite Assessment Matrix (Figure 4.11). This provides an overall rating of the three factor groups. The result is based on the assumption that each of the three principal factors have equal weight.
Adaptive Reuse Potential Rankings

The ranking of the underutilized mills (Figure 4.11) in the Uxbridge case study estimates the potentials for adaptive reuse based on assessments and our assumptions of Phases I and II. The scoring reveals that two mills have a high potential for successful adaptive reuse. The rankings of the mills are:

- #1 Stanley Woolen Mill and Waucantuck Mill
- #2 Bernat Mill

Figure 4.11 Composite Adaptive Reuse Potential Matrix

<table>
<thead>
<tr>
<th>ASSESSMENT RATING</th>
<th>BERNAT MILL</th>
<th>STANLEY WOOLEN MILL</th>
<th>WAUCANTUCK MILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>HISTORIC EDUCATION POTENTIAL</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>INFRASTRUCTURE SUPPORT &amp; BUILDING/SITE CONDITIONS</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>SURROUNDING LAND USE &amp; ENVIRONMENTAL CONCERNS</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL COMPOSITE SCORE</td>
<td>5</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>
The Bernat Mill scored only two points below the others. Consequently, it too represents good rehabilitation potential for future adaptive reuse efforts. For the purposes of this case study, the Stanley Woolen Mill is chosen for the site-specific planning and design.

4.3 PHASE III: SITE-SPECIFIC PLANNING AND DESIGN

Step One: Development of Use Alternatives for Stanley Woolen Mill

Three schemes or use alternatives were developed jointly by METLAND and the staff of the Blackstone Valley National Heritage Corridor Commission with input from the Uxbridge Industrial Development Commission. The alternatives attempt to follow both the Design Guidelines for Historic Structures: Standards for Rehabilitation (National Park Service, 1985) and the Design Guidelines and Standards for the Blackstone River Valley National Heritage Corridor (Eaton and Grady, 1989) presented in chapter 2. The alternatives developed are:

1. Continued Use
2. Partial Conversion
3. Full Conversion

These alternatives are discussed in greater detail in Section 3.4 of chapter 3.

All alternatives incorporate educational interpretive space. The options range from alternative one's modest unstaffed passive display area through alternative three's spacious interpretive center. Educational and interpretive activities and staffing needs increase with each alternative. Other alternative uses include mill use or light manufacturing/machine space, retail shops, factory outlet stores, storage space, incubator space for new start-up business ventures, office space for agencies or professionals, artist/designer studio space, and food service establishments. Alternatives were designed to escalate from low amounts to higher amounts of change in mill activity, reflecting the continuum of alternatives one through three. This allowed for
response to changing market and economic realities while examining the impacts and effects of adaptive reuse on a historic structure.

**Step Two: Site Analysis and Assessment**

With the conceptual use alternatives in mind and the needs of the proposed new activities, a site analysis and assessment was undertaken for the Stanley Woolen Mill complex. The findings of are illustrated in the following site maps and diagrams (Figures 4.12 and 4.13).
Site Assessment
Stanley Woolen Mill
Suitability Assessments for Adaptive Reuse

D.E.M Parking Lot
Provides Opportunities for Adaptive Reuse
Recreational and Tourism Activities

Possible New Entrance
Interesting View of Canal Gate

Significant Historic Mill
Housing Promotes Interpretive Opportunities

Historic Sites and Town Center Close By

Highly Suitable Access to Major Road

Highly Suitable Trail Linkage to Blackstone Heritage State Park

Possible Outdoor Activities Area

Area Suitable for Outdoor Dining with Views to River

Recreational Linkages, Pedestrian and Bicycle

Most Significant Auto Access

Appropriate Pedestrian Area

Water-based Recreation

Stanley Woolen Mill possesses great potential for Adaptive Reuse activity ranging from manufacturing to education.

Many existing and potential linkages for both pedestrians, bicyclist and other recreational users could be incorporated into the schematic design.

NORTH

0 40 60 80 Scale in Feet

Proposed Canoe Launch Area

Spring 1993

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Center for Economic Development
Step Three: Development of Alternative Layouts with Parking

The three use alternatives are drafted in graphic form to reveal the spatial layouts of the buildings if adaptive reuse activities are undertaken. The spatial needs, physical dimensions of the mill's interior and access points supporting the proposed uses, were taken into account and are reflected in the following Concept/Use Alternative Layouts (Figures 4.14, 4.15, and 4.16). Figures 4.17 through 4.19 are estimates of the parking requirements of the three alternatives and are based on the procedure outlined in chapter three.
Use Alternative One; Continued Use
Stanley Woolen Mill

Figure 4.14
Alternative One: Continued Use with Self-Guiding Interpretive Display (Plan Concept)

Use Alternative One
Floor Layout

<table>
<thead>
<tr>
<th>Activity</th>
<th>sq/ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>2,750</td>
</tr>
<tr>
<td>Retail</td>
<td>9,800</td>
</tr>
<tr>
<td>Mill/Manufacturing</td>
<td>83,750</td>
</tr>
<tr>
<td>Museum</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Parking Requirements
Spaces 51.45
Area 0.3 Acre

Scale in Feet

0 40 60 80

Ground Level
Access Points

Pedestrian
Entrances

Truck
Loading
Docks

Mill Space
21,575 sq/ft

3rd Floor

Mill Space
19,825 sq/ft

Studio
2,750 sq/ft

Second Floor

Mill Space
24,575 sq/ft

Retail Shops
4,800 sq/ft

Museum
750 sq/ft

First Floor

Mill Space
14,700 sq/ft

Third Floor

Mill Space
19,825 sq/ft

Fourth Floor

Retail
Shops
4,800
sq/ft

Ground Level
Access Points

Mill Space
21,575 sq/ft

Retail
Shops
4,800
sq/ft

Museum
1,250
sq/ft

Pedestrian
Entrances

Truck
Loading
Docks

Mill Space
21,575 sq/ft

Retail
Shops
4,800
sq/ft

Museum
750
sq/ft

Second Floor

Mill Space
24,575 sq/ft

Retail Shops
4,800 sq/ft

Museum
750 sq/ft

First Floor

Mill Space
14,700 sq/ft

Third Floor

Mill Space
19,825 sq/ft

Fourth Floor

Studio
2,750 sq/ft

Fifth Floor
Use Alternative Two: Partial Conversion

Stanley Woolen Mill

Figure 4.15 Alternative Two: Partial Conversion with Interpretive Center for Economic Development

Use Alternative Two Floor Layout

<table>
<thead>
<tr>
<th>Activity</th>
<th>sq/ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>2,750</td>
</tr>
<tr>
<td>Storage</td>
<td>7,325</td>
</tr>
<tr>
<td>Retail</td>
<td>9,800</td>
</tr>
<tr>
<td>Office</td>
<td>16,150</td>
</tr>
<tr>
<td>Mill/Manufacturing</td>
<td>38,125</td>
</tr>
<tr>
<td>Museum</td>
<td>11,125</td>
</tr>
</tbody>
</table>

Parking Requirements

Spaces: 100.7
Area: .69 Acre

Use Alternative Two: Partial Conversion

Scale in Feet

Ground Level
Access Points

Pedestrian Entrances

First Floor

Mill or Light Manufacturing

Museum

Second Floor

Mill/Manufacturing

Cafe

Retail

Museum

Third Floor

Office

Storage Area

Incubator Space

Fourth Floor

Office

Incubator Space

Storage Area

Fifth Floor

Studio

2,750 sq/ft
Use Alternative Three: Full Conversion
Stanley Woolen Mill

Figure 4.16 Alternative Three: Full Conversion with Interpretive Center (Plan Concept)

<table>
<thead>
<tr>
<th>Use Alternative Three Floor Layout</th>
<th>sq/ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>2750</td>
</tr>
<tr>
<td>Retail</td>
<td>19,750</td>
</tr>
<tr>
<td>Office</td>
<td>48,775</td>
</tr>
<tr>
<td>Restaurant</td>
<td>10,425</td>
</tr>
<tr>
<td>Museum</td>
<td>18,375</td>
</tr>
</tbody>
</table>

Parking Requirements
Spaces 297.9
Area 2.05 Acres

Ground Level Access Points
### SCHEMATIC PARKING REQUIREMENTS MATRIX FOR
**STANLEY WOOLEN MILL**
CONCEPTUAL USE ALTERNATIVE ONE

<table>
<thead>
<tr>
<th>USE CONCEPT</th>
<th>BUILDING SPACE SQ/FT</th>
<th>PARKING NEEDS</th>
<th>PARKING SPACES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>STUDIO</td>
<td>2,750</td>
<td>3 / 1000 SQ. GFA</td>
<td>2.75</td>
</tr>
<tr>
<td>RETAIL</td>
<td>9,600</td>
<td>5 / 1000 SQ. GFA</td>
<td>48</td>
</tr>
<tr>
<td>MILL</td>
<td>83,750</td>
<td>1 / 2-5 EMPLOYEES*</td>
<td>13.3</td>
</tr>
<tr>
<td>INTERPRETIVE DISPLAY</td>
<td>2,000</td>
<td>1 / 300 SQ. GFA</td>
<td>6.6</td>
</tr>
</tbody>
</table>

**TOTAL NUMBER OF SPACES**

| 70.65 |

**SQUARE FOOTAGE NEEDED EXPRESSED AS ACREAGE**

| 21,195 SQ/FT |
| 0.48 AC |

*Total employees 40 per shift for full mill operation based on past patterns

**Average 200 sq./ft per parking space with additional 30% for traffic circulation and landscaping

GFA - Gross Floor Area

---

**Figure 4.17 Area and Parking Requirements for Use Alternative One**
### Schematic Parking Requirements Matrix for Conceptual Use Alternative Two

<table>
<thead>
<tr>
<th>Use Concept</th>
<th>Building Space SQ/FT</th>
<th>Parking Needs</th>
<th>Parking Spaces Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>2750</td>
<td>3 / 1000 SQ. GFA</td>
<td>2.75</td>
</tr>
<tr>
<td>Storage</td>
<td>7,325</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Retail</td>
<td>9,600</td>
<td>3 / 1000 SQ. GFA</td>
<td>28</td>
</tr>
<tr>
<td>Office</td>
<td>16,150</td>
<td>3 / 1000 SQ. GFA</td>
<td>48.45</td>
</tr>
<tr>
<td>Mill</td>
<td>36,125</td>
<td>1 / 2-5 EMPLOYEES</td>
<td>8.5*</td>
</tr>
<tr>
<td>Cafe</td>
<td>3,950</td>
<td>0.3 / SEAT</td>
<td>13*</td>
</tr>
<tr>
<td>Interpretation/Workshop</td>
<td>11,125</td>
<td>1 / 300 SQ. GFA</td>
<td>37</td>
</tr>
</tbody>
</table>

**Total Number of Spaces**: 100.7

**Square Footage Needed Expressed as Acreage**: 30,210

**.69 AC**

---

* total employees 40 per shift for full mill operation based on past mill patterns

** Average 200 sq/ft per parking space with additional 30% for traffic circulation and landscaping

*** Calculated at 4 seats per 60 sq/ft of dining room floor area

GFA - Gross Floor Area

---

Figure 4.18 Area and Parking Requirements for Use Alternative Two

Adaptive Reuse of Historic Mills 86  Spring 1993
Uxbridge, Massachusetts  Center for Economic Development
### Schematic Parking Requirements Matrix for Conceptual Use Alternative Three

<table>
<thead>
<tr>
<th>Use Concept</th>
<th>Building Space SQ/FT</th>
<th>Parking Needs</th>
<th>Parking Spaces Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>2750</td>
<td>3/1000 SQ GFA</td>
<td>2.7</td>
</tr>
<tr>
<td>Retail</td>
<td>19,750</td>
<td>3/1000 SQ GFA</td>
<td>59.2</td>
</tr>
<tr>
<td>Office</td>
<td>48,775</td>
<td>3/1000 SQ GFA</td>
<td>146.3</td>
</tr>
<tr>
<td>Restaurant</td>
<td>10,425</td>
<td>0.3/SEAT</td>
<td>35*</td>
</tr>
<tr>
<td>Interpretation/Workshop</td>
<td>16,375</td>
<td>1/300 SQ GFA</td>
<td>54.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>297.7</strong></td>
</tr>
<tr>
<td><strong>Square Footage Needed</strong></td>
<td></td>
<td></td>
<td><strong>89,310</strong></td>
</tr>
<tr>
<td><strong>Expressed as Acreage</strong></td>
<td></td>
<td></td>
<td><strong>2.05</strong></td>
</tr>
</tbody>
</table>

* Calculated at 4 seats per 60 sq./ft of dining room floor area

** Average 200 sq./ft per parking space with additional 30% for traffic circulation and landscaping

GFA - Gross Floor Area

**Figure 4.19** Area and Parking Requirements for Use Alternative Three

**Step Four: Evaluation of Proposed Use Alternatives**

The evaluation of the alternatives is accomplished by use of the evaluation chart developed in chapter 3 (Figure 3.10) and applied in Figure 4.20.
## ALTERNATIVE EVALUATION MATRIX

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Alt. #1</th>
<th>Alt. #2</th>
<th>Alt. #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESPONDS TO HISTORIC SIGNIFICANCE</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>COMPATIBILITY WITH INTERPRETIVE ACTIVITIES</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>PROMOTES TOURISM ACTIVITY</td>
<td>L</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>ON-SITE SUPPORT FOR ACTIVITIES</td>
<td>L</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>SURROUNDINGS SUPPORT ACTIVITIES</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>BUILDING SUPPORTS ACTIVITIES</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>PARKING NEEDS SUPPORTED BY SITE</td>
<td>H</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>PROMOTES ENVIRONMENTAL QUALITY</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>PROGRAM PROVIDES DEVELOPMENT FLEXIBILITY</td>
<td>L</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

### Figure 4.20 Alternative Evaluation Matrix

The alternatives are given a rating of \( L = \) Low, \( M = \) Medium, and \( H = \) High based on an evaluation against the program criteria. As a result of the evaluation, METLAND recommends alternative two for schematic design because it achieved the highest rating against evaluation criteria. Additionally, alternative two, partial conversion with interpretive center, will demonstrate the feasibility of incorporating new uses into historic mills and will take full advantage of the mill.
building and surrounding area. Spatial limitations of the site in terms of parking rule out more concentrated activities.

Step Five: Schematic Design

Site analysis and assessment based on landscape architecture principles and norms identified several opportunities and constraints. (See Site Analysis and Assessment Maps, Figures 4.12 on page 79 and 4.13 on page 80). The schematic design is based on this information.

A schematic design developed for the mill incorporates proposed uses and the vehicular and pedestrian circulation needs within the existing building and site structure. (See Figures 4.21 and 4.22.) The Stanley Woolen Mill has several opportunities to make connections to recreational activities off-site such as the Heritage State Park and the proposed canoe launch on Mendon Street. The historic district in which the mill is the focal point retains much of the character of the Industrial Revolution era. Inquires directed to the Massachusetts Department of Environmental Protection revealed that the environmental pollution has not been fully assessed. If cleanup is perceived as manageable, the process may accomplished as part of the adaptive reuse plan.
Figure 4.21 Schematic Design of Alternative Two: Partial Conversion with Interpretive Center

Activities and levels of usage contained in Alternative Two (Partial Conversion) optimized available space and successfully addressed the Goals and Objectives of Economic Revitalization and Historic Preservation through Tourism and Interpretive opportunities.

Cost per square foot for rehabilitation of interior space ranging from $2 per sq/ft to $60 per sq/ft is a competitive option to new building construction.

Scale in Feet
4.4 SUMMARY OF CASE STUDY

Although all of the mills evaluated in this procedure exhibited meaningful potential for rehabilitation and revitalization, this study identified Stanley Woolen Mill as the most appropriate site for the initial adaptive reuse efforts. As a test case, the findings support Stanley Woolen Mill's potential as a historic and economic resource even with its designation by the Massachusetts Department of Environmental Protection as a Chapter 21E site.

The maps, charts, and schematic design presented in this chapter illustrate the above findings. The schematic designs display the potential integration of new uses as outlined in alternative two (partial conversion) into the Stanley Woolen Mill complex. The proposed changes and implementation of the schematic design recommendations, if undertaken, could facilitate the beginning of adaptive reuse of underutilized historic mills in Uxbridge.

The results of the assessment of adaptive reuse potential, evaluation of use alternatives, site analysis/assessment, and schematic design are summarized in the following findings organized by the levels of town, district, and mill.

Town Level

* The case study proved that the area under consideration presently contains over 542,000 square feet (approximately 12.4 acres) of available space in three mills: Bernat, Stanley Woolen, and Waucantuck.

* Existing infrastructure in Uxbridge can support adaptive reuse of the mills within the study area.
District Level

* Location on major transportation routes increases the likelihood of successful adaptive reuse.

* There is a high degree of probability that mills being studied for adaptive reuse will be partially or wholly within the 1% flood plain.

* Historically located on rivers, mills maybe linked to water-based recreational opportunities.

* Most mills are located in developed areas containing a mixture of uses ranging from industrial to residential.

* Mills located in developed areas often have parking constraints and little room for expansion.

* Most mills are within .5 mile walking distance from other historic buildings or sites.

The Blackstone Canal is historically prominent, giving rise to the growth of the mills along the Corridor.

Mill Level - Stanley Woolen Mill

* Activities and levels of usage in alternative two (partial conversion) optimized available space and successfully addressed the goals and objectives of economic revitalization and historic preservation through tourism and interpretive activities in the Stanley Woolen Mill.

* The industrial architectural integrity of the Stanley Woolen Mill, it’s prominence as a feature of the landscape, and the surrounding historic neighborhood are significant positive attributes for adaptive reuse.

* The area directly to the rear of the mill can support expanded parking needs connected with adaptive reuse.

* Many existing and potential linkages for both pedestrians, bicyclists, and other recreational users are easily incorporated into the schematic design.
* The mill possesses great potential for adaptive reuse activity ranging from manufacturing to education.

* Space within the mill is very flexible and can support a wide variety of new users.

* Cost per square foot for rehabilitation of interior mill space ranges from $2 to $60 per sq./ft depending on the new use and the level of finish. This is a competitive option over new building construction.
CHAPTER FIVE - CONCLUSION

This study focused on the process for adaptive reuse of historic mills. The assessment and planning method for prioritizing mills used three levels of evaluation (town, district, and site). This prototypical assessment method for adaptive reuse determines the feasibility of transforming historic mills to accommodate a variety of new uses. A first cut assessment such as the one developed here can direct reuse efforts towards those mills which have the highest adaptive reuse potential. This assessment can inform the Blackstone River Valley National Heritage Corridor Commission (BRVNHCC), the towns of the Blackstone River Valley, and developers about the relative adaptive reuse potentials of different mills. This would help to focus of subsequent work such as structural engineering and market analysis on sites with the highest potential for economic and historic preservation returns. The case study identifies sites with high potential for economic revitalization. A secondary benefit of revitalizing existing mills is the preservation of open space in and around historic districts. This helps meet the overall goal of the BRVNHCC, the preservation of the historic landscape fabric of the Blackstone Valley including mill village centers and outlying rural areas.

The adaptive reuse of historic mills can efficiently use existing infrastructure, thereby protecting both historic structures and the landscape fabric. In the Blackstone Valley, new uses such as interpretive history museums focusing on the Industrial Revolution era can be complemented by recreation opportunities like canoeing. This will encourage tourism based on the heritage and natural resources of the valley. In addition, opportunities arise from the adaptive reuse process for environmental clean-up of hazardous waste. With new uses for the mills, the cost of 21E cleanup can be recouped through shared public and private means, thus accelerating the
clean-up process. As many case studies have shown, the longer the delay in addressing contamination, the more expensive the consequences are, both monetarily and from a public health standpoint.

The need for adaptive reuse is clear from this planning and design case study of the Blackstone River Valley region. Targeting mills for adaptive reuse encompasses assessment, planning, and design methods that can help strike a balance between the needs of the region's residents, developers, historians, and environmentalists. From town to site design, landscape planning principles developed over the years by METLAND can assist economic revitalization, interpretive education, and adaptive reuse activities. In particular this study illustrates the many opportunities presented by underutilized historic mills and the landscape surrounding them. In light of the outcome of this project, adaptive reuse should be viewed as not only preservation but as progress.
APPENDIX

CONTENTS

HISTORIC SIGNIFICANCE AND EDUCATIONAL VALUE
ASSESSMENT SCORING SHEETS .................................................. 98

BUILDING/SITE CHECKLISTS ..................................................... 101

INFRASTRUCTURE SUPPORT AND BUILDING CONDITION
SUITABILITY ASSESSMENT SCORING SHEETS ............................. 103

SURROUNDING LAND USE AND ENVIRONMENTAL CONCERNS
SUITABILITY ASSESSMENT SCORING SHEETS ............................. 110

PLANTING PLAN .................................................................... 113

CONSTRUCTION DETAILS ....................................................... 114

COST ESTIMATE ..................................................................... 120
**Historic Education Potential Significance Assessments**

**BERNAT MILL Historic Education Potential Significance Assessment Scoring Sheet**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building is of a scarce style or type of construction</td>
<td>+</td>
</tr>
<tr>
<td>Building is older in age than others considered for adaptive reuse activity</td>
<td>-</td>
</tr>
<tr>
<td>Building has suffered little or no alterations to its exterior</td>
<td>+</td>
</tr>
<tr>
<td>Main component of mill is over sixty years old</td>
<td>-</td>
</tr>
<tr>
<td>Building/ Site is within .5 mile of schools</td>
<td></td>
</tr>
<tr>
<td>Building/ Site within .5 of a mile of other Historic Structures</td>
<td></td>
</tr>
<tr>
<td>Building has potential for public educational benefits</td>
<td>+</td>
</tr>
<tr>
<td>Building is highly visible and is prominent feature of the landscape</td>
<td>+</td>
</tr>
<tr>
<td>Building is located on a major road thereby increasing tourist access</td>
<td>+</td>
</tr>
<tr>
<td>Totals</td>
<td>4.5</td>
</tr>
</tbody>
</table>

---

Other buildings display similar architectural attributes

Building is younger than others considered for reuse activity

Building has significant alterations to its exterior

Main component of mill is under sixty years old

Building is over .5 mile away from schools

Building/ Site not within .5 of a mile of other Historic Structures

Building has limited potential for public educational benefits

Building is not a highly prominent feature of the landscape

Building is not located on a major road thereby decreasing tourist access

---

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Center for Economic Development
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building is of a scarce style or type of construction</td>
<td>+</td>
<td>Other buildings display similar architectural attributes</td>
</tr>
<tr>
<td>Building is older in age than others considered for adaptive reuse</td>
<td>X</td>
<td>Building is younger than others considered for adaptive reuse activity</td>
</tr>
<tr>
<td>Building has suffered no or little alterations to its exterior</td>
<td>X</td>
<td>Building has significant alterations to its exterior</td>
</tr>
<tr>
<td>Main component of mill is over sixty years old</td>
<td></td>
<td>Main component of mill is under sixty years old</td>
</tr>
<tr>
<td>Building/ Site is within .5 mile of schools</td>
<td>X</td>
<td>Building is over .5 mile away from schools</td>
</tr>
<tr>
<td>Building/ Site within .5 of a mile of other Historic Structures</td>
<td>X</td>
<td>Building, Site not within .5 of a mile of other Historic Structures</td>
</tr>
<tr>
<td>Building has potential for public educational benefits</td>
<td>X</td>
<td>Building has limited potential for public education benefits</td>
</tr>
<tr>
<td>Building is highly visible and is prominent feature of the landscape</td>
<td>X</td>
<td>Building is not a highly prominent feature of the landscape</td>
</tr>
<tr>
<td>Building is located on a major road thereby increasing tourist access</td>
<td>X</td>
<td>Building is not located on a major road thereby decreasing tourist access</td>
</tr>
<tr>
<td>Totals</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>WAUCANTUCK MILL Historic Education Potential Significance Assessment Scoring Sheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building is of a scarce style or type of construction</td>
<td>+ -</td>
<td></td>
</tr>
<tr>
<td>Building has suffered little or no alterations to its exterior</td>
<td>___ X ___</td>
<td></td>
</tr>
<tr>
<td>Main component of mill is over sixty years old</td>
<td>X ___</td>
<td></td>
</tr>
<tr>
<td>Building/ Site is within .5 mile of schools</td>
<td>___ X ___</td>
<td></td>
</tr>
<tr>
<td>Building/ Site within .5 of a mile of other Historic Structures</td>
<td>X ___</td>
<td></td>
</tr>
<tr>
<td>Building has potential for public educational benefits</td>
<td>X ___</td>
<td></td>
</tr>
<tr>
<td>Building is highly visible and is prominent feature of the landscape</td>
<td>X ___</td>
<td></td>
</tr>
<tr>
<td>Building is located on a major road thereby increasing potential tourist access</td>
<td>X ___</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>7 2</td>
<td></td>
</tr>
</tbody>
</table>

Other buildings display similar architectural attributes
Building is younger than others considered for reuse activity
Building has significant alterations to its exterior
Main component of mill is under sixty years old
Building is over .5 miles away from schools
Building / Site not within .5 of a mile of other Historic Structures
Building has limited potential for public education benefits
Building is not a highly prominent feature of the landscape
Building is not located on a major road thereby decreasing tourist access

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Spring 1993
Center for Economic Development
**Building / Site Checklist**

**Bernat Mill**

Building name: **Bernat Mill**  
Street address: **19 Depot Street**  
City, State: **Uxbridge, Massachusetts**  
Contact name: **Jim Schwartz**  
Company name: **Depot Street Associates**  

Present occupants: **Print Shop, Injection Foam Molding, Storage**  
Number of buildings in property: **4**  
Total square feet: **389,700+**  
Total land included in the property: **19.36 Acres**  
Previous use: **Woollen Weaving Mill**  
Zoned: **Industrial**  
Surrounding areas zoned: **Commercial, Residential, Industrial**  

Is the property for sale: **?**  
Is the property for lease: **Yes**

**Building Evaluation**

Utilities on site: **Yes**  
Natural Gas: **X**  
Public water: **X**  
Sewer: **X**  

How much on-site parking?: **.5 Acre**  
How much additional is available for parking?: **5 Acre on Mendon Street**  

How much abutting land is available/potentially available?: **5 Acres**

**Physical / Structural Observations**

Total square feet: **389,700+**  
Available square feet: **307,067+**  
Number of floors: **4** easy access: **2** limited access: **2**  
Type of construction: **Brick w/ Steel frame, Flat Roof**  
Age: **1920+**  
Rate the structures fire resistance: **Good**  
Sprinkler system: **Yes**  
HVAC systems: **Good**  
Number of elevators: **2** Condition: **Good**  
Location of elevators: **Loading Docks**  
Capacity: **Heavy Freight**  
How many loading docks are there?: **4**  
Location: **Front / Rear**  
Is there access for the physically impaired?: **No**  

Adaptive Reuse of Historic Mills  
Uxbridge, Massachusetts  

Center for Economic Development  
Spring 1993
For each of the following, estimate conditions and whether they may be used as is, repaired, or replaced.

Roof: USED AS IS

Walls: USED AS IS

Floors: USED AS IS

Stairs: USED AS IS

Ceilings: USED AS IS

Elevators: USED AS IS

Estimate the following:

Ceiling height: 8 TO 12 FEET, SOME HIGHER

Estimate Floor loading capacity: 50 to 100 pounds square foot

Column spacing: 10 to 15 feet apart
<table>
<thead>
<tr>
<th>Feature</th>
<th>Site/Building</th>
<th>Site/Building</th>
<th>Site/Building</th>
<th>Site/Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure supports the site to support adaptive reuse activity</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>The building is served by sewer/water/gas</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Site/buildings within 0.5 mile of a major road</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Site/buildings has direct access from railroad</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Building located on major road provides truck access</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>The building has operable elevators</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>The building has loading docks</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Site has large areas which could easily support parking lot expansion</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>The buildings interiors do not show signs of water damage or leaks from the roof</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>The building has working plumbing, heating, electrical systems</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Building has good interior natural lighting</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
</tbody>
</table>

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Spring 1993
Center for Economic Development
Totals 10 1

BUILDING / SITE CHECKLIST

STANLEY WOOLEN MILL

Building name: STANLEY WOOLEN MILL
Street address: 146 MENDON STREET
City, State: UXBRIDGE, MASSACHUSETTS
Contact name: JIM DRUMOND
Company name: DRUMOND WOOLEN MILLS
Present Owner or occupant(s) DRUMOND WOOLEN MILLS
Number of buildings in property: 2 + OUT BUILDINGS
Total square feet: 102,614
Total land included in the property: 3.37 ACRES
Previous use: WOOLEN MILL
Zoned: INDUSTRIAL
Surrounding areas zoned: RESIDENTIAL / AGRICULTURAL, COMMERCIAL
Is the property for sale: ?
Is the property for lease: YES

Building Evaluation

Utilities on site: YES
Natural Gas: X Public water: X Sewer: X

How much on-site parking?: 5 ACRE ON-SITE, 5 ACRE D.E.M. OWNED IN REAR
How much additional square feet are available for parking?: 5 ACRE SEE ABOVE
How much abutting land is available/potentially available?: 0

Physical/Structural Observations

Total square feet: 102,614
Available square feet: 73,882
Number of floors: 5 easy access; 1 limited access: 4
Type of construction: WOOD WITH STEEL FRAME AND BRICK
Age: BUILT 1852
Rate the structures fire resistance: MEDIUM
Sprinkler system: YES
HVAC systems: LIMITED
Number of elevators: 1  Condition: POOR
Location of elevators: FRONT OF MILLYARD
Capacity: SMALL, LIGHT FREIGHT
How many loading docks are there?: 2  Location: FRONT / SIDE
Is there access for the physically impaired?: NO
For each of the following, estimate conditions and whether they may be used as is, repaired, or replaced.
Roof: REPLACED
Walls: REPAIRED
Floors: REPAIRED
Stairs: REPAIRED
Ceilings: REPAIRED
Elevators: REPLACED
Estimate the following:
Ceiling height: 8 to 12 FEET SOME HIGHER
Floor loading capacity: 50 TO 100 POUNDS / SQUARE FOOT
Column spacing: 10 TO 15 FEET, VARIES
### STANLEY WOOLEN MILL

#### Infrastructure Support & Building / Site Conditions Suitability Assessment Sheet

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>The towns infrastructure has capacity to support adaptive reuse activity</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The building is served by sewer/water/gas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site / Buildings within .5 mile travel of from major roads.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site / Buildings has direct access from railroad</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Building located on major road provides truck access</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The building has operable elevators</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The building has loading docks</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site has large areas which could easily support parking lot expansion for adaptive reuse</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The buildings interiors do not show signs of water damage or leaks from roof</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The building has working plumbing, heating, electrical</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Building has good interior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building has poor natural</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Adaptive Reuse of Historic Mills  
Uxbridge, Massachusetts
BUILDING / SITE CHECKLIST
WAUCANTUCK MILL

Building name: WAUCANTUCK WOOLEN MILL
Street address: 323 MENDON STREET
City, State: UXBRIDGE, MASSACHUSETTS
Contact name: J. KINKEAD, P. CHIACCHIA
Company name: 
Present Owner or occupants: PARADISE MILLS, BARGAIN SHOP, WOODEN SIGN-CARVING SHOP, STORAGE

Number of buildings in property: 1
Total square feet: 108,200
Total land included in the property: 5.83 ACRES
Previous use: WOOLEN WEAVING MILL
Zoned: INDUSTRIAL
Surrounding areas zoned: RESIDENTIAL, COMMERCIAL
Is the property for sale: YES
Is the property for lease: YES

Building Evaluation
Utilities on site: YES
Natural Gas: X Public water: X Sewer: X
How much land is devoted to parking?: 0.5 ACRE
How much additional square feet are available for parking?: 0
How much abutting land is available/potentially available?: 1 ACRE
What is the surrounding available land zoned?: RESIDENTIAL

Physical/Structural Observations
Total square feet: 108,200
Available square feet: 88,724
Number of floors: 3 easy access: 1 limited access: 2
Type of construction: BRICK AND WOOD WITH STEEL FRAME
Rate the structures fire resistance: POOR
Sprinkler system: NO
HVAC systems: POOR
Number of elevators: 2 Condition: POOR
Location of elevators: CENTRAL
Capacity: UNKNOWN
How many loading docks are there?: 4 Location: FRONT / SIDE
Is there access for the physically impaired?: NO How many?:

For each of the following, estimate conditions and whether they may be used as is, repaired, or replaced.
Roof: REPLACED
Walls: REPAIRED
Floors: REPAIRED
Stairs: REPLACED
Ceilings: REPAIRED
Elevators: REPLACED

Estimate the following:
Ceiling height: 8 to 10 FEET SOME AS HIGH AS 16 FEET
Floor loading capacity: 50 TO 100 POUNDS / SQUARE FOOT
Column spacing: 10 TO 15 FEET, VARIES
WAUCANTUCK MILL

Infrastructure Support and Building Condition Suitability Assessment Sheet

<table>
<thead>
<tr>
<th>Feature</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>The town's infrastructure has capacity to support adaptive reuse activity</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The building is served by sewer/water/gas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site / Buildings within .5 of a mile travel of from major roads.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site / Buildings has direct access from railroad</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Building located on major road provides truck access</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The building has operable elevators</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The building has loading docks</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site has large areas which could easily support parking lot expansion for adaptive reuse</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The buildings interiors do not show signs of water damage or leaks from the roof</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The building has working plumbing, heating, electrical systems</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Building has good interior natural lighting</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Totals: 7 Yes, 4 No

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Spring 1993
Center for Economic Development
### BERNAT MILL

#### Surrounding Land Use and Environmental Concerns Suitability Assessment Sheet

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building/site not listed on Massachusetts Chapter 21 E Program</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>All of building is outside of 1% flood plain</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>All of the building / site is outside water resource district</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>All of the site is outside wetland 100 ft buffer zone</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Building / Site is not visibly adjacent to a landfill or mining operation</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Current use of the Building/Site is compatible with current zoning</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Surrounding land uses / zoning do not include residential areas thereby not restricting possible new uses</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site has adjacent vacant land which could easily support parking</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site is directly adjacent to amenities such as parks and recreation areas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Site is within .5 mile of shops, stores, schools, downtown</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Totals** 6 4
### STANLEY WOOLEN MILL

#### Surrounding Land Use and Environmental Concerns Suitability Assessment Sheet

| Building/ site not listed on Massachusetts Chapter 21E Program | + | Building is listed on Massachusetts Chapter 21E program | X |
| All of building is outside of 1% flood plain | | | X |
| All of the building / site is outside water resource district | | | X |
| All of the site is outside wetland 100 ft buffer zone | | | X |
| Building / Site is not visibly adjacent to a landfill or mining operation | X | | |
| Current use of the Building/ Site is compatible with current zoning | | | X |
| Surrounding land uses / zoning do not include residential areas thereby not restricting possible new uses | | | X |
| Site has adjacent vacant land which could easily support parking | | | X |
| Site is directly adjacent to amenities such as parks and recreation areas | | | X |
| Site is within .5 mile of shops, stores, schools, downtown | | | X |

**Totals**

| | 5 | 5 |

### WAUCANTUCK MILL

Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Center for Economic Development
Spring 1993
<table>
<thead>
<tr>
<th>Surrounding Land Use and Environmental Concerns Suitability Assessment Sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building/site not listed on Massachusetts Chapter 21 E Program</td>
</tr>
<tr>
<td>All of building is outside of 1% flood plain</td>
</tr>
<tr>
<td>All of the building/site is outside water resource district</td>
</tr>
<tr>
<td>All of the site is outside wetland 100 ft buffer zone</td>
</tr>
<tr>
<td>Building/Site is not visibly adjacent to a landfill or mining operation</td>
</tr>
<tr>
<td>Current use of the Building/Site is compatible with current zoning</td>
</tr>
<tr>
<td>Surrounding land uses/zoning do not include residential areas thereby not restricting possible new uses</td>
</tr>
<tr>
<td>Site has adjacent vacant land which could easily support parking</td>
</tr>
<tr>
<td>Site is directly adjacent to amenities such as parks and recreation</td>
</tr>
<tr>
<td>Site is within .5 mile of shops, stores, schools, downtown</td>
</tr>
</tbody>
</table>

| Totals | 5 | 5 |
Plan for Adaptive Reuse of Historic Mills

Use Alternative Two
Partial Conversion

Quercus Coccinea
4" cal felled and burlapped

Tilia cordata
"Greenspire"
4" cal felled and burlapped

All trees staked, guyed and wrapped as per planting details

Scale in Feet

0 40 80

NORTHERN

Blackstone River
Blackstone Canal
Blackstone Heritage State Park

Plan for Design
Stanley Woolen Mill
Proposed Canoe Launch Area

Proposed
Canoe Launch
Area

Mendon St.
Route 18

Adaptable reuse of Historic Mills
Unbridge, Massachusetts

Center for Economic Development
Spring 1993
GRANITE PAVING @ PLAZA

SCALE AS NOTED
ASPHALT BIKEWAY DETAIL

Scale: 1" = 1'0"
Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Center for Economic Development

Spring 1993

118
NOTE:
1. Soil mix for backfilling tree wells shall consist of:
   1 part sand, 2 parts clean loam,
   2 pounds 12-12-12 chemically combined fertilizer.
2. Mix thoroughly prior to backfilling.
3. Landscape architect shall approve all elements prior to mixing.

PLAZA TREE
PLANTING SPL.

SCALE: 3/4" = 1'-0"
Adaptive Reuse of Historic Mills
Uxbridge, Massachusetts

Center for Economic Development

Spring 1993

TREE STAKING DETAIL

NO SCALE

SELECTIVELY PRUNE CROWN
DO NOT CUT CENTRAL LEADER.

REINFORCED RUBBER HOSE

11 GAUGE WIRE TWISTED
ATTACH @ FIRST BRANCH
OR 1/3 UP TREE.

TREE WRAP

3" SHREDDED BARK MULCH
2" SPAHER AROUND TREE

GUING STAKE
CLEAN BACKFILL
UNDISTURBED SUBSOIL
DO NOT COMPACT

2' X 2' CEDAR STAKE 36" LONG

TREE WELL
ROOT BALL

*11 GAUGE WIRE

PLAN
Generalized Cost Estimate
Stanley Woolen Mill Complex

Site Work

Paving Surfaces

Bitumious Asphalt
47,520 sq/ft @ .60 sq/f $28,512
Brick Paving
11,700 sq/ft @ $6.60 sq/ft $77,220
Granite Cobble Plaza Paving
12,600 Sq/ft @ 15.70 sq/ft $197,820
Granite Curbing
3330 l/f @ $14.83 l/f $49,410
Catch Basins
6 @$1870.00 $11,220
Canal Bridge
One Lane with Ped / Bikeway 18 ft wide $26,000

Plantings

Trees
Tilia Cordata #83 @$425.00 Inst. $35,275
Quercus Coccinea #57 @ $324.00 Inst. $18,468

Grass Seeding
4000 sq/ft @ .10 sq/f $400

Site Furnishings

Bec&hes, Lighting, Trash Receptacles ect $42,000

Interior Rehabilitation Work

Mill, Studio and Storage Space
46,200 sq/ft @$2.00 sq/ft $92,400
Retail and Office Space
25,750 @$40.00 sq/ft $1,030,000
Cafe Space
1950 @ 40.00 sq/ft $78,000
Museum Space
11,125 @$40.00 sq/ft $445,000

Exterior Rehabilitation work reflected in above Figures.
( Roof, Foundation, Windows, Siding )

Total $2,131,838

Adaptive Reuse of Historic Mills 121
Uxbridge, Massachusetts

Spring 1993
Center for Economic Development
REFERENCES


Bunnell, Gene.; Mathews, Byron J.; LaBella, Carol; Allot, Katherine; and Kahn, Olga. 1980. *Removing Obstacles to Building Reuse and Community Conservation at the Local Level*. Boston, Massachusetts: Massachusetts Executive Office of Communities and Development.


