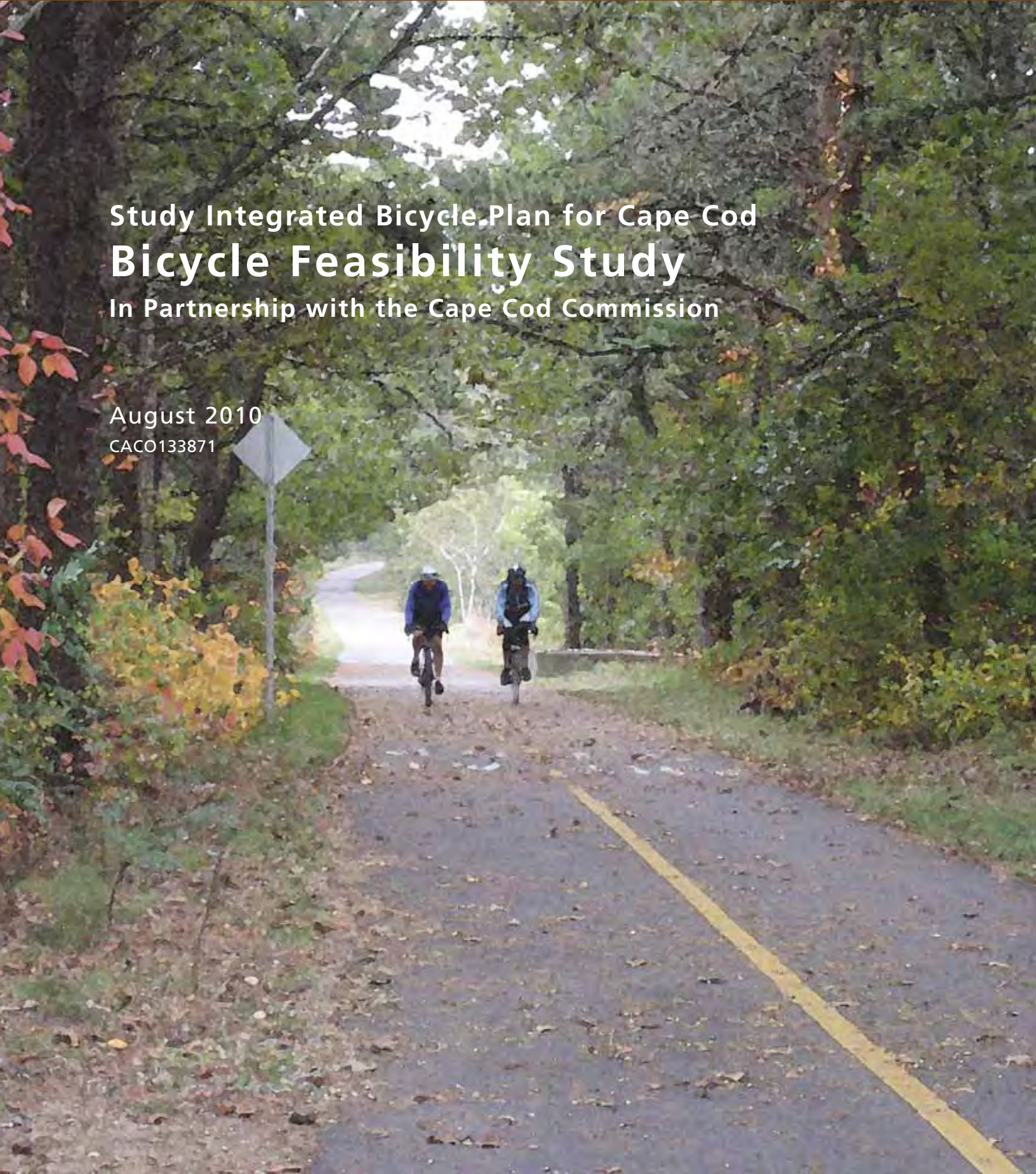




Study Integrated Bicycle Plan for Cape Cod **Bicycle Feasibility Study** In Partnership with the Cape Cod Commission

August 2010
CACO133871



Executive Summary

Background

Cape Cod National Seashore (CCNS) comprises 20% of Cape Cod's total land mass and consists of 43,500 acres stretching along the Outer Cape on the northeastern shore of Cape Cod within the towns of Provincetown, Truro, Wellfleet, Eastham, Orleans and Chatham. CCNS has 40 miles of beach, a variety of natural coastal features and wildlife as well as cultural and historic resources. With approximately 4-5 million visits annually, Cape Cod National Seashore is New England's most visited national park. Thirty nine percent of the total visitation occurs in the two months of July and August. Annual counts conducted by CCNS reveal that approximately 60% of total visits occur in the summer months of June through September.

The limited transportation network serving the Outer Cape as well as the National Seashore's proximity to developed areas that receive significant seasonal tourism results in considerable transportation and environmental impacts. Heavy reliance on automobile transportation results in congestion and excessive parking demand. This in turn impacts park accessibility and the visitor experience while contributing to impaired air quality. Impacts to sensitive natural features result from illegal spillover parking at some locations where demand is the heaviest.

Study Purpose and Need

The purpose of this feasibility study was to identify improvements necessary to develop an integrated bicycle network throughout Cape Cod. Such a network will provide enhanced recreational opportunities, but more importantly it will facilitate and encourage greater use of bicycling as a transportation option on Cape Cod.

The influx of both seasonal residents and visitors to Cape Cod during the summer months results in chronic traffic congestion that reaches critical levels on the Cape's busiest roads. Auto-dependence contributes to degraded air quality and other environmental impacts, including those resulting from excessive parking demands spilling onto sensitive lands.

Suburban development patterns on the Cape have resulted in a transportation network that is fragmented and which relies on a small number of primary arterials and collector roads to move the majority of traffic throughout Cape Cod. Travel across Cape Cod is facilitated largely by Route 6 and Route 28 along Cape Cod Bay and Nantucket Sound respectively. To a lesser degree Route 6A, a state scenic byway, provides travel across Cape Cod along a two-lane route paralleling Route 6. This same road network must be utilized by bicyclists which often results in long, circuitous routes that typically require bicyclists to travel on high speed, high volume roadways that are often uncomfortable for bicycling. In many instances there are no bicycle accommodations resulting in the potential for conflicts between motor vehicles and bicycles.

Cape Cod does benefit from over 80 miles of shared use paths, including approximately 12 miles within Cape Cod National Seashore. However most of these facilities are short routes that lack connectivity to destinations or to other bike paths or on-roadway (improved) bike routes. Even in the case of longer regional facilities such as the Cape Cod Rail Trail gaps often exist between the path and destinations such as neighborhoods, commercial centers, and CCNS attractions. Within the National Seashore several bike trails exist but are physically separated from one another and are not connected by on-roadway bike routes. Linkages are also needed to access transit services and transportation hubs, notably those located in Provincetown, Woods Hole, and Hyannis in order to facilitate greater utilization of multimodal transportation options.

Bicycling on Cape Cod is one of the most popular recreational activities and Cape Cod National Seashore estimates that bicycling may match beach-going as the most popular activity within the park in the near future. In order to encourage and facilitate greater use of bicycling for transportation, these linkages and improvements are needed.

Detailed planning for a bicycle network and supporting facilities has not been undertaken for CCNS and its environs for several decades. Neither has a comprehensive, coordinated vision been developed by CCNS and the 15 towns that comprise Barnstable County on Cape Cod to facilitate greater use of bicycling as a means of transportation. A safe, comprehensive bicycle path and route network that is integrated with public transit would encourage visitors to park their cars and explore the National Seashore and the whole of Cape Cod by bike. Visitors and residents alike could utilize bicycling as an option for conducting daily routine trips.

This study established an approach to identifying and assessing opportunities for projects and initiatives that improve bicycling conditions, and provides guidance on implementing them in an efficient and coordinated manner. This will result in multi modal transportation alternatives that can mitigate the existing congestion and auto-dependence.

The three primary goals of the study are:

- To integrate regional planning and the regional bicycle network with Cape Cod bicycle facilities and CCNS attractions.
- To identify projects that improve Cape Cod bicycle facilities and which integrate with the regional bicycle trail network.
- To identify projects that would improve bicycle access to and within Cape Cod National Seashore.

Project Process and Methodology

This feasibility study was funded through the National Park Service's Park Roads and Parkways Program and was completed in partnership with the Cape Cod Commission, the regional land-use and transportation planning agency representing the 15 towns of the Cape. A steering committee was established to guide this project and the consultant team selected to prepare the study. The committee was comprised of town bicycling representatives, the Cape Cod

Commission (the Cape Cod Joint Transportation Committee), Mass Bike, the National Park Service, elected officials, and several state agencies including the Massachusetts Department of Conservation and Recreation, the Mass Highway District, the MassDOT Office of Planning, and the Volpe National Transportation Systems Center. The committee advised the project team throughout the process and helped to shape the objectives and outcomes of the study. The steering committee served a critical role in ensuring the involvement of local communities and stakeholders by providing valuable feedback and local knowledge of conditions across Cape Cod.

The consultant team reviewed a variety of plans and data to establish an inventory of existing bicycle facilities and bicycling conditions throughout the Cape. Public meetings were held to solicit input on existing conditions, needed improvements, and proposed projects. The consultant team, working in conjunction with the National Park Service and the study's steering committee, developed an initial list of more than 120 proposed projects and initiatives. This list was coordinated with reviews of local and regional plans and existing projects that were programmed or already under construction.

The projects varied significantly in their nature, but were categorized into three primary types of projects:

- Improvements to existing facilities;
- New facilities; and
- Other initiatives, including safety education and outreach, improved policies, and programmatic efforts largely aimed at improving coordination among localities and by encouraging greater use of bicycling for transportation.

Outcomes

Though all 120+ proposed projects are integral to the completion of a comprehensive bicycling network on Cape Cod, the scope and budget of this study required a more manageable list of projects that could be further developed as the basis for funding requests. A number of proposals were very similar in nature and were consolidated, where possible, into single projects. An assessment protocol and sorting matrix was developed to categorize and identify a manageable list of projects that would yield significant benefits within reasonable costs.

The forty seven (47) projects identified by this study offer the opportunity to develop an integrated bicycle network for Cape Cod. Though this process did not prioritize individual projects, the forty seven projects selected from the full list of proposed projects were those deemed to deliver the greatest benefits while also having lower barriers to implementation.

The projects are a varied in nature, from “shovel-ready” to merely conceptual, and while many can be implemented relatively quickly others will require long range planning, including compliance with the National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA), as well as considerable funding. Some projects can be undertaken by individual localities or the NPS, while

regional projects will require significant coordination and prioritization between municipalities, the MPO, the Cape Cod Commission, Cape Cod National Seashore, and in some cases, adjacent regions. Even the many smaller projects within individual localities should be coordinated regionally when possible. Local projects that facilitate regional connections or close gaps should be prioritized to develop a connected network of routes. Coordination between the towns of Cape Cod will also ensure uniformity and consistency in designs, wayfinding, and the continuity of routes.

A number of challenges exist to developing an integrated and connected network of bicycle routes and facilities on Cape Cod. The fragmented roadway network results in limited options to be incorporated into direct and connected routes. Along the coasts of the Cape roadway linkages rely heavily on connections via collector and arterial roadways that are not comfortable for many bicyclists. In other instances limited right of way or the lack of a potential corridor for an off-roadway alignment limits opportunities for new or improved routes, or greatly increases costs of implementation.

This feasibility study serves as a tool for use by all stakeholders in the planning, prioritization, and implementation of projects and initiatives across Cape Cod. This study identifies projects that will help improve bicycling conditions, integrate bicycling with bus, rail, and ferry transit services, and which develop support for bicycling through programmatic initiatives. These projects can aid in reducing dependence on automobile transportation and move towards developing an integrated, multimodal transportation environment throughout Cape Cod.

How to Use This Study

This study is envisioned to serve as a resource for stakeholders in developing and implementing projects needed to create an integrated bicycle network for Cape Cod. This study identifies a variety of needed infrastructure improvements and supporting initiatives. Each of the 47 selected projects is described in Chapter 5, along with preliminary design concepts, planning level cost estimates, and recommendations for implementation.

The project descriptions are intended to be used to coordinate needed improvements, and to develop detailed project proposals and grant applications to secure funding for the projects. The level of detail included in the project descriptions is not sufficient for determining environmental compliance which will need to occur during the scoping of each individual project. Projects undertaken within Cape Cod National Seashore will require completion of an NPS Environmental Screening Form in determining the level of environmental compliance needed.

Chapters 1 and 2 provide the reader with an introduction to Cape Cod and Cape Cod National Seashore, as well as providing background on this study. Chapter 3 provides an overview of the existing traffic and bicycling conditions on Cape Cod, along with some of the factors that contribute to these conditions. Chapter 4 provides the reader with a detailed description of the project assessment and sorting process utilized by the consultant team in developing the final list of detailed projects.

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Chapter 1: Introduction

1.1 Study Purpose

The purpose of this Feasibility Study is to lay the groundwork needed to improve bicycling conditions on Cape Cod by developing a comprehensive and connected bicycle network. This study developed a list of both infrastructure improvements and programmatic initiatives to promote bicycling, enhance bicycle access and improve safety. This will help establish bicycling as a viable transportation option while reducing dependence on automobile transportation. This is to be accomplished by creating an integrated, multimodal transportation environment throughout Cape Cod. This study established an approach to identifying opportunities for projects and initiatives, and provides guidance on implementing them in an efficient and coordinated manner.

The three primary goals of the project are:

- To integrate regional planning and the regional bicycle network with Cape Cod bicycle facilities and CCNS attractions.
- To identify projects to improve Cape Cod bicycle facilities and facilitate integration with the regional bicycle trail network.
- To identify projects that would improve bicycle access to and within Cape Cod National Seashore (Seashore).

Bicycle facilities have been recognized as a regional priority in both Cape Cod National Seashore 1998 General Management Plan (CACO GMP) and the Regional Transportation Plan. Most of the localities on Cape Cod have also identified improved bicycling conditions as a priority, though the manner in which they have approached planning for, and implementing such improvements has varied widely from town to town. A comprehensive and accessible trail and bicycle route network that is integrated with public transit options would encourage visitors to utilize alternative transportation and explore the Seashore by bicycle, avoiding the congestion of roadways and competition for limited parking. Further, by evaluating bicycle access to towns throughout the Cape, and linkages to existing bicycle facilities, transit hubs and major trip generators, this study will help continue the region's investment in bicycle facilities both inside and outside the National Seashore.

This feasibility study will evaluate the existing bicycle facility network of Cape Cod, identify critical needs and gaps, and note improvements needed to develop a complete bicycle network linking all fifteen towns of the Cape and Cape Cod National Seashore. This study will also identify key linkages to the existing bicycle network and other supporting transportation services such as trailheads and transit services and the major bicycle trip generators throughout the Cape.

The impetus for this study arose from the CCNS; however the extent of the feasibility study and the projects proposed encompass the entirety of Cape Cod.

Additional consideration was given to develop solutions to address some of the transportation and parking issues within CCNS. This study identifies projects that will yield significant benefits while also having few barriers to implementation. The projects identified are among those needed to develop a regional network that would improve bicycle access and mobility, enhance safety, and/or encourage greater use of bicycling as a transportation option.

Lastly, this study identifies opportunities for state agencies and municipalities to incorporate their planning and development efforts into establishing a Cape-wide bicycle network, consistent with regional and NPS planning initiatives. The intended outcome is the creation of a multimodal transportation system that maintains, protects, and enhances the natural environment of Cape Cod while also identifying potential funding sources that may aid in implementing the study recommendations. The study identifies a range of projects and initiatives, their estimated costs, and recommendations for implementation or construction which in turn will allow localities to prioritize improvements in a logical fashion.

This study is intended to serve as a resource to a variety of stakeholders, providing information that will assist in identifying and prioritizing local and regional projects that can be developed in a coordinated manner throughout Cape Cod to further develop an integrated bicycle network. This study is intended to serve as a resource to supplement the preparation of grant applications and funding requests, as well as aiding in the implementation of projects.

Chapter 3 of this study presents the reader with an understanding of the existing conditions on Cape Cod. Chapter 5 provides a complete list of projects for which planning-level cost estimates and conceptual project descriptions have been provided, along with recommendations for project implementation. Appendix B includes information on a variety of possible funding sources that may be pursued for bicycle and pedestrian projects as well as a list of the projects proposed during the course of the study.

1.2 Project Description and Statement of Need

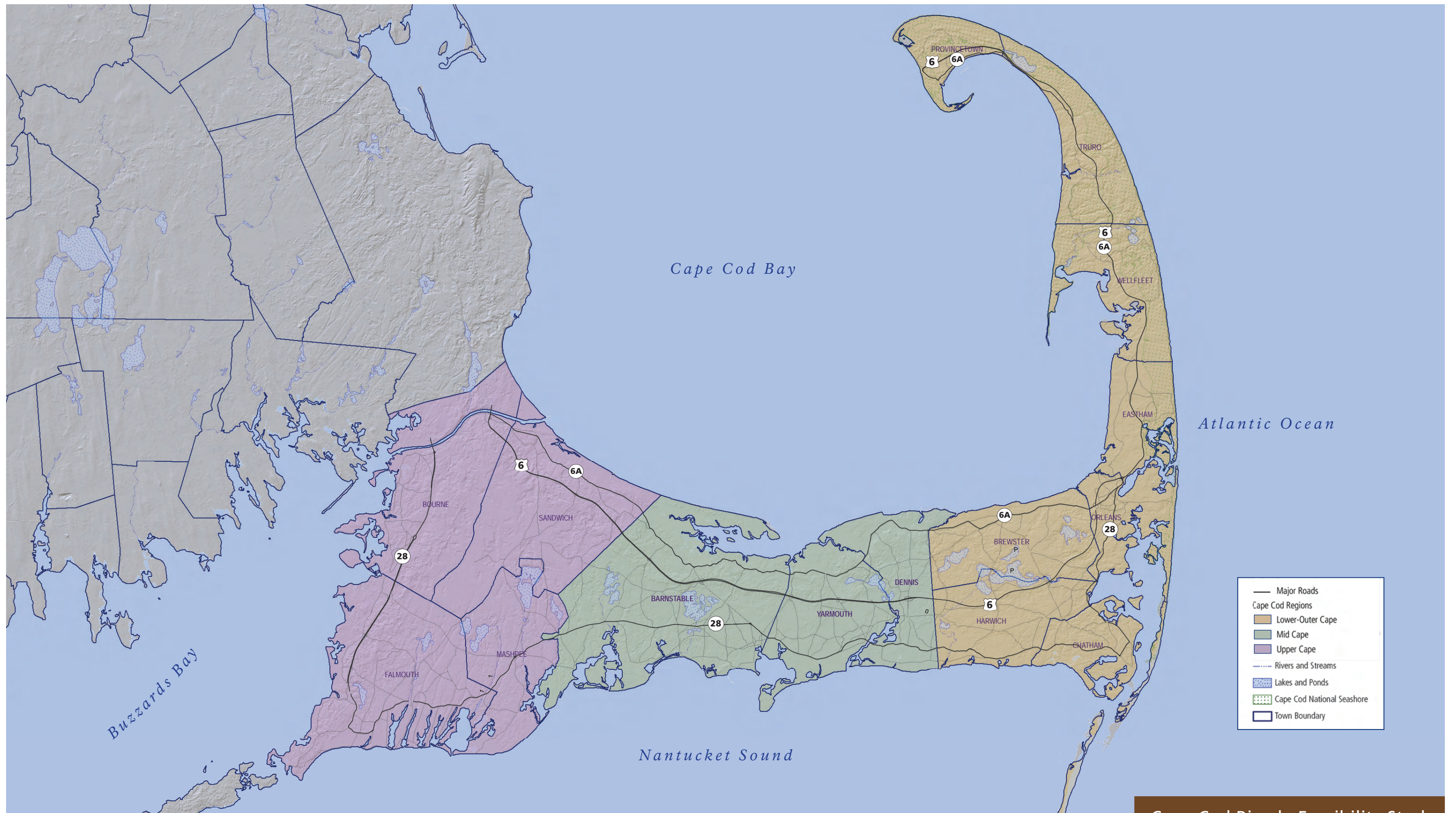
Bicycling is one of the most popular activities at the Seashore and is increasing in popularity. Currently the Lower Cape bicycle trails attract thousands of cyclists each year. The Cape Cod Rail Trail and the growing bicycle network throughout Cape Cod, including popular trails in the National Seashore, make Cape Cod a desirable place to explore by bicycle. Though there are no mechanisms in place to accurately track usage on a regular basis, peak hour counts on the Cape Cod Rail Trail have exceeded 400 users per hour and annual use is estimated to exceed 400,000 according to the 2007 Cape Cod Regional Transportation Plan. Although many of the CCNS beaches and other popular destinations are accessed by bicycle, many of the existing bicycle trails throughout the Cape lack connections to other bicycle routes, towns or destinations. As a result, bicycling isn't utilized for short trips to the extent that it could be, and likely would be if such connections existed.

Despite the demonstrated significance of bicycling activity there has been no comprehensive planning since the 1987 *Parkwide Bicycle Trail Study* to develop an

integrated bicycle network within the Seashore. Then, as now, the lack of a complete bicycle network that provides bicycle access to towns and destinations prevents greater use of bicycling for transportation. Planning for a Cape-wide bicycle network and supporting programs to encourage or facilitate use of bicycling as a transportation mode has not been undertaken to date. Greater utilization of bicycling for transportation within the Seashore as well as throughout the Cape would help relieve congestion and parking demand.

The Cape Cod peninsula of Massachusetts spans a distance of 65 miles and includes the 15 towns within Barnstable County. Covering nearly 20% of the Cape's land mass, Cape Cod National Seashore, a unit of the National Park System, consists of 43,500 acres stretching along the outer cape on the northeastern shore of Cape Cod within the towns of Provincetown, Truro, Wellfleet, Eastham, Orleans, and Chatham. The Seashore is home to 40 miles of beach, a variety of natural coastal features and wildlife as well as cultural and historic resources. According to National Park Service (NPS) estimates Cape Cod National Seashore is New England's most visited national park with approximately 4-5 million visits annually. Thirty nine percent of that total occurs in the two months of July and August. Annual counts conducted by the CCNS reveal that approximately 60% of total visits occur in the summer months of June through September.

The limited transportation network available throughout the Cape results in significant congestion, primarily during the summer months due to the Cape's popularity as both a place of residence and vacation destination. This is exacerbated in the more rural and ecologically sensitive parts of the peninsula and within the Seashore itself where transportation options are further limited. Though many modes of transportation exist on the Cape, the system is largely dominated by automobiles. This is true within the Seashore as well and is compounded by the limited parking available to accommodate visitors arriving by automobile. As a result there is inadequate capacity to handle the volume of traffic visiting the Seashore with many visitors unable to access the park safely or conveniently. Parking impacts on the National Seashore are identified in the 2009 *Cape Cod National Seashore Integrated Parking and Transit Plan*. Parking at Seashore facilities during peak season often spills over into unauthorized areas, including onto roadways, resulting in traffic backups, or onto fragile natural resource areas, resulting in damage to wildlife habitat and vegetation. Compounding matters is the threat posed by coastal erosion which may result in continued loss of existing parking areas as beaches and dunes recede.



This feasibility study was undertaken by the National Park Service in partnership with the Cape Cod Commission, the regional land-use and transportation planning agency representing the 15 towns of the Cape, to identify improvements necessary to develop an integrated bicycle network throughout Cape Cod. This approach will help to ensure an efficient, coordinated approach to addressing needed bicycle network improvements. Linkages between National Seashore destinations and Cape Cod's town centers are needed, as are connections to transit providers. The various initiatives throughout the Cape that support and encourage bicycling as a transportation option and recreational activity can also serve to increase bicycle ridership. In order to gain an understanding of the existing bicycle network and related amenities, data and background information was collected from various federal, state, and local sources beginning in October 2008. Information gathered is largely comprised of local comprehensive plans, open space plans, recreation/bike plans, and GIS data layers. Available information was obtained from the National Park Service, Cape Cod National Seashore, the Cape Cod Commission, each of the 15 towns on the Cape, the State of Massachusetts GIS data library (MassGIS), Massachusetts state agencies, and ESRI base data files.

An initial list of more than 120 proposed projects was developed through public comment, reviews of local and regional plans, and via the consultant team working in conjunction with NPS and the study's Steering Committee. These projects proposed a variety of new bicycle facilities or accommodations, improvements to existing accommodations, and programmatic initiatives aimed at supporting and encouraging bicycle use throughout Cape Cod.

The scope and budget of this feasibility study called for the consultant team to develop a list of approximately forty (40) projects for which detailed descriptions and planning level cost estimates could be developed. A protocol was developed to categorize and identify a list of projects that would be relatively easy to implement while also yielding significant benefit and within reasonable costs. It is important to note that all 120+ proposed projects are integral to a comprehensive bicycle network, and these are all valid projects that could move forward, given funding and agency and municipal support. Efforts should be made to carry forward any project that is deemed to impart the desired benefits within the Cape's local communities.

1.3 Overview of the Cape Transportation Network

Transportation on the Cape is predominately reliant upon automobiles with Route 6 being the primary roadway from the mainland to the northernmost end of the Cape at Provincetown. The rate of population growth on Cape Cod has historically outpaced the rest of the state and the trend persists as residential development continues and summer homes are converted to year-round residences. According to the Cape Cod Commission's 1998 population estimates growth of Barnstable County has more than doubled since the late 1960s from approximately 100,000 residents to almost 230,000 in 2003. Further compounding issues, the seasonal population swells dramatically, tripling to well over half a million people in the summer months according to Cape Cod Commission estimates. This creates major traffic bottlenecks on primary roadways, notably along Route 6. Along the southern

shore of the Cape, particularly through the Upper Cape, Route 28 provides an alternative to Route 6 but the heavily populated Upper Cape places significant demands on this corridor as well. Additionally Route 6, being the principal arterial through Cape Cod, can accommodate more traffic volume than Route 28. Moving eastward the capacity of Route 28 begins to diminish through the Middle Cape, and the Lower Cape relies almost exclusively on Route 6 as the main arterial. Route 6A alleviates some of this burden; however as a two-lane scenic highway it has much less capacity.

As the Cape's popularity as both a residential and vacation destination has soared over the last 30 years, so too have traffic demands on its roadways. According to transportation survey data included in the 2009 Cape Cod Regional Policy Plan, 98% of surveyed respondents identify traffic congestion on the Cape as a serious or moderate problem. Eighty-four percent of respondents to the same survey cited the availability of public transportation as a serious or moderate problem for their town. While roadway capacity has been or is being added in several locations, regional planning initiatives suggest that this increased travel demand must also be addressed through effective land use planning and alternative transportation options such as bus, train, or bicycle and pedestrian facilities.

In addition to the Cape's rise as a popular summer vacation destination over the past 30 years, the transportation and land use history on the Cape shows a marked increase in suburbanization, both by long-time Cape residents and Boston area commuters, according to the Cape Cod Five-Year Public Transportation Plan. Suburbanization, by its very nature, creates increased dependence on the automobile. Mobility via bicycling and walking is made difficult both by low density development and the separation of land uses such as commercial and residential areas. Compounding matters is the combination of land-use patterns and environmental features throughout Cape Cod that result in a fragmented road network. Suburbanization has resulted in many streets that lack connectivity due to cul-de-sacs and curvilinear roads in a non-grid pattern. Similarly, the environmental features, notably waterways and both tidal and nontidal wetlands that make Cape Cod the unique place that it is also contribute to a fragmented transportation network. The result is a transportation network that is circuitous, and which relies on collector and arterial roadways for connections and access to destinations. Not only does this contribute to traffic congestion, but it is also not conducive to bicycle and pedestrian mobility due to the frequent lack of accommodations for nonmotorized travel, longer travel distances and the need to utilize roads that often have high volumes of traffic and/or high vehicle speeds.

While successful efforts have provided additional modes of transportation via the construction of the Cape Cod Rail Trail, additional bicycle access across bridges, and more frequent ferry service, travel demands still weigh heavily on the automobile for regional connections. Regional plans have determined that a greater emphasis is needed on public transportation and its role in a multi-modal transportation system. For example, the 2000 census showed that 14.6% of employed Cape residents commuted off-Cape, while 4.4% commuted to the Cape. This totals over 30,000 trips across the Cape Cod Canal daily. However, the same census showed that 85.4% of employed Cape Cod residents work on Cape Cod, contributing the most to the local transportation system. In a survey conducted by the Barnstable County Department of Human Services in 2000, the personal automobile was the

preferred mode of transportation followed by a carpool with friend or neighbor, and bicycling and walking. More than half of survey respondents did not believe commuting by bus was possible because they felt there were no bus stops near their home, and a quarter of respondents had no knowledge of the bus system whatsoever. These statistics represent the Cape's dependency on the automobile and a lack of education about alternative transportation systems.

Transit options on Cape Cod do however exist. The Cape Cod Regional Transit Authority (CCRTA) provides a variety of transit services to all 15 Cape Cod communities, however the towns of the Upper and Mid-Cape are primarily served along the coast of Nantucket Sound (within the general Route 6 corridor). Transit service on Cape Cod includes year-round fixed-route, flex-route (deviated fixed-route), and demand response services as well as seasonal shuttle and local "trolley" services. The transit authority also operates the Hyannis Transportation Center which serves as the hub for several of the bus services on Cape Cod; the SeaLine provides year-round daily bus service between Hyannis and Woods Hole in Falmouth; the Hyannis-Orleans route, known as the H2O Line provides daily service from Hyannis to Orleans via Chatham; and the Barnstable Villager provides service from Hyannis to the Barnstable Courthouse Complex in Barnstable Village. During the summer the Villager also provides service to the Barnstable and Hyannis harbors. During the summer the WHOOSH trolley and Hyannis Area Trolley provide fixed-route circulator service in Falmouth and Hyannis respectively. The trolley services also provide linkages to the SeaLine and H2O routes. CCRTA bus routes are well integrated with fixed routes connecting to provide transfers to other routes and access throughout the Cape. All CCRTA are equipped with bicycle racks capable of carrying up to two bikes, making multimodal transit options available to bicyclists on the Cape. Efforts to enhance bicycle access to bus routes can partially alleviate the stated perception that transit is not a viable option. Bicycling can significantly increase the distance patrons are willing to travel to bus stops while also providing flexibility by allowing easy access to multiple destinations that are proximate to transit stops.

Further compounding matters are the changes that have occurred relative to the nature of tourist visits to Cape Cod with both the type and duration of visits being vastly different than years past. The Cape Cod National Seashore Alternative Transportation Systems Long Range Planning Study (2003) notes that visits that used to commonly last as long as a month have been replaced by the more typical weekend visits that last only two or three days. Short-stay visitors are much less likely to utilize transportation alternatives such as transit or bicycling and rely on personal vehicles for mobility on Cape Cod. This results in much greater demand for parking facilities and congestion on roadways as well as spillover effects such as air and noise pollution and degradation of sensitive natural areas, especially in the Seashore.



Bicycle on transit along the National Seashore

Through the Cape Cod Regional Policy Plan and Regional Transportation Plan, regional officials suggest the promotion of a multimodal transportation system and effective land use and conservation planning as steps toward relieving the Cape's traffic congestion issues. The Regional Policy Plan states a Cape-wide goal *"...to reduce and/or offset the expected increase in motor vehicle trips on public roadways, reduce dependency on automobiles, and reduce air and noise pollution. To promote a balanced and efficient transportation system that includes alternatives to automobile travel."* The Policy Plan also states that *"...the Cape Cod Commission will continue to ensure that Developments of Regional Impact identify and implement strategies to provide alternatives to single-occupant vehicle automobile travel."* Concurrently, the Regional Transportation Plan states specific objectives to increase ferry service, introduce commuter rail, implement real-time transportation monitoring and notification technologies, and expand commuter parking facilities, all while including bicycle and pedestrian amenities to link these services. The Plan expresses an overall goal to link bicycle amenities to other forms of transportation in support of a truly multi-modal transportation network.



Bicyclists with children crossing Route 6 near the National Seashore Visitor's Center.

Though Cape Cod boasts over 80 miles of bike paths and many more miles of designated bicycle routes, their conditions vary significantly and a connected and comprehensive network of bicycle facilities is lacking throughout the Cape. This contributes greatly to significant reliance upon automobiles to visit the park and for daily mobility throughout the Cape, even for the many short trips that could otherwise be accomplished by bicycling. Demand for bicycle facilities at the Seashore continues to increase, both for transportation as a means of accessing and visiting the park, and as a recreational activity. The implementation and use of an integrated bicycle network would assist in these region-wide efforts, allowing local officials to place an emphasis on an alternative transportation mode that is cost effective, accessible, and environmentally sustainable.

1.4 Transportation at Cape Cod National Seashore

Transportation access to Cape Cod National Seashore is equally vehicular dependent. The National Seashore boasts numerous recreational opportunities including the Head of the Meadow, Nauset, and Province Lands Bicycle Trails, proximity to much of the Cape Cod Rail Trail, and numerous public beaches. However, no bicycle/pedestrian connections exist to link these resources, essentially forcing visitors to drive to each destination within the park. Parking lots throughout the Seashore are frequently at capacity during summer months and cars have even been turned away from attractions in the past due to excessive parking demand. Spillover parking sometimes occurs illegally on sensitive natural areas, resulting in environmental impacts. Spillover parking onto roadways also results in traffic backups at times, adding to congestion. This diminishes the visitor

experience at the Seashore and leaves visitors desiring an alternative means or point of access.

Transit access to the National Seashore is available, with some service limited to peak season. The Cape Cod Regional Transit Authority offers two bus services in an effort to provide alternatives to automobile access at the National Seashore. The bicycle-friendly Provincetown/North Truro Shuttle operates during the summer, offering 20-minute service as well as the “shoulder season” (mid-April through May, & October) on a reduced schedule. The shuttle provides service to beaches and other local attractions throughout Provincetown, North Truro, and the northern end of the National Seashore for a relatively small fare. The Flex Bus system provides deviated fixed-route service for a \$2 fare for destinations on the main route between Provincetown and Harwich. For an additional \$2 fare the “flexible” service transports passengers to other destinations that are within $\frac{3}{4}$ mile distance of the primary route, though reservations are required for off-route destinations. As with other CCRTA bus services, both the Flex and shuttle services offer riders bicycle transport for no additional fee. With increased ferry connections to Provincetown, visitors have the ability to travel with a bicycle from Boston or Plymouth to the Seashore without an automobile.

In 1987 the CCNS prepared the *Parkwide Bicycle Trail Study and Traffic Safety Study*. The National Park Service set the goal of connecting the Cape Cod Rail Trail in Wellfleet to Provincetown. Three alternatives were identified with both on-roadway and off-roadway alignments, though it was noted that alignments would likely have to extend outside of the CCNS. That study identified the lack of linkages between the Cape Cod Rail Trail and towns or destinations as limiting the utility of the trail for transportation purposes. The study proposed the provision of loop connectors to towns and Seashore destinations for each of the three alternatives to create a bicycle network and facilitate use of the CCRT and expanded bike routes for transportation use. The study also evaluated existing traffic safety conditions, both for motorists and bicyclists. Observation of bicycle travel noted a frequent reliance upon Route 6, likely for directness of travel, and this informed the study team in their development of the proposed alignments.

The Cape Cod National Seashore General Management Plan, adopted in 1998, expresses a goal of developing a trail system throughout the park that would allow users increased accessibility as well as a method to enjoy the sensitive environment that comprises the Outer Cape in a way that is not possible in an automobile. Such a trail system and improvements to non-motorized visitor access is also the most environmentally sensitive means of accommodating visitors, thereby preserving the integrity of the National Seashore.



Heavy parking demand and outdated bicycle facilities at the National Seashore Visitor's Center

A bicycle connection to Cape Cod National Seashore has been identified in the Local Comprehensive Plans of the surrounding towns of Eastham, Wellfleet, Truro, and Provincetown, proving the desire for a unified bicycle network throughout the Outer Cape. Further developing this network and encouraging bicycle use would help alleviate congestion in the Seashore and throughout the Cape and mitigate pressures on the limited supply of parking within the Seashore. Increased bicycle use also holds the potential to improve air quality on the Cape which is a non-attainment area for ozone and air quality. Implementation of individual plans will require coordination between localities, the National Seashore, and the MPO to ensure a unified approach and the development of a connected bicycle network.

Chapter 2: Project Methodology

2.1 Data Collection

The consultant team worked with the staff of Cape Cod National Seashore, the Cape Cod Commission, the fifteen towns of Cape Cod, and the National Park Service's Denver Service Center to identify, collect, and review relevant data for this study. The consultant team also reviewed local, regional, state, and federal planning documents including transportation plans and studies, bicycle plans, transit plans, local comprehensive plans and other related documents in an attempt to identify the primary problems, needs and desired improvements related to enhancing the bicycling environment on Cape Cod. The team developed inventories of; existing bicycle facilities and conditions; planned bicycle accommodations; public rights of way and easements; roadway conditions such as traffic, congestion, and crashes; major bicycle trip generators; and other related data. This data was then mapped using geographic information system (GIS) software. This information served as both the basis for informing decisions that guided this study, as well as to inform citizens, elected officials, and other stakeholders throughout the process of developing this study.

2.1.1 Steering Committee

A Steering Committee was established to help guide the development of this feasibility study. The Steering Committee was comprised of town bicycling representatives, the Cape Cod Commission, Mass Bike, the National Park Service, the Cape Cod Joint Transportation Committee, and elected officials. The committee also included representatives from several state agencies including the Massachusetts Department of Conservation and Recreation, the MassDOT District 5 Office, the Mass DOT Office of Planning, and the Volpe National Transportation Systems Center.

The Steering Committee was instrumental in the development of this document on several levels. The primary functions of the Committee included:

- Advising the project team throughout the process and helping to shape the objectives and outcomes of the study
- Providing contact with Cape Cod communities and local stakeholders
- Identifying local issues and providing input on the needs of local communities
- Assisting with data collection related to existing conditions
- Identifying potential bicycle route connections and needed improvements
- Ensuring consistency with Federal, state, and local plans and planning processes
- Participation in public workshops
- Review of the draft feasibility study

Utilization of the Steering Committee helped to ensure the involvement of local communities and provided valuable feedback and local knowledge of conditions

across Cape Cod. Throughout the study process the Steering Committee provided the National Park Service and the consultant team with the guidance needed to ensure that the study resulted in a comprehensive and systematic approach to improving conditions for bicycling on the Cape in an efficient and coordinated manner.



Steering Committee meeting

2.1.2 Planning Documents

Beginning in October 2008, the consultant team began gathering local comprehensive plans, bicycle plans, transportation master plans, recreation and open space plans, and other relevant planning documents for each of the 15 towns. These documents were reviewed alongside broader planning documents prepared by the Cape Cod Commission, the state of MassDOT Office of Planning, and the National Park Service.

While varying in date of preparation, each of these documents expresses a desire to provide additional alternative transportation facilities on the Cape in order to reduce roadway congestion, improve mobility for nonmotorized modes of travel, and to provide additional recreation facilities for both residents and visitors, including those visitors to Cape Cod National Seashore. The provision of additional bicycle accommodations is noted as the most beneficial investment toward this goal in nearly every local comprehensive plan, though methods of attaining this goal vary. Some local plans recommend the installation of wider shoulders along roadways during roadway maintenance or construction, while others recommend wide sidewalks that may be used as shared-use facilities. Dedicated bicycle facilities separated from roadways are recommended in several towns' local comprehensive plans, particularly where residential subdivisions could be connected to village centers and schools.

Stronger encouragement/education of bicycle and pedestrian safety is among the top action items in nearly every town plan, with some plans specifically recommending the installation of clear and uniform signage and striping along roadways and at crosswalks. In addition to recommending signage as a safety improvement, several Towns also express a desire for wayfinding signage to direct visitors to beaches, commercial centers, historical landmarks, etc. This is particularly noted as necessary along the existing Cape Cod Rail Trail.

Bicycle connections to Cape Cod National Seashore were universally noted as a need by the immediately adjacent towns of Eastham, Wellfleet, Truro, and Provincetown. Desired connections to the Regional Transportation Center in Hyannis were shared by both the Town of Barnstable and neighboring Yarmouth. The extension of the Shining Sea Bikeway into Bourne to an eventual connection with the Cape Cod Canal trail was shared by both Bourne and Falmouth.

Another universally stated action item among the Town plans is a desire for additional bicycle racks and/or storage facilities. In several plans, these are a high priority action item at municipal buildings including town halls, post offices, libraries, etc. and are recommended for public parking areas, major retail centers, and developing residential areas throughout the Cape. Provision of secure, accessible bicycle parking can contribute to greater use of bicycling for daily routine trips while also minimizing undesirable bicycle parking such as to sign posts or trees.

Other recommendations of note found in individual local comprehensive plans include, but are not limited to:

- the development of a parks and recreation department (Bourne Open Space Plan, 2008);
- additional public parking along the Cape Cod Rail Trail (Eastham Local Comprehensive Plan, 2002);
- special signal phasing for pedestrians along Route 6 (Eastham Local Comprehensive Plan, 2002);
- bikeway connections to pocket parks (Falmouth Local Comprehensive Plan, 2004);
- extension of the Cape Cod Rail Trail to Provincetown (Provincetown Local Comprehensive Plan, 2000); and
- utilization of the community design and development process to secure rights-of-way and require provision of facilities that are needed to provide 'complete streets', with transit, bicycle, and pedestrian accommodations (Sandwich Local Comprehensive Plan, 2009)

All local plans coincide with the broader goals and objectives found in regional documents such as the Massachusetts Bicycle Transportation Plan, the Cape Cod Regional Policy Plan, and the Cape Cod National Seashore Long Range Interpretive Plan, among others. These documents all support the incorporation of bicycle and pedestrian facilities into the transportation framework across the Cape.

2.1.3 GIS Data Sources

Geographic information system (GIS) data was primarily used to produce maps of existing conditions, planned bicycle facilities, and major destinations and attractions throughout the Cape. These maps served as a starting point from which gaps in the bicycle infrastructure and feasible bicycle network improvements were identified. The GIS maps were not intended to serve as exhaustive inventories of existing bicycle infrastructure or roadway conditions, but rather provided a baseline from which a conceptual network could be developed. After reviewing the existing conditions, revisions were made based on input from the project Steering Committee and Public Workshop attendees to ensure complete and current data were utilized in the planning process. Final revisions to the data were made in June 2009.

During the mapping process, many data layers were found to be outdated, or of an insufficient coverage area. The data ultimately used for mapping includes transportation data and civic features such as Town Halls, Libraries, etc. that were obtained from the Massachusetts GIS Library website, MassGIS. New data layers were created to depict existing potential bicycle destinations such as bike rental shops, youth hostels, public restrooms, and campgrounds, for which data was otherwise unavailable. This data was created through extensive internet and plan research, as well as via Steering Committee input and public participation.

The bicycle route/trail data depicted on the existing conditions maps were originally created by the MassDOT Office of Planning and thereafter edited by, and obtained from, the Cape Cod Commission. Though other sources of existing bicycle facility data were utilized, this database was found to be the most comprehensive and up-to-date. Cape Cod National Seashore and the 15 Cape Cod towns also served as sources for some of the mapping data. Minor revisions were made to account for trail or plan updates over time and based upon feedback from the Steering Committee and public comments received through the planning process.

2.1.4 Public Workshops

Recognizing the importance of garnering the direct input from residents of Cape Cod, public participation and feedback was sought via public workshops. In an attempt to ensure involvement by both year-round and seasonal residents two workshops were held in May 2009 at the Hyannis Transportation Center and the Wellfleet Senior Center and two additional workshops held in August 2009 at the Hyannis Transportation Center and the Eastham Town Hall. This also helped ensure broad geographic access to the meetings. The meetings were advertised through a variety of media including newspapers and radio outlets, postcard mailings, and informational flyers distributed at local businesses, primarily bicycle shops.

Citizens were given the opportunity to discuss the study with the consultant team and provide input on needed improvements, connections within the bicycling network, new facilities or routes, and supporting amenities. Attendees

were able to review maps of the bicycling and transportation infrastructure on Cape Cod and engage in discussions regarding critical improvements. This hands-on process resulted in the master list of more than 120 proposed projects and initiatives for improving bicycling conditions on Cape Cod. This list was later consolidated to eliminate redundancy and each project was then assessed for development of detailed description and planning level cost estimates as part of this study. The consolidated list of proposed projects is included in appendix B along with the assessed category. A detailed description of the assessment process is provided in Chapter 4.

2.2 Analysis and Assessment

Following the data collection process the consultant team evaluated the data, existing conditions, and planning documents to begin the process of determining the network improvements that are needed, underway, or programmed (those included in the Statewide Transportation Plan, or which are already in design or under construction). The process also evaluated the supporting programmatic initiatives that could enhance bicycling conditions on Cape Cod. The existing accommodations and facilities were categorized according to the type of facility, such as shared-use paths, on-road accommodations, and unimproved bicycle routes. The mapping also included the roadway network, transit hubs, and trip generators and destinations.

2.2.1 Existing Conditions & Gaps

After mapping the existing conditions the consultant team began compiling and reviewing available data on bicycle facility usage and demand, National Seashore visitation data, and studying numerous transportation plans to determine the most frequently cited needs and deficient bicycling conditions throughout the Cape. Utilizing the mapped inventory of bicycle facilities, public transportation routes, and major destinations in conjunction with the plan and data analysis, crucial gaps in the bicycle network were identified. Also considered in the evaluation were the types of existing facilities and the level of access or mobility they provide to bicyclists of varying abilities. Emphasis was placed on facilitating access by bicycle to primary destinations such as town centers, beaches, commercial areas, or linkages to residential areas where bicycle trips would likely originate. The team was able to utilize this information in assessing the primary needs for improving conditions for bicycle mobility and subsequently develop a sorted list of projects for implementation.

2.2.2 Trends & Estimating Demand

The National Seashore currently does not count the number of visits by foot or bicycle, and as there are multiple possible points of entry it would be impossible to monitor all of these locations. However, anecdotal observations suggest that the total numbers would be significant, especially visits by bicycle to Herring Cove, Coast Guard Beach, and Race Point Beach which is accessed by the Province Lands Bicycle Trail. Nauset Light Beach, Marconi Beach, and Head of

the Meadow also have significant levels of bicycle activity, though access by bicycle is not as easy.

The towns of the Lower and Outer Cape also do not have systems in place to count vehicles, pedestrians, or bicycles accessing their beaches, though some traffic counts are conducted on roadways throughout Cape Cod. In general, counting bicycle and pedestrian use and trips can be difficult. Since trips are so dispersed for pedestrians and bicyclists, selecting appropriate locations to conduct counts can be challenging with the exception of shared-use paths or other dedicated bike/pedestrian facilities. The Cape Cod Commission does conduct counts on some of the larger rail-trails such as the Cape Cod Rail Trail and the Shining Sea bikeway. The Cape Cod Regional Transportation Plan (2007) indicates high usage of the CCRT with an estimated 400,000 annual users and greater than 400 trips/hour during peak summer usage. The Shining Sea Bikeway also has very high usage by bicyclists and pedestrians. The Cape Cod Commission Traffic Counting Report, 2009 shows upwards of 2,000 daily users along the more heavily used segments of the bikeway.

2.2.3 Coordination With Other Studies

Transportation needs in the national parks vary considerably from one park to another and can impact significantly the park experience enjoyed by visitors, as well as resulting in environmental, historical, and cultural impacts. The National Park Service strives to ensure that meeting these transportation demands is carried out in light of the overarching imperative of impacting as little as possible the surrounding natural and cultural surroundings and retaining the character central to the individual parks, for which the parks themselves were created. With annual visitation at national parks approaching 300 million, mostly by automobile, demands on many roads and parking facilities have exceeded their capacity. Cape Cod National Seashore, being New England's most visited national park, is emblematic of this problem. The Seashore's location proximate to many popular Cape Cod destinations and its reliance on a limited road network that must serve these destinations as well as the Seashore places especially unique demands on the transportation infrastructure.

The Federal Lands Highway Program (FLHP) provides funding for an integrated approach to addressing transportation needs in national parks through the Park Roads and Parkways Program (PRPP) including infrastructure (roads, trails), alternative transportation systems (transit, ferries), intelligent transportation systems (traveler information, traffic management), and planning efforts (studies, long-range planning). This program, which is administered by the NPS, helps to manage existing transportation resources while also aiding in resource protection, energy conservation, and reducing noise and air pollution.

Three additional studies underway concurrently with this feasibility study and funded through the PRPP include the Outer cape Parking Study; the Intelligent Transportation Implementation Plan; and the Flex Expansion Study, all of which seek to mitigate the impacts of automobile use to access Cape Cod National Seashore. This feasibility study and the conclusions and recommendations, along with any implementation actions need to be closely coordinated with these three studies, particularly the parking study.

As is noted throughout this study the ability for visitors and residents on Cape Cod to access and utilize alternatives to automobile transportation is limited. Towns and the National Park Service experience parking demands which often outstrip their capacity during peak season. The Volpe Center's *Cape Cod Parking and Transit Study* reveals that coastal erosion threatens to further reduce parking capacity, especially in the National Seashore, as well as at Brewster beaches. Traffic congestion reaches critical proportions during the summer and there is little ability, nor desire to expand the roadway network to attempt to accommodate the seasonal influx of automobile traffic. Consequently an integrated approach to mitigating the impacts of automobile travel on the Seashore and Cape Cod in general is needed.

The bicycle transportation network on Cape Cod needs to be expanded and enhanced considerably to provide a viable transportation alternative to a significant number of people. The existing and planned improvements can be integrated with these other transportation solutions by providing bicycle access to destinations and better integrating transit and bicycle transportation to result in attractive multimodal options. Increased bicycle shuttling and bikes-on-transit options, park-and-bike facilities and linkages between trip origins and destinations or bicycle facilities can increase the utilization of bicycling for short trips which make up a significant percentage of daily trips, thereby significantly reducing demand on roadways and parking facilities.

Intelligent Transportation Systems (ITS) provide travelers and visitors to the Cape with real-time information on transportation conditions and available options for mobility on Cape Cod and within the National Seashore. ITS can be provided through an increasing variety of media in the digital age. Information related to alternative routes, transit options (including headways and arrival times), parking availability, and general traveler information can be conveyed, including location-specific information. The proposed bicycle route mapping and wayfinding projects included in Chapter 5 of this document are envisioned to be available in a digital format as well, thereby being accessible to a broader array of potential users while also being easier to update and capable of conveying real-time information as compared to printed materials.

Chapter 3: Existing Conditions

Suburban development patterns have resulted in a transportation network that is fragmented and which relies on a small number of primary arterials and collector roads to move the majority of traffic throughout Cape Cod. This is exacerbated by the unique environment that makes Cape Cod so attractive; many streams, wetlands, and estuaries often confine the transportation network to neighborhood or subdivision streets that lack connectivity. Travel across Cape Cod is facilitated largely by Route 6 and Route 28 along Cape Cod Bay and Nantucket Sound respectively. To a lesser degree Route 6A, a state scenic byway, provides travel across Cape Cod along a two-lane route paralleling Route 6. This road network must also be utilized by bicyclists which often results in long, circuitous routes that often require bicyclists to travel on high speed, high volume roadways that are uncomfortable for bicycling. In many instances there are no improvements to the roadway to accommodate bicycle travel resulting in the potential for conflicts between motor vehicles and bicycles.

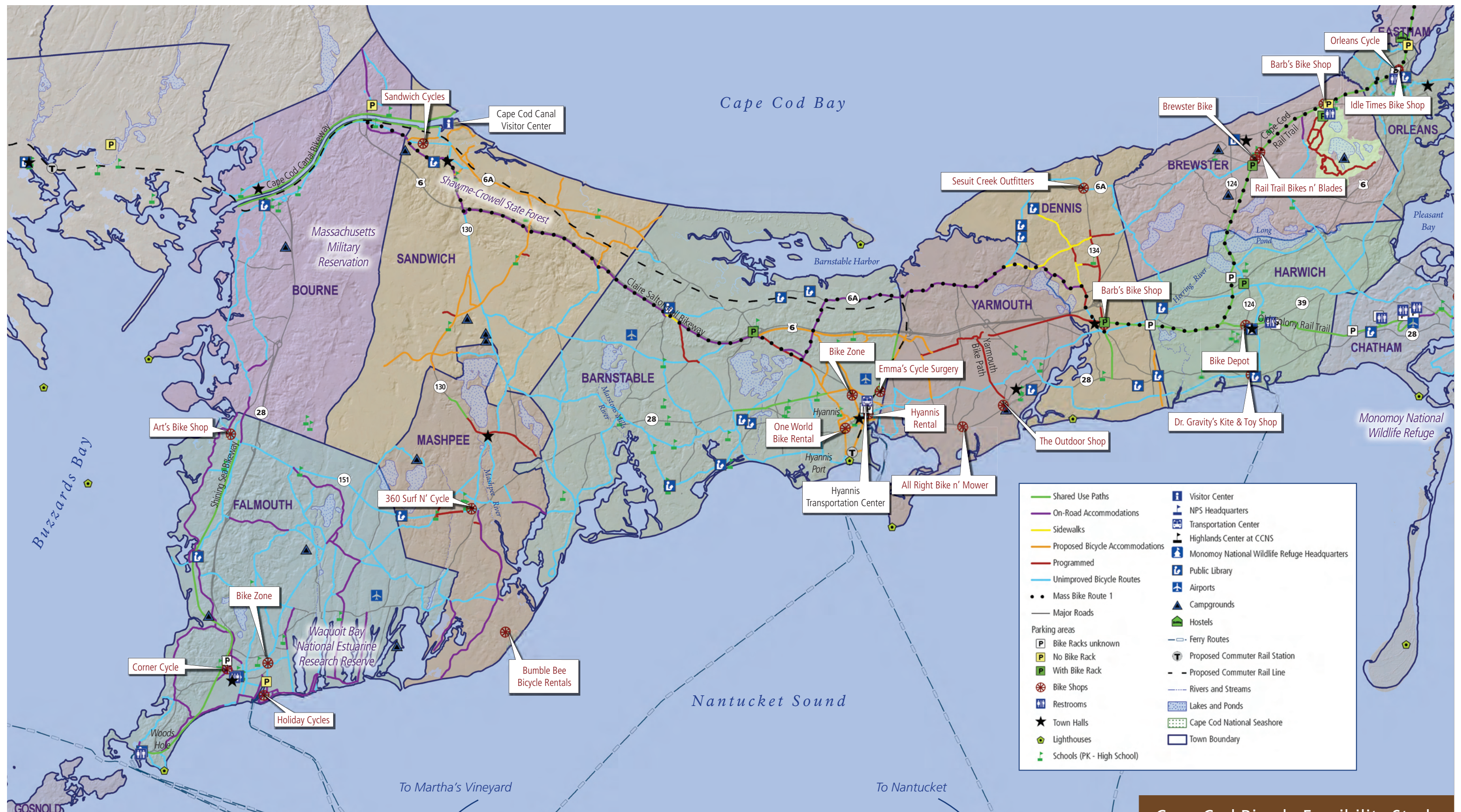
Cape Cod does benefit from over 80 miles of shared use paths; however most of these facilities are short routes that lack connectivity to destinations or to other bike paths or on-roadway (improved) bike routes. As a result there is not a complete and integrated network of bicycle routes and accommodations. Even in the case of longer regional facilities such as the Cape Cod Rail Trail gaps often exist between the path and destinations such as neighborhoods, commercial centers, and CCNS attractions. Linkages are needed to access transit services and transportation hubs, notably those located in Provincetown, Woods Hole, and Hyannis in order to facilitate greater use of multimodal transportation options.

Changing demographics on Cape Cod result in even greater reliance on automobile travel. Average visits are now shorter and visitors to the Cape may be less familiar with transportation options. Despite heavy use estimated at approximately 400,000 trips per year, the Cape Cod Rail Trail and other bicycle facilities often lack adequate wayfinding signage and gaps in the network make transportation by bicycle difficult, especially for visitors to Cape Cod.

3.1 Bicycle Facility Inventory Maps

Maps were prepared to depict existing bicycling conditions as well as projects that are included in the Statewide Transportation Plan, or which are already in design or under construction. Proposed projects from local and regional plans were also included in the maps to incorporate the planning efforts that had occurred prior to this study. These maps assisted the public involvement processes by allowing stakeholders to identify needed and potential routes and linkages within the existing, planned, and proposed network of bicycle facilities throughout the Cape. Following the project selection methodology outlined in Chapter 2 a list of projects was developed for this study for which project details and estimates were developed. Some, but not all of these preexisting proposed projects were included in the list of proposed improvements developed for this feasibility study, though

they should be considered valid projects that can proceed with development given adequate support from localities and stakeholders.



Cape Cod Bicycle Feasibility Study

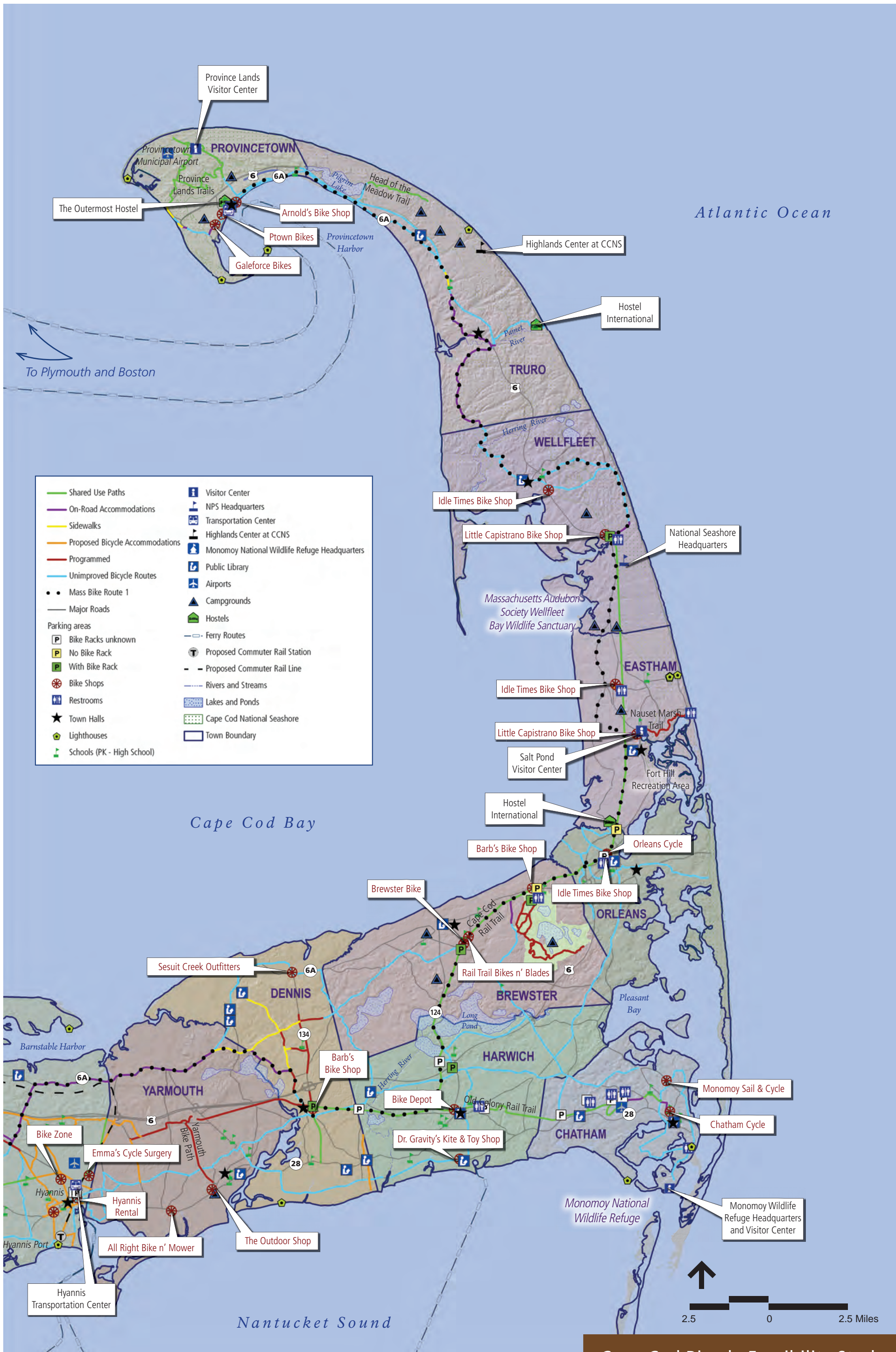
Figure 2
Inventory of Existing and
Proposed Routes



National Park Service
U.S. Department of the Interior

Cape Cod National Seashore





Cape Cod Bicycle Feasibility Study

Figure 3
Inventory of Existing and
Proposed Routes

3.2 Bicycle Network Overview

The existing bicycling conditions on Cape Cod vary considerably, and the principal goal of this feasibility study is to identify projects that enable stakeholders to move towards establishing a more complete and connected network. This network should consist of a variety of facilities and accommodations that can serve bicyclists of varying abilities and experience. A bicycle network can be comprised of a variety of facility types or improvements that serve as accommodations to make bicycling safer, more appealing or more comfortable for bicyclists. Additionally, different facilities or accommodations serve the varying needs of cyclists of different capabilities. The needs of a child or novice adult bicyclist will be vastly different than that of an experienced or avid cyclist. As a result, the type of facility and the travelling environment in which it is located will greatly impact how likely it is to be used on a regular basis, as well as how safe it will be for users. Following is a brief description of the most common types of bikeways. Tables 1 and 2 provide details on the total mileage of shared use paths and bike routes on Cape Cod at the time this study was prepared. The tables were originally prepared for the 2007 Cape Cod Regional Transportation Plan and data were updated for this study where available. Detailed descriptions for longer facilities, including the localities served by them, are provided later in this chapter. A detailed inventory with locations of the many short path segments distributed throughout Cape Cod is not included in the tables, but the total mileage is provided by locality and region.

Table 1 Bike Path and Route Mileage By Town and Region *

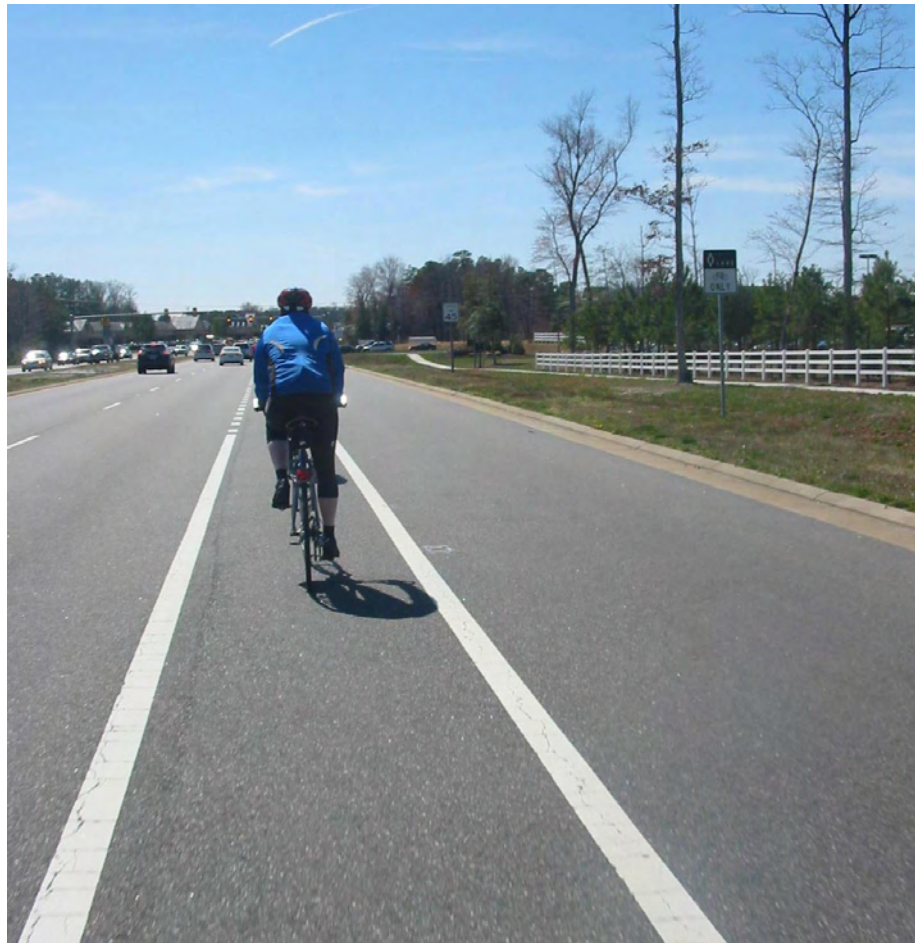
Town/Region	Bike Paths	Bike Routes
Upper Cape	22.2	166.1
Bourne	11.5	26.1
Sandwich	2.5	22.5
Falmouth	10.9	92.6
Mashpee	3.4	25.0
Mid Cape	16.6	66.6
Barnstable	4.8	41.2
Yarmouth	4.5	11.6
Dennis	7.3	13.8
Lower Cape	25.4	50.7
Harwich	8.7	20.2
Chatham	2.3	7.3
Brewster	12.5	12.1
Orleans	1.9	11.1
Outer Cape	19.6	49.6
Eastham	7.2	10.0
Wellfleet	2.8	16.4
Truro	1.9	17.6
Provincetown	7.7	5.6

** 2007 Cape Cod Regional Transportation Plan, updated to reflect current data where available*

Shared Use Paths – Often referred to simply as bike paths or even “trails”, a shared use path is usually located on an exclusive right-of-way outside of the roadway, and preferably with minimal cross-flow of automobile traffic. Users are often bicyclists, but typically such paths are frequented by walkers, joggers, skaters and other

nonmotorized users for both recreation and transportation purposes. Typically they are designed for two-way traffic and may be paved or composed of a firm, stable surface such as compacted cinders or crushed stone. Shared use paths often utilize abandoned rail lines or other corridors outside of the roadway network and serve to complement the on-road transportation routes, but in many instances these facilities will parallel high speed and/or heavily trafficked arterials that are uninviting for all but the most comfortable experienced cyclist. In some instances shared use paths include an adjacent, unpaved surface for equestrian use.

Bicycle Lanes – Bike lanes are on-roadway lanes that are striped at the outer edge of vehicle travel lanes (on the shoulder or between a vehicle travel lane and parking or turn lanes) and are designated for the preferential use by bicyclists. The width of the bike lane will vary depending upon the roadway geometrics and operations (such as on-street parking, presence of curb or shoulder, etc). Operating in a manner similar to a regular vehicle travel lane, bicycle lanes delineate space on the roadway for bicyclists, creating more predictable movements by both bicyclists and motorists. Though they don't physically separate the two modes, bike lanes can increase the comfort level of bicyclists by providing them with spatial separation from passing vehicles. Bike lanes may also help reduce wrong-way riding (bicyclists riding against traffic) by communicating the expected direction of travel for bicyclists. Bike lanes are not appropriate under all roadway conditions and careful consideration is needed when determining the appropriate use. Currently no designated bike lanes exist on Cape Cod.



Example of a bike lane on an arterial between the travel lane and turn lane

Wide Shoulders – Though technically not a bicycle-specific facility, wide shoulders are often utilized by bicyclists and can add to the comfort and perception of safety of bicyclists by providing a degree of separation from passing vehicle traffic. Because many roads incorporate shoulders for the safety and convenience of motor vehicles, they are an option for enhancing bicycle routes while also offering benefits to motorists such as pavement edge stabilization and a recovery area that reduces roadway departure crashes. When utilized as bicycle accommodations and especially when part of designated bicycle routes, care should be taken to ensure that routine maintenance is performed to keep shoulder free of debris and hazards that tend to accumulate outside of travel lanes. Under Massachusetts law a shoulder intended to satisfy bicycle accommodation requirements must be a minimum of 4' wide and adjacent to a vehicle travel lane of at least 11' wide. This is largely consistent with the 1984 NPS Park Road Standards which suggest a four foot width for shoulders that are designated as bikeways.



Wide, paved shoulder, Route 6

Designated Bicycle Routes – Signed shared roadways are bike routes that have been identified as a preferred route with signage. Reasons for signing a route can include; continuity or connection to other bicycle facilities; a route commonly used by bicyclists; roads preferable for bicycling due to low traffic volumes or speeds; the presence of geometrics or physical characteristics that make bicycling more comfortable such as wide paved shoulders or a designated bike lane; or the route proceeds along local streets to common neighborhood destinations and bicycle trip generators such as shopping districts, employment centers, or public spaces such as schools or parks. Typically designated bike routes should have physical or operational characteristics that are more favorable to bicycling such as wide travel lanes, bike lanes, shoulders, and/or low traffic speeds and volumes.

Unimproved Shared Roadways – The majority of roads fall into this category, as almost any road may be used by bicyclists. However, the physical and operational

characteristics will greatly impact how likely they are to actually be utilized by bicyclists. Unimproved roads most likely to be used by bicyclists are those with little traffic and low speeds where conflict with motor vehicles is unlikely and bicyclists of all abilities will typically feel comfortable. In other instances short sections of unimproved roadways with moderate traffic volumes may serve as connections to more desirable routes.



Bicyclists on shared roadway in Provincetown

Cape Cod's existing network of bicycle facilities is comprised of a variety of facility types with varying levels of accommodations for bicyclists. According to the 2007 Cape Cod Regional Transportation Plan there are currently over 80 miles of off-roadway shared use paths and approximately 82 miles of on-road accommodations such as wide shoulders, some of which are signed as bicycle routes. In total there are 173 miles of on-roadway bicycle routes designated by the Commonwealth of Massachusetts on Cape Cod, however many of the bike route signs have disappeared over the years resulting in an environment that would fall into the category of an unimproved shared roadway. Additional signed bike routes exist on Cape Cod, designated by local jurisdictions; however those too often have missing or inadequate signage. In total, the Cape Cod Regional Transportation Plan notes that a total of 333 miles of bicycle routes exist throughout Cape Cod, though the design and execution of designated bike routes throughout the Cape varies considerably. Some routes utilize non-standard pavement markings or signage (if signed at all), as well as varying infrastructure conditions that may not be comfortable for any but the most experienced bicyclists, and which may not conform to national guidelines for designated bicycle routes. At the time of this study there were no designated bike lanes on the Cape. Currently there are approximately 10 miles of bicycle accommodation projects programmed in the Regional Transportation Plan consisting of a five mile extension of the Cape Cod

Rail Trail in Dennis and five miles of roadway improvements to add paved shoulders along segments of Route 137 in Harwich and Route 134 in Dennis.

Though a considerable amount of bicycle paths and routes have been built or designated there are numerous gaps resulting in a fragmented and incomplete network throughout the Cape. As noted a number of designated routes have suffered benign neglect and signage has disappeared over time. In some instances there are long, continuous facilities that offer relatively uninterrupted routes but which lack connections or access to nearby towns or attractions. In other instances facilities provide access within towns and attractions such as the National Seashore but lack linkages to routes that facilitate greater mobility and travel between destinations, such as between towns or from one major bicycle destination to another. This is often the case with shared use paths as noted in the Cape Cod Regional Transportation Plan. That plan stated that most paths on the Cape are too short, terminate before reaching areas of commercial activity, or are simply located where they don't facilitate commuting or other utility cycling trips. As a result shared use paths are often utilized only for recreational purposes. In many instances, people using the paths and rail-trails must drive to and from these facilities to enjoy them, contributing further to automobile congestion, as opposed to being able to simply access them by bicycle or to use them to complete trips.



Route 6 in Wellfleet; bicycles on vehicles in both directions being driven to trailheads.

Other long distance on-road designated bike routes such as the Mass Bike Route 1, also known as the Claire Saltonstall Bikeway are in large part suitable only for experienced cyclists that are comfortable riding with traffic and in a variety of roadway conditions. Consequently, the varying conditions and types of accommodations present throughout Cape Cod result in a network that may not provide a safe and comfortable bicycling experience for many users, notably novice bicyclists and children. As a result the many miles of routes and facilities do not constitute an integrated and coordinated route network that provides a viable and attractive option to an automobile.

Local streets make up the majority of unimproved shared roads and often do not need improvements to make them safe and comfortable for most bicyclists. These roads often serve as the beginning or end point of trips as they include neighborhood streets and make up a considerable amount of the available bicycling network. According to the 2007 Cape Cod Regional Transportation Plan there are nearly 1,500 miles of local roads of this nature. There are several hundred more miles of roadways on the Cape with average daily traffic volumes (AADT) of less than 5,000 vehicles where bicyclists may, depending upon conditions and skill level, comfortably ride as well. Of the 2,590 miles of roads on Cape Cod fully 70% are local roads accessing residential or other primarily private areas. Only 30% of roads on Cape Cod are classified as arterials or collectors, yet they are the primary routes of travel throughout the Cape, contributing to the significant congestion experienced during peak season. Exacerbating this is the fact that many of the secondary roadways on Cape Cod are not connected other than by collector or arterial streets, resulting in limited route options for motorists, but more significantly for bicyclists as well. The resulting demand by multiple modes on these roadways result in congestion and an environment that is not conducive to bicycle or pedestrian travel.

In some instances improvements to secondary roads will be necessary or warranted to make the bicycling environment safer or more appealing to bicyclists of varying experience and skill. Though these roads make up the majority of the bicycle network on the Cape it is important to ensure that linkages are provided to other parts of a bicycling network where local roads connect to collector and arterial streets that may not be as suitable to bicycling or to make improvements along those roadways to facilitate bicycle mobility and safety, especially for children and novice bicyclists, and to ensure connectivity to desired destinations.



Regional bicycle route signage with destinations and distances

The towns of the Cape as well as the National Park Service have also recognized the need for improved supporting accommodations and programs throughout the Cape to both encourage and facilitate use of bicycling as a legitimate mode of transportation. Secure bicycle parking at prime bicycle destinations, wayfinding and route signage, connections to transit services, and improved education and safety initiatives aimed at both bicyclists and motorists are needed to ensure that bicycling can be utilized as a safe and attractive mode of transportation on the Cape by both residents and visitors of all ages.

3.2.1 Primary Bicycle Routes

Nineteen shared-use path facilities currently exist on Cape Cod. Of those, six paths total approximately 60 miles comprising nearly three-fourths of the total mileage of bike paths on Cape Cod. These six facilities are also notable in that they are medium and long-distance facilities that are 6 miles in length or greater, with the longest, the Cape Cod Rail Trail stretching approximately 22 miles across six towns of the Lower Cape. In addition to these paths Mass Bike Route 1, also known as the Claire Saltonstall Bikeway, extends from Boston across the entirety of Cape Cod to Provincetown along with a spur to Woods Hole. This route consists primarily of on-roadway alignments with some sections on shared-use paths. The following routes and/or facilities make up the majority of the bicycle network on the Cape and as such serve as spine routes that could or do facilitate connections and linkages between towns, regions, and popular destinations on Cape Cod. From these routes the expansion of the network and linkages to shorter, local facilities and primary destinations can begin to develop a more complete and integrated system of routes and facilities providing access across and throughout Cape Cod.

Table 2 Total Cape Cod Bike Path Mileage*

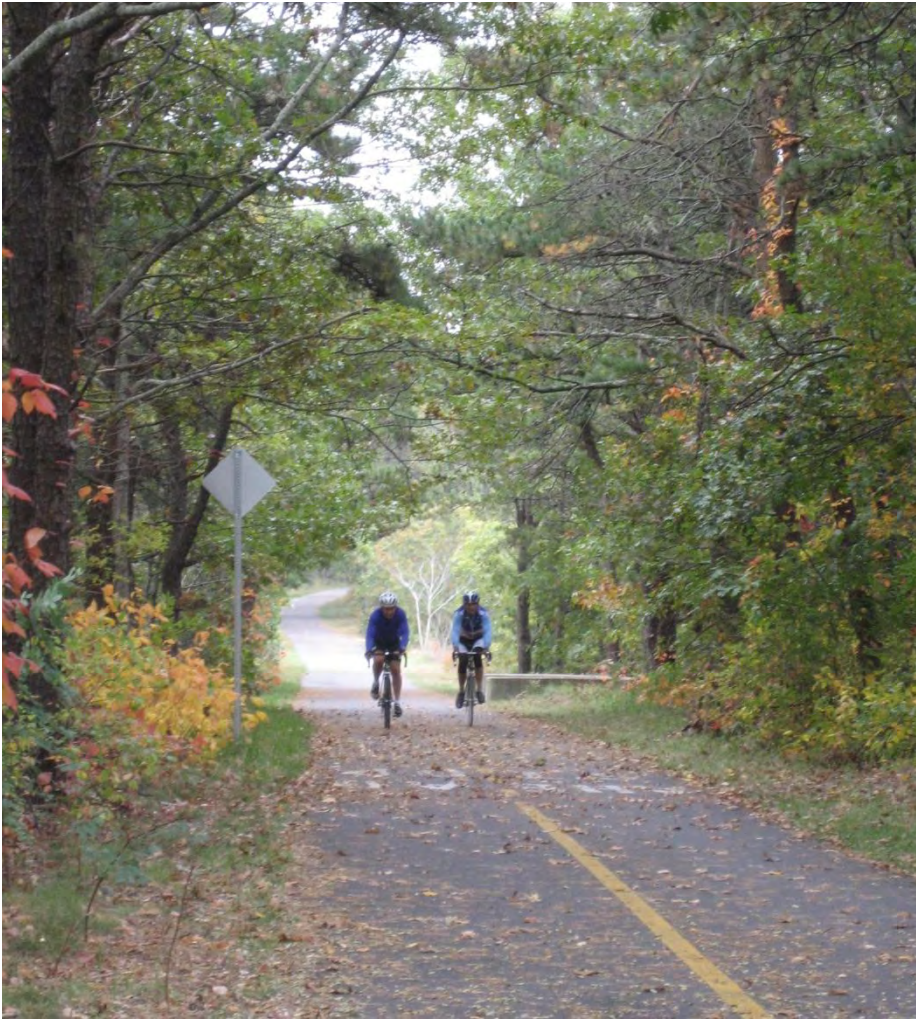
Path Name	Length (mi)	Width (ft)	Number of Road Crossings
Cape Cod Canal Bike Path	13.57	8	7
Cape Cod portion only	6.52	8	2
Cape Cod Rail Trail	21.9	10	45
Rail Trail Harwich-Chatham Spur (Old Colony Rail Trail)	7.5	8.5	15
Downtown Falmouth Path	0.2		0
Forest Road Path	1.4	8.5	8
Forestdale School Path	0.4	10	
Head of the Meadow Bicycle Trail	1.9	8.5	0
Hyannis Transportation Center Path	0.4		3
Nauset Bicycle Trail	1.9	8	6
Nickerson State Park Trails	6.8		6
Old Stage Road Path	1.9		6
Old Townhouse Road Path	2.0	8	3
Province Lands Bicycle Trail	7.6	8/10**	4
Herring Cove Beach Path	0.1	8	0
Route 130 Path	2.4		11
Route 151 Path	1.1		1
Route 28 Path	2.5	8	28
Setucket Road and Dennis Paths	7.0	8.5	38
Shining Sea Bikeway	10.7	8.5/10**	11

* 2007 Cape Cod Regional Transportation Plan, updated to reflect current data

**Newer / rehabilitated sections have been widened to 10'

- Cape Cod Rail Trail (CCRT) – The Cape’s longest shared-use path, this former rail line was converted to a bike trail that is now 22 miles long. Managed by the Massachusetts Department of Conservation and Recreation, the trail begins in Dennis and extends across much of the Lower Cape as it passes through Harwich, Brewster, Orleans, Eastham, and ultimately ending in South Wellfleet just north of the National Seashore Headquarters. Roadway connections to the CCRT provide access to all but the Provincetown beaches within the National Seashore. In addition to a recent extension, resurfacing and rehabilitation projects have resulted in the trail being widened to 10’ from its previous 8.5’ width, to meet current design guidelines and provide a safer, more enjoyable experience for bicyclists. Another unique feature is the bicycle roundabout that was constructed at the junction with the Old Colony Rail Trail. Various proposals exist to extend the CCRT both northward to Provincetown, and eastward to Hyannis. Private ownership of much of the proposed right of way poses a

potential hurdle to extension of the Rail Trail through Wellfleet, Truro, and Provincetown.



Bicyclists on the Cape Cod Rail Trail

- Old Colony Rail Trail – also known as the Harwich-Chatham spur of the Cape Cod Rail Trail, construction of the Old Colony trail provided an important linkage between the CCRT and the heart of Chatham on the Lower Cape. Extending 7.5 miles the trail connects the towns of Harwich and Chatham, while also providing bicyclists access to Chatham from the communities served by the Cape Cod Rail Trail. A unique feature of the Old Colony Rail Trail is the roundabout located at the junction with the Cape Cod Rail Trail. While largely a shared-use path along an abandoned rail line, the trail utilizes two brief on-roadway alignments in the Town of Chatham that total less than 1 mile.



Old Colony Rail Trail with additional unpaved surface for equestrians

- Shining Sea Bikeway – recently extended by the Town of Falmouth to more than double the previous length, the Shining Sea Bikeway on the Upper Cape covers 10.7 miles spanning four of Falmouth’s villages, following an abandoned rail bed. Roughly paralleling the Route 28 corridor, the trail begins in North Falmouth, just south of the Bourne/Falmouth line and heads south along Buzzards Bay to Woods Hole where bicyclists can access parking and the ferry service.
- Cape Cod Canal Bikeway – the Cape Cod Canal, part of the Atlantic Intracoastal Waterway, was completed in 1916 separates the Cape Cod peninsula from the Massachusetts mainland. Located on the Upper Cape, the Cape Cod Canal Bikeway is in actuality a pair of service roads for the Army Corps of Engineers which maintains both the canal and the trail. The bikeway is located on both sides of the canal running approximately 7 miles between the Bourne and Sagamore bridges which span the canal, linking the Cape to the mainland. Unimproved, on-roadway bicycle routes link the

bikeway to destinations in Sandwich and Falmouth, including the Shining Sea Bikeway.

- Claire Saltonstall Bikeway - also known as the Boston to Cape Cod Bikeway, this route totals 135 miles, approximately half of which is on Cape Cod. Consisting of on and off-roadway segments, the bikeway utilizes Route 6 and Route 6A for much of its on-road alignment but makes use of the Shining Sea Bikeway in Falmouth which serves as a spur to reach Wood Hole, and the Cape Cod Rail Trail along the Lower Cape. Though the route is signed as Mass Bike Route 1 many of the signs have disappeared over time and wayfinding, especially along roadway alignments, requires a map.



Mass Bicycle Route 1 signage (Claire Saltonstall Bikeway)

- Cape Cod National Seashore Trails – located within Cape Cod National Seashore in Provincetown the Province Lands Bicycle Trail is located at the very outermost end of Cape Cod. The 7.6 mile trail is comprised of a major loop trail that winds through dunes and other natural areas with short spurs accessing Race Point Beach and Herring Cove Beach. Renovated in 2009, the trail has been widened to ten feet in most places. In addition to the Province Lands Trail the Nauset Trail in Eastham and the Head of the Meadow Trail in Truro are paved trails managed by the National Park Service that primarily provide access to beaches. Both trails are approximately 1.9 miles in length and like the Province Lands Bicycle Trail, are in undeveloped areas that take bicyclists through a variety of natural environments and historical sites. Head of the Meadow and Nauset trails provide access to Head of the Meadow Beach and Coast Guard Beach respectively.
- Unimproved routes throughout the cape – making up the majority of Cape Cod's bicycle network there are many miles of unimproved roadways with

designated bicycle routes. Many have conditions that are suitable for bicycling by cyclists of varying ability while others have conditions that are comfortable only for experienced cyclists. Many of these routes that serve as direct connections between bicycling facilities (such as the Cape Cod Rail Trail) and town centers and Seashore destination, but which lack conditions suitable to average bicyclists were the focus of proposed improvements or alternative facilities in this study.

3.2.2 Primary Network Gaps

Though there are many miles of shared-use paths, many in the form of rail-trails, a number of towns on the Cape lack any connection to these primary bicycle routes. The facilities and/or routes themselves are often not linked, resulting in a discontinuous network that is not contiguous and integrated. As noted, there are many secondary roads and local streets that facilitate bicycle travel and mobility on Cape Cod, however busy roads such as major collectors and arterials introduce barriers that are difficult to navigate or even cross by less experienced cyclists. These roads are often a desirable corridor to be accessed by bicyclists since they provide direct routes and are also often the location for many businesses or other trip generators. When lacking facilities or accommodations for bicyclists these roads constitute significant gaps within the bicycle transportation network. Additionally, the secondary and neighborhood streets that are more conducive to bicycling often are disconnected, providing access only within a neighborhood, thereby having limited utility as a route to access destinations. The most notable gaps within the existing bicycle infrastructure on Cape Cod include:

The Cape Cod Rail Trail, being the longest continuous bicycle facility on the Cape forms what could be described as the partial backbone of the Cape's existing bicycle network. Currently running from Dennis to Wellfleet, there are two major connections that are viewed as essential; a linkage westward to Hyannis, approximately 8 miles away in Barnstable, providing a link to the Hyannis Transportation center in order to facilitate multimodal travel on Cape Cod; and to Truro, Provincetown, and the rest of the National Seashore to the north comprising an approximately 20 mile extension. Beyond those two extensions, a continuation westward would provide a link throughout the Mid Cape, and to the Upper Cape, resulting in a facility that runs the length of Cape Cod and serving as a complete spine route to which other facilities and network improvements could be added over time to develop a complete and connected bicycle network for all of Cape Cod.

The Towns of Dennis and Yarmouth are currently designing the extension of the CCRT from the trailhead at Route 134 (East-West Dennis Road) to Higgins-Crowell Road which would bridge 5.2 miles of the gap to the Hyannis Transportation Center. The Town of Barnstable is currently planning two extensions of the CCRT which would connect Higgins-Crowell Road to the Hyannis Transportation Center, completing this crucial linkage, while the second extension would carry the CCRT westward to Route 132, Iyannough Road, providing a connection the Claire Saltonstall Bikeway at the intersection of Route 132 and Phinneys Lane.

The primary gap existing on the Upper Cape exists between the Cape Cod Canal Bikeway in Bourne and the Shining Sea Bikeway in Falmouth; a gap of approximately 7 miles which is currently bridged by unimproved on-roadway bicycle routes. A secondary and much larger gap exists between the bicycle facilities of the Upper Cape and the Cape Cod Rail Trail. An extension of the CCRT to the Upper Cape would facilitate connections to these two facilities which would provide bicycle access to all 15 towns of the Cape, provided the other proposed extensions of the CCCRT were completed. Currently only on-roadway routes exist to link the towns of the Upper and Mid Cape with the Cape Cod Rail Trail. This includes the Claire Saltonstall Bikeway which is only suitable for experienced cyclists comfortable with riding in mixed roadway conditions, often with heavy traffic volumes. As a result, the towns of Sandwich, Mashpee, and Barnstable are largely lacking bicycle connections to the rest of the Cape as well as to neighboring municipalities.

Though the Province Lands Bicycle Trail is greater than 7 miles in length, it and other trails within the National Seashore are largely isolated from other bicycle routes and facilities as well as destinations other than those within the Seashore, and therefore largely serve a recreational purpose. The Province Lands Bicycle Trail with its close proximity to the heart of Provincetown results in a short but significant gap as a result of requiring travel across and along US Route 6, a principal arterial that has no bicycle accommodations and minimal shoulders, in order to access the neighborhoods and commercial attractions within Provincetown.

Massachusetts General Law requires the Commissioner of the Massachusetts Department of Transportation to make all reasonable provisions for the accommodation of bicycle and pedestrian traffic in the planning, design, and construction, reconstruction or maintenance of any project undertaken by the department. As construction and maintenance projects are implemented on Cape Cod this law will help to ensure that gaps are closed and accommodations are provided. However, planning efforts such as this feasibility study will need to be coordinated with those projects to ensure that the appropriate and desired type and level of accommodations are planned for and provided.

3.2.3 Multimodal Connections

An essential element needed to make bicycling a more viable transportation alternative is to facilitate multimodal transportation options by providing linkages to public transportation from the bicycling route network. Currently there are some bicycle linkages to public transportation including bus and ferry service on Cape Cod, however a number of gaps exist within the network. The Hyannis Transportation Center serves as a multimodal hub for all of Cape Cod, providing local and regional bus and shuttle service, rail service, and access to ferry and air travel. However, there is currently poor bicycle access to the center, consisting only of unimproved bicycle routes. The Cape Cod Rail Trail which provides bicycle access to much of the Outer Cape terminates in Dennis, approximately 8 miles from the Hyannis Transportation Center. This results in a considerable gap in access between one of the primary bicycle facilities and the transportation hub of Cape Cod.

Bicycle access to public transportation in Falmouth is provided by the Shining Sea Bikeway which has direct connections to both multimodal facilities in Falmouth; the Falmouth Bus Depot and the Woods Hole Steamship Authority. Local and regional bus and trolley services can be accessed at the Falmouth Bus Depot, as can shuttles that provide service to ferries at Woods Hole and the Falmouth Marina. The Shining Sea Bikeway terminates at the Woods Hole Steamship Authority where local and regional bus service and ferry service can be accessed.

The Outer Cape's primary transportation hub is MacMillan Pier in the heart of Provincetown where local, regional, and shuttle bus service is available, as is ferry service to Plymouth and Boston. Bicycle access throughout the Outer Cape is generally limited to unimproved roadways, however within Provincetown many low speed and lightly trafficked neighborhood streets allow bicycle access to MacMillan Pier. Further integration and coordination of a bicycle network with the many public transportation services on Cape Cod would likely result in greater use of multimodal options on the Cape.

Chapter 4: Project Assessment

4.1 Project Assessment Process

As described in Chapter 2, data was collected for the existing bicycling conditions on Cape Cod and input was sought from a variety of stakeholders to identify critical improvements. These included needed connections to towns and destinations, gaps in bicycle infrastructure, programs aimed at enhancing safety for bicycling, and other improvements needed to develop a complete bicycle network and supporting amenities. As a result the number of suggestions resulted in a list of more than 120 recommended projects and initiatives to enhance bicycling on Cape Cod.

Though virtually all of the projects are valid and justifiable, the consultant team was tasked to provide detailed descriptions of approximately forty projects for this report that could be further developed into grant proposals seeking funding. It was determined that an assessment and sorting process was needed in this study to develop a realistic list of potential projects for further consideration by identifying those that would be relatively easy to implement, recognizing funding constraints and the likelihood of receiving funding.

In discussions with staff from the NPS the consultant team investigated several alternatives to develop and apply a sorting and assessment protocol. One potential process entailed the Park and Cape Cod Commission, with assistance from the Steering Committee, utilizing a “dot” exercise to select projects. This common exercise allows screening the universe of options to identify those project ideas that are relatively easy to implement that have a high degree of payoff, or best value for the expenditure.

Each individual would be provided 10 sticky dots or votes to allocate toward their choices of among all of the projects. The votes could be “spent” all on one project or on many projects. This voting exercise is often done with the public in workshops to identify projects that should be carried forward, to cull the list to a manageable size for further consideration. One limitation is that the voting obviously reflects the bias of those in attendance at the screening meeting and participants must be encouraged to keep project goals and objectives in mind while making their recommendations, both of which can significantly skew the outcome of the exercise.

A second and similar alternative considered utilizing a weighted analysis in which an initial scoring of projects is utilized to establish an initial list. A subsequent weighting is then assigned to those projects based upon the degree of preference for the project which in turn is premised upon evaluation criteria that would be established.

The consultant team and the NPS recognized that to facilitate a system of connected bicycle facilities a stepwise, objective approach to selecting projects was needed. A process that would capitalize on opportunities for support of local,

regional and advocacy group projects and initiatives needed to be developed. The consultant team worked with NPS and the Cape Cod Commission to establish goals and criteria to assess the project proposals to narrow the list to those suitable for further description in this feasibility study. The process developed resulted in six specific goals to be used in developing and assessing the list of potential projects:

1. Provide a safe and enjoyable Cape experience for residents and visitors alike with a system of connected bicycle facilities.
2. Improve multimodal transportation on Cape Cod while enhancing access throughout Cape Cod and to the National Seashore.
3. Encourage bicycling as an alternative mode of transportation to reduce dependence on automobile travel.
4. Provide an improved visitor and resident experience through public outreach, and educational programs to improve safety and encourage healthy lifestyles.
5. Avoid and/or mitigate adverse environmental impacts of proposed improvements, while seeking ways to realize positive environmental enhancements.
6. Capitalize on opportunities to improve bicycle network through planned construction or maintenance.

Each goal is in turn supported by a set of assessment criteria as quantifiable measures.

Goal 1: Provide a safe and enjoyable Cape experience for residents and visitors alike with a system of connected bicycle facilities.

Criteria:

- 1.1 Connect two or more destinations with new or expanded bicycle facilities.
- 1.2 Link village centers and residential neighborhoods to existing and planned bicycle routes.
- 1.3 Encourage the provision of bicycle facilities as an integrated part of new development and redevelopment, including roadway construction.
- 1.4 Incorporate bicycle infrastructure into regular roadway maintenance.
- 1.5 Phase improvements in a logical and planned manner to foster development of a coordinated system of bicycle facilities.
- 1.6 Improve the bicycling experience on the Cape by providing support facilities such as bike racks, rest areas, restrooms, and water fountains.
- 1.7 Install a consistent system of safety signage on existing and future bicycle routes as well as existing and future roadways.
- 1.8 Improve sight distances on existing facilities and ensure new facilities are constructed with adequate sight distances.
- 1.9 Utilize a consistent treatment for roadway crossings.

Goal 2: Improve multimodal connections to bicycling on Cape Cod while enhancing access throughout Cape Cod and to the National Seashore.

Criteria:

- 2.1 Include directional and wayfinding information such as signs, brochures, and kiosks.
- 2.2 Enhance bicycle access throughout Cape Cod
- 2.3 Enhance connectivity to and through the National Seashore.
- 2.4 Reduce traffic congestion and/or minimize increases in congestion levels.

- 2.5 Provide bicycle racks, lockers, showers, and other support amenities at places of employment, schools, and other destinations.

Goal 3: Encourage bicycling as an alternative mode of transportation to reduce dependence on automobile travel.

Criteria:

- 3.1 Provide new and/or improved multimodal access to the Seashore and other primary attractions.
- 3.2 Improve existing bicycle facilities through enhanced maintenance, trail widening, and/or addition of amenities.
- 3.3 Publicize existing and planned facilities to encourage broader use by residents and visitors.
- 3.4 Provide convenient parking with direct access to bicycle routes.
- 3.5 Encourage local businesses to participate in providing bicycle amenities, maps, brochures and guides.

Goal 4: Provide an improved visitor and resident experience through public outreach, and educational programs to improve safety and encourage healthy lifestyles.

Criteria:

- 4.1 Include safety information as an integral part of bicycle maps, guides, and brochures.
- 4.2 Implement bicycle safety programs in the region's school systems.
- 4.3 Promote bicycling as part of health education and physical fitness programs.
- 4.4 Educate the public on the rights and responsibilities of cyclists.
- 4.5 Provide public workshops through MassBike programs.
- 4.6 Enhance opportunities to experience natural and cultural resources.

Goal 5: Avoid and/or mitigate adverse environmental impacts of proposed improvements, while seeking ways to realize positive environmental enhancements.

Criteria:

- 5.1 Ensure maximum use of sustainable materials and construction methods.
- 5.2 Ensure consistency with the General Management Plan for Cape Cod National Seashore, as well as local comprehensive plans.
- 5.3 Minimize impacts to viewsheds and historic resources.
- 5.4 Maintain or improve air quality and water quality.
- 5.5 Avoid or minimize impacts to sensitive vegetation and wildlife.

Goal 6: Capitalize on opportunities to improve bicycle network through planned construction or maintenance.

Criteria:

- 6.1 Capitalize on opportunities to improve bicycle network through coupling infrastructure or program improvement projects through planned construction or maintenance for related projects. (Include opportunities such as restriping, wastewater system improvements, and drainage improvements.)
- 6.2 Enable sharing of technology and information across towns and jurisdictions. (Relative to maintenance equipment performance and

- purchases, such as trail sweepers, site furnishings procurement, and construction drawings and standards.)
- 6.3 Provide opportunities to share responsibility for maintenance staffing.
 - 6.4 Provide opportunities to share/obtain funding for bicycle network/trail/route maintenance.

4.2 Results

The consultant team, utilizing the goals and supporting criteria, conducted the initial assessment for the entire range of proposed projects. Each project was categorized by applying them to a four-quadrant matrix which sorted projects based upon a high or low payoff, as well as a hard or easy implementation “cost” which considered barriers to actual construction or implementation. Those projects with a combination of high payoff and ease of implementation were assigned an “A” while those with a high yield but with a difficult implementation process were assigned a “B”. Figure 4 illustrates the assessment matrix.

		PROJECT ASSESSMENT MATRIX	
		<u>PAYOFF</u>	
		<u>HIGH</u>	<u>LOW</u>
<u>IMPLEMENTATION</u>	<u>EASY</u>	A	C
	<u>HARD</u>	B	D

Figure 4

Following an initial sorting by the consultant team the list of projects was presented to the Steering Committee for revisions and recommendations. Following this review process and after consideration of the feedback of the Steering Committee the consultant team developed the final list of sorted projects. A significant number of proposed projects fell into two distinct categories; installation of uniform signage for wayfinding and/or to enhance safety; and numerous shoulder improvements aimed at providing connections between existing bike routes/paths or to establish direct routes connecting towns and destinations. In an effort to further reduce the overall number of projects and to further manage implementation of the many small and dispersed improvements some of these similar proposals were consolidated into two groupings for signage and shoulder improvements respectively. These two groupings appear as single projects in the final sorting. Additionally, these consolidated projects will be more likely to result in a coordinated and consistent effort across jurisdictions by

identifying and defining needed improvements to corridors. This also resulted in a much more manageable list of sixty three projects.

This assessment process resulted in a total of forty seven (47) projects for which more detailed descriptions were included in this study; fifteen (15) “A” projects and an additional thirty two (32) “B” projects. Detailed project descriptions with cost estimates and implementation recommendations for the “A” and “B” projects are included in Chapter 5. A complete list of the assessed projects is included in appendix B of this study. These are all valid projects that could move forward, given funding and agency and municipal support.

Chapter 5: Identified Projects

5.1 Description of Project Types

The projects proposed to enhance the bicycling environment on Cape Cod were extremely varied in nature, ranging from programmatic initiatives such as education and outreach efforts and maintenance plans to infrastructure projects providing improvements to existing routes, as well as the construction of new facilities. The physical improvements themselves covered a broad spectrum of projects. They included improved signage, enhanced trail crossings at roadways, the creation of connector trails, and new facilities in corridors not currently served by bicycle routes or facilities. Three primary classifications were developed to categorize the proposed projects; improvements to existing facilities; new facilities; and other initiatives. These categories are described in more detail, as are the individual projects that were selected for inclusion in the study. Maps depicting the locations of the selected projects are included in this chapter along with a table for cross reference. Projects proposing regional corridor improvements have been mapped, however short corridor improvements with an undefined route have not been mapped. Several projects proposed development of routes following general corridors. Such routes have been depicted on the maps using broad arrows and do not indicate specific or preferred alignments, nor do they reflect environmental constraints or sensitive areas that may need to be avoided.

5.1.1 Improvements to Existing Facilities

As noted in Chapter 3, Existing Conditions, the bicycling network on Cape Cod is comprised of many types of facilities of varying conditions. Though many miles of bicycling routes and paths exist many have deficient conditions relating to safety or usability by less experienced bicyclists such as basic wayfinding and signage, especially for visitors that may not be familiar with the Cape. Additionally, access to trip generators such as neighborhoods, major destinations, town centers, or commercial areas are often lacking. These elements would facilitate greater utilization of the bicycling network for travel throughout Cape Cod and less reliance on automobile travel. A number of proposed projects aim to improve the existing facilities on the Cape and to make uniform the conditions experienced by bicyclists, whether in the form of improved wayfinding signage, consistent pavement markings, improving on-roadway conditions along existing bike routes, or upgrading facility designs to current standards.

5.1.2 New Facility Construction

In order to provide for complete mobility for nonmotorized users a variety of new construction projects are needed to extend existing facilities, connect existing facilities to destinations and localities, close gaps in the bicycle network on Cape Cod, and enhance safety. This process has resulted in identifying many needed routes or facilities that will provide safer, more comfortable bicycling conditions

for on-roadway routes, extend or connect facilities such as the Cape Cod Rail Trail extension and proposed spurs linking towns and destinations, and close gaps within the network by linking existing routes or facilities.

5.1.3 Other Initiatives - maintenance plans, new or revised programs and policies, outreach and education

Though a number of physical improvements have been identified to enhance and expand the network of bicycle routes throughout the Cape, many opportunities exist to improve bicyclist safety and to encourage the use of bicycling both for recreation and as a viable transportation option. Developing programmatic and policy elements will ensure a comfortable and consistent bicycling environment across the Cape for bicyclists of varying skills, abilities, and bicycling interests. Such programmatic elements will serve to address human factors, thereby creating a safer, more inviting bicycling environment, while also encouraging the use of a continually improving bicycle network as a means of routine travel throughout Cape Cod by both tourists and residents alike. Many of these proposed projects will work in tandem with projects aimed at improving infrastructure by ensuring awareness of bicycling transportation and recreation options, enhancing operational safety of bikeways and enhancing the utility of the bicycle network on Cape Cod. This will make the bicycle network more useable by a variety of visitors and residents, thereby alleviating the existing burden on the transportation network resulting from over-reliance on automobiles.

5.1.4 Selected Projects

The following lists of projects reflect those selected through the process described in Chapter 4. The sorting process did not assign a ranking or priority, but rather categorized them according to the level of benefit and the barriers to implementation. All proposed projects should be viewed as valid and potential projects that may be pursued for funding. Coordination between Cape Cod National Seashore, the Cape Cod Commission, and/or the respective municipality will need to coordinate selection and implementation of individual projects. A consolidated list of all proposed projects is included in Appendix B.

Each of the 47 “A” and “B” projects listed here includes a basic project description, preliminary design concepts, a planning-level cost estimate, and recommendations for implementation. Some projects have more detailed cost estimates as a result of greater levels of detail relating to alignments, the type of facility, proposed configurations, and total distance. However many projects are merely conceptual, identifying only a corridor or general route in need of improvement without specifying the project length, type or level of accommodation to be provided. Estimates for general conceptual projects only include unit costs for the different types of possible accommodations and alignments that may be utilized.

The cost estimates were prepared in 2009/2010, based upon typical project costs in the Cape Cod region. Due to the variability of construction and materials costs over time, an appropriate inflation factor should be determined and applied when using these estimates in future years.

Each project will require varying levels of environmental compliance dependent upon the agency undertaking it and the scope of the project. An NPS Environmental Screening Form would be completed for any project arising from this study to determine the level of environmental compliance required. Projects undertaken within Cape Cod National Seashore would require NEPA (National Environmental Policy Act) and possibly MEPA (Massachusetts Environmental Policy Act) documents for environmental clearance; however the specific level of required compliance would be determined through the individual project scoping process. Projects developed by localities would comply with applicable environmental clearance requirements, also to be determined during the project scoping process.

The individual project descriptions included in this chapter are intended to provide stakeholders with a resource to be used in developing project proposals and funding requests through a variety of sources. Conceptual details and planning level cost estimates will provide a basis for further development of individual project scopes and proposals. A variety of funding opportunities exist, largely via state and federal grant programs. Some of the funding sources available include the NPS Park Roads and Parkways Program, Transportation Enhancement grants, Recreational Trails Program, Congestion Mitigation Air Quality, and several Federal Transit Administration programs, among others. More details about some of the funding opportunities are presented in Appendix B along with a consolidated list of the projects proposed for this study.

5.2 Improvements to Existing Facilities

The following is a list of sixteen projects proposing improvements to existing facilities. These projects are numbered 5.2.1 through 5.2.16.

Project 5.2.1: Design Alternatives for Cape Cod Rail Trail Extension to Provincetown

Project Description – The existing Cape Cod Rail Trail (CCRT), which is maintained by the Massachusetts Department of Conservation and Recreation, currently terminates in South Wellfleet, just north of the National Seashore Park headquarters. Bicycle and pedestrian access to the remainder of the Outer Cape is largely limited to US Route 6, the principal arterial providing motor vehicle (and motor freight) access to this region of the Cape. The estimated 400,000 annual users of the CCRT therefore have no access to the Outer Cape and many of the attractions within the National Seashore. Extending the CCRT to Provincetown would provide the following benefits:

- Continuity in access to over 40 miles of the Outer Cape by bicyclists and pedestrians

- Bicycle and pedestrian access to virtually all destinations and attractions within Cape Cod National Seashore
- Enhanced safety by eliminating the need for bicyclists and pedestrians to travel along Route 6 which has no accommodations for bikes or pedestrians.
- Provision of a transportation alternative that would facilitate nonmotorized mobility and access to a significant number of Outer Cape destinations, thereby reducing congestion, parking demand, and the associated environmental and sensitive lands impacts.

This project would include preparation of an environmental assessment (EA) in accordance with the National Environmental Policy Act (NEPA) process that includes a description of the proposed project; the reasonable alternatives under consideration; the social, economic and environmental impacts of the alternatives; mitigation measures and a section on comments and coordination. The project will evaluate alternative alignments and their respective costs, impacts, and connections / accessibility provided.

Preliminary Design Concepts – The three alternative alignments and design concepts include:

- Eastern alignment
 - approximately 20 miles
 - largely through the National Seashore
 - consisting of both on-roadway and shared-use path segments
 - primarily undeveloped and natural environments
- Interior, or Bay alignment
 - mostly on secondary roadway alignments
 - via the towns and neighborhoods of Wellfleet, Truro, and Provincetown
 - primarily developed and largely residential environments
- Abandoned railroad alignment
 - located along the western side of the Outer Cape
 - shared-use path with occasional road segments
 - a mix of natural landscapes in the National Seashore and developed areas of North Truro and Provincetown

Class C Cost Estimate – Costs for 3 conceptual alignments

- Eastern Shore alignment: design cost \$3,385,000
- Interior, or Bay alignment: design cost \$1,100,000
- Rail alignment \$2,911,000

Design cost estimates at 17% of NET construction costs

Recommendations for Implementation – The EA should be undertaken to fully determine the extent of all impacts associated with the three alternatives. A subsequent analysis of the alternatives to determine which, if any of the three options are feasible along with costs associated with possible right of way acquisitions, and public input should be undertaken to establish a

preferred alignment. Mass DCR's maintenance responsibility for the CCRT requires close coordination between the state and CCNS.

Project 5.2.2: Wayfinding Signage and Pavement Markings on CCRT

Project Description – With an estimated 400,000 users annually the Cape Cod Rail Trail (CCRT) has the potential to serve as a significant alternative transportation facility, not merely a recreational route. Installation of consistent signage along the Cape Cod Rail Trail to include interpretive, directional, informational, and other wayfinding signage is needed to both enhance the trail user experience as well as facilitate use of the trail as a bicycle transportation corridor, especially by those that are not familiar with areas served by the facility. Additionally, improved pavement markings are needed, primarily at the 45 roadway crossings to enhance safety and communicate expected behaviors by both trail users and motorists at these conflict points. Motorist and trail user expectations and actions are not consistent, in part due to trail and roadway crossing designs that are inadequate and design treatments that are inconsistent and often don't comply with the MUTCD (the Manual on Uniform Traffic Control Devices) regulations or AASHTO guidelines.

Preliminary Design Concepts – The specific signage design and placement has to be determined, and avoidance of visual clutter is needed, however the primary information that needs to be considered for signage includes:

- Trail amenities including rest rooms & emergency services
- Historic resources
- Beaches
- National Seashore attractions
- Town centers and commercial destinations including restaurants, lodging, retail shopping, bike shops
- Distance signage (to destinations)
- Connections to intermodal transportation facilities including bus and ferry terminals
- Connections to other bicycle facilities & bike routes
- Communicating mobility issues for access by different users (including ADA issues)
- Safety information such as sand and other surface hazards

Class C Cost Estimate – Complete signage at \$18,400 per mile:

- \$405,000.00 for the existing CCRT
- \$129,000.00 for the Old Colony extension

Recommendations for Implementation – This approach will facilitate addressing the multiple locations that will be enhanced or addressed over time and in a phased manner, but this project provides a uniform protocol and design standards so that consistency is ensured.

Sign design, content, placement standards, measures to avoid visual clutter, installation and maintenance policies, and other considerations need to be established and agreed upon by stakeholders and responsible parties prior to implementation. The

parties responsible for installation and maintenance need to be apprised of protocols including coordination of responsibilities when multiple agencies are involved. This needs to include entities with roadway construction authority so that roadway projects impacting trail crossings and intersections include appropriate and uniform design treatments and standards, regardless of locality. As development and implementation of Intelligent Transportation Systems occurs wayfinding resources could be added such as location-specific information via cell phone (based upon mile posts along bicycle routes and rail trails.)

Project 5.2.3: Intersection Improvements on Setucket Road Path

Project Description – Intersection treatments along the Setucket Road and Old Chatham Road Paths are inconsistent and lacking in conspicuous pavement markings that comply with national standards and design guidelines. Designed primarily as a sidepath, there is a resultant 38 roadway crossings in only 7 miles, and as a result a need for high visibility crosswalks and other pavement markings to communicate to motorists and path users the presence of conflict points. Pavement markings and signage also communicate appropriate actions at intersections for both motorists and path users. Additionally, access to the paths needs to be upgraded to provide curb ramps and ADA-compliant detectable warning surfaces.

Preliminary Design Concepts – High visibility crosswalks and improved signage and intersection treatments that are consistent with MUTCD and ADA standards and AASHTO design guidelines need to be selected to be applied uniformly along the facility. Consideration should also be given to evaluating the existing configuration and geometrics for each of the intersections and changes made that will enhance safety. This review should include issues such as sight distance, bollard placement, path width, angle of approach/crossing (skewed crossings), etc.

Class C Cost Estimate – Costs vary subject to existing conditions and improvements needed at individual locations. Unit costs for typical crossing improvements are provided.

- Residential Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00

Assumes installation of signalized intersection on two-lane roadway with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – A complete review of the existing conditions should be conducted and documented and feedback from users should be collected to identify deficient conditions and desired improvements. Existing elements that are not consistent with MUTCD standards, AASHTO guidelines, and current best practices should be considered for retrofits and improvements. Regulatory and advisory signage should also be consistent with state law (such as the existing signage instructing bicyclists to dismount to cross intersections). A policy by which the

selected improvements are installed and maintained needs to be established. Uniform design treatments need to be consistently applied throughout the length of the facility.



High visibility crossings on the Cape Cod Rail Trail at Marconi Beach Road

Project 5.2.4: Enhance Bicycling Conditions by Providing Paved Shoulders

Project Description – Multiple locations were proposed for shoulder widening or the addition of paved shoulders throughout Cape Cod along roads appropriate for on-road bicycling in order to provide safer, more comfortable bicycling conditions while also reducing conflicts with motor vehicles. Routes favored by bicyclists and those roadways that serve as connections to destinations, neighborhoods, and existing bicycle facilities should be considered for shoulder improvements when traffic conditions merit. Adding paved shoulders has additional benefits including pavement edge stabilization, the addition of a recovery area which reduces roadway departure crashes, and a breakdown area that allows disabled vehicles to be moved out of the travel lane, thereby mitigating congestion impacts from such incidents. These all result in safety, operational, and maintenance benefits which yield long-term cost savings.

Preliminary Design Concepts – Widening or the addition of paved shoulders should consider the existing roadway geometrics. In order to be useful for bicycle travel shoulders and the adjacent travel lane need to be of adequate widths to provide a degree of separation between the two modes; otherwise safety can be impaired by inviting motorists to pass too closely to bicyclists that attempt to hug the outside edge of the roadway. In general a four foot shoulder is desirable to provide adequate operating space for a bicyclist while allowing motorists unimpeded travel within the adjacent lane. On roads with curb and gutter, the gutter pan and the longitudinal joint effectively reduces the useable width of the

shoulder and consideration needs to be given to the paved width of the shoulder exclusive of the gutter pan.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Widening to add shoulders/bike lanes – \$501,600.00
Assumes adding shoulders along both sides of the road.

Recommendations for Implementation – A protocol for identifying and prioritizing roads that will receive shoulder improvements needs to first be established. Limited resources dictate that shoulder improvements need to be made to roads where the benefits are the most significant and needed. Conditions to be considered should include:

- Roads already heavily used by bicyclists
- Designated bike routes with unimproved conditions
- Roads connecting to destinations or bicycle facilities
- Roads that establish a network or close a network gap
- Motor vehicle and truck traffic volumes
- Possible alternate routes (that are more suitable or which can be improved at a lower cost)
- Existing right of way
- Need for relocation of ditches (trench widening or wedging)
- Concurrency (opportunities to include shoulders as part of planned or programmed road projects)
- Coordination across jurisdictions for route continuity

Following the identification of candidate roads opportunities should be sought to begin implementing improvements through coordination with other construction and maintenance projects. Policies and procedures should be established to ensure that construction and maintenance projects determine whether a road is listed as a priority route for paved shoulders and then scoped to include the improvements. Routine pavement overlay and resurfacing projects should include shoulder paving for the identified routes. Consideration should be given to establishing a goal of spending a set percentage of maintenance and/or paving funds on adding shoulders for bicycle improvements. Maintenance needs to be considered so that the functionality of shoulders for bicycling purposes is retained as the natural sweeping action of vehicles often results in debris accumulating in the untraveled shoulder.

Project 5.2.5: Identify Possible Sidewalks and Pedestrian Crossings near Brackett Road & Route 6

Project Description – Brackett Road in Eastham intersects with the Cape Cod Rail Trail and connects a largely residential area east of the trail to a commercial center at the intersection with Route 6, approximately ¼ mile to the west of the trail. Some pedestrian improvements are partially constructed, however further funding is needed for completion. Additional sidewalks and pedestrian crossings need to be identified and designed to develop a complete

network of pedestrian facilities to provide access and improve safety within this corridor.

Preliminary Design Concepts – Sidewalks should be provided to establish linkages between the commercial trip generators along Route 6 with the Cape Cod Rail Trail and the residential neighborhoods accessed via Brackett Road. Depending upon traffic volumes, speeds, and location of pedestrian trip generators, sidewalks should be considered along both sides of the street. Appropriate marked crosswalks and signage, consistent with the roadway geometrics and existing traffic patterns should be installed at intersections where the heaviest pedestrian movements are likely to occur. Additional pedestrian safety countermeasures should be considered where appropriate.

Class C Cost Estimate – Sidewalks and crossing improvements, unit costs:

- 5' Sidewalks, bituminous, both sides of street – \$120.00/linear foot
- 5' Sidewalks, concrete, both sides of street – \$140.00/linear foot
- Marked Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00
Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – A gap analysis should be undertaken to identify and prioritize sidewalks and crossings needed to develop a complete network which integrates the existing pedestrian infrastructure (such as the CCRT) with the surrounding pedestrian trip generators including both residential and commercial origins and destinations. Safety countermeasures should be considered for locations where potential exists for vehicle/pedestrian collisions, primarily at the intersection with the CCRT and along Route 6 where pedestrian travel may present multiple conflict points with vehicle ingress and egress. Access management should be considered at these locations, and improvements along Route 6 should also seek to improve access to transit stops.

Project 5.2.6: Western Extension of CCRT through Independence Park

Project Description – Located along Route 6 in Barnstable, Independence Park, a commercial and industrial business center, lies just to the north of the Hyannis Transportation Center and the Barnstable Municipal Airport. Providing a connection to the CCRT would facilitate greater utilization of the trail for bicycle commuting trips, especially if coordinated with access to the Hyannis Transportation Center. Multimodal commute options would be greatly expanded as a result.

Preliminary Design Concepts – The extension should utilize current design guidelines for shared-use paths and rail-trails with a minimum 10' paved trail width. A wider paved surface should be

considered along segments that are envisioned to have higher volumes of users. Current practices also consider separation of bicycle and pedestrian modes by providing a wider trail surface and designation of walking and bicycling lanes to make for a safer and more enjoyable environment along segments where there is considerable mixing of bike and pedestrian traffic. The proposed western extension of the CCRT linking the existing terminus in South Dennis to the Hyannis Transportation Center would likely utilize an alignment to the east of the regional airport that is proximate to Independence Park. A short spur, likely passing to the north of the airport would be needed to provide a connection between the business park and the extension of the CCRT. The actual alignment needs to be determined.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00

Recommendations for Implementation – This connection needs to be coordinated with planning or construction related to the western extension of the Cape Cod Rail Trail, most notably the extension to the Hyannis Transportation Center (Project 5.2.7) which would result in a CCRT alignment that is proximate to this location. Additionally, Project 5.2.13 should be considered for coordination since it may facilitate a logical termini for either a future extension of an off-roadway alignment linking the CCRT to the Cape Cod Canal Bikeway, or at least serving to access an on-roadway route.

Project 5.2.7: Western Extension of CCRT to Hyannis Transportation Center

Project Description – The current terminus of the Cape Cod Rail Trail in South Dennis lies approximately 8 miles to the east of the Hyannis Transportation Center. Connecting the CCRT to Hyannis is significant in that it is an urban center of Cape Cod with considerable population and commercial activity, and also the site of the Cape’s primary multimodal center providing rail, air, bus, and ferry service. The CCRT serves as one of Cape Cod’s primary bicycle facilities and by providing direct access to the transportation center bicycling can become a more integrated mode in the Cape’s transportation network and linking the center and Hyannis to multiple communities and destinations in the Mid and Lower Cape.

Approximately 3.3 miles of the proposed extension are currently programmed, continuing along the existing abandoned rail bed. The proposed alignment could utilize the existing two mile long Old Townhouse Road Trail needing only to close a small .15 mile gap between those two alignments. Another 1.25 mile section of the Old Townhouse Road Trail is currently programmed, which would extend the CCRT to Higgins Crowell Road leaving approximately a 2.5 mile gap to connect to the Hyannis Transportation Center. The

most likely alignment from that point would continue along the Old Townhouse Road corridor and then in the proximity of Yarmouth Road which provides access the Hyannis Transportation Center. The proposed extension runs primarily through Yarmouth, with short segments at either termini in Dennis and Barnstable.

Preliminary Design Concepts – The extension should utilize current design guidelines for shared-use paths and rail-trails with a minimum 10' paved trail width. A wider paved surface should be considered along segments that are envisioned to have higher volumes of users. Current practices also consider separation of bicycle and pedestrian modes by providing a wider trail surface and designation of walking and bicycling lanes to make for a safer and more enjoyable environment along segments where there is considerable mixing of bike and pedestrian traffic. Utilization of any existing path segments should consider retrofitting to ensure continuity in design, including intersection treatments.

Class C Cost Estimate – Shared-use path cost:

- utilizing combination of alignments noted – \$5,200,800.00

Recommendations for Implementation – The proposed corridor and specific alignments have undergone conceptual design but it may be necessary to determine potential gaps, notably if any existing facilities are to be used. Further, if existing facilities are to be utilized and integrated into the extension they need to be evaluated for retrofits or improvements to provide consistency and continuity with the design standards employed for the remainder of the CCRT. An environmental assessment is needed before final design and construction can proceed. The extension should also be coordinated with planning or construction related to Projects 5.2.6 and 5.2.13.

Project 5.2.8: Connect Chatham Municipal Parking Lot and Old Colony Rail Trail and Old Queen Anne Road via Route 137 Improvements

Project Description – The Old Colony Rail Trail in Chatham lies along the north side of Route 28 with a trailhead located near the intersection of Route 28 (Main Street) and Route 137 (Meetinghouse Road). Access north to East Chatham and Brewster is needed and is proposed via roadway improvements including the addition of 4' paved shoulders along approximately 1.25 miles of Meetinghouse Road between Main Street and Queen Anne Road.

Preliminary Design Concepts – Roadway improvements along Route 137 to provide 11' travel lanes and 4' paved shoulders. On-roadway improvements and accommodations are needed to provide direct, comfortable bicycle routes. Shoulder widening, pavement markings, signage, intersection enhancements, and other safety countermeasures along with wayfinding measures would provide a convenient and comfortable route for cyclists of varying abilities. Specific design treatments should be sensitive to the particular needs and context of each road where improvements are made.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00

- Widening to add shoulders/bike lanes – \$501,600.00
Assumes adding shoulders, signs, and pavement markings along both sides of the road.

Recommendations for Implementation – Opportunities should be sought to begin implementing improvements through coordination with other construction and maintenance projects. Routine pavement overlay and resurfacing projects should include shoulder paving for this route if adequate right of way exists or can be obtained. Maintenance needs to be considered so that the functionality of shoulders for bicycling purposes is retained since the natural sweeping action of vehicles often results in debris accumulating in the untraveled shoulder.

Project 5.2.9: Extension of the Old Colony Rail Trail from Volunteer Park to Schoolhouse Pond

Project Description – The existing Bicycle Spur from Volunteer Park is called the Old Colony Rail Trail and also the Chatham Spur. Currently the Chatham Spur ends in Chatham and utilizes a brief on-road alignment in the vicinity of the airport. In order to connect this trail to Schoolhouse Pond, an extension of the multi-use trail is required for a distance of approximately 3000 feet. Also, a “Share the Road” bike route or bike lane is required on Old Queen Anne Road for a distance of 4000 feet to make final connections to Sam Ryder Road, the access road to Schoolhouse Pond.

Preliminary Design Concepts – The extension should utilize current design guidelines for shared-use paths and rail-trails with a minimum 10’ paved trail width. A wider paved surface should be considered along segments that are envisioned to have higher volumes of users. Current practices also consider separation of bicycle and pedestrian modes by providing a wider trail surface and designation of walking and bicycling lanes to make for a safer and more enjoyable environment along segments where there is considerable mixing of bike and pedestrian traffic.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Recommendations for Implementation – Landowner issues may present difficulty in acquiring the needed right of way for a trail alignment. Alternative alignments should be investigated to determine the most feasible connection.

Project 5.2.10: Connect Shining Sea Bikeway to Gifford Street

Project Description – This proposed connection has been conceived by the Falmouth Bikeways Committee. The goal is to provide bicycle access to Gifford Street, a major north/south local

collector connection Brick Kiln Road to Main Street (Route 28).

There are a number of local roads that can be used as a bike route to facilitate this connection including Pumping Station Road, Jones Road and Kathleen Lee Bates Road; the preferred alternative. The most challenging constrain is the crossing of State Highway Route 28. The Falmouth Bikeways Committee has made inquiries to MassDOT regarding this location to in hopes to having a pedestrian bridge constructed to facilitate a safe and convenient crossing.

Preliminary Design Concepts – The connection is envisioned to utilize local roads with several possible options including Pumping Station Road, Jones Road, and Katherine Lee Bates Road which is the preferred alternative. Two primary design issues entail identifying and designing a suitable crossing of Route 28, and access from the bikeway to Route 28 which may involve private property. Few streets provide a direct route from the bike way across Route 28 due to offset intersections. As a result a short shared-use path spur may be necessary to provide a connection between the bikeway and Route 28. Wayfinding signage should be installed along the selected route.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

Crossing improvements, unit costs:

- Marked Crossing – \$1,500.00
 - Signalized Crossing – \$70,000.00
- Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – Some have advocated for a pedestrian bridge for the Route 28 crossing, however such structures require significant right of way and are very costly. Crossing improvements will be needed at the location chosen and specialized pedestrian crossing signals should be considered such as a HAWK or the rectangular rapid flash beacon (RRFB) both of which are only activated when a pedestrian or bicycle is present, otherwise allowing the uninterrupted flow of traffic. The preferred alignment along surface streets will dictate where the crossing of Route 28 will need to occur and an evaluation will be needed to determine the appropriate type and level of crossing accommodation and countermeasures needed. The alignment options should also consider the potential need for a path connection and related expenses.

Project 5.2.11: Extend Shining Sea Bikeway through Bourne to Cape Cod Canal Bikeway

Project Description – This proposed connection has been conceived by the Falmouth Bikeways Committee. The Route 28

state highway layout is approximately 200 feet wide and contains a very wide, wooded median separating the northbound road from the southbound road. The Committee envisions bridging the southbound road way and construction of a multi-use path through the wooded median for a distance of approximately 6 miles to make a final connection to the Cape Cod Canal Bikeway. This will provide an alternate route to a branch of Bike Route #1, located on County Road in Bourne.

It is important to note that the Town of Bourne is in support of an alternate concept for the connection to the Canal which utilizes a 'rails-with-trails' design along the Old Colony tracks. (See Project 5.3.8)

Preliminary Design Concepts – The extension should utilize current design guidelines for shared-use paths and rail-trails with a minimum 10' paved trail width. A spur linking the existing bikeway with the proposed alignment via the media will need to be identified, either within existing road right of way or along an independent alignment.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

Bike/pedestrian bridge, unit costs:

- Survey, design, geo-tech, permitting, etc. – \$240,000.00
- Total lump sum (LS) construction – \$1,200,000.00

Recommendations for Implementation – Due to the unique alignment through the Route 28 median Mass Highway Department will need to be consulted for approval of both the concept and specific design elements. Because of the cost of a flyover access to the median it will be important to indicate that this segment of the bikeway would have limited access points. Conceptual plans should incorporate at least a couple proposed access points to facilitate wider use of the corridor by bicyclists seeking to access nearby destinations. Routing of a shared-use path through an interchange can prove difficult and access to the median will also prove challenging. Opportunities such as utilizing the existing rail alignment south of Route 151 should be investigated to deem whether access could to the median could be achieved, mitigating the need for a flyover.

Project 5.2.12: Parking Improvements at Trailheads

Project Description – Significant usage of the trail facilities on Cape Cod results in inadequate parking capacity. Both existing and proposed facilities need to plan for and construct parking facilities for visitors accessing trailheads by car. Opportunities to utilize existing, but underused parking capacity should also be investigated.

Project Location Map – NA

Preliminary Design Concepts – Designs will be specific to individual trailheads, parking facilities, and parking demands.

Class C Cost Estimate – Construction of parking lot at trailhead:

- \$50,000.00

Recommendations for Implementation – Existing trailheads need to be identified which currently experience excessive parking demand and opportunities for expansion investigated. Possible locations of new trailheads where adequate right of way exists for parking should be identified. Opportunities for joint-use or facility sharing should be investigated. Cape Cod localities should investigate adoption of local ordinances to facilitate use of shared parking facilities. Model agreements and ordinances should be developed that can be shared among Cape Cod localities to facilitate use of shared facilities. This approach provides an opportunity for facility sharing which increases the utilization of existing infrastructure while reducing the need for construction of additional parking facilities, many of which will be unutilized much of the year.



Limited parking availability at trailheads

Project 5.2.13: Connect Cape Cod Canal Bikeway to Hyannis Transportation Center

Project Description – Linking the developed areas of Bourne and Sandwich to the Hyannis Transportation Center, approximately 22 miles away would provide multimodal transportation options to the Upper Cape. Route 6 serves as the primary corridor facilitating travel between the Upper and Mid-Cape, though it is largely unsuitable to bicycle travel. Ultimately an extension of the Cape Cod Rail Trail along the entire length of Cape Cod is envisioned, though at this time that is not feasible due to costs and logistics. This project should identify off-roadway alignments to develop

some shared-use path segments while utilizing secondary roads for other segments.

Preliminary Design Concepts – The design concepts are subject to determination of a feasible alignment, whether on-roadway or for share-use path segments. Since conditions will vary considerably throughout the region connections should consist of both on-road and shared-use path connections. The designs will need to consider the appropriate elements for the context in which the routing takes place. Secondary streets with low traffic speeds and volumes can provide adequate connections with minimal enhancements such as improved signage and/or pavement markings. Shared-use path sections should utilize current design guidelines for shared-use paths and rail-trails with a minimum 10' paved trail width. A wider paved surface should be considered along segments that are envisioned to have higher volumes of users. Current practices also consider separation of bicycle and pedestrian modes by providing a wider trail surface and designation of walking and bicycling lanes to make for a safer and more enjoyable environment along segments where there is considerable mixing of bike and pedestrian traffic.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Recommendations for Implementation – Due to the length and multiple jurisdictions a coordinated planning effort will be required to identify a proposed route and facilities needed. A corridor approach should be adopted to identify potential shared-use path alignments throughout the region to ensure connectivity as the segments can be built in phases, perhaps by different agencies or municipalities. The desired conditions and accommodations to be provided along on-roadway segments need to be established and agreed upon by stakeholders so that conditions are consistent for bicyclists traveling between jurisdictions. Planning and construction should be coordinated with Projects 5.2.6 & 5.2.7 in order to link proposed projects and develop a wider bicycle network.

Project 5.2.14: Develop Plan for Intermodal Center in Falmouth

Project Description – This proposed connection has been conceived by the Falmouth Bikeways Committee. The intermodal center is proposed to be located at the former North Falmouth railroad station at the intersection of County Street with the Bay Colony Rail/ Commonwealth of Massachusetts Executive Office of Transportation Railroad right-of-way. At the present time this site is at the northern terminus of the Shining Sea Bike trail. This lot is unpaved and is currently used as a parking lot for trail users. The site supports an active section of Bay Colony Rail operations.

Preliminary Design Concepts – This lot is large enough to support a paved parking lot and bus stop operations. The improvement could include formal curb cuts, a paved parking field with internal circulation, a ‘kiosk’ type bus shelter mounted on a raised pedestrian island, and bike racks.

Class C Cost Estimate – Multiple facility improvements:

- Parking lot – \$50,000.00
- Bus shelters – \$20,000.00
- Secure bicycle parking (unit cost)– \$1,500.00

Recommendations for Implementation – Multiple entities need to coordinate efforts and agree upon the scope of the facility and operations proposed for the intermodal center. The specific configuration and ingress and egress to the facility would need to be evaluated and a possibly a traffic study conducted to determine traffic impacts. It has been proposed that the railroad could provide some level of funding for a shared facility.

Project 5.2.15: Improve Bicycle Facilities on Tupper Road South of Route 6A

Project Description – Tupper Road in Sandwich provides access to the terminus of the Cape Cod Canal Bikeway, paralleling much busier Route 6A which also serves as Mass Bike Route 1. Tupper Road then provides a north/south connection between Route 6A and Route 130, Main Street, but lacks any bicycle accommodations. Adding paved shoulders or other bicycle improvements would provide safer, more comfortable bicycling conditions while also reducing conflicts with motor vehicles. Adding paved shoulders has additional benefits including pavement edge stabilization, the addition of a recovery area which reduces roadway departure crashes, and a breakdown area that allows disabled vehicles to be moved out of the travel lane, thereby mitigating congestion impacts from such incidents. These all result in safety, operational, and maintenance benefits which yield long-term cost savings.

Preliminary Design Concepts – Road widening or the addition of paved shoulders should consider the existing roadway geometrics. In order to be useful for bicycle travel shoulders and the adjacent travel lane need to be of adequate widths to provide a degree of separation between the two modes, otherwise safety can be impaired by inviting motorists to pass too closely to bicyclists that attempt to hug the outside edge of the roadway. In general a four foot shoulder is desirable to provide adequate operating space for a bicyclist while allowing motorists unimpeded travel within the adjacent lane. On roads with curb and gutter, the gutter pan and the longitudinal joint effectively reduces the useable width of the shoulder and consideration needs to be given to the paved width of the shoulder exclusive of the gutter pan. Realignment of Mass Bike Route 1 (the Claire Saltonstall Bikeway) onto this improved route, complete with appropriate signage would offer a more appealing route for long-distance bicyclists.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Widening to add shoulders/bike lanes – \$501,600.00
Assumes adding shoulders along both sides of the road.

Recommendations for Implementation – Opportunities should be sought to begin implementing improvements through coordination with other construction and maintenance projects. Routine pavement overlay and resurfacing projects should include shoulder paving for this route if adequate right of way exists or can be obtained. Maintenance needs to be considered so that the functionality of shoulders for bicycling purposes is retained since the natural sweeping action of vehicles often results in debris accumulating in the untraveled shoulder. In order to further develop an improved corridor and continuous route, and perhaps a resultant realignment of the Claire Saltonstall Bikeway, any improvements should be coordinated with Projects 5.3.15 and 5.3.17.

Project 5.2.16: Evaluate Use of Unpaved Roads for Bike Path Connections in Cape Cod National Seashore

Project Description – Within the National Seashore a number of unpaved roads currently exist which could be utilized to provide bicyclists with access to several popular bicycle trails. This would result in establishment of a unified network without having to travel on the more heavily traveled roadways, particularly Route 6, and which could be accomplished with minimal improvements, resulting in a low cost enhancement to the existing, but fragmented bicycle network in the Seashore.

Preliminary Design Concepts – Design issues would largely be limited to providing adequate wayfinding signage to direct bicyclists through the Seashore to popular destinations and trails. Such signage should follow the standards and protocol established via Project 5.2.2 (if implemented) to maintain consistency with bicycle wayfinding signage throughout the region.

Class C Cost Estimate – NA

Recommendations for Implementation – Possible connector routes via existing unpaved roads should be identified, especially those that are likely to have the least impact to sensitive environmental or historical features within the Seashore. Existing conditions should be evaluated for compatibility with bicycle use and any needed improvements should be documented for consideration in the planning process including grading and additional loads of surface material. Should unpaved roads be used for this purpose a maintenance policy will be needed to ensure conditions suitable for bicycling are maintained and wayfinding signage will be needed to direct bicyclists to destinations and trails within the Seashore.

5.3 New Facilities

The following is a list of twenty two projects proposing construction of new facilities. These projects are number 5.3.1 through 5.3.22.

Project 5.3.1: Evaluate Local Roads and Establish Bicycle Connections between Cape Cod National Seashore and Neighboring Communities

Project Description – A two-phase project proposing to develop planning alternatives to improve bicyclist safety and access by providing connections between Cape Cod National Seashore and six neighboring communities followed by a pilot project implementation component.

Component A – Feasibility Study to include

- General overview, project purpose and need, local and regional perspectives;
- Project Description, including locus map, major constraints and opportunities;
- Corridor Right of Way: public vs. private property;
- Resources: GIS level environmental resources such as waterways, wetlands, vernal pools, wildlife habitat, management/refuge areas, historic areas/districts/sites, contaminated sites;
- Trail or route design criteria;
- Structures required; and
- Route and trail amenities: parking, access to attractions, wayfinding & interpretive signing.

Component B – Implementation of pilot project on 1 roadway

Preliminary Design Concepts – Conceptual design would include typical sections, alignment, road/water crossings, structures, trail amenities, impacts & mitigation, ROW actions, permitting requirements, and construction. Final design would include construction plans, specifications, right-of-way plans, and bidding documents for advertising by Massachusetts Highway Department or the municipality.

This project proposal assumes a 2 mile pilot project for cost estimating purposes consisting of minor roadway widening, and intersection and traffic signal improvements.

Class C Cost Estimate –

- Feasibility Study – \$20,000
- Pilot project design and construction – \$3,471,046.66

Recommendations for Implementation – Prior to evaluating local roads for suitable bicycling conditions it will be necessary to establish evaluation criteria and metrics. Roadway geometrics, traffic volumes, prevailing speeds, the presence of trip generators including residential origins, and directness of travel should be considered. Subsequently, selection of neighboring communities and potential connector routes or corridors is needed before any feasibility study and analysis can proceed. The list of potential routes should be inclusive of a variety of roadways and conditions so that alternatives can be established and evaluated to determine opportunities and barriers to implementation of improvements and connections. Off-roadway alignments should be considered and evaluated as well including abandoned rail lines, utility line easements, conservation lands, or other possible alignments. Demonstration of the improvements resulting from the pilot project requires the collection of baseline (current conditions) data for comparison after implementation. Data to be collected will

need to be determined specific to the community and route selected, however the following should be considered:

- Route / facility usage (bike/pedestrian trips)
- Type of trips made via corridor / route
- Crash data
- Perceived level of safety among facility users
- Perceived level safety among motorists encountering bicyclists and pedestrians
- Ease of wayfinding

Project 5.3.2: Feasibility Study and Design of Bike Path along Route 6 from Herring Cove Parking Lot to Race Point Road

Project Description – A two-phase project to develop a bicycle path connecting the CCNS parking facilities at Herring Cove to other National Seashore facilities, including the Province Lands Bicycle Trail at Race Point Road. The first phase is to conduct a Feasibility Study coordinated between the Cape Cod Commission, the State of Massachusetts, the National Park Service, and the town of Provincetown to identify dedicated alignment within the existing right of way along the north Side of Route 6 from Herring Cove to Race Point Road.

Route 6 is a principal arterial that provides direct access between Herring Cove and the National Seashore attractions at Race Point, including the Province Lands Bicycle Trail. Completely lacking in bicycle and pedestrian accommodations, Route 6 i has only minimally paved shoulders, significant traffic volume, truck traffic, and posted speed limits varying between 35 MPH and 45 MPH. Though Herring Cove and Race Point are connected via the Province Lands Bicycle Trail, it is a circuitous path and doesn't facilitate convenient and expedient bicycle and pedestrian mobility between the two points. Additionally, bicycle access to these two locations from the commercial center and the neighborhoods of Provincetown is not available. As a result nonmotorized modes cannot be comfortably utilized to reach these nearby destinations, resulting in greater reliance on automobile travel within this region of Cape Cod.

Component A – Feasibility Study to include

- General overview, project purpose and need, local and regional perspectives;
- Project Description, including locus map, major constraints and opportunities;
- Corridor Right of Way: public vs. private property;
- Resources: GIS level environmental resources such as waterways, wetlands, vernal pools, wildlife habitat, management/refuge areas, historic areas/districts/sites, contaminated sites;
- Trail or route design criteria;
- Structures required;
- Trail amenities: parking, access to attractions, wayfinding & interpretive signing;

- Trail access points providing connections to on-roadway bicycle and pedestrian routes in Provincetown;
- Needed facilities and retrofits to connecting bicycle and pedestrian routes within Provincetown;
- Conceptual Design including typical sections, alignment, road/water crossings, impacts & mitigation, permitting requirements, construction costs; and
- Operations & Maintenance requirements.

Component B – Class III design and construction plans

Design cost estimates at 17% of NET construction costs

Preliminary Design Concepts – Conceptual design would include typical sections, alignment, road/water crossings including trail access points at intersections that provide connections to neighborhoods and the commercial center of Provincetown, structures, trail amenities, impacts & mitigation, ROW actions, permitting requirements, and construction. Final design would include construction plans, specifications, right-of-way plans, and bidding documents for advertising by Massachusetts Highway Department or the municipality. The envisioned project would be approximately 2 miles long.

Class C Cost Estimate –

- Feasibility Study – \$20,000
- Class III Design & Construction – \$3,456,085

Recommendations for Implementation – Coordination of stakeholder interests is needed to fully develop the scope of the feasibility study component. Existing plans should be consulted to determine how related projects can contribute to the overall development of a facility that is integrated into the existing bicycle and pedestrian network in Provincetown. Planned or programmed projects that have the potential to impact concurrency issues, notably those on connector routes providing access to the proposed path should be investigated to determine possible synergies and cost savings with minimal changes to scopes of work. Specifically any improvements should be coordinated with Project 5.3.12 to integrate efforts at developing linkages throughout Provincetown and the Province Lands attractions within the Seashore.

Project 5.3.3: Identify Possible Connections between the Cape Cod Rail Trail and Cape Cod National Seashore Trails

Project Description – Envisioned primarily in Eastham where the Nauset Trail is proximate, but not connected to the Cape Cod Rail Trail, connections between the CCRT and trails within the Seashore are needed. The CCRT, located to the west of Route 6 is approximately ½ mile from the Salt Pond Visitor’s Center but requires crossing Route 6 to facilitate a direct connection. Just north of the Salt Pond Visitor’s Center (site of the trailhead) the CCRT passes underneath Route 6 and on-roadway routes could be designated without the need to cross Route 6 at-grade, though they would provide less direct access.

Preliminary Design Concepts – The design concepts are subject to determination of a feasible alignment to connect Seashore trails to the Cape Cod Rail Trail. Since conditions will vary considerably at each location the connections could consist of both on-road and shared-use path connections the designs will need to consider the appropriate elements for the context in which the routing takes place. Secondary streets with low traffic speeds and volumes can provide adequate connections with minimal enhancements such as improved signage and/or pavement markings. Shared-use path sections could utilize a paved surface, or a natural surface. Unpaved roads should also be considered to establish connections.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation – Locust Road provides the most direct access between the visitor’s center and the rail-trail, however access via this route requires an at-grade crossing of Route 6. The intersection is controlled by a signal however, and if chosen as the alignment the signal operation should be evaluated for compatibility with bicycles (bicycle detection, appropriate timing and clearance intervals). An alternative route would utilize the CCRT underpass beneath Route 6 to access the neighborhood streets to the east via Old Orchard Road and School House Road. This option would avoid an at-grade crossing of Route 6 but would result in a longer, more circuitous route. Existing conditions on all potential roadway segments should be evaluated to determine the most feasible routing requiring the least infrastructure improvements to keep costs low.

Project 5.3.4: Regional and local Pedestrian and Bikeway connectivity to Dennis Port

Project Description – The Town of Dennis, through its Dennis Port Revitalization Committee, has established a prime objective of making pedestrian and bikeway connections to key destinations in the region surrounding the Dennis Port Village. These connections include (among others); providing links to the hotel / motel district located on Lower County Road; the playgrounds and historic sites located in South Dennis; the Cottage Colony located between Lower County Road and the beach / waterfront area; and a combination of shared routes and/or multi-use paths to provide connections to the Cape Cod Rail Trail at Route 134, and the Old Colony Rail Trail in Harwich. The various desired connections are

identified and illustrated in the Dennis Port Master Plan which may be found online at: www.dennisportrevitalization.org.

Preliminary Design Concepts – On-roadway improvements and accommodations are needed to provide direct, comfortable bicycle routes and safe roadway crossings to access the rail trails. Shoulder widening, pavement markings, signage, intersection enhancements, and other safety countermeasures along with wayfinding measures would provide a convenient and comfortable route for cyclists of varying abilities. Sidewalks and improved crossings are needed at various locations to establish pedestrian routes and connections. Specific design treatments should be sensitive to the particular needs and context of each road where improvements are made.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders, signs, and pavement markings along both sides of the road.

Sidewalks and crossing improvements, unit costs:

- 5' Sidewalks, bituminous, both sides of street – \$120.00/linear foot
- 5' Sidewalks, concrete, both sides of street – \$140.00/linear foot
- Marked Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00

Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – The feasibility of adding paved shoulders or bicycle lanes and improving conditions to one or more roads needs to be determined. Multiple connections should be considered to provide for access to both rail trails and destinations along the potential routes should be considered when selecting alignments. Routes that serve to connect multiple trip generators would serve to increase the utilization of bicycling for utility trips and multiple connections would establish a more complete route network in the region. A four foot shoulder is desirable to provide adequate operating space for a bicyclist while allowing motorists unimpeded travel within the adjacent lane.

Project 5.3.5: Identify Regional Connections between Existing Paths and Locations with High Pedestrian Traffic

Project Description – Sidewalks or shared-use paths should be provided to establish connected and contiguous pedestrian access

routes between the commercial trip generators, residential neighborhoods, and existing pedestrian facilities where pedestrian traffic is currently high or for which there is significant latent demand. Pedestrian networks should be established on a regional basis to connect villages and towns when density and proximity warrant.

Preliminary Design Concepts – Depending upon traffic volumes, speeds, and location of pedestrian trip generators, sidewalks should be considered along both sides of the street. Appropriate marked crosswalks and signage, consistent with the roadway geometrics and existing traffic patterns should be installed at intersections where the heaviest pedestrian movements are likely to occur. Additional pedestrian safety countermeasures should be considered where appropriate.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

Sidewalks and crossing improvements, unit costs:

- 5' Sidewalks, bituminous, both sides of street – \$120.00/linear foot
- 5' Sidewalks, concrete, both sides of street – \$140.00/linear foot
- Marked Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00

Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – A gap analysis should be undertaken to identify and prioritize sidewalks and crossings needed to develop a complete network which integrates the existing pedestrian infrastructure including sidewalks, paths, and neighborhood streets with the surrounding pedestrian trip generators including both residential and commercial origins and destinations. Safety countermeasures should be considered for locations where potential exists for vehicle/pedestrian collisions, primarily at the intersections with arterial and collector roadways and where commercial entrances or lack of access management results in frequent conflict points. Access management should be considered at these locations, and improvements should also seek to improve access to transit stops when appropriate.

Project 5.3.6: Identify a “Shore Route” South of Route 28 from Woods Hole in Falmouth to Stage Harbor in Chatham

Project Description – Identification of a “Shore Route” of approximately 45 miles providing bicycle access and connectivity across a region comprised of eight localities would link the many destinations and villages of this heavily developed region of the

Cape. Proposed as an on-roadway route, it would closely follow the coastline along Nantucket Sound. Limited route options in many locations result from a fragmented road network that would require use of Rte 28 in many locations. In developed areas where Route 28 lies farther from the coast, more route permeability typically exists, allowing for more routing options, though this is intermittent throughout the corridor from Falmouth to Chatham.

Preliminary Design Concepts – On-roadway improvements and accommodations are needed to provide a relatively direct, comfortable, and connected bicycle route south of the Route 28 corridor. Shoulder widening, pavement markings, signage, intersection enhancements, and other safety countermeasures along with wayfinding measures should be utilized consistent with the context and conditions of the specific roadways where improvements are implemented. Because of the circuitous routing that would be required wayfinding is an essential element. Where the use of Route 28 is required careful consideration needs to be given to providing bicycle accommodations and countermeasures that facilitate bicyclists safely entering and departing this heavily traveled roadway.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
 - Widening to add shoulders/bike lanes – \$501,600.00
- Assumes adding shoulders, signs, and pavement markings along both sides of the road.

Recommendations for Implementation – Due to the regional nature of the proposed project, coordination among the eight localities and the Cape Cod Regional Commission is needed. The large area and the lack of a connected network of candidate roadways pose significant barriers to implementation. Uniformity in accommodations through the corridor should be sought so that cyclists utilizing the route for travel across the Cape will encounter a unified and integrated route from one jurisdiction to the next. Local comprehensive plans and other local and regional plans should be reviewed and amended to reflect the proposed project, the desired level of accommodations, and means by which individual localities can implement improvements. The project should be coordinated with other proposed improvements where new routes might utilize Route 28 or parallel corridors such as the proposed improvement and designation of Route 28 as a bicycle route (Project 5.3.10) and the proposed “OBHC Triangle Route” (Project 5.3.18). Additionally, the improvements should be coordinated with the proposed connections between the Old Colony Rail Trail and Harwich Port and Dennis Port (Projects 5.3.9 & 5.3.4) in order to ensure linkages that will establish a connected network of bicycle routes.

Project 5.3.7: Identify a “Bay Route” from the Cape Cod Canal in Bourne to Orleans

Project Description – A “Shore Route” of approximately 30 miles is envisioned to provide continuous bicycle access and connectivity

across the six localities along Cape Cod Bay. The route would link the villages and destinations of this developed region of the Cape similar to the proposed “Shore Route” paralleling it along the southern coast of the Cape. Likewise, the “Bay Route” is envisioned as an on-roadway route following the coastline along Cape Cod Bay, north of Route 6 and traversing the popular destinations along the coast. Limited route options in many locations result from a road network fragmented by both manmade and natural features, and which would require use of Route 6A in many locations. In developed areas where Route 6 lies farther from the coast more route options exist, most notably in West Barnstable and Dennis. Unlike the Rte 28 corridor of the “Shore Route” Route 6A parallels Route 6, providing a largely continuous route option with slower speeds and traffic volumes than the principal arterial Route 6, though it would still need infrastructure improvements to be a suitable route.

Preliminary Design Concepts – On-roadway improvements and accommodations are needed to provide a relatively direct, comfortable, and connected bicycle route north of Route 6. Shoulder widening, pavement markings, signage, intersection enhancements, and other safety countermeasures along with wayfinding measures should be utilized consistent with the context and conditions of the specific roadways where improvements are implemented. Because of the circuitous routing that might be utilized along secondary and residential streets wayfinding is an essential element.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
 - Widening to add shoulders/bike lanes – \$501,600.00
- Assumes adding shoulders, signs, and pavement markings along both sides of the road.

Recommendations for Implementation – Due to the regional nature of the proposed project, coordination among the six localities and the Cape Cod Regional Commission is needed. The large area and the limited network of connected candidate roadways pose significant barriers to implementation. Uniformity in accommodations through the corridor should be sought so that cyclists utilizing the route for travel across the Cape will encounter a unified and integrated route from one jurisdiction to the next. Local comprehensive plans and other local and regional plans should be reviewed and amended to reflect the proposed project, the desired level of accommodations, and means by which individual localities can implement improvements. The project should be coordinated with other proposed improvements within or adjacent to the Route 6 corridor such as the proposed route through the Sandwich Historic District (Project 5.3.27) and the “OBHC Triangle Route” (Project 5.3.18).

Project 5.3.8: Relocation of Existing Rail Line and Conversion to Trail

Project Description – This 6 mile project in the Town of Bourne proposes to create a rails-with-trail facility from the northern

terminus of the Shining Sea Bike Path to the Cape Cod Canal Bikeway via the existing EOT/Bay Colony railroad right-of-way (ROW). This existing rail corridor parallels Shore Road in Bourne. Although the title suggests that the tracks require relocation, it is possible that the railroad ROW maintains sufficient width to support a new multi-use trail without the need to move the tracks.

It is important to note that the Town of Falmouth is in support of an alternate concept for the connection to the Canal which utilizes the Route 28 median for construction of a multi-use path to make the connection from the Shining Sea bike path to the Cape Cod Canal. (See Project 5.2.11)

Preliminary Design Concepts – The trail should utilize current design guidelines for shared-use paths and rail-trails with a minimum 10' paved trail width. A wider paved surface should be considered along segments that are envisioned to have higher volumes of users. A number of at grade crossings will require individual consideration based upon the conditions present and safety countermeasures required.

Class C Cost Estimate – Shared-use path, unit costs per mile:

- Along abandoned RR bed – \$660,000.00

Crossing improvements, unit costs:

- Marked Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00
Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Rail relocation costs:

- TBD, if necessary

Recommendations for Implementation – Additional research is required to confirm the layout width of the railroad ROW. The project will also require the design of numerous at grade crossings at the various intersection with public and private streets. This would likely be a mega-project requiring significant funding and a phased approach. The initial phase should include linkages to existing trail or on-road routes to be an integrated facility, not a stand-alone facility.

Project 5.3.9: Connect Harwich Port to Old Colony Rail Trail

Project Description – Harwich Port is located approximately 1½ miles south of the center of Harwich and the Old Colony Rail Trail. Currently there are no bicycle routes or accommodations linking Harwich Port to the trail. Several potential routes exist, notably along Bank, Forest, and South Streets, that could be improved and designated by adding shoulders or bike lanes along with signage, including wayfinding aids.

Preliminary Design Concepts – On-roadway improvements and accommodations are needed to provide direct, comfortable bicycle routes and safe roadway crossings to access the rail trails. Shoulder widening, pavement markings, signage, intersection

enhancements, and other safety countermeasures along with wayfinding measures will provide a convenient and comfortable route for cyclists of varying abilities. Specific design treatments should be sensitive to the particular needs and context of each road where improvements are made.

Class C Cost Estimate – On-roadway improvements (1.5 miles):

- Signing and striping – \$15,840.00
 - Widening to add shoulders/bike lanes – \$752,400.00
- Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation – The feasibility of adding paved shoulders or bicycle lanes to one or more of the three likely candidate streets needs to be determined. Existing right-of-way, utilities, and/or the existence of undeveloped properties along the candidate routes will largely determine the preferred alignment of an improved bike route. A four foot shoulder is desirable to provide adequate operating space for a bicyclist while allowing motorists unimpeded travel within the adjacent lane. Coordination with Project 5.3.4 and 5.3.6 seeking to improve bicycling conditions in the Route 28 corridor will help to ensure connectivity.

Project 5.3.10 Designate Route 28 as a Bike Route and Improve Conditions

Project Description – Though Route 28 is mainly a secondary highway it serves as the primary corridor along Nantucket Sound linking 8 towns through the Upper, Mid, and Lower Cape.

Approximately sixty miles of Route 28 provides access to a number of destinations across the Cape including villages, town centers, the Hyannis Transportation Center, and the Cape Cod/Old Colony Rail Trail. Despite being the primary route through this heavily developed area of Cape Cod the road is mostly a two-lane, undivided road, often lacking paved shoulders, and is heavily congested during peak season. Improvements would provide bicyclists with a convenient and comfortable route linking the many towns, villages, and destinations along Nantucket Sound. Improvements would also reduce conflicts between bicyclists and motorists and reduce congestion, both by encouraging greater use of bicycling for transportation and by reducing vehicle where passing opportunities don't currently exist.

Preliminary Design Concepts – On-roadway improvements and accommodations are needed to provide a direct, comfortable bicycle route through the Route 28 corridor. Shoulder widening, pavement markings, signage, intersection enhancements, and other safety countermeasures along with wayfinding measures should be utilized consistent with the context and conditions of the specific roadways where improvements are implemented. In some locations a shared-use path design may be appropriate or desirable if children and less experience adult bicyclists are intended users of the route.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00

- Existing corridor (minor grading/clearing) – \$792,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation – Due to the regional nature of the proposed project, coordination among the eight localities and the Cape Cod Regional Commission is needed. The large geographic area and the limited right of way in many locations pose many challenges to implementation. Uniformity in accommodations through the corridor should be considered so that cyclists utilizing the route for travel across the Cape will encounter a unified and integrated route from one jurisdiction to the next. Local comprehensive plans and other local and regional plans should be reviewed and amended to reflect the proposed project, the desired level of accommodations, and means by which individual localities can implement improvements. The project should be coordinated with other proposed improvements where new routes might utilize Route 28 or parallel corridors such as the proposed “Shore Route” (Project 5.3.6) and the proposed “OBHC Triangle Route” (Project 5.3.18).

Project 5.3.11 Establish Bicycle & Pedestrian Connections between Orleans Villages

Project Description – Sidewalks or shared-use paths providing connected and contiguous pedestrian access routes between the villages of Orleans and their respective trip generators will enhance mobility and increase safety. Bicycle connections also will facilitate greater mobility and less reliance on automobile travel, and the addition of on-road accommodations and shared-use path facilities should be considered based upon context and intended users. The Village Center, South Orleans, East Orleans, Rock Harbor, and Skaket need to be considered for both bicycle and pedestrian connections as called for in the Orleans Comprehensive Plan (OS22).

Preliminary Design Concepts – Depending upon traffic volumes, speeds, and the location of pedestrian trip generators, sidewalks should be considered along both sides of the street. Appropriate marked crosswalks and signage, consistent with the roadway geometrics and existing traffic patterns should be installed at intersections where the heaviest pedestrian movements are likely to occur. Additional pedestrian safety countermeasures should be considered where appropriate.

On-roadway accommodations, shared-use paths and linkages, bike route signage, and roadway widening and striping should be considered to provide enhanced conditions for bicyclists. Due to right of way concerns, on-roadway alignments will likely prove the most feasible options and can utilize secondary and neighborhood streets with lower speeds and moderate traffic with minimal

improvements while still providing an adequate level of accommodation for most bicyclists.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Sidewalks and crossing improvements, unit costs:

- 5' Sidewalks, bituminous, both sides of street – \$120.00/linear foot
- 5' Sidewalks, concrete, both sides of street – \$140.00/linear foot
- Marked Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00

Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – A gap analysis should be undertaken to identify and prioritize sidewalks, crossings, shared-use paths, and on-roadway improvements needed to develop a complete bicycle and pedestrian network which links the villages of Orleans to one another and to existing bicycle and pedestrian trip generators. Safety countermeasures should be considered for locations where potential exists for conflict points with the addition of bicycle and pedestrian facilities.

Project 5.3.12 Connect MacMillan Pier to Cape Cod National Seashore Bicycle Paths

Project Description – MacMillan Pier in the heart of Provincetown serves as a multimodal center with local and regional bus service as well as ferry service to Plymouth and Boston. Bicycle travel on the commercial and residential streets of Provincetown is manageable with lower traffic speeds; however access to the National Seashore becomes more difficult requiring riding along and crossing collectors and arterials since limited routes exist to link the two destinations. Enhancing the ability to access the National Seashore bike paths from Provincetown, and specifically MacMillan pier will improve multimodal options and facilitate greater use of bicycling to access the Seashore without requiring reliance on automobiles.

Preliminary Design Concepts – On-roadway improvements and accommodations are needed to provide direct, comfortable bicycle routes and safe roadway crossings. Shoulder widening, pavement markings, signage, intersection enhancements, and other safety countermeasures will provide bicyclists with wayfinding along a convenient and comfortable route for cyclists of varying abilities.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
 - Widening to add shoulders/bike lanes – \$501,600.00
- Assumes adding shoulders, signs, and pavement markings along both sides of the road.

Recommendations for Implementation – Due to the limited roads that will provide access to the Province Lands Bicycle Trail via Race Point Road several routing options should be established and existing conditions evaluated. Needed improvements should be determined and the most feasible route chosen for improvements. Coordination with Project 5.3.2, the proposed path linking Herring Cove’s parking facilities with Race Point Road, will ensure that intersection improvements and logical connections between this on-road route and the proposed provide a continuous and integrated network linking Provincetown with the Seashore destinations. Coordination with Provincetown will be needed.

Project 5.3.13 Connect Province Lands Bicycle Trail and Head of the Meadow Trail

Project Description – The 7.6-mile Province Lands Bicycle Trail and the 2-mile Head of the Meadow Trail, two of the Seashore’s most popular trails, lie approximately four miles apart on the Outer Cape. Currently the trails are not accessible from one another other than by transiting along Route 6. Though an alignment for a separate trail linking these two trails is desirable the dunes and other sensitive features make that difficult to achieve. Use of existing roads, paved or unpaved, is likely needed for at least part of the alignment. Connection of the two trails would reduce the need to access both trails by automobile, thereby helping to ease congestion and parking demand. If done in conjunction with proposed improvements to link the Province Lands Bicycle Trail with the commercial and residential center of Provincetown access throughout this region of the Seashore has the potential to significantly reduce reliance on automobiles for access to these Seashore trails.

Preliminary Design Concepts – The design concepts are subject to determination of a feasible alignment to connect the two trails. Likely consisting of both on-road and shared-use path connections, the designs will need to consider the appropriate elements for the context in which the routing takes place. If Route 6 is chosen appropriate accommodations and safety countermeasures will be needed due to the volume and speeds of traffic. Shared-use path sections could utilize a paved surface, or a natural surface, but any design chosen should provide a firm, stable surface that is compatible with bicycle use while also providing access to disabled visitors and complying with ADA.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
 - Widening to add shoulders/bike lanes – \$501,600.00
- Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation – Several existing unpaved trails located between the beach and the dunes, primarily in Truro, should be considered for enhancements to be made compatible with bicycle travel. However, the parabolic dunes and other sensitive natural features are of concern and impacts need to be avoided or mitigated. The paths could retain natural surfaces to avoid both visual and environmental impacts associated with hardening, though the environmental impacts of such use would need to be evaluated. Route 6 provides the only roadway alignment to connect the two trails and options to avoid an on-roadway facility should be considered since it would not be inviting to many less experienced bicyclists.

Project 5.3.14 Connect Truro Village Center to Truro Destinations

Project Description – Connecting the two villages and the destinations of Truro via a bicycle network is needed to facilitate nonmotorized mobility while also enhancing the visitor experience to this popular summer destination. Largely rural and comprised primarily of the National Seashore, Truro has a number of popular seasonal destinations including Head of the Meadow Trail, Coast Guard Beach, the Highlands Center, Hostel International, and three campgrounds. Truro's population and developed areas are largely located in two village centers; Truro and North Truro, both on Cape Cod Bay, and which are connected primarily via Routes 6 and 6A. Like many other parts of the Cape the developed areas are not well connected through a network of secondary roads suitable for bicycling, often requiring use of collectors and arterials for transit between destinations. Aside from destinations within the two village centers most of Truro's attractions are in the National Seashore and require access along and across Routes 6 and 6A. The village centers are currently connected via Mass Bike Route 1, primarily along Route 6A and Castle Road, both of which have minimal signage but no physical accommodations for bicycles.

Preliminary Design Concepts – Bicycle connections would largely consist of on-road improvements with some off-roadway alignments where needed, based upon the needs and bicycling experience of intended users. A number of unpaved roads within the Seashore could be utilized for connections with very low traffic volumes making bicycling comfortable for a variety of users; however hardening would be needed in some locations to provide an adequate surface, although annual grading would likely provide an acceptable surface on unpaved roads that experience very low vehicle use. Wayfinding signage should be added consistent with the protocols and designs developed elsewhere on the Cape.

Adequate shoulders exist on much of Route 6 in Truro, including the short section that is utilized for the Claire Saltonstall Bikeway (Mass Bike Route 1), but the shoulder with is reduced at the junction with Route 6A northward in North Truro. Though Mass Bike Route 1 diverts onto Route 6A at this point many bicyclists still use Route 6. Interchange improvements such as bike lane pockets and/or signage should be considered along Route 6 to mitigate potential for conflicts at these weave movements, including at this location which requires north-bound bicyclists to make a left turn at an uncontrolled intersection.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation – Coordination between Truro and the National Park Service will be needed to identify desired routes and to develop plans for connecting destinations within the village centers and the National Seashore. An Environmental Screening Form would need to be completed for the elements within the Seashore to determine the level of environmental compliance required. Because hunting is allowed in some parts of the Seashore consideration needs to be given to routing of bicyclists through those areas. Habitat fragmentation is also of concern to CCNS and needs to be considered. Coordination with Project 5.3.13 is needed to develop continuity between Truro destinations and the linkages that are proposed to provide access within the National Seashore and between the existing Seashore trails.

Project 5.3.15: Connect Shawme-Crowell State Forest to the Cape Cod Canal Bikeway

Project Description – Located in Sandwich, the Shawme-Crowell State Forest is proximate to the Cape Cod Canal Bikeway but lacks an improved route or facility to connect them. The forest has a variety of park and camping facilities and lies between Routes 6 and 6A with the main entrance off of Rte 130 (Main Street). The Claire Saltonstall Bikeway does pass the entrance to the forest though there are no bicycle accommodations or facilities.

Preliminary Design Concepts – The short linkage needed to connect the Cape Cod Canal Bikeway with the state forest allows for several design alternatives to be utilized. An unused alignment for Bayview Rd near the intersection of Route 6A and 130 could allow for a shared-use path that would access the back of the state forest. The alignment is currently cleared almost to the Cape Cod

Canal Bikeway, though it would require access across a rail line. An on-road route could be established using secondary roadways, preferably with bicycle accommodations provided. The most likely alignment would utilize Tupper Road and Main Street although shoulders or bike lanes should be considered to improve the existing conditions to increase safety and reduce conflicts with automobiles on these narrow roads that lack paved shoulders. Other possible on-road routes could be utilized, but would be less direct. Any route established should utilize wayfinding signage to direct bicyclists to these two facilities.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation – Several improvements in or adjacent to this general area have been proposed and should be coordinated to develop a connected and integrated network of bicycle routes and facilities. Projects 5.2.15 (improvements on Tupper Rd. south of Rte 6A) and 5.3.17 (bicycle improvements through the Sandwich Historic District) propose improved bicycle facilities in this immediate area and could be combined into a larger project, especially if this proposed connection to the forest utilizes a route along Tupper Road. Data collected during this feasibility study also indicate that existing proposed improvements call for a shared-use path or on-road improvements on Route 6A which could also facilitate this needed connection. The Claire Saltonstall Bikeway should be realigned to utilize an improved route through this corridor if bicycle accommodations are provided as a result of these proposed projects.

Project 5.3.16: Connect Wellfleet Bay Wildlife Sanctuary to Cape Cod Rail Trail

Project Description – Mass Audubon’s Wellfleet Bay Wildlife Sanctuary is located on Wellfleet Harbor and is a popular destination with 5 miles of natural walking trails. The sanctuary is approximately one mile due west of the Cape Cod Rail Trail at the point where the CCRT passes through the National Seashore, however the trail is located on the opposite side of Route 6. Further complicating connection of the CCRT to the sanctuary is the need for a connection across private property. Entrance Road provides access to the sanctuary and intersects Route 6 across from the Wellfleet Lodge and the Wellfleet Motel where the most direct connection could take place. However, the CCRT parallels

Route 6 behind the hotels and access from the CCRT to Route 6 would require crossing private property.

Preliminary Design Concepts – A shared-use path design typical should be utilized to provide a short, approximately ¼-mile spur linking the CCRT to Route 6. More significantly consideration and installation the appropriate crossing treatments and countermeasures are needed at the intersection with Route 6. Route 6 is a 2-lane cross section with a posted speed of 45 MPH at this location. With the traffic volumes experienced during peak season and the bicycle and pedestrian access from the CCRT, significant bicycle/pedestrian conflicts with motor vehicles would likely result. Minor improvements might be needed along Entrance Road to include directional signage and possibly pavement markings to create awareness of a shared-road environment.

Class C Cost Estimate – Shared-use path connection (0.25 miles):

- Path along new alignment – \$217,800.00

On-roadway improvements (.35 miles):

- Signing and striping – \$3,696.00

Improved crossing at Route 6:

- Marked Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00

Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – Construction costs associated with the short spur would be minimal, however access across private property (one of the two hotel properties) could potentially increase the costs significantly. A trail easement would allow access without the need for costly right of way acquisition and the adjacent properties of the two lodging properties would provide an alignment directly across from Entrance Road. The somewhat remote location of this proposed spur and the trail traffic generated by the sanctuary would likely minimize any potentially undesirable traffic across the properties. Additionally, some businesses have welcomed access to regional trail facilities, recognizing that it has the potential to serve to attract patrons. Pending development of the connection, an engineering study should be conducted to determine the appropriate level of accommodations needed to facilitate safe crossing of Route 6.

Project 5.3.17: Identify Potential Bikeway Alignment through Sandwich Historic District

Project Description – The Sandwich Historic District lies just to the east of the terminus of the Cape Cod Canal Bikeway, though there are no designated bike routes through Sandwich. A shared-use path through the district likely holds appeal to many, however such an alignment would prove difficult due to lacking right of way. Old King's Highway (Route 6A) borders the district to the south and is the primary route through Sandwich. Roadways along Cape Cod

Bay are discontinuous and limit the availability of alternate routes through town.

Preliminary Design Concepts – Largely consisting of on-road bike routes the alignment should consider the existing conditions and whether shared-road conditions and geometrics are adequate or in need of improvements. At the least wayfinding signage is needed, especially for any alignment along secondary roads. Cul-de-sacs and dead-end residential streets may present challenges in identifying a route, however short connections between these types of streets should be considered where appropriate to facilitate bicycle and pedestrian route connections while still preventing automobile through traffic.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation –The route alignment should consider directness, ability to access destinations, and the possibility of short connections between streets that are not currently linked. The Claire Saltonstall Bikeway, also known as Mass Bike Route 1 follows Route 6 to the south of the Sandwich Historic District. Due to the existing conditions along Route 6 any improved alignment through Sandwich should consider the realignment of this long-distance bike route along an improved route.

Coordination with Projects 5.2.15, 5.3.15, and particularly 5.3.7 (the proposed “Bay Route”) will help to ensure continuity and establishment of a connected bicycle network. Projects providing regional connections may also be viewed more favorably with regards to obtaining funding and can be implemented by multiple localities.

Project 5.3.18: Identify and Implement “OBHC Triangle” Route

Project Description – Orleans, Brewster, Harwich, Chatham constitute a roughly triangular area that occupies the region where the Outer Cape begins. Limited route availability due to a lack of a network of secondary roads that connect these towns will make difficult the development of a suitable bicycle route of approximately 30 miles constituting the “OBHC Triangle”. The towns are largely interconnected via routes 6A, 39, 28, 137, and 124; all of which have little to no accommodations for bicycles and which have considerable vehicular traffic, especially during peak season. Nickerson State Park lies in the center of the region further contributing to the traffic in the region.

Preliminary Design Concepts – Envisioned as an on-roadway route linking the four towns, a designated route will need to consider roadway improvements in order to adequately accommodate bicycle travel, especially by cyclists other than experienced cyclists comfortable riding in a shared-roadway environment. Some paved shoulders exist, though in most instances they are inadequate to serve as a bicycle accommodation and are discontinuous. Addition of paved shoulders or traffic control devices highlighting a shared-roadway condition should be considered. Such measures could include “share the road” signage or use of “sharrows” officially known as shared lane markings. Along roadway segments where adequate paved width exists or may be easily added, designated bike lanes may be considered as appropriate.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
 - Widening to add shoulders/bike lanes – \$501,600.00
- Assumes adding shoulders, signs, and pavement markings along both sides of the road.

Recommendations for Implementation – Due to limited routing options implementation will require selection of a route and evaluation of existing conditions to determine needed improvements and countermeasures. Coordination with Projects 5.3.6, 5.3.7 (the proposed “Shore” and “Bay” routes respectively), and 5.3.10 will ensure that proposed improvements are consistent throughout the region. Since those proposed routes are of a regional nature segments of the “OBHC” route that are coordinated with these projects will likely receive greater priority for funding. Emphasis of the efforts to integrate these proposed routes into a cohesive network linking towns and destinations would likely increase the potential for funding.

Project 5.3.19 Improve Bicycling Conditions on Route 130 in Sandwich

Project Description – Bicycling conditions along Route 130 (Forestdale Road/Water Street/Main Street) in Sandwich are currently challenging with little or no paved shoulder, significant traffic volume, and a posted speed limit of 40 MPH. Adding paved shoulders or other bicycle improvements would provide safer, more comfortable bicycling conditions while also reducing conflicts with motor vehicles. Route 130 provides connections to destinations, neighborhoods and the adjacent town of Mashpee. Adding paved shoulders has additional benefits including pavement edge stabilization, the addition of a recovery area which reduces roadway departure crashes, and a breakdown area that allows disabled vehicles to be moved out of the travel lane, thereby mitigating congestion impacts from such incidents. These all result in safety, operational, and maintenance benefits which yield long-term cost savings.

Preliminary Design Concepts – Widening or the addition of paved shoulders should consider the existing roadway geometrics. In order to be useful for bicycle travel shoulders and the adjacent travel lane need to be of adequate widths to provide a degree of

separation between the two modes, otherwise safety can be impaired by inviting motorists to pass too closely to bicyclists that attempt to hug the outside edge of the roadway. In general a four foot shoulder is desirable to provide adequate operating space for a bicyclist while allowing motorists unimpeded travel within the adjacent lane. On roads with curb and gutter, the gutter pan and the longitudinal joint effectively reduces the useable width of the shoulder and consideration needs to be given to the paved width of the shoulder exclusive of the gutter pan.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders along both sides of the road.

Recommendations for Implementation – Opportunities should be sought to begin implementing improvements through coordination with other construction and maintenance projects. Routine pavement overlay and resurfacing projects should include shoulder paving for this route. Maintenance needs to be considered so that the functionality of shoulders for bicycling purposes is retained since the natural sweeping action of vehicles often results in debris accumulating in the untraveled shoulder.

Project 5.3.20: Improve Bicycling Conditions on Quaker Meeting House Road in Sandwich

Project Description – Located in Sandwich Quaker Meeting House Road is located in a heavy residential area and the roadway currently has intermittent facilities with short segments of shared-use paths connecting some subdivision developments. The roadway geometrics consist of a two-lane secondary roadway with minimal paved shoulders. As a result, the discontinuous nature of the infrastructure makes travel by bicycle difficult for anyone not comfortable with riding in a shared travel lane with automobile traffic. There are numerous points of destination along Quaker Meeting House Road including Sandwich High School, Oak Ridge School, and a municipal complex that justify the need for bicycle accommodations. The town is currently constructing a continuous sidewalk along the entire length of Quaker Meeting House Road from Route 6A to Route 130. The Town desires to widen the existing roadway to provide 11' lanes and 4' shoulders in both directions in conformance to state requirements for bicycle accommodations. The proposed projects are fully designed and are "shovel ready" but are unfunded.

Preliminary Design Concepts – Roadway improvements along Quaker Meeting House Road to provide 11' travel lanes and 4' paved shoulders. On-roadway improvements and accommodations are needed to provide direct, comfortable bicycle access to the many destinations in this residential area. Shoulder widening, pavement markings, signage, intersection enhancements, and other safety countermeasures along with wayfinding measures would provide a convenient and comfortable route for cyclists of varying abilities.

Class C Cost Estimate – On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Sidewalks and crossing improvements, unit costs:

- 5' Sidewalks, bituminous, both sides of street – \$120.00/linear foot
- 5' Sidewalks, concrete, both sides of street – \$140.00/linear foot
- Marked Crossing – \$1,500.00

Recommendations for Implementation – Identification of funding sources and programming of funds is needed to facilitate implementation since the projects are fully designed. Final designs should be reviewed for appropriate integration with the existing bicycle infrastructure on Quaker Meeting House Road and improvements to the existing infrastructure, if needed, should be considered in order to provide continuity in the accommodations.

Project 5.3.21: Establish a Bicycle & Pedestrian Connection from Fort Hill Area Trails to Governor Prence Road

Project Description – The Town of Eastham, through its Planning and Economic Development Department, has identified the Governor Prence Road, a major access to the Red Maple Swamp and Fort Hill Trail, as the only major crossing of Route 6 that does not have a traffic signal. The Eastham Visitor's Center is also located at this intersection which maintains high traffic volumes, has significant left turns, and is a high crash location. As a result warrants should be easily met to justify a traffic signal. A pedestrian actuated traffic signal at this intersection will encourage residents and vacationers, who now drive to Fort Hill or Hemenway Beach to bike or walk to these popular destinations. Sidewalks or shared-use paths are needed to establish a connected and contiguous pedestrian access route between the Fort Hill trails and Governor Prence Road which intersects the Cape Cod Rail Trail less than one mile west of this intersection. Improved bicycle conditions linking the CCRT with Fort Hill are also needed.

Preliminary Design Concepts – Depending upon traffic volumes, speeds, and location of pedestrian trip generators, sidewalks should be considered along both sides of the street. Appropriate marked crosswalks and signage, consistent with the roadway geometrics and existing traffic patterns should be installed at intersections where the heaviest pedestrian movements are likely to occur. Additional pedestrian safety countermeasures should be considered where appropriate.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Sidewalks and crossing improvements, unit costs:

- 5' Sidewalks, bituminous, both sides of street – \$120.00/linear foot

- 5' Sidewalks, concrete, both sides of street – \$140.00/linear foot
- Marked Crossing – \$1,500.00
- Signalized Crossing – \$70,000.00

Assumes installation of signalized intersection with mast arms, signal heads, pedestrian signals, pavement markings, and appropriate pedestrian upgrades such as curb cuts and ADA curb ramps.

Recommendations for Implementation – Gaps within the existing pedestrian and bicycle network should be identified for improvements concurrent with the installation of a traffic signal. Appropriate safety countermeasures should be considered for locations where potential exists for vehicle/pedestrian collisions, primarily at the intersection of Governor Prence and Route 6, as well as along Governor Prence if a connection to the CCRT is desired. Improvements should also seek to improve access to transit stops when appropriate.

Project 5.3.22: Define Loops and Connections to Develop a “Grand Cape Tour” Along the Cape Cod Rail Trail

Project Description – The Cape Cod Rail Trail currently serves as a major bicycle facility stretching twenty two miles across six of Cape Cod’s municipalities. Proposed extensions to the north and west would provide access to four additional localities. A Grand Cape Tour would provide visitors to Cape Cod with bicycle access to towns and Seashore destinations with the CCRT serving as the spine route. Loop routes and spurs that provide direct bicycle access would also result in a connected bicycle network throughout much of the lower and outer Cape that could be used for utility trips as well.

Preliminary Design Concepts – Loop routes and access routes would likely consist of on-road bike routes and shared-use paths depending upon the specific conditions. Each proposed alignment should consider the existing conditions and whether shared-road conditions and geometrics are adequate or in need of improvements, or whether a shared-use path would be most appropriate for the intended and likely user. Wayfinding signage is needed, especially for any alignment along secondary roads.

Class C Cost Estimate – Shared-use path, unit costs per mile along varying alignments:

- Adjacent to roadway with utility relocation – \$765,600.00
- Along new alignment – \$871,200.00
- Existing corridor (minor grading/clearing) – \$792,000.00
- Along abandoned RR bed – \$660,000.00

On-road improvements, unit costs per mile:

- Signing and striping – \$10,560.00
- Widening to add shoulders/bike lanes – \$501,600.00

Assumes adding shoulders, striping and signage along both sides of the road.

Recommendations for Implementation –The route alignments should consider directness, ability to access destinations, and the

potential to integrate with the larger bicycle network envisioned for Cape Cod. Though intended to serve as a contiguous route throughout the entire area of the existing and proposed CCRT, such a network would facilitate bicycle use for commuting and routine utility trips in addition to recreation and tourism. Linkages therefore should consider popular tourism sites as well as town centers and commercial areas. Coordination with projects that are proximate to the existing CCRT, as well as future extensions would ensure development of a connected network of bicycle routes and facilities. Coordination of multiple localities, the Cape Cod Commission, and Massachusetts Department of Conservation and Recreation will be required.

5.4 Other Initiatives

The following is a list of nine projects proposing various initiatives to support and improve bicycling on Cape Cod. These projects are number 5.4.1 through 5.2.9.

Project 5.4.1: Bike Route Brochure & Wayfinding Map

Project Description – A multi-phase project proposing to develop and maintain a brochure, including a wayfinding map that describes the primary destinations accessible by bicycle including recreation features of pocket parks, beaches, town landings, shopping districts, hiking areas, bike paths, and other facilities and attractions followed by a subsequent implementation phase with wayfinding improvements along a pilot route.

Currently inconsistent signage and pavement markings throughout the Cape results in impaired safety and a poor visitor experience. Destination access is difficult due to the lack of wayfinding and directional signage which contributes to low use of bicycling and bicycle facilities for basic mobility and transportation to access destinations, resulting in over-reliance on autos, especially by visitors not familiar with Cape Cod. This in turn contributes to congestion and excessive parking demand. By encouraging and facilitating the use of bicycling as an alternative transportation mode improvements to air quality (all of Cape Cod is a non-attainment area), reduced congestion, and reduced impacts to sensitive lands and natural features resulting from illegal spillover parking, especially in the National Seashore, can be achieved.

The project will also yield safety improvements by addressing existing conditions which include lacking or inconsistent signage, pavement markings, and inadequate design treatments at intersections. Motorist and bicyclist/pedestrian expectations and actions are not uniform, crossings are often inadequate, and design treatments are inconsistent and often don't comply with MUTCD (the Manual on Uniform Traffic Control Devices) standards.

Component A – Conduct a Pilot Study to apply signage to one connector route. This proposed element is a follow-on to Project 5.2.2 and would utilize the wayfinding standards and protocols established via that project.

This component would require the following steps:

- Identify candidate routes that facilitate mobility and connection to multiple destinations
- Identify the pilot route for implementation
- Establish baseline data collection needs for comparison after pilot implementation
- Collect baseline data

Component B – Implement signage and pavement markings along pilot route

Component C – Develop six wayfinding itineraries with maps for bicycling experiences on Cape Cod to facilitate connection via bike or walking to destinations and attractions within Seashore and local communities, to include:

- Cape historic resources
- trail amenities including restaurants, rest rooms, accommodations, retail shopping area, bike repair/rental shops and emergency services
- connections to intermodal transportation facilities including bus and ferry terminals/connections
- Sand (surface hazard) and other cautionary items
- connections to other bicycle facilities including the Pan Mass Challenge Route and the Mass Bike Route 1 (Claire Saltonstall Bike Route)
- connections to primary destinations (Seashore attractions, town centers)
- communicating mobility issues for access by different users (ADA issues)
- coordination of all 6 regions to create larger overall “regional experience”

The data collection needed for Component A should also consider surveying bicyclists and users of bicycle routes and facilities regarding needed or desired content and the ease with which they can currently navigate the bicycle network on Cape Cod.

Preliminary Design Concepts – Installation of signage and wayfinding amenities should follow the protocols and guidance established as a result of Project 5.2.2 for existing facilities, relating to signage and wayfinding on the CCRT. Wayfinding itineraries and maps should be printed on water resistant stock and be either pocket-sized allowing use by bicyclists or pedestrians. Maps and related print documents should be made available in electronic format as well and updated regularly. Electronic versions have the added benefit of being able to provide more current content, and even real-time information such as trail closings and conditions, and links to transit schedules.

Class C Cost Estimate –

- Signage installation on pilot route – \$18,400 per mile
- Maps and wayfinding itineraries – \$120,000

Recommendations for Implementation – Signage, wayfinding, and pavement marking guidelines and protocol need to be established prior to implementation, either via Project 5.2.2 associated with signage of the CCRT, or as a separate effort. Pilot route selection should follow the implementation guidance established in Project 5.3.2 by identifying potential connector routes or corridors, evaluating the alternative, and determining the specific pilot route. It will also be necessary to determine the baseline data that needs to be captured or collected, and the process by which that will be accomplished before the second phase involving signage installation can proceed. Additionally, data collection should include bicyclist's perception of current wayfinding resources and their needs or desires for content in the printed product. An opportunity for feedback on the printed product should be included such as a survey or an online form that can capture impressions of the quality of the guide/map and needed changes or suggested improvements. Due to the regional focus and the implications for towns, coordination is needed between towns as well as with the Massachusetts Office of Travel and Tourism (MOTT). Coordination with Intelligent Transportation Systems could provide real-time information and enhance wayfinding and transit service integration.

Project 5.4.2: Establish Nonprofit for Stewardship of the Cape Cod Rail Trail

Project Description – Form a nonprofit 501(c)3 alliance for stewardship of the entire & future Cape Cod Rail Trail. The CCRT currently provides a continuous 22 mile facility that serves as bike and pedestrian corridor through the Outer and Lower Cape, providing access to communities and attractions on Cape Cod, including the National Seashore. However visions exist for a facility that will extend throughout the entire length of the Outer and Lower Cape, connecting Hyannis to Provincetown, and providing multimodal access to much of Cape Cod. A facility of this size would benefit from the guidance and stewardship of a nonprofit organization to ensure proper care and maintenance, address operational and safety considerations, especially those related to improvements and physical extensions to service new locations, and to help remove or reduce barriers within the community to expanding the facility to serve additional towns and destinations on Cape Cod via advocacy and generating support for the expansion of the facility.

Preliminary Design Concepts – NA

Class C Cost Estimate –

- \$70,000.00

Recommendations for Implementation – The primary focus of the no-profit needs to be established and a commensurate framework for the organization developed. Similar organizations have been developed for other trail facilities with widely varying missions, from safety patrols, to routine maintenance and caretaking efforts

such as “adopt a trail” efforts, to broader advocacy and stewardship endeavors aimed at enhancing and expanding a facility and serving to raise funds and support from the local community, including elected officials and business leaders.

The scope of the organization needs to be determined along with establishment of a governing body to ensure proper management of both the organization as well as to provide direction for a course of action to be taken and sustained. A board or other body that is assembled for this purpose should consider carefully the makeup (members) needed to adequately address the and achieve the desired functions.

Project 5.4.3: Cape Cod Nonmotorized Master Plan

Project Description – Develop a nonmotorized transportation master plan for Cape Cod that consolidates and integrates facilities, routes, and accommodations for bicyclists and pedestrians, including those owned or managed by localities, the National Park Service, and nonprofit organizations (such as conservation groups) into a single coherent network. Existing route and network plans, proposed facilities, identified gaps and gap analyses, policies for addressing the needs of bicyclists and pedestrians, and a prioritized list of projects and supporting initiatives across jurisdictions and stakeholder agencies needs to be established in order to adequately integrate and coordinate bicycle accommodations throughout Cape Cod.

Preliminary Design Concepts –The development of a master plan should seek to establish uniformity in standards and design guidelines, as well as consistency of policies and approaches to providing bicycle and pedestrian accommodations across Cape Cod. The plan should ensure continuity both in developing and connecting bicycle and pedestrian networks and in the actual design and construction of facilities, especially when they cross jurisdictional boundaries in order to facilitate mobility and access by bicyclists and pedestrians as well as to provide a consistent level of service.

Class C Cost Estimate – Subject to scoping details

Recommendations for Implementation – Of primary importance is coordination across municipalities, including funding requests and applications and regional prioritizing of projects. Existing plans should be evaluated for shared visions and desired projects, as well as to establish consistency in facility design especially at jurisdictional boundaries to ensure continuity of infrastructure and accommodations along bicycle routes.

Project 5.4.4: Development of Trail Access Parking Agreements

Project Description – Develop agreements with schools to use school parking lots during off-times for trail parking to in order to alleviate parking demands resulting from trail use. With limited parking available and thousands of daily users of trail facilities on Cape Cod during peak summer season, parking demand can create

problems with finding adequate parking at or near trailheads. The use of public parking infrastructure at schools during non-school hours will mitigate excessive parking demand while also utilizing existing parking facilities, thereby eliminating the need to construct additional capacity specifically for trail access. Shared parking efforts similar to this have eliminated added expenses while also increasing the utilization of an existing public resource.

Preliminary Design Concepts – NA

Class C Cost Estimate – NA

Recommendations for Implementation – A model agreement should be developed that can be shared among Cape Cod localities. Standard signage and policies should be developed to ease implementation and retain uniformity at multiple locations. Local political issues will need to be addressed, however this approach provides an opportunity for facility sharing which increases the utilization of existing infrastructure while reducing the need for construction of additional parking facilities, many of which will be unutilized much of the year. Use of school facilities could be limited to time of day and/or time of year to provide additional parking capacity during peak season which coincides with school closures for summer break.

Project 5.4.5: Safety Education & Outreach

Project Description – Develop and implement an education and outreach initiative aimed at bicyclists and motorists with the intent of improving safety for bicyclists. With bicycling on Cape Cod being popular for both recreation and transportation there is a significant need to ensure safety is improved by addressing the human factors related to bicycle crashes, bicycle/motor vehicle collisions, and interactions between roadway users. Since human factors are a major contributor to bicycle/motor vehicle crashes this is a low cost/high value project.

Preliminary Design Concepts – NA

Class C Cost Estimate – NA

Recommendations for Implementation – Education and outreach initiatives can comprise a broad range of strategies. Cape Cod stakeholders should develop a strategic approach to developing and deploying resources by identifying the primary issues that need to be addressed, target populations, and the commensurate strategies that should be investigated. Overly broad approaches are likely to be less effective than those aimed at addressing specific challenges and problems that currently exist. A number of safety and educational initiatives and corresponding materials currently exist around Massachusetts and the U.S. Existing resources should be evaluated to determine which, if any can serve as a template for the materials and initiative to be utilized by Cape Cod communities.

Project 5.4.6: Maintenance Program Development & Implementation

Project Description – Develop and implement a maintenance program to ensure appropriate and routine maintenance is

provided for bicycle facilities and accommodations. Because bicycle facilities and accommodations are often outside of the road right of way or at the least are located along the margins of transportation facilities, they often do not receive the maintenance that is provided to roadway networks. Additionally, bicycle facilities will have maintenance needs that are different than those of roadways by virtue of their use and operation. On-roadway facilities such as bike lanes and shoulders often accumulate debris as a result of the natural sweeping action of motor vehicles pushing debris outward from the travel lanes, but not beyond the shoulder or bike lane. On roads with shoulder typical sections debris, notably loose soils and sand, tends to encroach and collect on the shoulder as well. As a result the bicycle accommodation can become virtually impassable while also constituting a crash or tire puncture hazard.

Drainage grates also pose a significant hazard to bicyclists as a result of raised vertical edges which can damage tires and wheels or deflect a wheel sideways causing a crash. Worse are grates with longitudinal openings that can trap a bicycle wheel, throwing the rider from the bike. Grate installation, repair, and replacement policies and practices should utilize bicycle-friendly grate designs, location outside of the bicycle path of travel if possible, and maintenance which maintains a smooth, flush transition from pavement to grate.

Shared-use paths and rail-trails outside of road rights of way often do not receive routine maintenance. As a result conditions often deteriorate to the point that the facility is not inviting or perhaps even results in compromised safety. A routine maintenance program and budgeting enhances the utility of a facility and can serve to expand the service life through preventive maintenance.

Preliminary Design Concepts – NA

Class C Cost Estimate – NA

Recommendations for Implementation – The many bicycle accommodations on Cape Cod are the responsibility of a variety of entities, including state and local government. Coordination between stakeholders, memorandums of understanding, and identification of funding sources will be needed in addition to the development of the policies and programmatic elements. If development of a 501(c)3 nonprofit trail advocacy group proceeds their role in maintenance should be incorporated into these efforts. Routine evaluation of conditions and planning for maintenance should be incorporated into other infrastructure maintenance policies, activities, and budgets.

Project 5.4.7: Interpretive Film Promoting Cape-Wide Bicycle Network and Bicycle Safety

Project Description – Many of the attributes that make Cape Cod a popular destination are accessible and enjoyable by bicycle. As efforts to expand the bicycle network on Cape Cod continue, bicycling as both recreation and a transportation mode on the Cape

will continue to grow in popularity. Currently many of the bicycling resources on the Cape are not widely known and an interpretive film could serve to both increase awareness of bicycling options on the Cape, as well as aiding people navigate the Cape's bicycle network and utilize it for accessing destinations and increasing their mobility on the cape without reliance on automobiles. Additionally, interactions with pedestrians on shared-use paths and motorists on shared roadways results in unsafe conditions at times. Incorporating bicycle safety content into the film provides an opportunity to present safety information in a medium that would likely be better received than that of a stand-alone safety message.

Preliminary Design Concepts – NA

Class C Cost Estimate – NA

Recommendations for Implementation – The proposed film should be available as an online resource and opportunities should be identified to publicize links to the website. MassBike, other bicycle advocacy or safety organizations, and bicycle clubs could assist in disseminating information on the availability of this resource once it is developed and available.

Project 5.4.8: Enhance Bicycle Shuttling Opportunities

Project Description – As a result of the many gaps in the existing bicycle infrastructure on the Cape, there is a need for convenient and widely accessible bicycle shuttling between destinations. Currently there are a number of transit services on Cape Cod and most buses and transit vans are outfitted with bicycle racks that can accommodate up to two bicycles. Long headways, infrequent service, and occasionally heavy demand during peak season however can significantly reduce the utility of these transit services, especially when considering the need for a family or group of bicyclists to use shuttle services. Increased capacity and more frequent service, especially in the areas of greatest demand is needed.

Preliminary Design Concepts – NA

Class C Cost Estimate – NA

Recommendations for Implementation – This project would assume that bicycle shuttling is limited to bus services. The Cape Cod Regional Transit Authority should work with localities and the National Park Service to identify destinations, routes, and service times that are in need of augmentation. Options for outfitting shuttle vehicles with increased bicycle capacity should be investigated.

Project 5.4.9: Utilize Utility Easements and Infrastructure projects to Establish Bicycle Routes and Corridors

Project Description – Use of utility rights of way and easements for bicycle routes and corridors has the potential to both increase the options for bicycle routes, while also reducing costs related to acquisition of right of way. Existing utility corridors are also already free of many of the physical barriers that can make difficult the development of a bicycle network. Such corridors are often already

cleared and may also have some degree of access, often in the form of unpaved roads or trails that are used for utility maintenance. Use of these corridors also have the benefit of providing bicycle facilities that are largely free of conflicting vehicle movements as occur at intersections with roadways and commercial entrances when a path is located beside a roadway. In some instances utility corridors are the only feasible connections between communities and existing or proposed bicycle facilities, such as the proposed route across Harwich.

There are numerous examples of co-use of utility corridors for transmission and recreational use including several in Massachusetts. Many utility corridors are currently used informally for recreational activities, however in most cases they are private property owned by the respective utility company or utility easements on private property. Several factors need to be considered when evaluating co-use of these corridors including: Public exposure- State and federal laws govern the separation distance between people, equipment and some utilities especially electrical transmission lines.

Recreational use cannot create additional risk of damage to utility structures or transmission facilities. Activities cannot preclude future construction or expansion of the utilities within the right-of-way. Access to/from, and along the right-of-way for maintenance, emergency repairs or future expansion cannot be impeded by recreational use. Recreational use must include a management plan that addresses trash collection and prevention/repair of erosion. Additional impacts to sensitive environmental resources will be viewed as a negative.

Preliminary Design Concepts – NA

Class C Cost Estimate – variable

Recommendations for Implementation – Use of utility corridors can require complex legal agreements. Additionally, in some instances the utility has an easement but does not own the right of way, requiring the involvement of multiple parties to include the actual land owner. Conservation easements should also be investigated to determine if these can be used to encourage dedication of right of way in the existing utility corridors, whether from the utility company or a third part landowner. Paved trails may enhance maintenance access in some corridors, thereby yielding a positive benefit to the utility company. The 48-mile W&OD Trail in northern Virginia is a prime example of a long-distance bike path that can be facilitated through the use of a utility corridor.

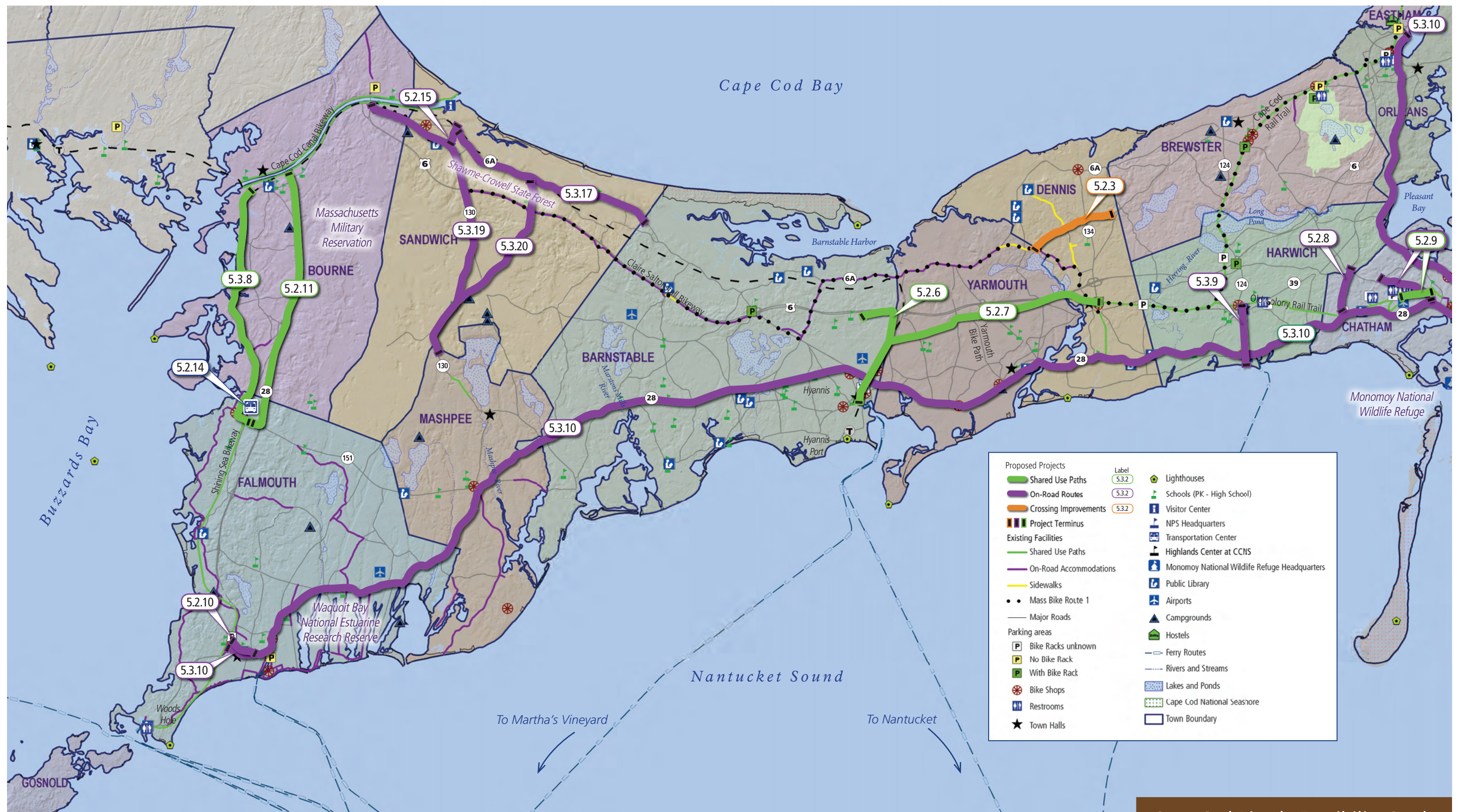
Table 3 List of Mapped Projects*

Project	Project Description
5.2.1	Proposed shared-use path corridor for CCRT Extension to Provincetown
5.2.3	Setucket Road Path intersection improvements
5.2.5	Brackett Rd & Rte 6 sidewalks and improved crossings
5.2.6	Cape Cod Rail Trail extension to Independence Park
5.2.7	Cape Cod Rail Trail extension to Hyannis Transportation Center
5.2.8	Connect Old Colony Rail Trail and Old Queen Anne Road via Route 137
5.2.9	Old Colony Rail Trail extension from Volunteer Park and access to Schoolhouse Pond
5.2.10	Connect Shining Sea Bikeway to Gifford Street via on-road route
5.2.11	Extend Shining Sea Bikeway through Bourne to Cape Cod Canal Bikeway
5.2.13	Connect Cape Cod Canal Bikeway to Hyannis Transportation Center
5.2.14	Develop Plan for Intermodal Center in Falmouth
5.2.15	Improve Bicycle Facilities on Tupper Road South of Route 6A
5.3.2	Feasibility Study & Design of Bike Path along Route 6 from Herring Cove Parking to Race Point Road
5.3.3	Identify Possible Connections between the Cape Cod Rail Trail and National Seashore Trails
5.3.6	Identify a “Shore Route” South of Route 28 from Woods Hole in Falmouth to Stage Harbor in Chatham
5.3.7	Identify a “Bay Route” from the Cape Cod Canal in Bourne to Orleans
5.3.8	Relocation of Existing Rail Line and Conversion to Trail
5.3.9	Connect Harwich Port to Old Colony Rail Trail
5.3.10	Designate Route 28 as a Bike Route and Improve Conditions
5.3.12	Connect MacMillan Pier to National Seashore Bicycle Paths
5.3.13	Connect Province Lands Bicycle Trail and Head of the Meadow Trail
5.3.16	Connect Wellfleet Bay Wildlife Sanctuary to Cape Cod Rail Trail
5.3.17	Identify Potential Bikeway Alignment through Sandwich Historic District
5.3.18	Identify and Implement “OBHC Triangle” Route
5.3.19	Improve Bicycling Conditions on Route 130 in Sandwich
5.3.20	Improve Bicycling Conditions on Quaker Meeting House Road in Sandwich
5.3.21	Establish a Bicycle & Pedestrian Connection from Fort Hill Trails to Governor Prence Road

** See Chapter 5 for detailed project descriptions and maps*

Table 4 Bicycle & Pedestrian Accommodations Unit Costs

Accommodation	Requirements	Unit	Unit Cost
On-road bikeway	Signing & striping	LF	\$ 2.00
On-road bikeway	Widen existing roadway to provide shoulder/bike lane	LF	\$ 95.00
Off-road bikeway	Construct shared use path adjacent to existing roadway, including utility pole relocation	LF	\$ 145.00
Off-road bikeway	Construct rail to trail path using abandoned railroad bed, minimal grading required	LF	\$ 125.00
Off-road bikeway	Construct shared use path on new alignment	LF	\$ 165.00
Off-road bikeway	Construct shared using existing corridor, minor grading and clearing required	LF	\$ 150.00
Roadway Crossing, residential	Pavement markings, and curb cuts/ADA curb ramps	EA	\$ 1,500.00
Roadway Crossing, signalized	Mast arms, signal heads, pedestrian signals, pavement markings, and curb cuts/ADA curb ramps	EA	\$ 70,000.00
5' Sidewalk, bituminous	Sidewalks located on both sides of street	LF	\$ 120.00
5' Sidewalk, concrete	Sidewalks located on both sides of street	LF	\$ 140.00
Bicycle/pedestrian bridge	Total lump sum construction	LS	\$1,200,000.00
Wayfinding Signage	Complete signage for wayfinding including directional and distance signs, route signs, destinations, etc.	LM	\$ 18,400.00
Bicycle rack (parking)	Installation on existing slab, drill & grout bolts	EA	\$ 1,500.00
Parking lot, trailhead		EA	\$ 50,000.00



Cape Cod Bicycle Feasibility Study

Figure 5
Assessed Projects



National Park Service
U.S. Department of the Interior

Cape Cod National Seashore





Cape Cod Bicycle Feasibility Study

Figure 6
Assessed Projects



National Park Service
U.S. Department of the Interior
Cape Cod National Seashore

Cape Cod National Seashore Trail Connector Corridor (5.3.13)



Cape Cod Bicycle Feasibility Study

Figure 8
Proposed Corridors for
Further Study



National Park Service
U.S. Department of the Interior
Cape Cod National Seashore

Chapter 6: Conclusions

Cape Cod attracts hundreds of thousands of visitors annually and is growing in population. This increasing popularity as both a vacation destination and place of residence, whether year-round or seasonal, has placed tremendous demands upon the transportation infrastructure, especially within Cape Cod National Seashore. Traffic congestion and demand for limited parking during the summer peak season reaches critical levels throughout the Cape making travel and mobility difficult at times, impacting air quality and the sensitive features of the Seashore, while also diminishing the visitor experience. Balancing the need to ensure the Seashore retains the natural elements that make it such a popular attraction with the ability to accommodate visitors has proven increasingly challenging.

Improving conditions for bicycling throughout the Cape, and specifically within the National Seashore has the potential to mitigate some of the negative effects of auto-dependence. To do so will require an integrated approach to expanding and connecting the existing bicycle infrastructure on Cape Cod and better integrating bicycling with transit services. Residents and visitors must also be encouraged to utilize bicycling for more than just recreation.

Bicycling is one of the most popular activities at the Seashore and improving bicycling conditions is a regional priority as identified in both Cape Cod National Seashore 1998 General Management Plan (CACO GMP) and the 2007 Cape Cod Regional Transportation Plan. Most of the localities on Cape Cod have also identified improved bicycling conditions as a priority, though the manner in which that is proposed to be accomplished varies widely from town to town.

The extent of the study and the projects proposed encompass the entirety of Cape Cod, though some emphasis has been placed on addressing needs specific to Cape Cod National Seashore. By encouraging, and more importantly, facilitating visitors and residents of Cape Cod to utilize bicycling as a viable and attractive transportation alternative, and better integrating bicycling with transit options it is hoped that roadway congestion and demands for limited parking can be reduced.

Cape Cod benefits from a significant number of bicycle facilities such as shared-use paths and rail-trails, however they often lack connections to nearby destinations and are not interconnected via a broader network of improved on-road bike routes. Additionally, the existing bicycle routes and paths frequently lack wayfinding signage. As a result bicycling is largely a recreational activity and not typically relied upon for daily transportation. By laying the groundwork for a uniform approach to enhancing conditions for bicycling on Cape Cod and identifying a variety of infrastructure improvements and programmatic initiatives, this feasibility study will help the region develop a complete bicycle network. This feasibility study has laid out a methodical approach to implementing projects that will move towards developing this integrated, multimodal environment.

A number of challenges exist to developing an integrated and connected network of bicycle routes and facilities on Cape Cod. Approximately 1,800 miles of

secondary roads exist on Cape Cod, however many are residential and subdivision streets that do not provide connectivity to one another. This fragmented roadway network results in limited options to be incorporated into direct and connected bicycle routes, especially along the coasts of the Cape. Heavy reliance on collector and arterial roads results in routes that may be direct, but which have heavy automobile traffic and/or high speeds. For this reason many miles of existing bike routes on the Cape must utilize these roads which are often uninviting for use by any but the most experienced bicyclists. In other instances limited right of way or the lack of a potential corridor for an off-roadway alignment limits opportunities for new or improved routes, or greatly increases costs of implementation. Nonetheless, this study has identified forty seven (47) projects that were determined to potentially offer significant improvements with relatively few barriers to implementation.

The forty seven projects identified by this study offer some of the best opportunities to develop a complete bicycle network for Cape Cod. Though this process did not prioritize individual projects, the forty seven projects developed and selected from the 120+ proposed were those deemed to deliver the greatest benefits while also having lower barriers to implementation. All of the proposed projects, as well as preexisting proposals for bicycle improvements, should be viewed as valid projects that can be implemented with adequate locality and stakeholder support. The National Park Service is also capable of providing assistance to localities in developing funding applications and requests for many of the proposed projects included in this study.

The proposed projects are varied in nature, from “shovel-ready” to merely conceptual, and many can be implemented relatively quickly while others will require long range planning and considerable funding. Some projects can be undertaken by individual localities or the NPS, while regional projects will require significant coordination and prioritization between municipalities, the regional commission, and Cape Cod National Seashore. Even the many smaller projects within individual localities should be coordinated regionally when possible. Local projects that facilitate regional connections or close gaps should be prioritized to develop a connected network of routes. Coordination between the towns of Cape Cod will also ensure uniformity and consistency in designs, wayfinding, and the continuity of routes.

This feasibility study is a tool that will help local communities, the Cape Cod Commission and NPS improve bicycling conditions, **integrate bicycling with transit services, and develop support through initiatives which will aid in reducing dependence on automobile transportation and move towards developing an integrated, multimodal transportation environment.** Serving as a resource to all stakeholders, this study will assist in the planning, prioritization, and implementation of bicycling-related projects and initiatives across Cape Cod.

Appendix A: Cape Cod Rail Trail Extension - Proposal

In December 2008 the Cape Cod Commission and Cape Cod National Seashore prepared an overview and proposal seeking funding for the Senator Edward M. Kennedy Bicycle Trail; a proposed extension of the Cape Cod Rail Trail connecting Hyannis to Provincetown. Three conceptual alignments and cost estimates were developed for the study area.

The three alignments identified general corridors and did not evaluate specific alignments or environmental impacts. Rather, they reflect three possible alternatives with their respective general impacts and infrastructure needs. The feasibility of a specific proposal would need to be determined and consideration given to environmental and social impacts. An NPS Environmental Screening Form would be completed for a project arising from this proposal to determine the level of environmental compliance required. Any extension of the CCRT would require NEPA (National Environmental Policy Act) and possibly MEPA (Massachusetts Environmental Policy Act) documents for environmental clearance; however the specific level of required compliance would be determined through the project scoping process. The proposal, as presented in 2008 is included in this appendix.

SENATOR EDWARD M. KENNEDY BICYCLE TRAIL

Presented by the Cape Cod Commission and the Cape Cod National Seashore

December 2008

OVERVIEW

The following is a proposal for extending and improving the Cape Cod Rail Trail and dedicating it to Senator Ted Kennedy. This will create a first-class multi-use trail between Provincetown and Hyannis, through the Cape Cod National Seashore created on August 7, 1961 by President John F. Kennedy. This improved trail would provide both a premier experience for visitors to the Cape and an environmentally friendly alternative transportation system for visitors and residents.



The major improvements include extending the existing rail trail from Wellfleet to Provincetown and extending the trail from the southern terminus in Dennis to the Hyannis Transportation Center. Both of these extensions have been proposed in the past and are included in long-range transportation plans for the region. Links to other existing trails will further enhance the Senator Kennedy Bicycle Trail.

BACKGROUND

The Senator Kennedy Bicycle Trail will be a major enhancement for the existing Cape Cod Rail Trail (CCRT). The current facility is a major tourist destination, attracting an estimated 400,000 users annually, with over 400 observed on the trail during seasonal peak hours. The trail accommodates pedestrians and equestrians as well as cyclists as it passes through pine woods, salt marshes, cranberry bogs, beaches, and freshwater ponds, providing a unique Cape Cod experience for many tourists and residents.

The existing CCRT, completed in 1994, follows a former rail right-of-way for 22 miles through the towns of Dennis, Harwich, Brewster, Orleans, Eastham, and Wellfleet. Approximately six miles of trail is within the Cape Cod National Seashore which is managed by the National Park Service. The Massachusetts Department of Conservation and Recreation recently invested \$6.2 million into CCRT improvements to maintain this level of service and continue to draw visitors to the Cape.

The CCRT also provides access to many off-trail attractions including public beaches, village centers, and parks. Food and water are also readily available and public restrooms can be found at Nickerson State Park, Salt Pond Visitor Center at Cape Cod National Seashore and the National Seashore Headquarters.

The trail is accessible by public transit at many locations and all Cape Cod Regional Transit Authority buses are bicycle-friendly, making the trail an ideal multi-modal facility for a family day trip or a daily commute to work or school. By providing an alternative to the motor vehicle, the CCRT

encourages an environmentally friendly, healthy lifestyle and helps to minimize congestion, parking areas, and environmental impacts to sensitive natural resources throughout the Cape.

Bicycle facilities are considered a regional priority as evidenced by two recent extensions of the Shining Sea Bikeway and construction of two major bicycle bridges for the Rail Trail. In addition, over 80% of the Congestion Management and Air Quality funds spent in the region over the last four years have gone toward the construction of bicycle facilities.

NORTHERN EXTENSION – WELLFLEET TO PROVINCETOWN

For the proposed northern extension from Wellfleet to Provincetown, three general route corridors, or a combination thereof, would be investigated. Conceptual estimates for the corridors have been developed; however further study will need to be done to define a final alignment. The selected trail alignment would include historical and environmental interpretive signage, trailheads, restrooms, and other comfort amenities, as well as provide access to town centers, residential, and recreational areas. These connections will make the trail a viable option as not only a recreational facility, but also an alternative mode of transportation.

The alternatives are expected to include:

- “Outer Cape” Corridor

The most scenic of the potential corridors, the “Outer Cape” corridor, consists largely of relatively undeveloped land within the Cape Cod National Seashore. This alignment has the potential to connect to the Pamet Area Trails, the Highlands Center, Head of the Meadow Beach and Trail, Pilgrim Heights recreation area, Province Lands Visitor Center and recreation area, and downtown Provincetown.

- “Inner Cape” Corridor

The “Inner Cape” corridor refers to a potential route west of Route 6. A trail alignment through this corridor would be primarily a share-the-road experience due to the abundance of residential development between Wellfleet and Provincetown.

This alignment would include “spurs” to connect visitors and residents alike to local recreation areas and attractions such as Massachusetts Bike Route 1, the Great Island Trail, downtown Wellfleet, the Griffin Island picnic area, the Atwood-Higgins House, and downtown Provincetown.

- “Rail Corridor”

This alternative would follow the abandoned rail corridor which is the basis for the existing rail trail. The former rail bed would be used where possible; however alternative routes would be necessary in some areas where the alignment is no longer available.

The Rail Corridor would provide trail users with a Cape experience that blends the natural, preserved, landscape of the National Seashore in South Truro with the residential and commercial areas of North Truro and Provincetown. Coastal segments of the rail corridor would provide scenic views of the Cape Cod Bay and access to several public beaches.

SOUTHERN EXTENSION – DENNIS TO BARNSTABLE

This portion of the Senator Ted Kennedy Bicycle Trail will extend the existing trail approximately 5 miles from its southern terminus at Route 134 in Dennis through Yarmouth to the Hyannis Transportation Center. This extension, in addition to the northern extension outlined above, would complete a 40+ mile facility and provide interconnectivity with other bicycle routes spanning the entire length of Cape Cod.

The proposed southern extension has already been designed and proposed in the region's Transportation Improvement Plan but has not yet been funded.

INTERMODAL TRAIL CONNECTIONS

Tourists would have the ability to experience Cape Cod in its entirety, from the traditional sand dunes to village centers and their "Cape Cod Character", while residents would be afforded an alternative mode of transportation to work, school, or other daily commutes throughout the Cape.

Together, the northern and southern trail extensions offer the opportunity to expand the connectivity and accessibility of the existing CCRT to provide a safe and enjoyable Cape-wide experience from Dennis to Provincetown as well as a multi-modal environment that connects two of Cape Cod's "urban clusters" and two major transportation centers:

- The Hyannis Transportation Center accommodates buses from New York and Rhode Island with connections to Amtrak and TF Green Airport and Western Massachusetts as well as direct service from Boston and Logan Airport. Access to ferries that serve Martha's Vineyard and Nantucket is also available at the Hyannis Transportation Center as well as access to the Barnstable Municipal Airport (Massachusetts' 3rd busiest airport). Accommodations for rail service are also provided here with future plans for passenger service.
- Provincetown is also a hub for intercity buses from Boston and Logan Airport as well as ferries from Boston, Gloucester, Salem and potentially Portsmouth, New Hampshire. The town also hosts an airport which is connected by transit to McMillan Pier, the defacto transportation center.

These regional multi-modal connections to the CCRT would encourage eco-tourism throughout the region by providing an alternative transportation system in and around the Cape.

PRELIMINARY COST ESTIMATES

Preliminary cost estimates were developed for each of the proposed corridors and include planning, design, compliance, and construction costs. The cost estimates assume minimal land acquisition. POTENTIAL TRAIL CORRIDORS		PRELIMINARY COST (in millions)
Outer Cape Corridor + Proposed Southern Extension		\$64
Inner Cape Corridor + Proposed Southern Extension		\$26
Rail Corridor + Proposed Southern Extension		\$41

Cape Cod Rail Trail
Wellfleet to Provincetown

National Park Service
U.S. Department of the Interior
Cape Cod National Seashore



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DRAFT November 19, 2008

Appendix B: Complete List of Assessed Projects

The following table lists the proposed projects/project groupings and their respective category following the matrix sorting protocol described in Chapter 4. The sorting and assessment matrix developed for this study is included on the following page. The sorting process did not assign a ranking or priority, but rather categorized them according to the level of benefit and the barriers to implementation. All proposed projects should be viewed as valid and potential projects that may be pursued for funding. Coordination between Cape Cod National Seashore, the Cape Cod Commission, and/or the respective municipality will need to coordinate selection and implementation of individual projects. The National Park Service can provide assistance to Cape Cod localities in preparing grant applications and funding requests for many of the proposed projects. The environmental clearance requirements will need to be determined through the scoping process for each individual project. An NPS environmental screening form is utilized to determine the level of environmental compliance required for projects undertaken by NPS. Similarly, projects initiated by localities will also undergo environmental review and clearance during project scoping to satisfy state and federal requirements.

A variety of possible funding sources exist, from local government funding to state and federal agencies that provide grant funding for transportation projects. Many federal grant programs are administered through MassDOT while others are administered directly from the respective federal agency. The following is only a partial list of possible grant funding opportunities that should be considered.

- Transportation Enhancement (TE) funding
<http://www.eot.state.ma.us/default.asp?pgid=content/enhanceProgram&sid=about>
- Congestion Mitigation and Air Quality (CMAQ) funding
<http://www.fhwa.dot.gov/environment/bikeped/cmaqfunds.htm>
- Recreational Trails funding
<http://www.mass.gov/dcr/stewardship/greenway/regionalGrants.htm>
- Federal Transit Administration Transit Enhancement funding
http://www.fhwa.dot.gov/environment/te/te_provision.htm
- US DOT-EPA-HUD Interagency Partnership for Livability funding
<http://www.epa.gov/smartgrowth/partnership/>
- NPS Park Roads and Parkways Program, Category III – Alternative Transportation Systems
http://workflow.den.nps.gov/88_PRPPHandbook/prpp_home.htm
- Federal Transit Administration, Transit in Parks Program (TRIP)
http://www.fta.dot.gov/funding/grants/grants_financing_6106.html
- USDOT complete list of federal funding sources for bicycle & pedestrian activities
<http://www.fhwa.dot.gov/hep/bikepedtbl.htm>

Project Assessment Matrix developed to assess and categorize proposed projects.

PROJECT ASSESSMENT MATRIX			
		<u>PAYOFF</u>	
		<u>HIGH</u>	<u>LOW</u>
<u>IMPLEMENTATION</u>	<u>EASY</u>	A	C
	<u>HARD</u>	B	D

PROJECT	TYPE	LOCALITY	EVALUATION CATEGORY	RELATED PROJECTS	COMMENTS
Install pavement striping at Setucket Road/Old Chatham Rd Multi-use Path intersections.	Infrastructure	Dennis	A		Wheelchair ramps and crosswalks and intersection improvement.
Install consistent signage along bicycle facilities and within destinations to provide better connections, including along the CCRT, directions to restrooms, directions to ferries. Also provide consistent crosswalk and pavement markings	Infrastructure	Regional	A	40,43,90,138, 96, 6,10	item and related projects pertain to installation of way finding signage
Identify possible connections between Cape Cod Rail Trail and National Seashore trails.	Plan and Implement	Eastham	A	14,62,65,79,81, 102,140	Relates to all Cape Cod Rail Trail improvements
Identify possible sidewalks and/or pedestrian crossings in vicinity of Brackett Road/Route 6.	Plan and Implement	Eastham	A		Project is partly constructed yet needs funding to complete.
Identify connection possibilities between bike paths and walking paths that exist in town park areas, as well as to other high pedestrian traffic locations.	Plan and Implement	Regional	A		Assume that this item includes implementation. Combine with connectivity projects.
Identify a "Shore Route" south of Route 28 from Woods Hole in Falmouth to Stage Harbor in Chatham.	Plan and Implement	Various	A	63	Regional East-West Route. This would be a share the road type facility.
Identify a "Bay Route" north of Route 6 from Canal to Orleans.	Plan and Implement	Various	A	64	Regional East-West Route. This would be a share the road type facility.
Develop and maintain a brochure, including a map, that describes the recreation features of all pocket parks, beaches, town landings, hiking areas, bike paths, and other recreation facilities.	Programmatic	Orleans	A	35	One map regional focus. Combine coordination between towns and Mass Office of Travel and Tourism (MOTT).
Form a non-profit 501© 3 alliance for stewardship of the entire & future Cape Cod Rail Trail	Programmatic	Various	A		Use Falmouth as example. "Friends of Falmouth Bikeways"
Develop plan to incorporate walking and bicycle paths, dirt roads and trails owned by the Town, National Seashore and private conservation groups into one coherent system.	Programmatic	Wellfleet	A	142	Same as unpaved roads but includes the Wellfleet connections.
Establish bicycle connection from Old Colony Rail Trail to downtown/Dennisport	Infrastructure	Dennis	A	104,108,112, 119	Team could not find local roads that would connect utilize rail trail to 134 but this could be a signed route. This is the assumption.
Develop agreements with schools to use parking lots during off-times for trail parking.	Programmatic	Regional	A	3	Only valuable that schools are reasonably close to the trails. Related to signage and political process.
Develop and implement a safety education/outreach program.	Programmatic	Regional	A	37,38	Not much money for great value.
Link to an interpretive film promoting the Cape-wide bike network and safe cycling.	Safety	Regional	A	37,28	Publicize and link to websites. MassBike could disseminate to all groups.

PROJECT	TYPE	LOCALITY	EVALUATION CATEGORY	RELATED PROJECTS	COMMENTS
Develop and implement a consistent maintenance program.	Programmatic	Regional	A		Assumes that maintenance programs would be orchestrated at the municipal level for local paths. Combine with 501c3 discussion.
Construct western extension of Cape Cod Rail Trail through Independence Park to Service Road at Exit 6 (RTP).	Infrastructure	Barnstable	B	14,62,65,81, 100,102,140	Relates to all Cape Cod Rail Trail improvements Merge with 79, 67, 80, and 81.
Construct planned alignment to extend Cape Cod Rail Trail to Hyannis via new bike path, including direct connection to Hyannis Transportation Center (RTP).	Infrastructure	Barnstable	B	14,62,65,79, 100,102,140	Relates to all Cape Cod Rail Trail improvements
Relocate rail line to east of MacArthur Blvd. in Bourne and convert existing rail to bikepath (RTP).	Infrastructure	Bourne	B		Mega Project requiring relocation of a portion of a rail facility
Establish connection from existing Old Colony Rail Trail to West Chatham Village Center/Barnhill Rd.	Infrastructure	Chatham	B	92,104,108, 119	Relates to all Old Colony Rail Trail improvements. Rail trail from Westside to Village center. Very doable.
Extend existing bicycle spur from Volunteer Park to schoolhouse pond via Sam Ryder Road.	Infrastructure	Chatham	B		Very high priority close to this one. Will connect to Old Queen Anne. 137 bike shoulders will it close to connecting. Land ownership issues.
Establish connection from E Falmouth to Gifford Street to Shining Sea Bikepath (RTP).	Infrastructure	Falmouth	B	44,47 ,49,50	Project relates to a northerly extension of the Shining Sea Bikeway. This is a crossing at 28 into park facilities. Signalized or other. Issues is that warrants for pedestrians are required tough to implement.
Extend Shining Sea Bikeway north to Town of Bourne and, ultimately, to the Cape Cod Canal Bike Path, via right-of-way to east side of northbound Route 28.	Infrastructure	Falmouth	B	44,47,48, 49	Project requires bridging Route 28 and construction of the multi-use trail with State highway layout; Project relates to a northerly extension of the Shining Sea Bikeway. Multi-million dollar project but a good one.
Establish bicycle/pedestrian connections between the existing Old Colony Rail Trail Spur and HarwichPort.	Infrastructure	Harwich	B	105, 106	Relates to all Old Colony Rail Trail improvements; rating assessment based in part on need for road widening construction on both sides to accommodate 4 ft shoulder width. Several potential routes
Designate Route 28 as a bike route, establish east-west bike lanes, and provide signage and connections.	Infrastructure	Regional	B		Regional, tough project.
Establish bicycle/pedestrian connections between Village Center, S Orleans, E Orleans, Rock Harbor/Skaket areas.	Infrastructure	Orleans	B		All in Orleans. Identified in a comprehensive plan (OS22). Bike routes signage, some widening and striping required. ROW concerns.
Improve connections between Town streets and bicycle paths w/in National Seashore.	Infrastructure	Provincetown	B	130	
Establish connection from MacMillan Pier ferry and	Infrastructure	Provincetown	B	131	Relates to 131.

PROJECT	TYPE	LOCALITY	EVALUATION CATEGORY	RELATED PROJECTS	COMMENTS
transit station to existing bike pathways within the National Seashore, Race Point Road.					
Establish connection between existing Head of the Meadow Trail in Truro and Province Lands Trail.	Infrastructure	Provincetown	B		
Provide accessible parking for enhanced access to existing and future trails.	Infrastructure	Regional	B	32	item refers to construction of new parking lots for autos.
Provide wide shoulders on roadways appropriate for on-road cycling.	Infrastructure	Regional	B	21,22,135,91,88,8 6,62,78	rating assessment based on the need for road widening construction on both side to accommodate 4 ft shoulder width, Combine with similar projects.
Establish connection between Truro Village Center and destinations. Head of the Meadow Trail and Coast Guard Beach.	Infrastructure	Truro	B		Political process with Town of Truro. Doable. Involves hardening. Is a hunting area. Consultation process required.
Connect the Cape Cod Canal to the Hyannis Intermodal Center to extend the Cape Cod Rail Trail from Sagamore to Provincetown.	Infrastructure	Various	B	14,62 79,81, 100,102,140	Relates to all Cape Cod Rail Trail improvements. Related to Shining Seas to Interpretive Center. Cannot really connect Shining Sea to the Canal. Get lost after marina.
Connect Shawme-Crowell State Park to the Cape Cod Canal. (Sandwich locale.)	Infrastructure	Various	B		Part of 65. Depends on route. It is a northern connection
Extend Cape Cod Rail Trail to Provincetown (RTP).	Infrastructure	Various	B	14,62,65,79,81, 100,102,	Relates to all Cape Cod Rail Trail improvements. NEPA process.
Establish connection from Rail Trail to Wellfleet Bay Sanctuary.	Infrastructure	Wellfleet	B		
Define loops and connections to develop grand Cape tour along Cape Cod Rail Trail.	Plan and Implement	Regional	B	62,65,79,81, 100,102,140	Relates to all Cape Cod Rail Trail improvements
Identify potential alignment through Sandwich historic district to Route 130.	Plan and Implement	Sandwich	B		B cubed project. Very difficult to implement.
Identify and implement OBHC Triangle route – connecting Orleans, Brewster, Harwich, and Chatham.	Plan and Implement	Various	B		
Establish plan for intermodal center at abandoned rail lot at Route 151/Shining Sea junction in Falmouth.	Planning	Falmouth	B	44,47,48, 50	Project relates to a northerly extension of the Shining Sea Bikeway. Required for intermodal development. Railroad could fund this project if a high priority.
Identify dedicated alignment within the existing ROW along the north Side of Route 6 from Race Point Road and Herring Cove Parking Lot.	Planning	Provincetown	B		North lane. Good project. Feasible.
Enhance bicycle shuttling opportunities.	Programmatic	Regional	B	143	Assume shuttling opportunities are limited to Bus Systems
Improve bicycling facilities at Tupper Rd south of Route 6A.	Infrastructure	Sandwich	B		Turn into a B project

PROJECT	TYPE	LOCALITY	EVALUATION CATEGORY	RELATED PROJECTS	COMMENTS
Improve bicycling facilities at Route 130 from existing sidewalk south of the Forestdale School to Mashpee Town Line.	Infrastructure	Sandwich	B		Better definition would be to provide shoulders on state sections of route 130.
Improve bicycling facilities at Quaker Meeting House Road from Route 130 to existing sidewalk, from Cotuit Road to existing sidewalk near Oakridge School, and from Oakridge School to Sandwich High School.	Infrastructure	Sandwich	B		These projects are designed yet unfunded (shovel ready).
Establish bicycle/pedestrian connection from Fort Hill area pedestrian trails to Governor Prence Road.	Planning	Eastham	B		Desirable, but traffic light is needed at this high accident location.
Consider existing unpaved roads in the National Seashore for bike path connections.	Planning	Various	B		Federal owned, NEPA process required to identify and recommend.
Capitalize on utility easements and infrastructure construction projects to allow bike facilities beneath powerlines.	Programmatic	Regional	B		Requires complex agreements to allow public access to utility company. Only feasible connection proposed across Harwich. Opportunity but difficult to implement.
Install bike racks and other amenities at strategic locations.	Infrastructure	Regional	C	7,97,133,57	item and related projects pertain to installation of bike racks and other trail amenities at various locations. Develop initiative to provide information to support town acquisition of amenities racks etc. for bicyclists. Combine.
Construct new bike facilities near senior centers to provide an outdoor recreational activity without requiring transport.	Infrastructure	Regional	C		Assume this item is a localized path. Could be an initiative.
Procure vans/ trailers and designate pick-up and drop-off areas to serve the Cape Cod Rail Trail demands (RTP).	Programmatic	Various	C	23	Combine with 123.
Improve safety through education and enforcement initiatives and facility performance measurement.	Safety	Regional	C	38.28	Need to establish.
Improve bicycling facilities from Town Neck Road to the Marina.	Infrastructure	Sandwich	C		Easy to implement but not a high payoff, also safety of doing this is questionable.
Inventory existing and identify need for rest areas (or directions to nearest public facilities).	Infrastructure	Regional	C	134	item refers to construction of new rest areas
Identify a "Bay Route" north of Route 6 from Canal to Orleans. Saltonstall.	Plan and Implement	Various	D	111	Regional East-West Route. Won't ever be widened. Could be a D. tough sell.
Identify potential connections to youth/community centers.	Planning	Regional	D	9, 24,33,19,	Not considered a regional facility
Create Parks & Recreation Department to oversee encouragement of recreational activities and acquire	Programmatic	Bourne	D		Consider striking but call town to see if they need this process to support this initiative.

PROJECT	TYPE	LOCALITY	EVALUATION CATEGORY	RELATED PROJECTS	COMMENTS
funding for additional amenities.					
Improve bicycling facilities at Water Street in front of the Wing School.	Infrastructure	Sandwich	D		Just in front of a specific location, does not affect high payoff and would be expensive.
Implement the proposed "South to the Sea" bike path in Dennis Port.	Infrastructure	Dennis			Relates to all Old Colony Rail Trail improvements - Talk to Tom
Evaluate local roads (Capewide) for safe bicycling roads to promote to promote connectivity to important destinations Define importance and quality of the road (Old County Road, Shore Road, South Highland Road)	Plan and Implement	Truro			Need to establish criteria for evaluation.
Continue from Mashpee Rotary to Quinequasset intersection		Mashpee			VHB to Rate
Build exclusive multi-use bike path from Willow street to Service Rd.		Mashpee			VHB to Rate
Consider acquisition of property in Bay Ridge Rail trail connection		Orleans			VHB to rate
Consider acquisition of property in Bay Canal Road Connection		Orleans			VHB to Rate

Appendix C: Public Workshop Documents

- 2009 Final Press Release – April 14, 2009
- CCNS Public Comment Form
- Public Workshop Flyer – May 12, 2009
- CCNS News Release – August 4, 2009
- Public Workshop Flyer – August 25, 2009
- Public Workshop Postcards – August 25, 2009



National Park Service
U.S. Department of the Interior

Cape Cod National Seashore 99 Marconi Site Road
Wellfleet, MA 02667

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Cape Cod National Seashore News Release

Release date: Immediate

Contact(s): George E. Price, Jr.

Phone number: (508) 771-2144

Date: April 14, 2009

Seashore seeks public input on Integrated Bicycle Study for Cape Cod

The National Park Service (NPS) and Cape Cod National Seashore (CCNS) with the Cape Cod Commission are seeking public input on an Integrated Bicycle Study for Cape Cod that will identify potential improvements to the bicycle network throughout Cape Cod. The public is invited to attend either of two public workshops on May 12, 2009. A workshop will be held from 10:00 AM - 12:00 PM at the Hyannis Transportation Center, 1st Floor Conference Room, 215 Iyannough Road, Hyannis and from 7:00 PM - 9:00 PM at the Wellfleet Senior Center, Long Pond Room, 715 Old Kings Hwy., in Wellfleet.

The purpose of this feasibility study is to identify projects that will create an overall integrated bicycle network throughout Cape Cod, with specific focus around bicycle connections to Cape Cod National Seashore. The study will identify potential for new bicycle facilities as well as improvements to existing facilities.

To date, data has been collected about existing and planned bicycle facilities from the Sagamore Bridge to Provincetown. The NPS project team is looking for public comment as to how this bicycle network may be improved. Examples of identified projects may include the location of a new bicycle path, upgrades to amenities at an existing trailhead, improved maintenance guidelines, or additional multi-modal access to an attraction.

Information regarding the project will be posted on the National Park Service Planning and Environment Public Comment (PEPC) website at <http://parkplanning.nps.gov>. If you are unable to attend a public workshop on May 12, please keep up to date via this website and share your ideas with us via letter to CCNS, 99 Marconi Site Road, Wellfleet, MA 02667. An additional public meeting will be scheduled in August 2009 to seek input from seasonal residents and visitors on the Cape.

(NPS)

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U.S. Department of the Interior
National Park Service - Denver Service Center
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Denver, CO 80225-0287

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National Park Service
U.S. Department of the Interior

Cape Cod National Seashore



Public Comment Form

Cape Cod Bicycle Feasibility Study

The National Park Service (NPS), in partnership with the Cape Cod Commission, has initiated a feasibility study to create an integrated bicycle network throughout Cape Cod, with specific focus around bicycle connections to the Cape Cod National Seashore.

The study will identify potential for new bicycle facilities as well as needed improvements to existing facilities. Recommended improvements may include the creation maintenance plans, construction of amenities to support a facility, widening of an existing path, or necessary safety improvements, for example.

As part of this study, all interested individuals, organizations, and agencies are invited to provide written ideas, comments, or suggestions during the public comment period, which extends through June 12, 2009. The NPS invites the public to provide written comments on this form, via the seashore’s Planning, Environment, and Public Comment website: <http://parkplanning.nps.gov/caco>, or in writing (Attn: Superintendent, Cape Cod National Seashore, 99 Marconi Site Road, Wellfleet, MA 02667).

Comments are typically treated as a public record and available for public review. Individuals may request that the National Park Service withhold their name and address from disclosure. Such requests will be honored to the extent allowable by law.

Please print so we can accurately record your comment. Thank you.

Name: _____ Date of Comment: _____

Address: _____ Email: _____

_____ Update to existing contact info? ☐ Yes

How would you prefer to be sent project information? ☐ email ☐ postal mail to the above address ☐ not at all

Would you like to be added or removed from the project mailing list? ☐ added ☐ removed

Would you prefer your name and address be withheld from public record to the extent allowable by law? ☐ Yes

Please provide your comments or corrections regarding the maps presented at today’s workshop:

Please fold and use address on the reverse side of this form to return by mail.

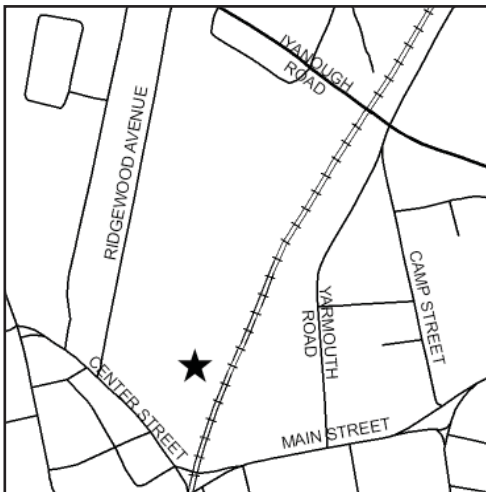
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Notice

National Park Service
in partnership with the Cape Cod Commission
Public Workshops for the
Cape Cod Bicycle Feasibility Study
May 12, 2009

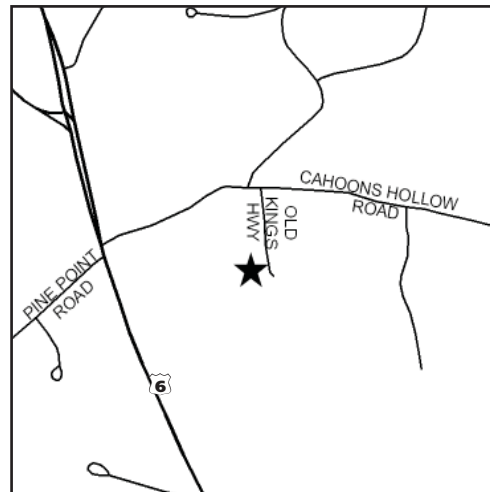
10:00 AM - 12:00 PM
Hyannis Transportation Center
1st Floor Conference Room
215 Iyannough Road
Hyannis



Directions from Route 6:

- Exit 7 to Willow St.
- South on Willow toward Hyannis
- Willow St. becomes Yarmouth Rd.
- Cross Route 28 at traffic light and veer right to remain on Yarmouth
- Turn right onto Main St.
- Turn right onto Center St.
- Center entrance immediately on right

7:00 PM - 9:00 PM
Wellfleet Senior Center
Long Pond Room
715 Old Kings Hwy
Wellfleet



Directions from Route 6:

- Turn east onto Cahoon Hollow Rd.
- Turn Right on Old Kings Hwy
- Senior Center is first right on Old Kings Hwy

Project information available online at
<http://parkplanning.nps.gov>

Comments may be addressed to:
Superintendent, Cape Cod National Seashore
99 Marconi Site Road
Wellfleet, MA 02667



National Park Service
U.S. Department of the Interior

Cape Cod National Seashore 99 Marconi Site Road
Wellfleet, MA 02667

508 771-2144 phone
508 349-9052 fax

Cape Cod National Seashore News Release

FOR IMMEDIATE RELEASE: August 4, 2009

CONTACT: George E. Price, Jr., Superintendent, 508-771-2144

Seashore Seeks Public Input on Integrated Bicycle Study for Cape Cod

The National Park Service (NPS) and Cape Cod National Seashore (CCNS) with the Cape Cod Commission are seeking public input on an Integrated Bicycle Study for Cape Cod that will identify potential improvements to the bicycle network throughout Cape Cod. The public is invited to attend either of two public workshops on August 25, 2009. A workshop will be held from 10:00 AM - 12:00 PM at the Eastham Town Hall, 2500 Route 6, Eastham and from 7:00 PM - 9:00 PM at the Hyannis Transportation Center, 1st Floor Conference Room, 215 Iyannough Road, Hyannis.

The purpose of this feasibility study is to identify projects that will create an overall integrated bicycle network throughout Cape Cod, with specific focus around bicycle connections to Cape Cod National Seashore. The study will identify potential for new bicycle facilities as well as improvements to existing facilities.

To date, data has been collected about existing and planned bicycle facilities from the Sagamore Bridge to Provincetown. Previous public workshops were held in May to gather public comments and further the data collection process. The purpose of these August meetings is to gain any final public comments on how to improve the integrated bicycle network on the Cape. Examples of identified projects may include the location of a new bicycle path, upgrades to amenities at an existing trailhead, improved maintenance guidelines, or additional multi-modal access to an attraction.

Information regarding the project will be posted on the National Park Service Planning and Environment Public Comment (PEPC) website at <http://parkplanning.nps.gov>. If you are unable to attend a public workshop on August 25, please keep up to date via this website and share your ideas with us via letter to CCNS, 99 Marconi Site Road, Wellfleet, MA 02667.

(NPS)

EXPERIENCE YOUR AMERICA

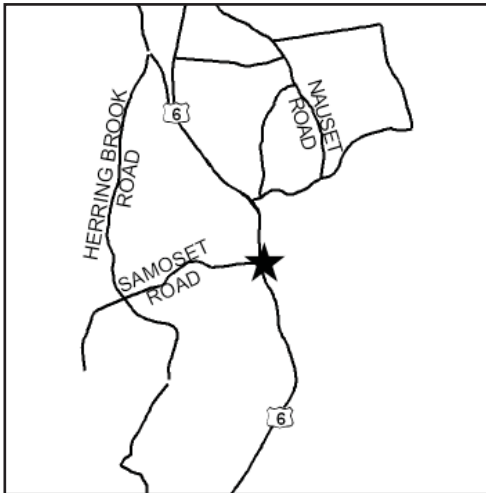
The National Park Service cares for special places saved by the American people so that all may experience our heritage.



Notice

National Park Service
in partnership with the Cape Cod Commission
Public Workshops for the
Cape Cod Bicycle Feasibility Study
August 25, 2009

10:00 AM - 12:00 PM
Eastham Town Hall
2500 Route 6
Eastham

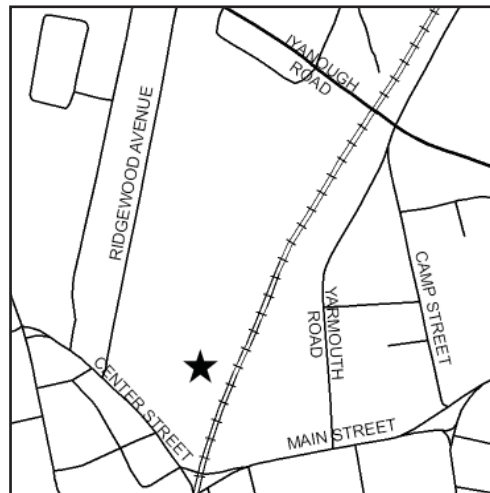


Directions from Orleans/Eastham

Rotary:

- Continue north on Route 6 for 2.5 miles
- Town Hall entrance is on your right, across from Samoset Road

7:00 PM - 9:00 PM
Hyannis Transportation Center
1st Floor Conference Room
215 Iyannough Road
Hyannis



Directions from Route 6:

- Exit 7 to Willow St.
- South on Willow toward Hyannis
- Willow St. becomes Yarmouth Rd.
- Cross Route 28 at traffic light and veer right to remain on Yarmouth
- Turn right onto Main St.
- Turn right onto Center St.
- Center entrance immediately on right

Project information available online at
<http://parkplanning.nps.gov>

Comments may be addressed to:
Superintendent, Cape Cod National Seashore
99 Marconi Site Road
Wellfleet, MA 02667



Cape Cod National Seashore

Notice

National Park Service
Public Workshops for the
Cape Cod Integrated Bicycle Feasibility Study

August 25, 2009
10:00 AM - 12:00 PM
Eastham Town Hall
2500 State Route 6
Eastham

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1st Floor Conference Room
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Hyannis

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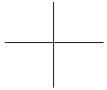
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Appendix D: Bike Facility Categories & Definitions

Bike Facility Categories as defined by
MassHighway's 2006 Project Development & Design Guide
(Guide)

Shared use Paths – Facilities on exclusive right-of-way with minimal cross flow by motor vehicles (Guide pp 5-24)

“Shared use paths are designed to accommodate a variety of users, including walkers, bicyclists, joggers, and people with disabilities, skaters, pets, and occasionally equestrians.... for both commuting or recreational purposes.” (Guide pp 11-1)

Greenways – Recreational facilities through backcountry or other less accessible areas

“These facilities are generally unpaved trails and can serve hikers, mountain bikers, equestrians, or other off-road users.” (Guide pp 11-1)

On-Road Accommodations – Street-level visible accommodations on or along the roadway, namely bike lanes and signed bike routes generally at least 4 feet in width.

Bicycle lanes are “one-way facilities that carry bike traffic in the same direction as the adjacent motor vehicle traffic” and are designed for bicycle use. (Guide pp 5-20)

Signed Bicycle Routes are facilities marked with signs that are intended to guide bicyclists onto or along particular roadways from a starting location to an ending location.

Unimproved Bicycle Routes – Routes without visible street level accommodations such as bicycle lanes or road signs. These routes may be found in commercially produced bicycle tour books, maps, or on websites.

Bicyclists must bring route information with them to determine where the route starts, traverses, and ends rather than referring to posted signs.

This category is also used for off-road accommodations, where the course or condition is unverified.

Programmed – Project listed in Statewide Transportation Improvement Plan, in design or under construction.

Proposed Bicycle Accommodations – Recommended for study or construction in Regional Transportation Plans developed by Metropolitan

Planning Organizations or from public participation during public outreach efforts.

Sidewalks* - A paved pathway paralleling a highway, road, or street intended for pedestrians.

Though it is legal in Massachusetts to ride a bicycle on a sidewalk, most bicycle guidelines do not recommend this as appropriate signage and other safety precautions are usually not in place for a general sidewalk.

*Not included in MassHighway's design guidelines, definition taken from the AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities*.

References: List of Preparers, Contributors, and Consultants

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Nicole Brooks, NPS-Cape Cod National Seashore
Sue Moynihan, NPS-Cape Cod National Seashore
Clay Schofield, Cape Cod Commission
Chris DeWitt, VHB, Inc.
Andra Limbaugh, VHB, Inc.
Joe Magni, VHB, Inc.
Bill DeSantis, VHB, Inc.
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Margaret Beavers, VHB, Inc.

Steering Committee

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Jillian Douglass, Town of Brewster, Assistant Town Administrator
Paul Lagg, Town of Chatham, Community Development
Lindsey Counsell, Town of Barnstable
Alisha Parker, Town of Barnstable, Property Management Coordinator
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Dick Thomas, Town of Harwich
Elizabeth Hude, Town of Harwich, Planning Department
Judi Weil, Town of Orleans, Chair of the Orleans Bike and Walkways Committee
John Fallender, Town of Orleans
Paul Tilton, Town of Sandwich
Sam Jensen, Town of Sandwich
Joe Rodricks, Town of Dennis
David Gardner, Town of Provincetown, Asst. Town Manager
Charleen Greenhalgh, Town of Truro, Asst. Town Administrator/Planner
Kathy Herrick, Town of Eastham, Eastham Bikeways Committee
Rob Micelli, Town of Mashpee, MassBike
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Terry Sheehan, Volpe Natl Transportation Systems Center, Community Planner

Robbin Bergfors, MA Dept. of Conservation and Recreation, Landscape Architect

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.