



Cape Cod National Seashore Integrated Parking and Transit Study



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PMIS 133881



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Report notes

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Executive Summary

The coast line of Cape Cod continues to change, due to tidal activity causing erosion and accretion, or build up of sand. Many of the beaches along the Lower/Outer Cape, which encompasses the Cape Cod National Seashore (Seashore) and the towns of Provincetown, Truro, Wellfleet, Eastham, Orleans, Harwich, Brewster and Chatham, have parking directly adjacent, either just beyond the dunes or on the cliffs just above the beaches. As the coastline shifts and experiences erosion, the parking areas are under threat of falling into the ocean or being covered by receding dunes.

The Seashore – which encompasses 43,500 acres of wetlands, dunes, woods, ponds, submerged lands – is responsible for most of the oceanside coastline on the Outer Cape and portions of the bayside in Truro and Wellfleet. The Park staff work with the adjacent towns, many of whom manage their own beaches or those within the Seashore boundary.

This study explores the possibility of shuttling visitors from remote parking locations to beaches as existing coastal parking disappears. The study assesses current and future beach parking availability, considering visitor demand and erosion potential, on the Lower/Outer Cape over a 20-year period, and identifies potential ways to maintain and improve access. The study focuses on identifying potential shuttle routes that would replace current beachside parking. While some consideration is made to connecting with existing transit services and other locations visitors may wish to travel from, the primary focus of this study is looking at alternatives to the existing coastal parking areas. The study focused on identifying existing parking areas or disturbed lands as potential parking areas and did not consider existing undisturbed lands. In addition to identifying potential routes, the study calculates the operating characteristics and costs that would be required to provide the shuttle service and makes recommendations as to which potential routes are most feasible from an operational perspective.

The study team worked with the Cape Cod National Seashore and the towns on the Lower/Outer Cape but did not reach out to each of the owners of the areas identified as potential parking areas. The Seashore and towns will have to contact and negotiate with the property owners if there is interest in implementing any of the shuttle routes. Guidance on the next steps required to implement any of the shuttle services is provided to assist the Seashore, towns, or other stakeholders in moving forward with implementing a shuttle service, but study does not make explicit recommendations regarding which services to implement or how exactly it should be done as there are many choices that need to be made at the local level before any given service can be implemented.

Study Area

The Project Team conducted an initial assessment of beach parking demand and erosion threat, as well as other Seashore and town activities and priorities, which led to a refined study area including beaches in the following groupings:

- Truro oceanside;
- Wellfleet oceanside;
- Eastham bayside;
- Eastham oceanside;
- Orleans bayside;
- Orleans oceanside; and
- Brewster bayside.

The list of beaches included for shuttle routes was further refined in later phases of the study, based on more in-depth demand and erosion analysis and shuttle operations analysis.

Parking Needs Analysis

Potential demand for shuttle service was determined by analyzing current use rates of beach parking areas, expected growth in demand and estimated erosion rates. Current demand for parking at each beach in the study area was estimated based on the total number of existing parking spaces and anecdotal

data provided by the Seashore and the towns regarding how frequently the parking areas are full (often, sometimes, or rarely). This analysis estimated parking demand for the current (2008) conditions and the future, based on 2030 population growth projections.

The erosion analysis used generalized, long-term erosion rates that coastal geologists agree can be applied to the Cape Cod shoreline. For the east-facing, oceanside bluff, geologists accept a rate of one meter per year as a conservative, high estimate for long-term bluff erosion. The west-facing, bayside bluff is estimated to erode at a rate of 0.5 meter per year, also a conservative, high estimate. In areas where shifting sand dunes are covering parking areas, the overall rate of dune migration is assumed to be equivalent to the erosion rate of nearby bluff. The report highlights the beaches for which the analysis did not follow these general assumptions. Using high-resolution aerial photography from 2008, the edge of the bluff was clearly discernable, allowing analysts to illustrate the inward migration of the bluff at 10-, 20-, and 30-year increments, based on the identified erosion rates. This method was employed to visualize the portions of the beach parking areas expected to be affected by erosion over the horizon of this planning study. For each beach, the Project Team used the illustrations to approximate a percentage of the parking area lost due to erosion over a 20-year period.

Beaches with an estimated future deficit of 15 or more spaces or a loss of 50 percent or more of the current number of parking spaces were further considered for potential shuttle routes. The analysis also calculated the total expected parking capacity or deficit within each town/coast grouping, as it may be more efficient to direct visitors to a single beach parking shuttle service, if the beach that it serves can accommodate additional visitors.

Potential Satellite Parking Area Identification

The Project Team used stakeholder input, geospatial analysis, aerial photography and site visits to identify potential satellite parking areas. Consistent with environmental goals to avoid additional land disturbance, this study focused on identifying existing underutilized parking areas and previously disturbed sites, though it did include some publicly owned undisturbed parcels in close proximity to beaches.

Fifty-two sites were described based on whether they were publicly or privately owned, the current use of the site, and the (estimated) number of spaces. While the Project Team tried to be as comprehensive as possible, privately-owned commercial areas were identified as examples of potential parking areas. Neither the Project Team nor other stakeholders contacted property owners of privately owned sites to inquire about potential use as satellite parking. Throughout the course of the study period, plans and use of some of the private and public parking areas have changed. These changes are documented where known; this highlights the need to monitor potential parking areas to be aware of current conditions and the potential for uses to change in order to reach out to lot owners at appropriate times. For the parking areas that were identified in the recommended future shuttle routes, the Project Team worked with the Cape Cod Commission to conduct a preliminary environmental review to identify major concerns associated with future use as satellite beach parking.

Shuttle Route Analysis and Recommendations

The shuttle route analysis primarily considered routes that would link one beach with one parking area, though there are examples of multiple beaches served by one route (e.g., in Brewster, Eastham bayside, and Wellfleet), or multiple parking areas serving one beach (e.g., Wellfleet). The Project Team identified and assessed potential parking areas for the beaches based on proximity to the beach, number of parking spaces, proximity to the main route, and other known or perceived limitations. Based on this list of parking areas, the Project Team developed a total of 36 routes, which serve 17 beaches (there are multiple potential routes to serve each beach), as well as a high level operations analysis for each potential route. In general, the identified routes represent the most direct travel between the parking area(s) and the beach(es).

The full list of routes also includes several “community shuttle” routes that would not necessarily link directly to satellite parking, but would collect visitors at commercial, lodging, and residential centers.

These routes would pick up passengers at their point of origin, thereby eliminating the visitors' need to drive for a portion of the trip to the beach. These routes could potentially operate independently or as an extension of another route connecting to satellite parking. Because these routes follow a different model than those based on beach parking demand, they are presented only with an overall operating cost per day rather than a per passenger cost. Potential ridership for these routes has not been estimated.

Based on the analysis of all potential routes, the Project Team recommended eight routes for further consideration. These routes do not necessarily serve every beach; visitors to the beaches not served by shuttle routes would be encouraged to visit an alternate location if they are unable to park at their original destination. The route recommendations are based on the professional judgment of the Project Team, considering the following issues:

- Beach management and location (NPS vs. town)
- Estimated cost per passenger
- Route distance and length
- Parking area ownership (public vs. private)
- Expected availability of parking areas in the short- and long-term
- Known local political issues and feasibility

Based on this analysis the study recommends eight routes in Wellfleet and Eastham for further consideration. The routes are shown and described in the table below.

**Table ES-1
Recommended Beach Shuttle Routes**

Route ID	Route Name	2028 Available Parking	2030 Parking Demand	2030 Satellite Spaces Needed	Spaces at Satellites	Total Town 2030 Unmet Demand	One Way Scheduled Travel Time (min)	Shuttle Vehicles	Route Miles (One Way)	Total Daily Cost	Cost per Pax	Cost per Pax All Town Demand
E-N1	Nauset Light - Nauset Regional High School	167	206	39	265	19	7	2	0.8	\$1,170	\$9.84	\$19.92
E-N1-N	Nauset Light - Wellfleet Motel/Lodge to Nauset Reg HS via Tilcon	167	206	39	-	19	14	3	3.2	\$1,755	-	-
E-NC	Nauset Light- Coast Guard - Route 6 via Tilcon	167	206	39	-	19	16	3	3.5	\$1,755	-	-
E-C1	Connection - Salt Pond Visitor Center and Route 6	650	669	19	-	19	6	1	1	\$585	-	-
W-M1	Ocean View Drive Shuttle	785	1192	407	Meets demand	366	19	3	3.3	\$1,755	\$1.40	\$1.56
W-M2	Wellfleet Ocean View Beach Loop	785	1192	407	146	366	21	5	4.6	\$2,925	\$6.50	\$6.50
E-F2	First Encounter – Elks Lodge / Hotels	175	241	66	80	101	12	2	2.3	\$1,170	\$5.77	\$4.75
E-F3	First Encounter – Visitation Church	175	241	66	100	101	12	2	2.7	\$1,170	\$5.77	\$3.80

Implementation Considerations

Finally, the study discusses some of the key implementation considerations related to operations, vehicles, financing, and satellite parking areas. The discussion outlines basic issues and questions to be considered and provides general information about such services. It does not provide an in-depth study of viability or service planning.

Conclusions and Next Steps

While some beach parking areas often fill up on the busiest weekends, most beaches currently have adequate parking. It is possible that erosion will happen slowly eliminating parking at approximately one

meter per year; or a catastrophic event will destroy all of a beaches parking in one storm. Since when exactly additional parking will be needed is unknown, it may make sense to begin some initial planning for routes sooner rather than later. For the highest priority routes, the Seashore and towns should monitor potential parking areas to take advantage of opportunities for securing satellite parking or seeking alternative parking options when the use of a potential parking area changes and becomes incompatible with beach shuttle parking.

While it is not explicitly focused on parking replacement, extending the existing Little Creek parking shuttle to the Visitor Center is the easiest follow-on to consider since it would rely on existing infrastructure and would be entirely operated and managed by the park service and would require minimal coordination with others. This route would allow visitors to access the beach by connecting to regional transit.

Another potentially straightforward next step would be to set up a memorandum of understanding with the Nauset Regional School District to use the high school parking area as a first pilot shuttle route to deal with existing over-capacity on peak weekends, presuming the beach can accommodate additional visitors. If after discussions with the School District, use of the high school parking area does not look like a feasible option, the Park Service should investigate the feasibility of working with Eastham to develop a parking area at the Tilcon site.

1 Introduction

The coast line of Cape Cod continues to change due to tidal activity causing erosion and accretion, or build up of sand. Many of the beaches along the Lower/Outer Cape, which encompass the Cape Cod National Seashore (Seashore) and the towns of Provincetown, Truro, Wellfleet, Eastham, Orleans, Harwich, Brewster and Chatham, have parking directly adjacent, either just beyond the dunes or on the cliffs just above the beaches. As the coastline shifts and erodes, the parking areas are under threat of falling into the ocean or being covered by receding dunes.

The Seashore is responsible for most of the oceanside coastline on the Outer Cape and portions of the bayside in Truro and Wellfleet. In addition, the Seashore coordinates with all of the towns on the Outer Cape, many of whom manage their own beaches or those within the Seashore boundary. The Lower Cape towns of Brewster and Harwich are included in the study scope as these towns are at the entry to the Outer Cape. The full study area is shown in

Figure 1 in the broader New England context, and in more detail in Figure 2.

One goal of the 1998 General Management Plan (GMP) that guides management of the Seashore is to “allow natural shoreline processes to take place unimpeded, while also counteracting human-caused disturbances.” This limits the interventions that the National Park Service (NPS) will conduct in order to save the existing parking facilities. As existing parking areas may become unusable due to erosion, the GMP encourages identification of alternative sites that limit the environmental impact, including prohibiting development on sensitive resource areas.

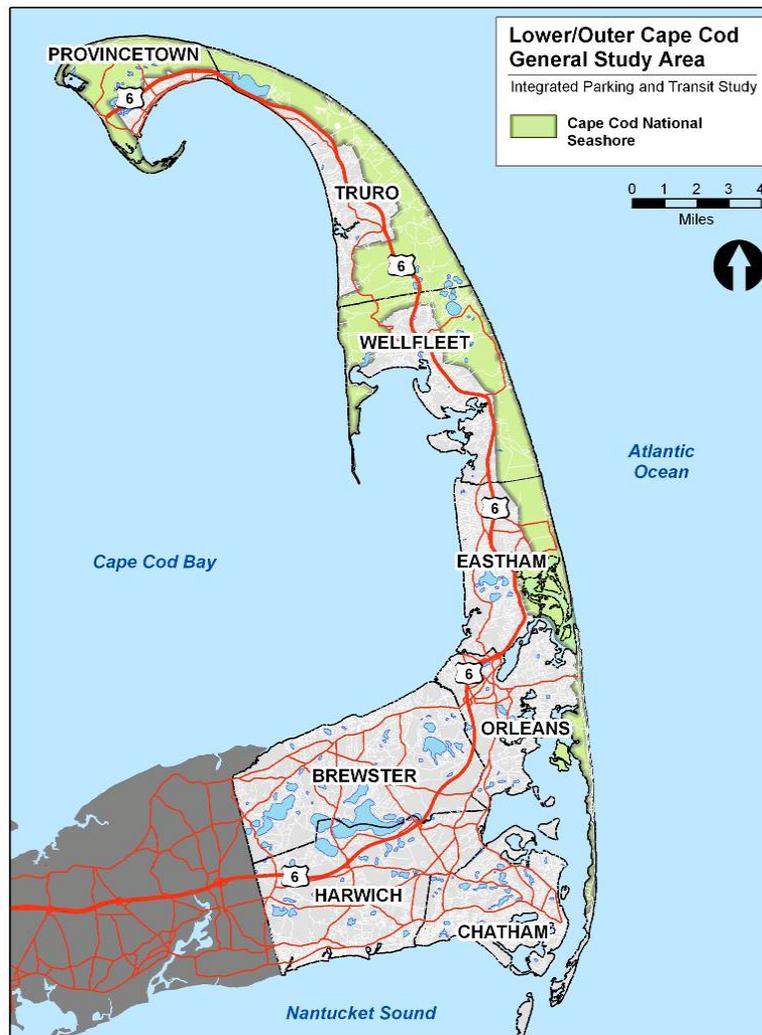
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The study team worked with the Cape Cod National Seashore and the towns on the Lower/Outer Cape but did not reach out to each of the owners of the areas identified as potential parking areas. The Seashore and towns will have to contact and negotiate with the property owners if there is interest in implementing any of the shuttle routes. Guidance on the next steps required to implement any of the shuttle services is provided to assist the Seashore, towns, or other stakeholders in moving forward with implementing a shuttle service, but study does not make explicit recommendations regarding which services to implement or how exactly it should be done as there are many choices that need to be made at the local level before any given service can be implemented.

Figure 1
Study Area in Relation to Region



Figure 2
Lower/Outer Cape General Study Area



1.1 Approach

This report focuses on the beaches managed by the Seashore and each of the towns within the Seashore boundary, differentiating between beaches located on the bayside or the oceanside of the Lower/Outer Cape and recognizing that the beach management approach and regulations vary significantly depending on the entity with management responsibility. The scope of the study initially included all public beaches in the Lower/Outer Cape, but as the study progressed, beaches in Chatham, Harwich, Provincetown and finally Orleans were removed from the analysis and no shuttle routes were considered for these towns. The report provides information as to why each of the areas was eliminated from the analysis at the point that the decision was made.

Where available, the Project Team used existing data to better understand current conditions on the Lower/Outer Cape. Because limited data exists on historic use of facilities, the Project Team relied on qualitative information provided by stakeholders; throughout the course of the study, stakeholders provided a wealth of information regarding current and future conditions as well as political feasibility of various concepts. In addition to points of contact within the Seashore and each town, the Volpe Center worked with the Cape Cod Commission and Cape Cod Regional Transit Authority (RTA) and coordinated with other concurrent research projects including studies examining Intelligent Transportation Systems (ITS), bicycle, and satellite vehicle maintenance facility options. Outside

resources, including Graham Geise, a coastal geologist at the Provincetown Center for Coastal Studies, were contacted when additional technical information was needed.

Primary project coordination took place with the Seashore and Cape Cod Commission through biweekly conference calls. Outreach activities with the towns and the RTA comprised primarily of email updates and requests for review of interim reports, individual and group meetings, and several other public and stakeholder meetings.

1.2 Report Organization

The purpose of this report is to explore and analyze alternate parking areas and potential shuttle routes to maintain visitor access to the beaches of the Lower/Outer Cape while minimizing expansion of parking to undisturbed natural areas. The organization of the report is as follows:

- Chapter 2 summarizes the existing physical conditions of the Lower/Outer Cape and provides initial information on current use of beach parking facilities.
- Chapter 3 estimates current and future need for beach parking facilities, and also estimates future erosion and availability of parking at each of the beaches included in the study.
- Chapter 4 begins to identify potential satellite parking areas, focusing on existing parking areas or previously disturbed lands, and provides initial environmental information about some potential sites.
- Chapter 5 identifies and analyzes potential shuttle routes connecting satellite parking areas to beaches, and
- Chapter 6 discusses several implementation issues for the Seashore and towns to consider in planning shuttle routes or other future access improvements.

2 Existing Conditions

This chapter discusses existing conditions related to beaches, beach parking, and transportation facilities for the Cape Cod National Seashore and the towns included in this study.

2.1 Cape Cod National Seashore

The U.S. Congress authorized the Cape Cod National Seashore (the Seashore) in 1961. According to the Seashore's General Management Plan, the authorization "was an attempt to conserve a fragile and precious resource that overlays six established communities so that residents and visitors alike may enjoy it for generations to come." The Seashore's purpose is to "preserve the nationally significant and special cultural and natural features, distinctive patterns of human activity, and ambience that characterize the Outer Cape, along with the associated scenic, cultural, historic, scientific, and recreational values," as well as "provide opportunities for current and future generations to experience, enjoy, and understand these features and values both the natural environment and the cultural character of the Cape".¹ Based on these notions, NPS is charged with protecting both the natural and cultural or recreational resources of the Cape, two goals that are deeply interconnected but not always compatible.

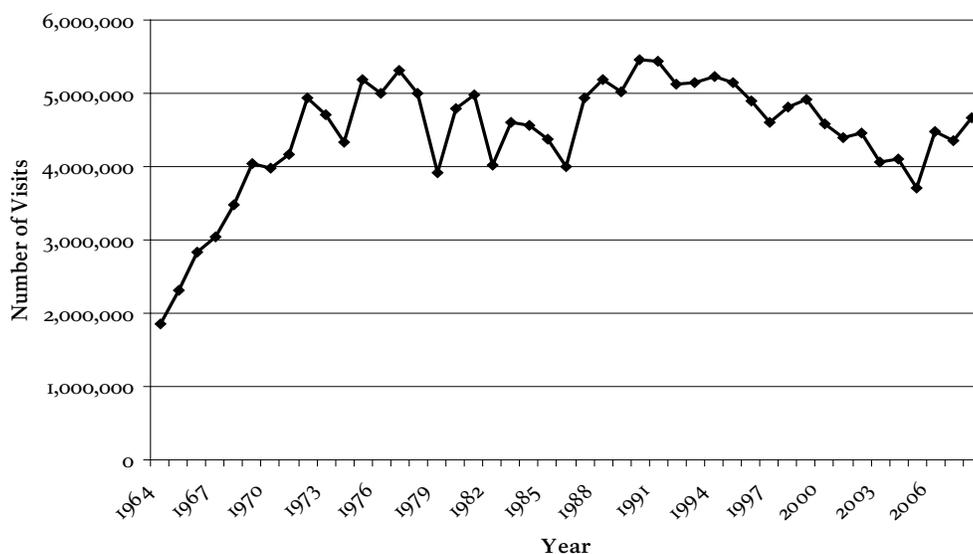
The Seashore encompasses over 43,500 acres of wetlands, dunes, woods, ponds, submerged lands, and shoreline. In addition to recreational facilities, historic sites, and interpretive centers, the Seashore manages six beaches (from north to south): Race Point Beach (Provincetown), Herring Cove Beach (Provincetown), Head of the Meadow Beach (Truro), Marconi Beach (Wellfleet), Coast Guard Beach (Eastham), and Nauset Light Beach (Eastham).

Visitation to the Cape Cod National Seashore

The Seashore reports an average of four to five million annual visits, more than half of them during the summer.² Each visit is counted separately; repeat visits by the same people are all counted as individual visits. Figure 3 provides annual visitation data over the past several decades; Figure 4 provides monthly visitation data over the past five years. Some of the variation in visitation is likely due to changes in methodology for how traffic was counted by the Seashore, in addition to weather, the economy, and national or regional external events.

Figure 3
Annual Visitation to Cape Cod National Seashore (1964-2008)

Source: NPS Public Use Statistics Office, <http://www.nature.nps.gov/stats/>



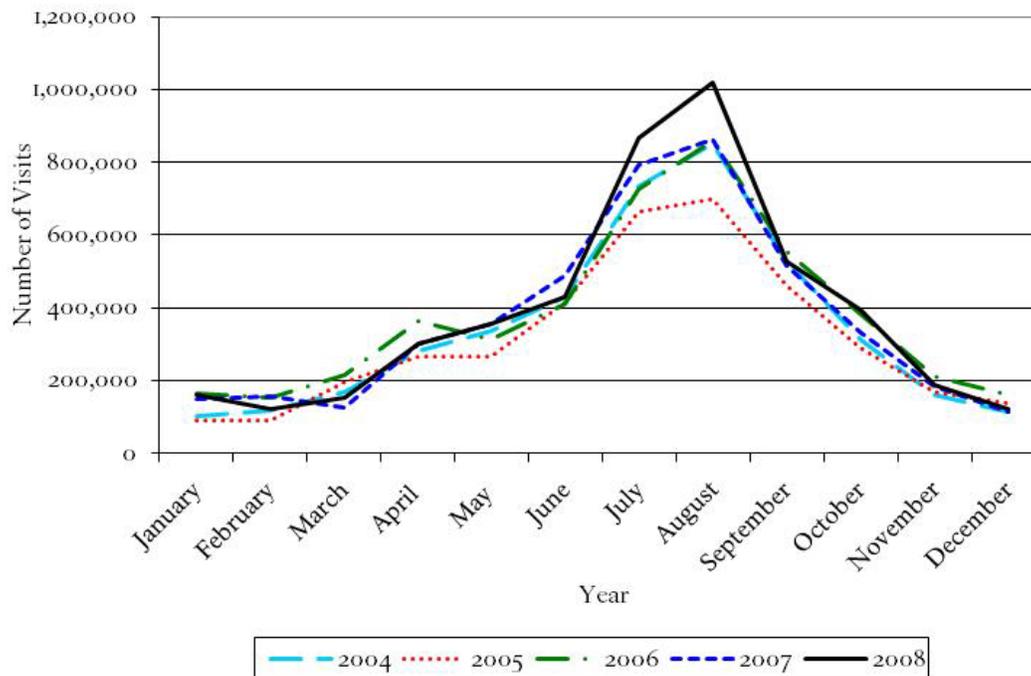
¹ Cape Cod National Seashore General Management Plan. National Park Service. 1998.

² NPS Public Use Statistics Office, <http://www.nature.nps.gov/stats/>

Figure 4

Cape Cod National Seashore Monthly Visitation for the Last 5 Years (2004-2008)

Source: NPS Public Use Statistics Office, <http://www.nature.nps.gov/stats/>



The Seashore currently does not have the ability to count the number of visits by foot or bicycle, and as there are multiple possible points of entry by foot or bicycle, it would be impossible to monitor all of these locations. Anecdotal observations suggest that the numbers would be of some significance, especially visits by bicycle to Herring Cove, Race Point, Coast Guard, and Head of the Meadow, all of which have direct connections to bicycle trails. In addition, all but the Truro and Provincetown NPS beaches are connected by road to the Cape Cod Rail Trail. The Cape Cod Regional Transit Authority’s Provincetown-Truro Shuttle provides transit access to Herring Cove and Race Point beaches; however, because the visitors are considered “walk-ins,” there are no records of how many visitors arrive by the shuttle.

2.2 Lower/Outer Cape Towns

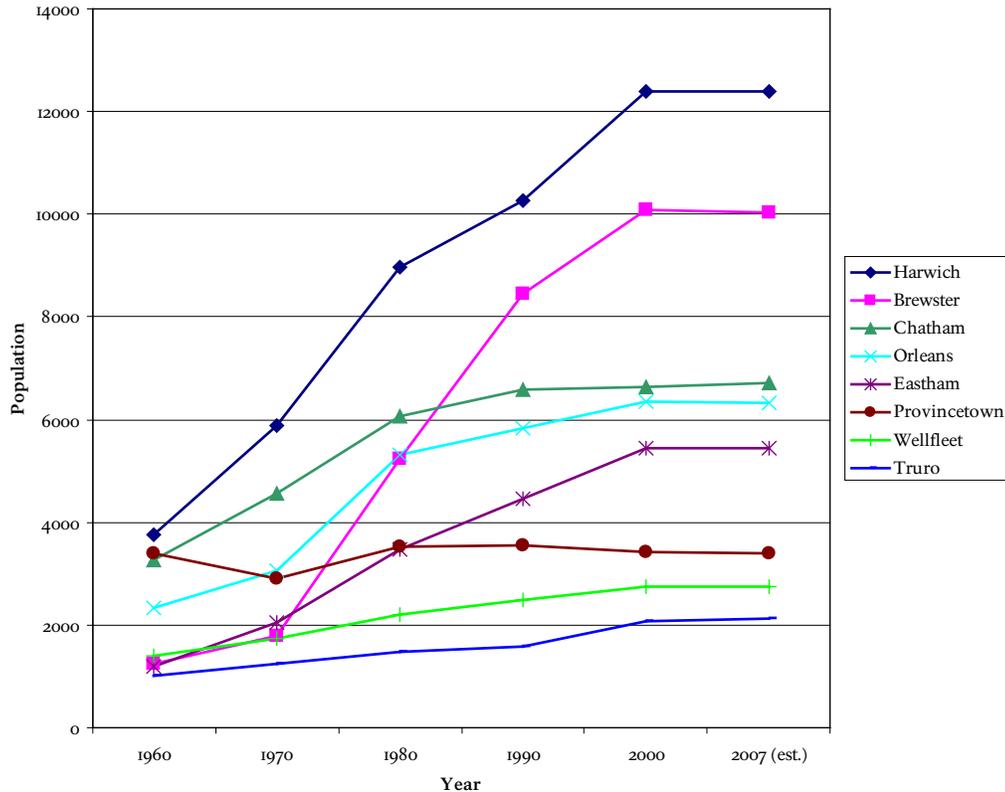
There are eight towns initially included in this study – Provincetown, Truro, Wellfleet, Eastham, Orleans, Harwich, Chatham, and Brewster. The following sections provide basic information about the towns.

Population and Demographics

Figure 5 displays growth in the year-round population in each of the towns since 1960. While estimates suggest that population growth on the Lower/Outer Cape has slowed in recent years, it is clear that each town has experienced significant growth in the past several decades. The higher population has placed pressure on the transportation network and local infrastructure and increased demand for services for beach access.

Figure 5
Lower/Outer Cape Town Population

Source: U.S. Census



Much of the land on Cape Cod is designated for protection and preservation of natural and cultural resources. Though these lands are often considered amenities, their regulation constrains opportunities for growth and land development in an area that is already physically constrained. Within the Seashore boundaries, in particular, there are complex property issues due to the presence of town lands and private residences within the Seashore boundaries. In addition to the constraints created by protected lands, growth on Cape Cod is also limited by its sole source aquifer and the resulting availability of fresh water. Consequently, groundwater and run-off issues are of primary importance.

Tourism and Visitation

Cape Cod is a major tourist destination. In addition to a large number of second homes, the Cape welcomes visitors with numerous rental homes, hotels, bed and breakfasts, campgrounds, restaurants, shopping districts, recreational facilities, and other tourist amenities. Tourism is the largest industry on the Cape, and each town relies heavily on the income generated by out-of-town visitors. The towns and the Cape Cod National Seashore depend on each other for sustaining tourism, with the Seashore providing natural, cultural, and recreational amenities and activities, and the towns providing lodging and other conveniences and attractions.

A relatively small percentage of residents remain on the Cape year-round, but the population grows significantly in the summer. The 2000 U.S. Census categorized approximately half of the housing units on the Lower/Outer Cape as seasonal, recreational, or in occasional use.³ These units include beach cottages and time-sharing condominiums. Much of the future population growth is expected to come from

³ 2000 U.S. Census, Summary File 3. American Factfinder. <http://factfinder.census.gov>

seasonal residents becoming year-round residents of the Cape Cod towns. This type of residential growth would be largely supported by existing housing stock, though it could stress other infrastructure systems.

Visitation estimates vary and are based on a variety of measures, including traffic counts and lodging occupancy rates. A 2000 Cape Cod Commission report estimated that over five million tourists visit Cape Cod each year and nearly two thirds (65 percent) of all visitors arrive in the summer and early fall.⁴ The same report estimates that the addition of seasonal residents and visitors triples the population on Cape Cod from winter to summer. Over the past decade, the Cape Cod National Seashore has averaged between four and five million visits annually, with 60 percent of those visits coming during the peak season of June through September.⁵ The increased population strains local infrastructure, primarily roadway capacity and water supply, in ways that are not experienced during the off-season.

2.3 Transportation on the Lower / Outer Cape

This section provides an overview of the existing road network, transit systems, and non-motorized transportation networks on the Lower/Outer Cape.

Roads and Highways

Cape Cod has an extensive network of roads and highways, most of which are small, residential roads owned and maintained by the individual towns. The major routes of the Lower/Outer Cape are 6, 6A, and 28, all of which are owned and maintained by the Massachusetts Department of Transportation (MassDOT). Seventy percent of the Lower/Outer Cape's roadway mileage is comprised of local roads, while 30 percent of the mileage is arterial and collector roads, by functional class.⁶

U.S. Highway 6 is the only continuous north-south route serving the Lower/Outer Cape and is also the only access route from the Upper Cape. Consequently, it bears the load of almost all local and regional travel. While Route 6 is generally able to accommodate both local and regional traffic in the off-season, there are often high levels of congestion during the summer months.

There are two distinct sections of Route 6 within the project study area. Through Harwich, Brewster and continuing to the rotary in Orleans, Route 6 is a two-lane, limited access highway with a raised median and yellow reflective posts. Passing is prohibited on this section. Between the Orleans rotary and Truro, Route 6 is a fully accessible highway with curb-cuts and two to four travel lanes. The portion in Provincetown is again limited-access. It has been noted by several Cape Cod residents and officials that traffic on Route 6 and other major thoroughfares increases when the weather is poor and people turn to attractions and activities other than the beaches.

Public Transportation

There are several public and private transportation options available in the Lower/Outer Cape towns included in the study area, though they currently provide limited access to beaches. The public transportation services are described in this section.

Cape Cod Regional Transit Authority

Cape Cod Regional Transit Authority (RTA) is the public transportation provider for Cape Cod. In addition to a number of systems serving the more densely populated towns of the Mid/Upper Cape, RTA has three routes that operate within the eight Lower/Outer Cape towns, as well as demand response service. Fares for the three fixed route services are \$2.00 for a one-way ride, with seniors and people with disabilities paying half of the regular price. There are pass and multi-ride card options that reduce the cost for frequent riders.

Flex Route

In 2006, the RTA began operating the Flex system on the Lower/Outer Cape, supported by funding through the Cape Cod National Seashore and the participating towns. Flex is the primary transit system

⁴ Cape Cod Commission. Help! Wanted Cape Cod's Seasonal Workforce. 2000. <http://www.capecodcommission.org/econdevel/seasonalworkforce.pdf>

⁵ NPS Public Use Statistics Office, <http://www.nature.nps.gov/stats/>

⁶ Cape Cod 2007 Regional Transportation Plan.

for the study area. Consisting of a fixed route integrated with a flexible, on-demand concept, the Flex bus adheres to a set route and schedule, but is able to deviate up to $\frac{3}{4}$ mile from the established route upon reservation. The fixed route begins in Harwich, and continues through Brewster, Orleans, Eastham, Wellfleet, Truro, and Provincetown.

Flex operates on two seasonal schedules: in summer, it runs seven days a week, from early morning through late evening, and in the winter it runs six days a week, with no Sunday service. The ridership during the summer season is significantly higher than the rest of the year; the monthly ridership for July and August exceeds 12,000 each month, while November through May, ridership is below 4,000 per month. There is an additional \$2.00 one-way charge for an off-route trip (seniors and people with disabilities pay half of the whole trip price).

Hyannis-to-Orleans

The Hyannis-to-Orleans (H2O) Breeze Line is a fixed route serving Harwich, Chatham, and Orleans, in addition to other towns beyond the study area. Like Flex, H2o runs seven days a week during the summer, but eliminates Sunday service during the off-season. Of the transportation systems that serve the Lower/Outer Cape, H2o has the highest annual ridership and serves three of the four most-populated Lower/Outer Cape towns. Its ridership is not as seasonal as the Flex but it does have higher ridership during the summer, with a dip November through March.

Provincetown-Truro Shuttle

The Provincetown Shuttle is seasonal bus line running from North Truro to Provincetown during the summer and fall months (May through October).

B-Bus/Dial-a-Ride Transportation

The RTA operates a demand-response service, B-Bus, which employs on-demand vehicles for specific pick-up and drop-off locations scheduled by the rider. B-Bus riders must schedule rides in advance in order to use B-Bus services. Estimated B-Bus ridership for the Lower/Outer Cape communities is fairly constant throughout the year, ranging from 2,500-3,500 per month. One-way trips cost \$3.00 or \$1.50 for seniors and people with disabilities. Multi-ride passes are also available at a discount.

Private Transportation Providers

Private bus, airline, and ferry companies also provide transportation to the Cape and, in some cases, within Cape Cod. The Plymouth & Brockton Street Railway Co. (P&B) offers daily bus service between Downtown Boston and Logan Airport and Cape Cod, with service all the way to Provincetown. The service is primarily used for commuters or for access to the airport. Monthly ridership averages 3,500, ranging from 5,000 in the summer to 2,000 in the winter.

Bay State Cruise Company and Boston Harbor Cruises provide ferry service between Provincetown and Boston daily May or June through September or October; there is also ferry services between Provincetown and Plymouth. In 2007 the estimated ferry ridership out of Provincetown was 140,000.⁷ The Provincetown Municipal Airport,⁸ operated by the Town of Provincetown on land leased from NPS, serves Cape Air and JetBlue airlines.⁹

The total ridership, or one-way trips, for each service for 2007 is shown in Figure 6; the ridership shown for the B-Bus, which is a Cape-wide service, is an estimate for the Lower/Outer Cape communities. Monthly ridership in 2007 is shown in Figure 7.

⁷ Estimate provided by Bay State Cruise Company referencing the total revenue received by the Town of Provincetown from the embarkation fee charged per ferry passenger.

⁸ Cape Air website. www.capeair.net

⁹ Airport Master Records and Reports. GCR & Associates, Inc. and Federal Aviation Administration Aeronautical Information Service. <http://www.gcri.com/5010web/default.cfm>

Figure 6
2007 Total Ridership by Service

Source: Cape Cod Regional Transit Authority

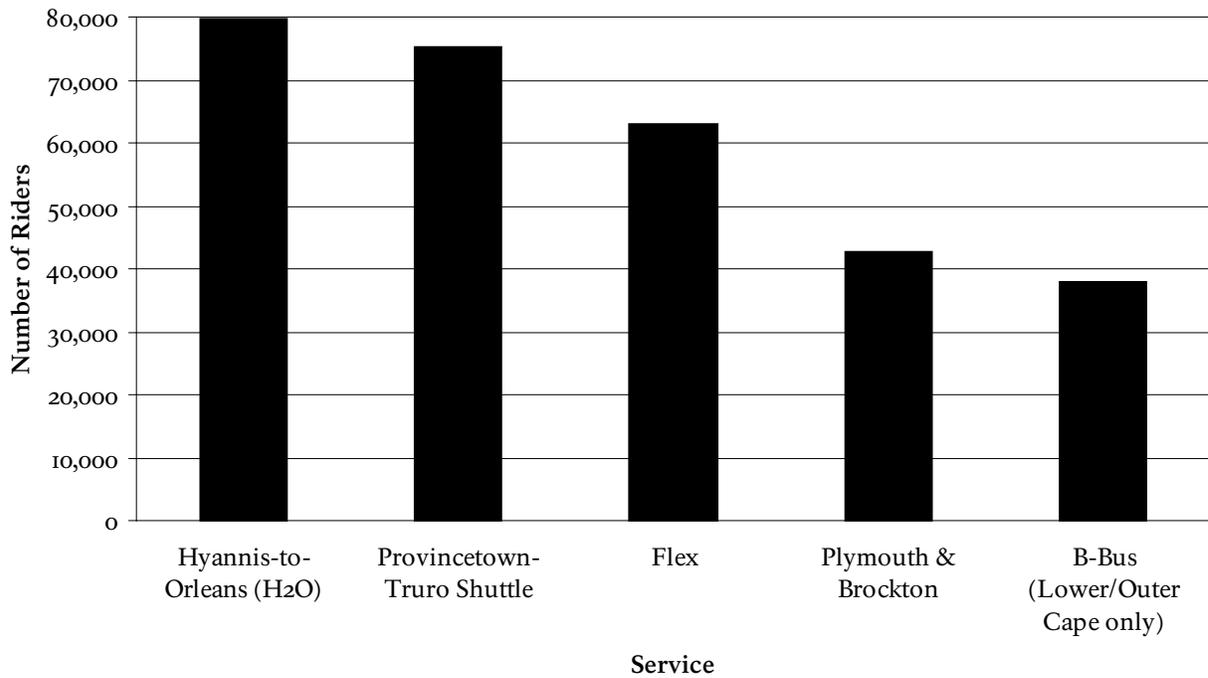
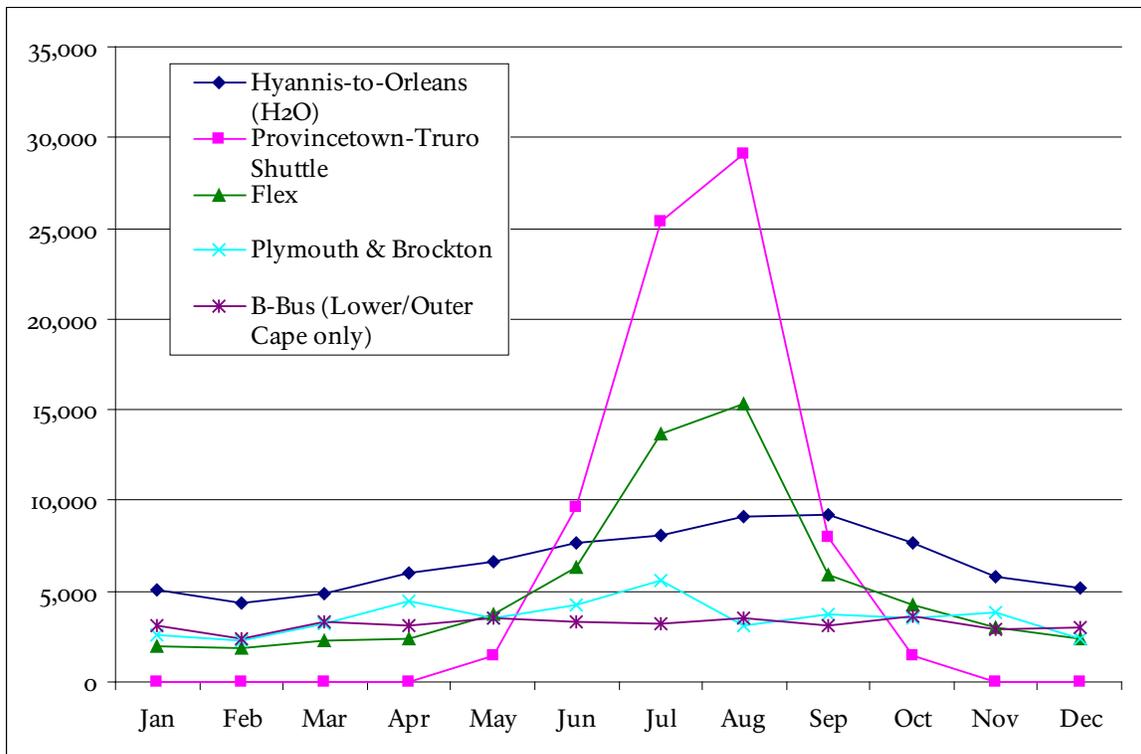


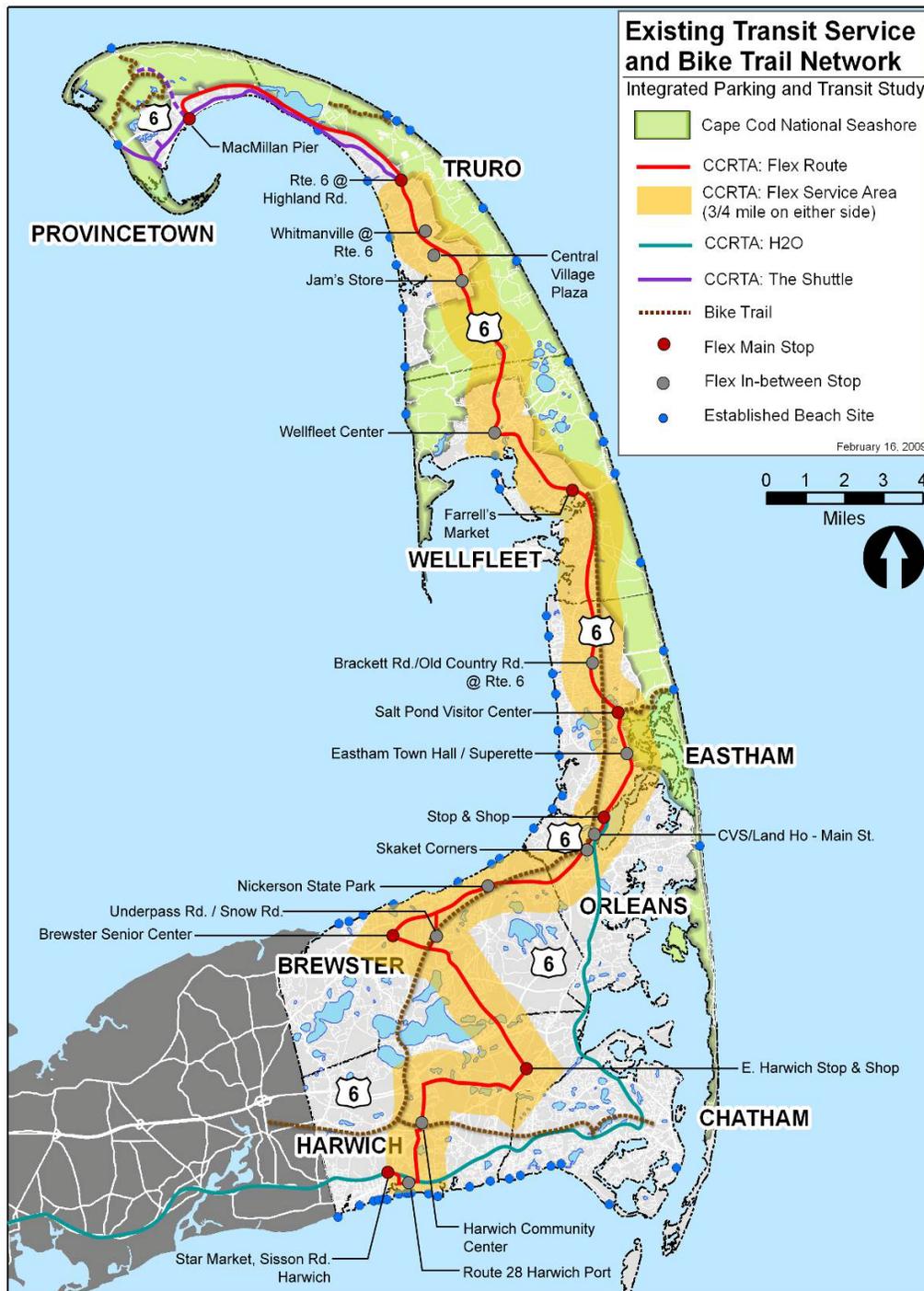
Figure 7
2007 Monthly Ridership by Service

Source: Cape Cod Regional Transit Authority



The RTA routes and the bike trail network, discussed in Section 2.3.3, are shown in Figure 8.

Figure 8
Existing Transit Service and Bike Trail Network



Nonmotorized Transportation

Cape Cod bicyclists and pedestrians are served by a network of paved trails, state-designated bicycle routes, and sidewalks.

Cape Cod Rail Trail

The Cape Cod Rail Trail is a converted rail grade that runs from Dennis (just west of the study area) to Wellfleet, passing through Harwich, Brewster, Orleans, and Eastham. It includes a spur from Harwich to

Chatham. The main line of the trail is 21.9 miles and the Chatham Branch is 6.2 miles. The Massachusetts Department of Conservation and Recreation (DCR), the owner and maintainer of the trail, estimated that 400,000 people use the trail annually.¹⁰

Nauset Trail

The Nauset Trail is a multi-use bicycle trail that runs 1.9 miles between the Salt Pond Visitor Center and Coast Guard Beach. It is owned and maintained by the Seashore.

Province Lands Trails

The Province Lands Trails are a system of trails in the dunes of the Race Point area of the Seashore. These paths were constructed before the establishment of design standards for bicycle trails, and are often too steep and/or curvy. The maximum speed on these trails is 10 miles per hour. The loop trail is 5 ½ miles long and there are three spurs: Herring Cove (1 mile one-way), Race Point Beach (1/2 mile one-way) and Bennett Pond (1/4 mile one-way). The system is owned and maintained by the Seashore.

Head of the Meadow Trail

Located in Truro and within the Seashore, the Head of the Meadow Trail is a multi-use bicycle trail that connects Head of the Meadow Road to High Head Road. It is used primarily for recreation purposes and is owned and maintained by the Seashore. It is two miles long.

Self-Guided Nature Trails

The Seashore and some of the towns also have several self-guided nature trails that provide opportunities to enjoy the natural and cultural features of the area. NPS trails include the Fort Hill Trail, Buttonbush Trail, Doane Trail, the Red Maple Swamp Trail, and the Nauset Marsh Trail in Eastham; the Atlantic White Cedar Swamp Trail, and Great Island Trail in Wellfleet; the Pilgrim Spring Trail, Small's Swamp Trail, and Pamet Area Trails in Truro; and Beech Forest Trail in Provincetown.

Sidewalks

More than 90 percent of Cape Cod roads do not have sidewalks¹¹. Many of the roads without sidewalks are located in residential and/or non-urban neighborhoods, where traffic is light. Some areas, however, are considered unsafe due to lack of sidewalks, and in places like Harwich, these areas include beaches that might otherwise be easily accessed by foot.

Claire Saltonstall Bike Route

The Claire Saltonstall Bikeway, also known as the Boston to Cape Cod Bikeway, runs from Boston to Provincetown. The 135-mile route, marked as Bicycle Route 1, mostly uses back roads and bike paths, with occasional stretches of secondary highways. It features signs with a picture of a bicycle in a green background and the green number 1.

Beach Access

Some beaches are accessible by transit or nonmotorized modes, while for others, primary access is by personal automobile. Many of the town-managed beaches are located within walking distance of residential neighborhoods. Several NPS-managed beaches are accessible by improved bicycle or pedestrian trails, and in some cases (such as Coast Guard Beach and Head of the Meadow Beach), the trails are connected to non-fee parking areas.

The NPS-managed Herring Cove and Race Point beaches and Province Lands Visitor Center in Provincetown are serviced by the Provincetown-Truro Shuttle (public) during summer months; the Province Lands Visitor Center is also served by the Provincetown Trolley (private) during the summer. The NPS Coast Guard Beach in Eastham is served by a free shuttle from the Little Creek parking area. In the summer, the beach is not accessible to the general public by car (there are some spaces at the beach reserved for visitors with disabilities and Eastham residents); visitors must park at Little Creek and ride the shuttle to the beach.

¹⁰ Cape Cod 2007 Regional Transportation Plan.

¹¹ 2007 Massachusetts Road Inventory File

This study will identify potential shuttle routes that could serve beaches; in some cases a shuttle route may not be appropriate, but enhanced pedestrian and bicycle facilities could improve access to the beaches. The Seashore has recently completed a study identifying bicycle project priorities for the Cape. The recommended shuttle routes from this study should be evaluated against the bicycle priorities to determine the best way to improve beach access.

2.4 Coastal Erosion on the Lower / Outer Cape

Cape Cod, the world's largest glacial peninsula, is largely composed of materials deposited by retreating glaciers approximately 15,000 years ago. The resulting dynamic landform consists of windswept beaches and forested uplands, sheer bluffs and rolling dunes, freshwater ponds and saltwater marshes. For its entire existence, Cape Cod's coastline has experienced significant physical change, a result of inevitable coastal processes shaped by winds, waves, tides and currents. In recent times, it has been recognized that human efforts to minimize coastal change have proven ineffective and may even create or exacerbate problems elsewhere along the coast. Sea-level rise is another issue that will likely impact the Cape's low-lying areas, but the relative rise in sea level will depend on subsidence and other coastal processes. Scientists do not yet know the impact that climate change will have on storm frequency or severity.

Much of the Lower/Outer Cape's coastline is defined by bluffs and dunes. Bluffs, also known as sea cliffs, are glacial escarpments that are stable on the surface but prone to erosion and undermining. Dunes are sensitive sand hills whose stability relies on fragile vegetative systems. Dunes often act as a buffer for marshes and lowlands, but when stability is compromised, they migrate, leaving some areas unprotected and other areas covered in sand.

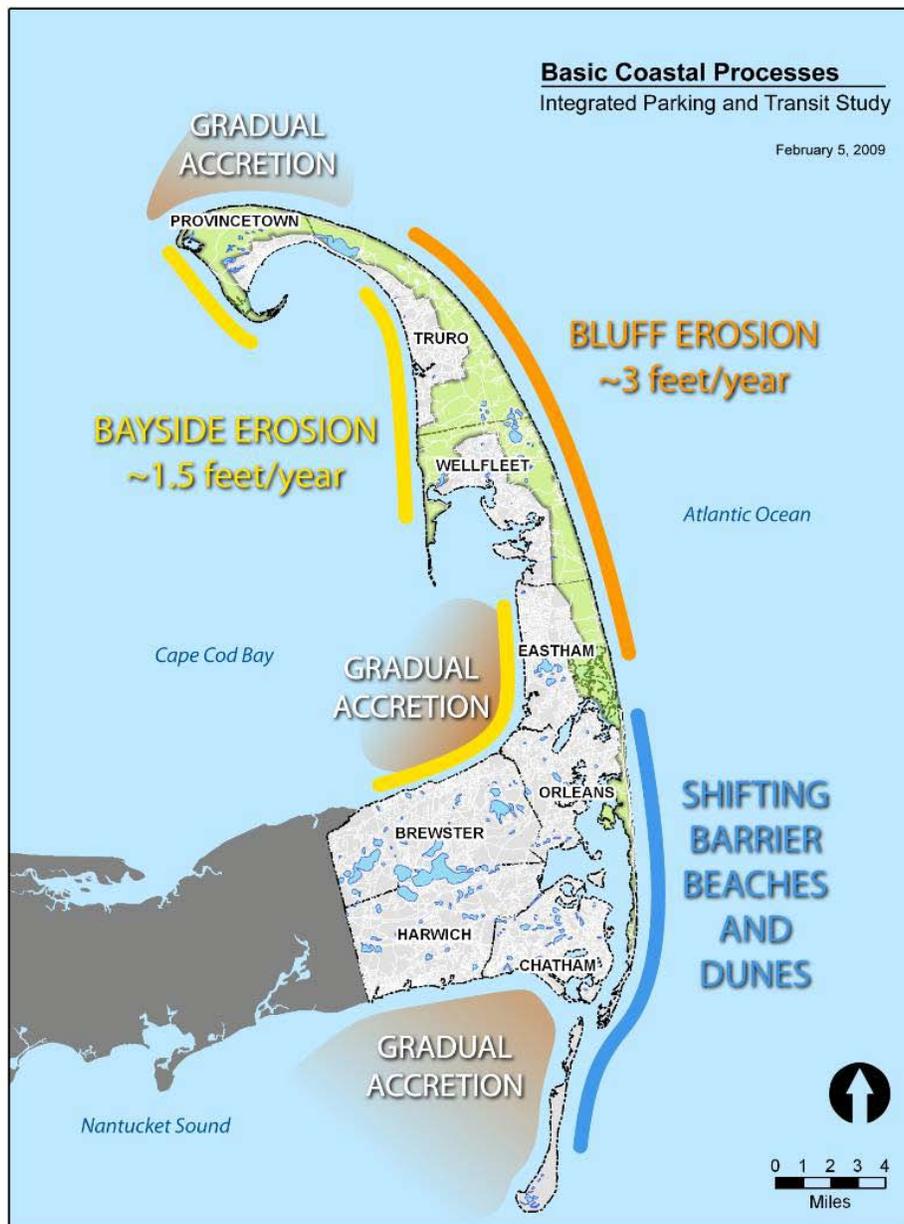
The Cape Cod bluff runs nearly continuously along the eastern coast from the NPS Coast Guard Beach in Eastham to Head of the Meadow Beach in Truro. Cape Cod's erosion experts estimate that the oceanside bluff loses approximately 0.8 meters (or roughly three feet) annually to erosion. In some cases, the bluff may lose much more than three feet at a time, but after a significant erosive event, the land may stabilize for many years before becoming vulnerable to erosion again. While storms during the winter and spring of 2010 caused more substantial erosion of beaches and damage to infrastructure than in previous years, such effects are not expected to alter the overall rates and trends.^{12, 13}

Figure 9 illustrates some of the major coastal processes that are occurring on the Lower/Outer Cape. This study is concerned with site-specific erosion issues at each of Lower/Outer Cape's established beach sites, and their effect on beach access and parking. At the same time, however, it is important to recognize that depending on a beach's location, multiple short-term and long-term coastal processes are taking place at each beach site. For example, in addition to erosive forces, a few areas are also experiencing accretion, or the gradual buildup of land caused by the steady deposition of sand and sediment by ocean currents. Thus, both erosion and accretion are taking place on different time scales at several beach sites in these areas.

¹² "Cape Cod Landforms and Coastal Processes." Cape Cod Cooperative Extension and the Woods Hole Oceanographic Institution Sea Grant Program.

¹³ Giese, Graham and Mark Adams. Telephone interviews. December 11, 2008 and January 26, 2009.

Figure 9
Basic Coastal Processes



2.5 Beaches Included in this Study

This section identifies and introduces the beaches that are initially considered in this study, describes fees and permits, and provides information about the beaches and parking areas included in this study, by jurisdiction.

Beaches are important to Cape Cod, for both residents and visitors. Much of the Cape is outlined by white sand and beaches are located either on the Atlantic Ocean, the Cape Cod Bay, or the Nantucket Sound. Beach sites vary in the facilities and amenities they offer – some provide only a small, unpaved parking area, whereas others have lifeguards, concessions, restrooms, and hundreds of paved parking spaces. Availability of parking at the beaches is not the only significant factor in visitors' selection of which beach to visit or whether to visit beaches at all. Other determining factors include the weather, wave strength, width of the beach, availability of stairs or steepness of the dunes, and the desired activity of the visitors –

oceanside beaches offer surfing and other opportunities while bayside beaches offer warmer, calmer water with opportunities to explore tidal pools. Depending on the desired experience, some beaches may be more attractive at different times of day or for families with small children.

Each town defines beach areas differently, making it difficult to determine the exact number of beaches on Cape Cod; the Project Team worked together with representatives from each of the towns to identify the list of beaches considered in this study. In general, the beaches evaluated for parking area capacity and potential erosion are publicly-accessible, have some parking capacity, are located within the defined study area, and are managed by either a town or the Seashore. Thus, each of the Lower/Outer Cape beaches can be broadly categorized into one of three groups:

- Beach and beach facilities located within the Seashore boundaries, and managed by NPS.
- Beach and beach facilities located within the Seashore boundaries, but managed by the town in which the beach is located.
- Beach and facilities not located within the Seashore boundaries, and managed by the town in which the beach is located.

Figure 10 shows the beaches that were initially considered in this study. The beach names and locations were derived from publicly-available geospatial data. This study does not include beaches at inland freshwater or marine ponds. Through discussions with the towns, the Seashore, and other stakeholders, this list was initially refined based on the risk of erosion and frequency with which the parking area is filled to capacity. The first round of refinements is included in the following sections describing the beaches in each town. Further refinements, based on more in-depth analysis, will be noted in later chapters.

Figure 10
Lower/Outer Cape Cod Beaches

Source: Massachusetts Office of Geographic and Environmental Information. <http://www.mass.gov/mgis/>



Fees and Permits

The majority of Cape Cod beach-goers access the beach by car, and parking is usually available at each beach with a valid permit or paid entrance fee during summer day-time hours. Beach parking fees are an important source of revenue for the Seashore and the towns. They may fund lifeguards, beach facilities, and in some cases may fund other, non-beach related expenses.

In each Lower/Outer Cape town (with the exception of Provincetown), residents and non-resident taxpayers pay for or receive a seasonal permit while other visitors must purchase a daily, weekly, or seasonal permit (see Table 1). Provincetown does not have any town beaches that require specific parking permits; all publicly-accessible beaches are either NPS-owned or are served by general municipal parking facilities. While many of the beaches are often accessed by car, some beach-goers arrive by foot, bicycle, or public transportation. For town beaches, there is no fee system in place for those who do not park a car; for NPS beaches, there is a \$3.00 entrance fee for pedestrians, bicyclists, and motorcyclists, though enforcement is inconsistent.

The fee for each type of permit varies for each town; Table 1 shows the types of permits and costs by town as of 2008. Permits are generally required for weekends May through October and daily June through September.

Table 1
Cost and Number Sold by Type of Permit for each Town (2008)

Source: Town staff

Type of Permit	Cost / Count	Truro	Wellfleet	Eastham	Orleans	Brewster	Harwich	Chatham
Daily	Cost per vehicle	\$10	\$15 (3-day \$35)	\$15	15 (\$5)**	\$15	\$15	\$15
Daily	Cost per pedestrian, bicyclist, or motorcyclist	Free	Free	Free	Free	Free	Free	Free
Daily	Count (vehicle only)	1,240*	7,980 (3-day 1,797)	6,988	42,996	Not available	2,136	8,220
Weekly	Cost	\$30	\$70 (\$120 for 2 weeks)	50 (\$90 for 2 weeks)	\$50	\$50	\$55	\$60
Weekly	Count	1,240*	4,265 (1,120 for 2 weeks)	1,723 (280 for 2 weeks)	1,548	Not available	649	750
Seasonal	Cost	\$30-\$150	\$225	\$135	\$110/\$150***	\$125	\$125	\$125
Seasonal	Count	4,400	159	97	114/128	Not available	43	126
Annual (residents and non-resident tax-payers)	Cost	\$10	\$15	\$15	Free	\$5	\$20	Free
Annual (residents and non-resident tax-payers)	Count	2,402	5,722	7,423	8,567	Not available	7,916	4,932

* Truro received \$34,000 in revenues for daily and weekly permits in 2008; the estimated accounts assume that equal numbers of each were sold.

**Lower charge is for pre-season (5/24-6/8) and post-season (9/6-9/21)

***Visitors staying in Orleans are given a discount and pay \$110; visitors staying elsewhere pay \$150.

As shown in Table 2, the Seashore offers similar types of permits, which are valid at any of the NPS beaches. NPS also participates in several national permits that the towns do not. Coast Guard Beach is not accessible to the general public by car during the summer; visitors must park at the Little Creek parking area and ride a shuttle a short distance to the beach. Payment is collected at Little Creek and the shuttle ride is free. There is a separate parking lot with a limited number of spaces reserved for Eastham town residents located within walking distance to the beach, which is used during the summer under an agreement between the town and NPS.

Table 2
NPS Permits (2008)

Source: Cape Cod National Seashore

Type of Permit	Cost	NPS (Sales)	NPS (Entrances)
Daily (per vehicle)	\$15	57,539	57,539
Daily (per pedestrian, bicyclist, or motorcyclist)	\$3	386	386
Seasonal	\$45	8,300	43,478
America the Beautiful – The National Parks and Federal Recreational Lands Annual Pass	\$80	294	5,711
Senior Pass (U.S. citizens or permanent residents age 62 or over)	\$10	1,734	19,599
Access Pass (U.S. citizens or permanent residents with permanent disabilities)	Free	255	2,305

* Eastham taxpayers, with an Eastham sticker, may enter NPS beaches in the town of Eastham at no charge, if spaces are available. 2008 entrance counts for Eastham taxpayers were 4,769.

* With the purchase of a daily fee, one may leave and reenter, or enter any NPS beach by showing their receipt at the entrance station. For 2008, there were 5,385 re-entrances counted.

Cape Cod National Seashore Beaches

The Cape Cod National Seashore manages six beaches: Herring Cove Beach (Provincetown), Race Point Beach (Provincetown), Head of the Meadow Beach (Truro), Marconi Beach (Wellfleet), Coast Guard Beach (Eastham), and Nauset Light Beach (Eastham).

The Seashore collects data on the number of vehicles entering each beach parking area, as shown in the following figures. Figure 11 shows average monthly visits from 1991-2007 for each of the six beaches and

Figure 12 shows data for the summer of 2008 for each beach. Based on this data, it appears that the most visited beaches are Herring Cove Beach in Provincetown and Nauset Light Beach in Eastham.

Figure 11
Average Monthly Visits 1991-2007

Source: Raw Vehicle Count Data from NPS Public Use Statistics Office

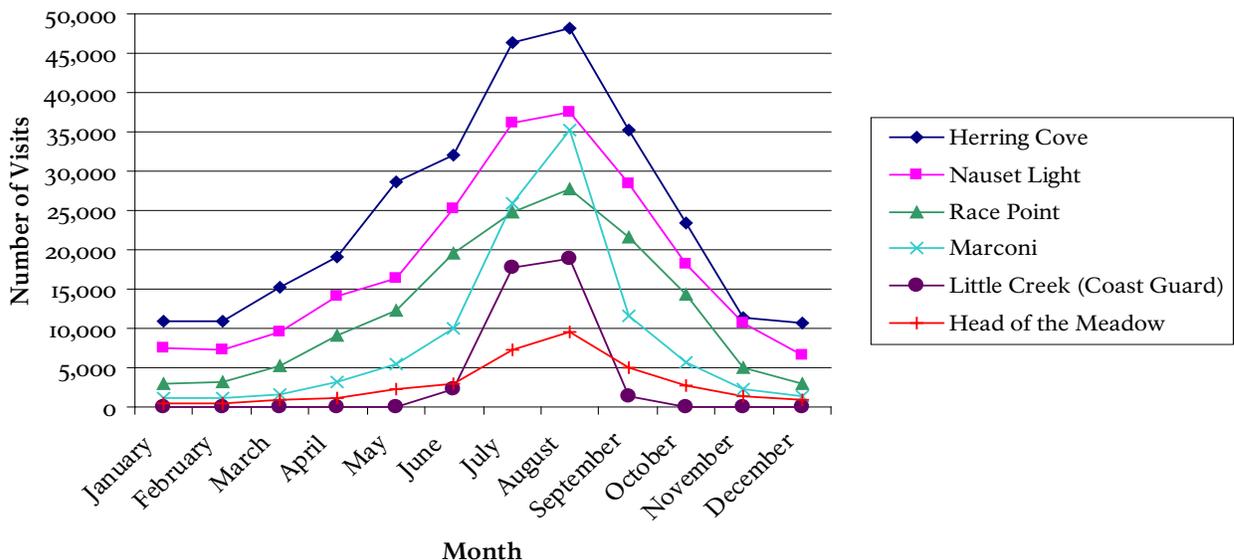
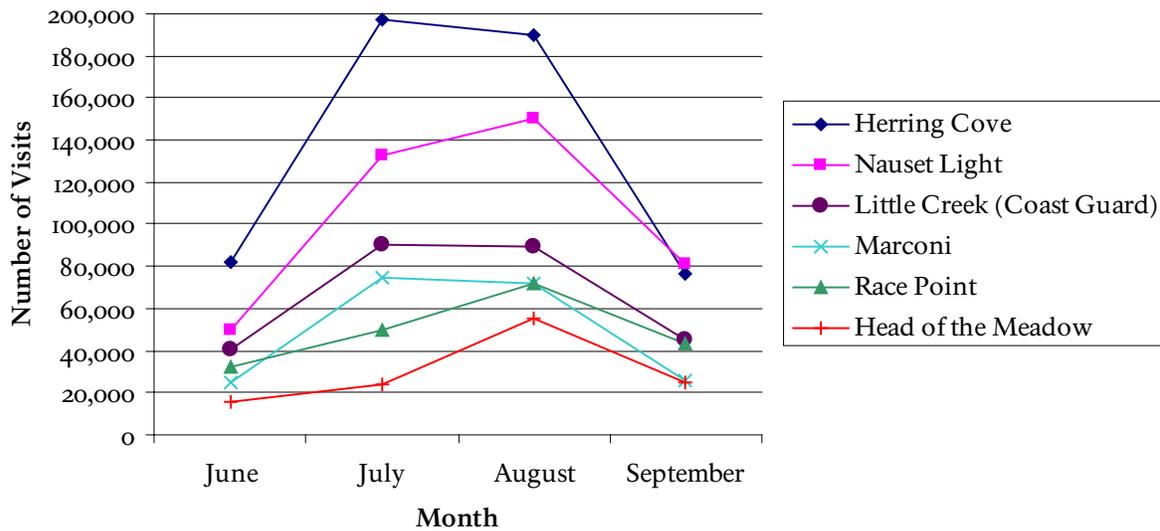


Figure 12

Number of Visits by NPS Beach, Summer 2008

Source: NPS Public Use Statistics Office, <http://www.nature.nps.gov/stats/>



After Coast Guard Beach lost its parking area due to erosion from a powerful storm in 1978, the Seashore constructed a new parking lot inland at Little Creek and instituted a shuttle to provide access to the beach. Of the Seashore beaches, the parking area at Nauset Light Beach is currently regarded as most at risk; it is predicted that Nauset Light will lose its bathhouses to erosion within 10 years and the entire parking area within 15-20 years. A storm in the spring of 2010 destroyed the access stairs from the parking to the beach at both Nauset Light and Marconi Beaches. According to Cape Cod coastal geologists, Nauset Light is at the edge of the strip of bluff that runs north from Coast Guard Beach and lacks separation or protection from dunes.

Marconi and Race Point Beaches are not considered to be in danger of significant erosion. Herring Cove Beach in Provincetown is facing several challenges, some man-made and some natural. The North parking area is unique and important to the community because it is directly adjacent to the beach, providing easy access, opportunities for tailgating, clam bakes, and barbecues, and a scenic view from parked vehicles. As such, this parking area fills up regularly but during storms it also experiences overwash at the northern end, near the entrance to the bicycle trail. In between the north and south parking areas, the bathhouse is structurally unsound and needs to be removed, with replacement facilities built further back from the beach. There are remnants of macadam along the beach in front of the bathhouse, which has caused erosion of the shore to the south. Its removal would eventually lead to the stabilization of the coastline but the immediate effects are unknown.

Table 3 provides information about the parking areas at the six NPS beaches. NPS collects entrance fees at all beaches from late June through early September when lifeguards are on duty, and on weekends/holidays from Memorial Day to the end of September.

Table 3
NPS Beach and Beach Parking Area Information

Source: Cape Cod National Seashore Staff

Town	Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces
Provincetown	Herring Cove Beach (South)	Oceanside	Y	525	
Provincetown	Herring Cove Beach (North)	Oceanside	Y	232	
Provincetown	Race Point Beach	Oceanside	Y	355	
Truro	Head of the Meadow Beach	Oceanside	Y	365	
Wellfleet	Marconi Beach	Oceanside	Y	530	
Eastham	Coast Guard at Beach	Oceanside	Y	61 spaces for Eastham residents and handicapped visitors	
Eastham	Coast Guard at Little Creek	Oceanside	Y	368 (+3 RV and +44 additional unmarked spaces that could be used for vehicles)	7
Eastham	Nauset Light Beach	Oceanside	Y	160*	7*
Total				2582	14

* Of the total spaces, 62 regular spaces and 2 handicapped spaces are used exclusively by Eastham residents between ~ July 4 and Labor Day.

Provincetown Beaches

Provincetown is the northern-most town included in this study. It is geographically isolated, primarily surrounded by water and land under the jurisdiction of the Cape Cod National Seashore, though it does connect to Truro to the south. Many of Provincetown’s visitors arrive by ferry from Boston; others drive or travel by bus from the mainland via Route 6.

According to the Provincetown Comprehensive Plan, 4,500 acres of Provincetown’s 6,444 acres (approximately 70 percent) is within the Seashore boundary. This primarily consists of an area known as the Province Lands. The town has no dedicated beaches of its own but does have several Harbor beach landings and beach access points within the town. The two primary beaches, Herring Cove and Race Point, are located within the Seashore and managed by NPS. The two beaches are connected to the town during the summer by the Provincetown-Truro Shuttle. In addition, a seasonal, private interpretive service, the Provincetown Trolley, takes visitors on a 40-minute ride that includes at the Province Lands Visitor Center near Race Point. Herring Cove can be reached by foot or bicycle from the town; however, there is a need for adequate bicycle parking at one access point on Moors Road and for management and containment of the multiple pedestrian trails through the sand dunes to prevent further erosion.

Based on initial information about beach parking demand, erosion threat, Seashore priorities and other projects currently underway, Provincetown beaches were not further considered in this study.

Truro Beaches

The Town of Truro is located between Provincetown and Wellfleet. According to the Truro Comprehensive Plan, approximately 70 percent of the town lies within the Cape Cod National Seashore’s boundary. It is the smallest town in the Study Area with a population of just over 2,000. Because of its geographic position, beaches in Truro are mostly likely to be visited by those staying in the town or day visitors from Provincetown; day visitors from the mainland or other Upper Cape towns tend to stop at open beaches further south.

The Town of Truro manages eleven beaches: four on the oceanside, and seven on the bayside. The oceanside beaches all lie within the Seashore boundaries and thus the parking areas are surrounded by the Seashore. Head of the Meadow Beach has two sections – one managed by the town and one managed by the National Seashore. Truro’s oceanside beaches are known for their cliffs; Coast Guard Beach also offers surfing and fishing. Ballston and Longnook are the most popular Truro beaches and the town and coastal geologists estimate that their parking areas are in the most danger of erosion. The Town of Truro

estimates that Ballston has lost 30 spaces in the last 30 years and is at high risk of losing the entire parking area to a storm. Head of the Meadow Beach, also estimated to have lost parking area (about 90 feet) in the past 30 years, is currently experiencing a dune migration into the parking lot. According to coastal geologists, Ballston is a very unique barrier beach located near the headwaters of the Pamet River, and its dune system is essential to maintaining its integrity as the only natural land-link around the Pamet River.

A beach permit issued by the Town of Truro is required for parking at all town beaches from mid-June through Labor Day; the fee is per vehicle. The town’s Head of the Meadow oceanside beach and Corn Hill bayside beach offer on-site daily passes and accept weekly stickers, and provide the largest parking areas. The other beaches require seasonal or residential stickers. Stickers are required from mid-May to Labor Day and can be purchased from the Beach Commission Sticker Sales Office. Entry to Truro beaches is free after 4pm. Three oceanside beaches – Ballston, Longnook, and Coast Guard – have parking areas and street-side parking and are all often at full capacity during the peak season. Fisher Beach on the bayside is also often at full capacity but has fewer parking spaces.

Truro sold 2,400 residential permits in 2008, slightly down from previous years; this number is still more than the estimated number of Truro residents for 2007. This is most likely due to several factors: the presence of non-resident taxpayers who are eligible for residential permits (a high percentage of the housing in Truro are second homes); multiple cars per resident; and the fact that most if not all residents purchase permits. Truro does not maintain a breakdown of weekly and daily permits, but overall revenues from those sales indicate that Truro sells anywhere from 1,500 to 5,000 weekly and daily permits each year. Truro also sells almost 4,500 non-resident seasonal passes. Thus, in total, Truro has at least 6,900 seasonal stickers (resident and non-resident)

Table 4 provides information on the parking areas of the 11 Truro beaches.

Table 4
Truro Beach and Beach Parking Area Information

Sources: Town of Truro staff.

Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces	Type of Permit(s) Accepted
Ballston	Oceanside	Y	60 (15)*	2	Residential or Seasonal
Coast Guard	Oceanside	Y	25 (30)*	2	Residential or Seasonal
Cold Storage	Bayside	N	25	2	Residential or Seasonal
Corn Hill	Bayside	N	150	4	All
Fisher	Bayside	N	10	1	Residential or Seasonal
Great Hollow	Bayside	N	40	2	Residential or Seasonal
Head of the Meadow (town only)	Oceanside	Y	180	3	All
Longnook	Oceanside	Y	50 (40)*	2	Residential or Seasonal
Noon's	Bayside	N	15 (not paved)	0	Residential or Seasonal
Ryder	Bayside	N	25	2	Residential or Seasonal
<i>Total</i>			665	20	

*street-side parking

Based on initial information about beach parking demand and erosion threat, only the beaches on the oceanside of Truro are considered in later phases of this study.

Wellfleet Beaches

Wellfleet is located between Truro and Eastham. It has eight coastal beaches, four on the oceanside and four on the bayside. The Cape Cod National Seashore’s headquarters and one of the NPS beaches, Marconi, are also located in Wellfleet, south of the town beaches. According to the Wellfleet Comprehensive Plan, approximately 61 percent of the land in Wellfleet is within the Seashore boundary.

A beach permit, issued by the Town of Wellfleet, is required for parking at all town beaches except for Mayo Beach, on the bayside. Only two of the beaches – White Crest and Cahoon Hollow – allow daily

passes; as a result, over half of weekend visitors to White Crest are day visitors from out of town. Visitors can also park at White Crest and walk 10 minutes along the beach to Cahoon Hollow, which has a popular restaurant and bar adjacent to the beach. All other beaches are only accessible by residents and non-resident tax-payers with passes or visitors staying in Wellfleet with weekly or seasonal passes. As shown in Figure 13, portions of the parking lots at Newcomb Hollow and Le Count Hollow beaches are owned by NPS; the town holds a Special Use Permit for their use as parking.

Figure 13
Wellfleet Parking Areas Used Under NPS Special Use Permit

Source: Redrawn from NPS Special Use Permit Maps



The four of the oceanside beaches are facing an average loss of three feet per year due to erosion, though it is typically not gradual or incremental, but rather significant losses at once. Newcomb Hollow lost 30 feet of macadam when it was undercut during a storm several years ago; the town had paved too close to the beach and left no natural barrier for drainage. In addition, Cahoon Hollow has a drainage problem erosion of the parking lot.

The oceanside beaches are often at full capacity during the peak season. Newcomb Hollow is the only exception – in the past it filled to capacity by 11am but in 2008 it only filled up a few times. As off-shore conditions change annually, popularity of the beaches for specific audiences or activities can fluctuate.

Wellfleet has considered a shuttle bus in the past that would serve the four oceanside beaches on Ocean View Drive, but when the idea was presented in a town meeting, residents expressed concerns about the shuttle going by kettle ponds, which residents want to protect from noise and from non-local visitors, and possibly increasing the number of visitors to the beach.

Table 5 provides information on the parking areas of the eight Wellfleet beaches.

Table 5
Wellfleet Beach and Beach Parking Area Information

Source: Town of Wellfleet staff.

Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces	Type of Permit(s) Accepted
Burton Baker	Bayside	N	8	0	-
Cahoon Hollow	Oceanside	Y	88	2	All
Duck Harbor	Bayside	Y	48	2	Residential
Indian Neck	Bayside	N	38	2	Residential
Maguire's Landing/Le Count Hollow	Oceanside	Y	164	3	Residential
Mayo*	Bayside	N	26	4	None required
Newcomb Hollow	Oceanside	Y	370	5	Residential
White Crest	Oceanside	Y	397	7	All
<i>Total</i>			<i>1169</i>	<i>25</i>	

*nearby parking lot has additional 30 spaces

Based on initial information about beach parking demand and erosion threat, only the beaches on the oceanside of Wellfleet are considered in later phases of this study.

Eastham Beaches

Eastham is located between Wellfleet and Orleans. Approximately a third of the land area in Eastham lies within the Seashore boundary, according to the Eastham Comprehensive Plan. The Seashore's main visitor center, the Salt Pond Visitor Center, is located in Eastham, as are two of its beaches (Coast Guard and Nauset Light). Eastham has eight bayside beaches and no oceanside town managed beaches. However, due to a deeded right, Eastham residents and non-resident taxpayers with an Eastham parking sticker may access either of the two oceanside NPS beaches in Eastham (Coast Guard and Nauset Light) for free, if spaces are available. In addition, Nauset Light Beach has 62 regular spaces and two handicapped spaces available in a lot adjacent to the beach that are open exclusively to Eastham residents between July 4 and Labor Day; the town helps manage these spaces.

On the bayside, the beach with the largest parking area is First Encounter. Its parking area is often at full capacity and when it is, the facilities and beach are nearly at capacity. The four most northern bayside beaches are facing the most serious erosion threats. The bayside beaches (not including First Encounter) lost approximately 15 feet of asphalt in the early 2000's and several have little to no beach area at high tide. Sunken Meadow and Campground beaches are also often at capacity, and are surrounded by private property, thus restricting the possibility of moving or extending the parking lots. The Town of Eastham estimated that 1,500 cars visit the 600 parking spaces at the bayside beaches on a peak day.

A beach permit, issued by the Town of Eastham, is required for parking at all town beaches. First Encounter, Campground, and Cook's Brook sell and accept daily passes; the other beaches accept only weekly, seasonal, and residential passes.

Table 6 provides information on the parking areas of the nine Eastham beaches.

Table 6
Eastham Beach and Beach Parking Area Information

Source: Town of Eastham staff.

Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces	Type of Permit(s) Accepted
Boat Meadow	Bayside	N	10		All but daily
Campground	Bayside	N	119		All
Cole Road	Bayside	N	12		All but daily
Cook's Brook	Bayside	N	85		All but daily
First Encounter	Bayside	N	199		All
Kingsbury	Bayside	N	0		-
Sunken Meadow	Bayside	N	26		All but daily
Thumpertown	Bayside	N	18		All but daily
Wiley Park	Bayside	N	18		
<i>Total</i>			<i>487</i>		

Based on initial information about beach parking demand and erosion threat, all of the beaches in Eastham are considered in later phases of this study.

Orleans Beaches

Orleans is bordered by Eastham to the north, Brewster and Harwich to the west, and is separated from Chatham in the south by water. Although the National Seashore does not manage any beaches in Orleans, Nauset Beach lies within the Seashore's boundaries, and 15 percent of Orleans' land area falls within the Seashore boundary, according to the Orleans Comprehensive Plan.

Orleans has one bayside beach, Skaket, and one oceanside beach, Nauset. Nauset is the first oceanside Lower/Outer Cape beach encountered by visitors traveling on Route 6 from the mainland and Upper Cape. Nauset Beach also has the largest parking area on the Lower/Outer Cape, with 900 spaces. The parking area experiences erosion at an average rate of five feet per year, and is expected to erode completely in the next 25-30 years. The parking area is sometimes at capacity, and when it is, the beach and facilities are over capacity. In recent summers, Orleans has placed a variable message sign on Route 6 to indicate whether Nauset Beach is open that has received favorable feedback from visitors, residents, and local businesses.

A beach permit, issued by the Town of Orleans, is required for parking at both town beaches daily from mid-June through Labor Day and on weekends from Memorial Day through Columbus Day.

Table 7 provides information on the parking areas of the two Orleans beaches.

Table 7
Orleans Beach and Beach Parking Area Information

Source: Town of Orleans staff.

Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces	Type of Permit(s) Accepted
Nauset	Oceanside	Yes	886	14	All
Skaket	Bayside	No	170	5	All
<i>Total</i>			<i>1056</i>	<i>19</i>	

Based on initial information about beach parking demand and erosion threat, both of the beaches in Orleans are considered in later phases of this study.

Chatham Beaches

Chatham is located at the “elbow” of Cape Cod, to the east of Harwich and south of Orleans, from which it is separated by water. It is also separated by water from the Cape Cod National Seashore, to the east, and the U.S. Fish & Wildlife Monomoy National Wildlife Refuge, to the south.

Chatham has five beaches on Nantucket Sound and one oceanside beach, Lighthouse Beach. All of the beaches on the Sound have limited parking space except Harding’s Beach and all have very narrow beach areas. The town is considering dredging projects for sand replenishment. The parking area at Cockle Cove is the most threatened by erosion; the town has planned an emergency, temporary fix with boulders and sand replenishment but will need to consider longer-term solutions in the future. The parking area at Harding’s Beach is set back from the dune line but the break in the dune line between it and the beach leaves it vulnerable. Parking permits are required from 73 days before Labor Day to Labor Day at Harding’s, Cockle Cove, and Ridgevale, but not Forest. Ridgevale often fills up during peak season.

Lighthouse Beach has a main parking area with short-term (30-minute) parking that often fills up during peak season as well as street parking along Bridge Street. In December 2008, the Board of Selectman approved a parking sticker requirement for Bridge Street July 1st through Labor Day starting in the summer of 2009. The plan is experimental and is intended to raise revenue, possibly discourage parking on Bridge Street, and encourage parking at other town beaches. In addition, the Town removed lifeguards and made Lighthouse Beach “swim at your own risk” due to safety concerns at the beach. There are dangerous currents and drop-offs in the area, which have led to several deaths in recent years. The effect of these changes on the demand for beach parking is still unknown at this time.

Access to the beaches is mainly by car. There is a 3-phase sidewalk project underway from Harding’s Beach to Route 28, mainly for neighborhood use. The owners of a former gas station property charge \$5 for parking and another \$5 to drive people to Lighthouse Beach in a station wagon; the lot can hold approximately 50 cars and can fill in peak season with people visiting Main Street and/or the beach.

Table 8 provides information on the parking areas of the six Chatham beaches.

Table 8
Chatham Beach and Beach Parking Area Information

Source: Town of Chatham staff.

Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces	Type of Permit(s) Accepted
Cockle Cove Beach	Sound	N	75	4	All
Forest Beach	Sound	N	38	2	No permit required
Harding’s Beach	Sound	N	389	8	All
Lighthouse Beach	Ocean	N	48 30-minute parking spaces (counted from aerial) (Bridge Street Parking: 125)	2	Bridge Street fee as of July 1, 2009
Pleasant Street Beach	Sound	N	20	1	No permit required
Ridgevale Beach	Sound	N	96	4	All
<i>Total</i>			<i>791</i>	<i>21</i>	

Based on initial information about beach parking demand, erosion threat, Seashore priorities and other projects currently underway, Chatham beaches were not further considered in this study.

Brewster Beaches

Brewster is located in the Mid or Lower Cape, between Orleans and Dennis and north of Harwich. Its coast is entirely on the bayside and it has seven bayside beaches. None of its land lies within the Seashore boundaries but visitors must pass through Brewster to access the Outer Cape. Brewster is connected to the Outer Cape via the Flex bus system.

Virtually all of Brewster’s beach parking areas are at or over capacity during peak season and two of the parking areas, at Paine’s Creek and Ellis Landing, are currently threatened by erosion. They have experienced a recent loss of parking surface and increased steepness of the access to the beach.

A beach permit, issued by the Town of Brewster, is required for parking at any of the beaches from 9am-3pm daily from June 12 through Labor Day. Anyone can purchase a daily (\$15), weekly (\$50), or seasonal (\$125) parking permit at the Town Office for \$15 but may not find parking at beaches; the fine for parking without a permit is \$30. Table 9 lists the beaches in Brewster.

Table 9
Brewster Beach Information

Source: Town of Brewster staff.

Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces	Type of Permit(s) Accepted
Paine's Creek	Bayside	N	14	2	All
Robbins Hill (Mant's Landing)	Bayside	N	39	2	All
Saint's Landing	Bayside	N	34	2	All
Point of Rocks Beach	Bayside	N	23	0	All
Breakwater Beach	Bayside	N	57	2	All
Breakwater Landing	Bayside	N	5	0	All
Ellis Landing	Bayside	N	20	1	All
Linnell Landing	Bayside	N	21	3	All
Crosby Landing	Bayside	N	60	3	All
<i>Total</i>			<i>273</i>	<i>15</i>	

Based on initial information about beach parking demand and erosion threat, all of the beaches in Brewster are considered in later phases of this study.

Harwich Beaches

Harwich, like Brewster, is located in the Mid or Lower Cape, south of Brewster, and between Dennis and Chatham. It has 14 beaches abutting Nantucket Sound. Also similar to Brewster, Harwich is not adjacent to nor does it contain any of the Seashore, but visitors to the Seashore must pass through Harwich on Route 6 and Harwich is also connected to the Outer Cape by the Flex bus system.

Harwich’s beaches are only accessible by roads running North-South; there is a lack of East-West connections so most people walk to the beach south of their neighborhoods. While the parking areas are not experiencing erosion, the beaches are, and Harwich is considering options for dredging and re-nourishment, though funding for such activities is limited. Bank Street is the beach of most concern in terms of access; it has limited parking that is consistently full and people park downtown and walk to the beach even though are no sidewalks. Harwich has a number of transportation projects that are undergoing or proposed, including evaluating bicycle and pedestrian access to various destinations, including beaches.

Table 10 provides information on the parking areas at the 14 Harwich beaches.

Table 10
Harwich Beach and Beach Parking Area Information

Source: Town of Harwich staff.

Beach	Location	Within NPS Boundary	Regular Parking Spaces	ADA Parking Spaces	Type of Permit(s) Accepted
Bank Street	Sound	N	57 (people also park on Schoolhouse Road and walk)	4	All but daily
Earle Road	Sound	N	81	9	All
Pleasant Road	Sound	N	81	3	All but daily
Red River Road	Sound	N	186	10	All
<i>Total</i>			<i>405</i>	<i>26</i>	

Based on initial information about beach parking demand, erosion threat, Seashore priorities and other projects currently underway, Harwich beaches were not further considered in this study.

3 Parking Needs Analysis

The Project Team estimated beach parking supply and demand for beaches located in the following priority areas, as identified in the Existing Conditions analysis:

- Truro oceanside;
- Wellfleet oceanside;
- Eastham bayside;
- Eastham oceanside;
- Orleans bayside;
- Orleans oceanside; and
- Brewster bayside.

The assessment is based on current patterns of beach parking use, estimated additional demand from future population growth, and potential losses due to coastal erosion trends. The assessment estimates current parking supply and demand as well as anticipated 2030 needs.

The calculations are based on individual beaches and aggregated by town and designation as bayside or oceanside. The following sections describe the methods for estimating parking demand and supply.

3.1 Beach-Related Parking Demand

The following sections describe methods for estimating current and future demand at beaches in the study area. Note that NPS beaches are accounted for as part of the town in which they are located, contributing to total demand and availability in each town.

Current Demand

Current demand for parking at each beach in the study area was estimated based on the total number of existing parking spaces and anecdotal data provided by the Seashore and the towns regarding how frequently the parking areas are full (often, sometimes, or rarely). As no quantitative data were available on parking lot use, a percentage was assigned to each of these designations to estimate the existing demand for parking. The “fill-up” factor values are shown below in Table 11. These percentages were reviewed by the Seashore and town stakeholders.

Table 11
Beach Parking “Fill-up” Percentages

Designation	Percentage
Often	120%
Sometimes	90%
Rarely	60%

Note that the factor provided for the “often” designation is greater than 100 percent, indicating that there is currently demand for more parking than is available at a given beach, during the peak summer season. This analysis does not address the ability of a given beach to accommodate additional visitors with respect to other beach facilities or actual space on the sand – such determinations are the responsibility of the Seashore or the town managing the beach. This analysis addresses the ability of the existing parking area to accommodate parking demand.

Estimating Future Beach-Related Parking Demand

The demand for beach-related parking facilities is expected to change in the future. A number of factors including local population growth, aging of the population, and changes in the balance between year-round and seasonal residents are expected to impact the need for beach parking facilities. No data are available, however, to link these factors directly to changes in beach usage.

As shown in Figure 3 and Figure 5, despite significant population growth on Cape Cod, there has been no consistent trend of increased or decreased annual visitation to NPS beaches since 1970. The lack of trend makes it difficult to estimate if and how changes to future Cape Cod population and demographics may

impact visitation and parking demand at NPS and town beaches. While the population in each town is expected to grow over the next 20 years, some of the growth is anticipated to result from a shift from seasonal to year-round residency. These “new” residents may not represent an increase in beach visitation, as they tend to be older, they may already visit the beach now, and some may currently rent their homes in the summer to larger groups than will live there when the owners eventually live there full-time.

In order to estimate a potential upper range for beach parking demand, the Project Team used 2030 population growth projections developed by the Cape Cod Commission, and discounted them to reflect the anticipated demographic shifts addressed above. The Project Team assumed that additional demand would be 10 percent of the expected percent population growth for each town. Future parking demand for each beach was estimated by applying the adjusted percentage increase in the town’s population to current parking demand for each beach. The population growth and additional beach demand values for each town are provided in Table 12. The calculations for town-managed beaches use the population growth value for that town since the town have discounted rates for locals; the calculations for the NPS-managed beaches use the average population growth value for all of Barnstable County since parking fees at NPS beaches are the same for all visitors, regardless of where they live or stay.

Table 12
Anticipated 2030 Population Growth and Additional Beach Parking Demand by Town

Source: 2007 Cape Cod Regional Transportation Plan, Cape Cod MPO (population growth projections)

Town	2007-2030 % Population Growth	2007-2030 % Beach Parking Demand Growth
Truro	33%	3.3%
Wellfleet	55%	5.5%
Eastham	8%	0.8%
Orleans	30%	3.0%
Brewster	82%	8.2%
Barnstable County Total	26%	2.6%

The current and future calculated demand and beach parking availability and are provided in Table 13.

Table 13
Current and Future Beach Parking Demand

Town	Beach	NPS / Town	Ocean / Bay	2008 Total* Spaces	2008 Estimated Occupancy	2008 Estimated Needed Spaces	Growth in Demand 2007-2030	2030 Estimated Needed Spaces
Truro	Ballston	town	Ocean	77	often	92	3.3%	95
Truro	Coast Guard	town	Ocean	57	often	68	3.3%	71
Truro	Head of the Meadow (town)	town	Ocean	183	rarely	110	3.3%	113
Truro	Head of the Meadow (NPS)	NPS	Ocean	285	rarely	171	2.6%	175
Truro	Longnook	town	Ocean	92	often	110	3.3%	114
Truro	Total	town	Ocean	409		380		393
Truro	Total	NPS	Ocean	285		171		175
Wellfleet	Cahoon Hollow Beach	town	Ocean	90	often	108	5.5%	114
Wellfleet	Marconi Beach	NPS	Ocean	530	sometimes	477	2.6%	489
Wellfleet	Maguire's Landing/ Le Count Hollow	town	Ocean	167	often	200	5.5%	211
Wellfleet	Newcomb Hollow	town	Ocean	375	sometimes	338	5.5%	356
Wellfleet	White Crest Beach	town	Ocean	404	often	485	5.5%	511
Wellfleet	Total	town	Ocean	1,036		1,131		1,194
Wellfleet	Total	NPS	Ocean	530		477		489
Eastham	Boat Meadow	town	Bay	10	rarely	6	0.8%	6
Eastham	Campground	town	Bay	119	sometimes	107	0.8%	108
Eastham	Cole Road	town	Bay	12	often	14	0.8%	15
Eastham	Cooks Brook	town	Bay	85	rarely	51	0.8%	51
Eastham	First Encounter	town	Bay	199	often	239	0.8%	241
Eastham	South Sunken Meadow	town	Bay	26	often	31	0.8%	31
Eastham	Thumpertown	town	Bay	18	often	22	0.8%	22
Eastham	Total	town	Bay	469		470		474
Eastham	Coast Guard @ Beach**	town	Ocean	61	often	73	0.8%	74
Eastham	Coast Guard @ Little Creek	NPS	Ocean	422	sometimes	380	2.6%	390
Eastham	Nauset Light Beach	NPS	Ocean	167	often	200	2.6%	206
Eastham	Total	town	Ocean	61		73		74
Eastham	Total	NPS	Ocean	589		580		596
Orleans	Skaket	town	Bay	175	often	210	3.0%	216
Orleans	Total	town	Bay	175		210		216
Orleans	Nauset	town	Ocean	900	sometimes	810	3.0%	835
Orleans	Total	town	Ocean	900		810		835
Brewster	Breakwater Landing	town	Bay	5	often	6	8.2%	6
Brewster	Breakwater Beach	town	Bay	59	often	71	8.2%	77
Brewster	Crosby Landing	town	Bay	63	often	76	8.2%	82
Brewster	Ellis Landing	town	Bay	21	often	25	8.2%	27
Brewster	Linnell Landing	town	Bay	24	often	29	8.2%	31
Brewster	Paine's Creek	town	Bay	16	often	19	8.2%	21
Brewster	Robbins Hill (Mant's Landing)	town	Bay	41	often	49	8.2%	53
Brewster	Saint's Landing	town	Bay	36	often	43	8.2%	47
Brewster	Total	town	Bay	265		318		344
All	Total	NPS	Both	1,404		1,228	2.6%	1,260

*Total spaces include regular striped, handicapped accessible, and other reported on-site available parking spaces.

** Coast Guard @ Beach is managed by NPS but included as "town", because the spaces are specifically reserved for town residents.

3.2 Impact of Erosion to Existing Parking Areas

Erosion of beach parking areas is expected to accelerate the need for alternate beach parking locations or other modes of beach access. Many beach parking areas are situated very close to the shoreline, with only the steep face of a glacial bluff (or upland) separating the pavement from the beach. The bluff is highly exposed to strong wind and wave action, and while erosive events may cause dramatic changes to the shoreline in a short period of time, coastal geologists agree that a generalized, long-term erosion rate can

be applied to the Cape Cod shoreline. For the east-facing, oceanside bluff, geologists accept a rate of one meter per year as a conservative, high estimate for long-term bluff erosion. The west-facing, bayside bluff is estimated to erode at a rate of 0.5 meter per year, also a conservative, high estimate. In areas where shifting sand dunes are covering parking areas, the overall rate of dune migration is assumed to be equivalent to the erosion rate of nearby bluff.

There are several beaches for which the shoreline erosion pattern discussed above does not apply. These areas are typically defined by complex dune systems, salt marshes, barrier islands/spits, or areas of significant human intervention. While these sites do experience erosion, upland parking areas are generally less threatened.

Nauset Beach in Orleans is among the beaches experiencing dune migration issues rather than bluff erosion, and was not analyzed according to the methodology described above. In 2006, the Town of Orleans commissioned a study of beach erosion to plan for management of the beach and parking area.¹⁴ The study included an analysis of historical shoreline change, short- and long-range rates of erosion, and potential for breaching/inlet from storm waves. The results of the study suggest that much of the protective coastal dune will be eroded by 2035. As the shoreline and dune continue to erode in the coming years, the existing infrastructure (parking lot, buildings, etc.) will become increasingly vulnerable to storm damage and flooding. While the study does not anticipate erosion loss of the beach parking facilities by 2030, it does anticipate enough erosion to threaten it soon after.

The bayside beaches south of First Encounter (Eastham) were also not addressed according to the common erosion analysis methodology. The erosion patterns of the north-facing, bayside beaches in Brewster do not follow the same pattern as other east- or west-facing beaches of the Lower/Outer Cape. Coastal erosion rates in Brewster vary from beach to beach, based on localized natural characteristics as well as erosion management and engineering practices. The Project Team worked directly with the town Conservation Administrator to develop 10-, 20-, and 30-year erosion projections for the beaches in Brewster. The rates are based on a town review of parking areas and landings using the Massachusetts Office of Coastal Zone Management's Historical Shoreline Change maps, and are also informed by the 2009 town-initiated study of Paine's Creek Beach, which evaluates existing conditions and potential improvements.¹⁵

The Project Team used observations from site visits, discussions with local beach erosion experts, and discussions with the individual towns to confirm these assumptions and estimates, and revise as necessary.

Table 14 lists the type of erosive forces faced by each beach considered in this analysis.

¹⁴Woods Hole Group, Inc. for Town of Orleans. Analysis of Physical Changes and Management Alternatives for the Nauset Beach Area, Cape Cod, Massachusetts, Final Report. January 2006.

¹⁵ Woods Hole Group, Inc. for Town of Brewster. Feasibility Study of Paine's Creek Beach Parking Area Protection and Improvements, Brewster, MA. September 2009.

Table 14
Erosive Forces by Beach

Town	Beach	NPS/ Town	Primary Parking Area Concern
Truro	Ballston	town	Oceanside Dune Migration
Truro	Coast Guard	town	Oceanside Dune Migration
Truro	Head of the Meadow Beach	town	Oceanside Dune Migration
Truro	Head of the Meadow Beach	NPS	Oceanside Dune Migration
Truro	Longnook	town	Oceanside Erosion
Wellfleet	Cahoon Hollow Beach	town	Oceanside Erosion
Wellfleet	Marconi Beach	NPS	Oceanside Erosion
Wellfleet	Maguire Landing/ Le Count Hollow	town	Oceanside Erosion
Wellfleet	Newcomb Hollow	town	Oceanside Erosion
Wellfleet	White Crest Beach	town	Oceanside Erosion
Eastham	Coast Guard @ Beach	NPS	Oceanside Erosion
Eastham	Nauset Light Beach	NPS	Oceanside Erosion
Eastham	Campground	town	Bayside Erosion
Eastham	Cooks Brook	town	Bayside Erosion
Eastham	First Encounter	town	Bayside Erosion
Eastham	South Sunken Meadow	town	Bayside Erosion
Eastham	Thumpertown	town	Bayside Erosion
Orleans	Nauset	town	Oceanside Dune Migration
Brewster	Breakwater Landing	town	Bayside Erosion
Brewster	Breakwater Beach	town	No Erosion
Brewster	Crosby Landing	town	No Erosion
Brewster	Ellis Landing	town	Bayside Erosion
Brewster	Linnell Landing	town	No Erosion
Brewster	Paine's Creek	town	Bayside Erosion
Brewster	Robbins Hill (Mant's Landing)	town	Bayside Erosion
Brewster	Saint's Landing	town	No Erosion

As part of the parking supply and demand analysis, the Project Team employed a geospatial analysis to estimate the loss of parking due to erosion at the priority beaches in the study area. Using high-resolution aerial photography from 2008, the edge of the bluff was clearly discernable, allowing analysts to illustrate the inward migration of the bluff at 10-, 20-, and 30-year increments, based on the identified erosion rates. This method was employed to visualize the portions of the beach parking areas expected to be affected by erosion over the horizon of this planning study. For each beach, the Project Team used the illustrations to approximate a percentage of the parking area lost due to erosion over a 20-year period. The maps containing the high resolution photographs, bluff migration lines, and parking area loss estimates are provided in Appendix A.

Table 15 provides the anticipated losses from erosion to the parking areas of each beach in the priority study area. As can be seen in Table 15, Thumpertown, South Sunken Meadow, and Cooks Brook on Eastham's bayside and White Crest and Cahoon Hollow on Wellfleet's oceanside are expected to lose 30 percent or more of their total parking surface. Overall the loss of parking on the oceanside, particularly in Wellfleet, is expected to be greatest due to the large parking areas in close proximity to the coast.

Table 15
Anticipated 2028 Beach Parking Erosion and Remaining Spaces

Town	Beach	NPS / Town	Ocean / Bay	2008 Total* Spaces	Estimated 2028 % Parking Loss	Estimated 2028 Spaces Lost	2028 Spaces Remaining AFTER Erosion
Truro	Ballston	town	Ocean	77	10%	8	69
Truro	Coast Guard	town	Ocean	57	10%	6	51
Truro	Head of the Meadow (town)	town	Ocean	183	20%	37	146
Truro	Head of the Meadow (NPS)	NPS	Ocean	285	25%	70	215
Truro	Longnook	town	Ocean	92	7%	6	86
Truro	Total	town	Ocean	409	14%	57	352
Truro	Total	NPS	Ocean	285	25%	70	215
Wellfleet	Cahoon Hollow Beach	town	Ocean	90	60%	54	36
Wellfleet	Marconi Beach	NPS	Ocean	530	0%	0	530
Wellfleet	Maguire's Landing/ Le Count Hollow	town	Ocean	167	12%	20	147
Wellfleet	Newcomb Hollow	town	Ocean	375	15%	56	319
Wellfleet	White Crest Beach	town	Ocean	404	30%	121	283
Wellfleet	Total	town	Ocean	1,036	24%	251	785
Wellfleet	Total	town	Ocean	530	0%	0	530
Eastham	Boat Meadow	town	Bay	10	-	0	10
Eastham	Campground	town	Bay	119	18%	21	98
Eastham	Cole Road	town	Bay	12	0%	0	12
Eastham	Cooks Brook	town	Bay	85	30%	26	60
Eastham	First Encounter	town	Bay	199	12%	24	175
Eastham	South Sunken Meadow	town	Bay	26	60%	16	10
Eastham	Thumpertown	town	Bay	18	50%	9	9
Eastham	Total	town	Bay	469	20%	96	373
Eastham	Coast Guard @ Beach**	town	Ocean	61	0%	0	61
Eastham	Coast Guard @ Little Creek	NPS	Ocean	422	0%	0	422
Eastham	Nauset Light Beach	NPS	Ocean	167	0%	0	167
Eastham	Total	Town	Ocean	61	0%	0	61
Eastham	Total	NPS	Ocean	589	0%	0	589
Orleans	Skaket	town	Bay	175	-	0	175
Orleans	Total	Town	Bay	175		0	175
Orleans	Nauset	town	Ocean	900	0%	0	900
Orleans	Total	Town	Ocean	900	0%	0	900
Brewster	Breakwater Landing	town	Bay	5	1%	0	5
Brewster	Breakwater Beach	town	Bay	59	0%	0	59
Brewster	Crosby Landing	town	Bay	63	0%	0	63
Brewster	Ellis Landing	town	Bay	21	5%	1	20
Brewster	Linnell Landing	town	Bay	24	0%	0	24
Brewster	Paine's Creek	town	Bay	16	30%	5	11
Brewster	Robbins Hill (Mant's Landing)	town	Bay	41	35%	14	27
Brewster	Saint's Landing	town	Bay	36	0%	0	36
Brewster	Total	Town	Bay	265		20	245
	Total	NPS		1,404	5%	70	1,334

*Total spaces includes regular striped, handicapped accessible, and other reported on-site available parking spaces.

** Coast Guard @ Beach is managed by NPS but included as "town", because the spaces are specifically reserved for town residents.

3.3 2030 Estimated Beach Parking Demand and Availability

The results from the two analyses described above were combined to develop a more comprehensive estimate of future beach parking area supply and demand for each beach in the priority study area. It should be noted that this study has only addressed erosion of the parking area itself, and not estimated beach parking lost if NPS or the towns employ parking management strategies to respond to and prepare for future loss of the parking areas.

The erosion estimates for 2028 complement the population growth and beach parking demand estimates for 2030. Given the scale of the assumptions on which these two estimates are based, the difference in horizon year is considered to be small enough to be negligible. Further, it should be noted that given the nature of the assumptions used in this study, the intent is to estimate rough orders of magnitude of the number of parking spaces needed rather than a precise number of spaces. The total estimated future parking demand and supply for each beach is provided in Table 16.

Table 16
Comparison of Future Parking Demand and Availability

Town	Beach	NPS / Town	Ocean / Bay	2008 Total* Spaces	2030 Estimated Spaces Needed	2028 Spaces Remaining AFTER Erosion	Future Excess or Shortfall
Truro	Ballston	town	Ocean	77	95	69	-26
Truro	Coast Guard	town	Ocean	57	71	51	-19
Truro	Head of the Meadow (town)	town	Ocean	183	113	146	33
Truro	Head of the Meadow (NPS)	NPS	Ocean	285	175	215	40
Truro	Longnook	town	Ocean	92	114	86	-28
Truro	Total	town	Ocean	409	393	352	-41
Truro	Total	NPS	Ocean	285	175	215	40
Truro	Total	both	Ocean				-1
Wellfleet	Cahoon Hollow Beach	town	Ocean	90	114	36	-78
Wellfleet	Marconi Beach	NPS	Ocean	530	489	530	41
Wellfleet	Maguire's Landing/ Le Count Hollow	town	Ocean	167	211	147	-64
Wellfleet	Newcomb Hollow	town	Ocean	375	356	319	-37
Wellfleet	White Crest Beach	town	Ocean	404	511	283	-229
Wellfleet	Total	town	Ocean	1,036	1,193	785	-407
Wellfleet	Total	NPS	Ocean	530	489	530	41
Wellfleet	Total	both	Ocean				-366
Eastham	Boat Meadow	town	Bay	10	6	10	4
Eastham	Campground	town	Bay	119	108	98	-10
Eastham	Cole Road	town	Bay	12	15	12	-3
Eastham	Cooks Brook	town	Bay	85	51	60	8
Eastham	First Encounter	town	Bay	199	241	175	-66
Eastham	South Sunken Meadow	town	Bay	26	31	10	-21
Eastham	Thumpertown	town	Bay	18	22	9	-13
Eastham	Total	town	Bay	469	474	373	-101
Eastham	Coast Guard @ Beach**	town	Ocean	61	74	61	-13
Eastham	Coast Guard @ Little Creek	NPS	Ocean	422	390	422	32
Eastham	Nauset Light Beach	NPS	Ocean	167	206	167	-39
Eastham	Total	town	Ocean	61	74	61	-13
Eastham	Total	NPS	Ocean	589	595	589	-6
Eastham	Total	both	Ocean				-19
Orleans	Skaket	town	Bay	175	216	175	-41
Orleans	Total	town	Bay	175	216	175	-41
Orleans	Nauset	town	Ocean	900	835	900	65
Orleans	Total	town	Ocean	900	835	900	65
Brewster	Breakwater Landing	town	Bay	5	6	5	-1
Brewster	Breakwater Beach	town	Bay	59	77	59	-18
Brewster	Crosby Landing	town	Bay	63	82	63	-19
Brewster	Ellis Landing	town	Bay	21	27	21	-7
Brewster	Linnell Landing	town	Bay	24	31	24	-7
Brewster	Paine's Creek	town	Bay	16	21	16	-10
Brewster	Robbins Hill (Mant's Landing)	town	Bay	41	53	41	-26
Brewster	Saint's Landing	town	Bay	36	47	36	-11
Brewster	Total	town	Bay	265	344	265	-99
	Total NPS Managed			1,404	1,259	1,334	75

*Total spaces includes regular striped, handicapped accessible, and other reported on-site available parking spaces.

** Coast Guard @ Beach is managed by NPS but included as "town", because the spaces are specifically reserved for town residents.

Based on the assessment of future parking needs and supply summarized in Table 16, the Project Team narrowed the list of beaches for development of potential satellite parking and shuttle routes to those with the greatest need. Beaches for which the analysis indicates that there will be sufficient parking supply to satisfy demand through 2030, even with some erosion of the parking areas, were not considered for further analysis. Several additional beaches were taken off the list if the deficit between available parking and demand was less than 50 percent and less than 15 parking spaces.¹⁶ With such a small gap between demand and availability, it is believed that a shuttle service for these parking areas would not be necessary or viable.

All of the beaches identified as having the greatest need are in regions where shuttle services will be examined for specific beaches. In these regions, specifically Brewster and Eastham bayside, parking capacity to provide for the total regional deficit in parking will be considered for the beaches where shuttle services will be investigated. If the parking at a specific bayside beach in a given town is full, visitors may find that a shuttle service to an alternate bayside beach within that town would provide the desired beach access. This would bring additional visitation to these beaches so it will be necessary to ensure that there is adequate capacity on the beach itself to accommodate additional visitors.

The following beaches are estimated to have a deficit of beach parking of at least 15 spaces or a future shortfall greater than 50 percent by the year 2030, and are included in the next phase of this parking and transit study, exploring potential satellite parking and shuttle route options:

- Ballston (Truro)
- Coast Guard (Truro)
- Longnook (Truro)
- Cahoon Hollow Beach (Wellfleet)
- Maguire's Landing/ Le Count Hollow (Wellfleet)
- Newcomb Hollow (Wellfleet)
- White Crest Beach (Wellfleet)
- First Encounter (Eastham)
- Nauset Light Beach (Eastham)
- South Sunken Meadow (Eastham)
- Thumpertown (Eastham)
- Skaket (Orleans)
- Breakwater Beach (Brewster)
- Crosby Landing (Brewster)
- Mant's Landing Beach (Brewster)
- Paine's Creek (Brewster)

¹⁶ While Paine's Creek does not meet these criteria, it remains on the list due to qualitative erosion concerns described in the Woods Hole Group study.

4 Potential Satellite Parking Area Identification

This section describes the process for identifying and characterizing areas that could potentially be used for future satellite beach parking. The process for both identification and characterization was iterative, with information supplied from multiple sources. While the project has considered many potential parking areas, further analysis is focused on the areas included in the recommended shuttle routes described in Chapter 5.

4.1 Parking Area Identification

As part of the initial identification of potential parking areas, the Project Team gathered information from the various project stakeholders – the Seashore, the towns, and the Cape Cod Commission – to develop a representative list of public and private parking areas that are currently underutilized or may have available parking capacity. Consistent with environmental goals to avoid additional land disturbance, the Project Team also used publicly available geospatial data to create a map of impervious surfaces for each of the towns on the Lower/Outer Cape. Some of the large impervious areas could potentially be good candidates for satellite beach parking, as their development would not significantly alter localized stormwater drainage or water quality. Finally, the Team also used aerial photography to investigate additional potential options that may have been previously overlooked.

The Project Team conducted site visits to further examine potential parking areas and impervious surface areas identified through these processes. The purpose of the visits was to assess parking capacities, characterize the surrounding area, determine access from major thoroughfares, determine access to beaches, and identify potential obstacles to their use.

This list shows representative locations and is not meant to be exhaustive. There may be additional publicly or privately owned sites convenient to Route 6 or to the beaches that could potentially become available over the next 20 years. This study is meant to explore the types of sites and their associated environmental and access related issues. Any efforts to implement shuttle services will require further review of available satellite parking locations.

Many of the parking areas considered in this analysis are privately owned, and speculation about their potential future use for satellite beach parking is sensitive. For this reason the Project Team has not contacted property owners to obtain more detailed information regarding the size and current use of the sites. This study uses the number of parking spaces or approximate size of the site, as observed in 2009 and 2010. It uses all spaces on the site, recognizing that while some sites may have some amount of available capacity during the peak season, it is unlikely that all spaces would be available for satellite parking. It also does not account for future changes in use due to redevelopment efforts. As this is a 20-year study horizon, there may be flexibility for future use as satellite parking, even if current conditions do not permit it. In the event that NPS and the towns decide to move forward with certain routes and potential satellite parking areas, outreach to the property owners will be essential.

Figure 14 provides the potential parking areas included in the initial identification.

Figure 14
Potential Parking Area Identification



4.2 Parking Area Characterization

The Project Team characterized each of the potential parking areas into the following categories:

- Site with marked parking spaces
- Site with unmarked parking spaces, pavement, or other level surface
- Disturbed site with no active use
- Disturbed site with active use
- Undisturbed land

The following sections describe these types of areas and the process for estimating the number of potential parking spaces. The number of parking spaces was used in shuttle route development to determine the ability of the areas to accommodate unmet beach parking demand.

Sites with Marked Parking Spaces

These sites are currently used for parking. The total number of existing parking spaces is equal to the number of potential spaces.

Sites with Unmarked Parking Spaces, Pavement, or Other Level Surfaces

These sites include paved, flat surfaces with undefined parking areas, or gravel lots where parking configurations are often logical but not explicitly defined. The number of potential parking spaces is based on current parking patterns; additional spaces were included if clear, flat land extends beyond the existing parking configuration.

Disturbed Site with No Active Use

These sites include areas that have been previously used and disturbed, though are not currently in use. Each of these sites is quite large, and could potentially be developed for use as satellite beach parking. The parking space estimates use a standard value of 100 spaces per acre. This is the lower end of the widely accepted range of 100-130 spaces per acre, depending on such characteristics as site configuration, shape, and topography.

Disturbed Site with Active Use

Active disturbed sites are similar to those that are inactive, with the exception that there may be additional limitations on their current availability, based on currently use for non-parking activities. The parking space estimates for these sites also use the standard value of 100 spaces per acre.

Undisturbed Land

This category represents undeveloped lands that have not been disturbed in the recent past. Many of these sites are wooded and may not be level. The parking space estimates for these sites also use the standard value of 100 spaces per acre.

Characterization information for each parking area is provided in Table 17. Several additional parking areas were identified but removed process and not characterized, due to early viability concerns. These areas are noted in Table 18.

**Table 17
Potential Satellite Parking Areas**

Key

Category	# Spaces
1 Sites with marked parking spaces	m.d. Meets Demand
2 Sites with unmarked parking spaces, pavement, or other level parking surface	
3 Disturbed land with no active use	a) Provided by town
4 Disturbed land with active use	b) Provided by NPS
5 Undeveloped land with no active use	c) Site visit
	d) Satellite imagery

Name	Town	Address	Public/Private	Category	# Spaces	Source
Downtown Parking Area	Truro	Truro Center Rd. & Castle Rd.	Public	1	13	c
Highlands Center	Truro	Old Dewline Rd.	Public	1,2,&3	md	c, d
High Head Trail Parking Area	Truro	High Head Rd.	Public	2	30	c, d
Jam's Store	Truro	14 Truro Center Rd.	Private	1	43	a
MassDOT Maintenance Facility	Truro	Route 6	Public	2	20	c, d
Pilgrim Heights Parking Area	Truro	Pilgrim Heights Rd.	Public	1	160	c, d
Transfer Facility	Truro	Route 6	Public	4	300	d
Truro Central School	Truro	317 Route 6	Public	1	58	a
Sand Pit	Truro	Sand Pit Rd.	Private	4	md	c, d

Name	Town	Address	Public/Private	Category	# Spaces	Source
CCRT South Wellfleet Trailhead	Wellfleet	Le Count Hollow Rd.	Public	1	32	c, d
South Wellfleet General Store	Wellfleet	Le Count Hollow Rd. at Route 6	Public	1	30	c, d
Cove Corner Shopping Center	Wellfleet	2393 Route 6	Private	1	84*	c, d
Downtown Wellfleet Parking Area	Wellfleet	Main Str.	Public	1	30	a
Mayo Beach	Wellfleet	Kendrick Ave.	Public	1	83	c, d
OCHS Wellfleet Health Center	Wellfleet	3130 Route 6	Public	2	40	c, d
Wellfleet Drive-in Theatre	Wellfleet	51 Route 6	Private	1	md	c, d
Wellfleet Elementary School	Wellfleet	100 Lawrence Rd.	Public	1	40	d
Wellfleet Marina	Wellfleet	Kendrick at Commercial	Public	1	143	a
Wellfleet Town Hall	Wellfleet	300 Main St.	Public	1	97	a
Wellfleet Senior Center	Wellfleet	715 Old County Rd.	Public	1	45	c
White Crest Beach	Wellfleet	Oceanview Dr.	Public	5	md	a
Cable Road Parcel	Eastham	Cable Rd.	Public	5	md	d
Eastham Town Hall	Eastham	2500 Route 6	Public	1	43	a
Eastham Senior Center	Eastham	1405 Nauset Rd.	Public	1	50	d
Elks Orleans/Eastham Lodge	Eastham	10 McKoy Rd.	Private	1	80	d
Michael's Way	Eastham	Michael's Way	Private	3	md	d
Nauset Regional High School	Eastham	100 Cable Rd.	Public	1	265	c, d
Ocean Park Inn	Eastham	3900 Route 6	Private	1	70	d
Little Creek Parking Area	Eastham	Little Creek Rd.	Public	1	422	b, c
Salt Pond Visitor Center	Eastham	50 Nauset Rd.	Public	1	150	d
Superette	Eastham	2475 Route 6	Private	1 & 2	55	c, d
Tilcon Plant	Eastham	Nauset Rd. at Railroad Ave.	Public	3	md	c, d
Visitation Church	Eastham	930 Massasoit Rd.	Private	2	100	c, d
Wiley Park	Eastham	Herring Brook Rd.	Public	1	55	a
Cranberry Cove Plaza	Orleans	24 Route 6A	Public	1	541	a
Depot Square Park	Orleans	Old Colony Way	Public	2	32	c
Downtown Commercial Lot	Orleans	Old Colony Way	Private	1	70	c, d
Eldredge Park	Orleans	Eldredge Parkway at Rt 28	Public	1	170	d
MassDOT Maintenance Facility	Orleans	Bay Ridge Lane	Public	2	20	d
Nauset Middle School	Orleans	70 Route 28	Public	1	75	d
Rock Harbor Municipal Lot	Orleans	Rock Harbor Rd.	Public	1	20	d
Skaket Corner	Orleans	9 West Rd.	Private	1	400	a
Brewster Baptist Church	Brewster	1848 Main St.	Private	1	99	a
Brewster Senior Center	Brewster	1673 Main St.	Public	1	65	a
Brewster Town Hall	Brewster	2198 Main St.	Private	1	73	a
Drummer Boy Park	Brewster	733 Main St.	Public	2	25	d
Eddy Elementary School	Brewster	2298 Main St.	Public	1	93	a
EPOCH Senior Health Care of Brewster	Brewster	873 Harwich Rd.	Private	1	170	a
Nickerson State Park: Area 1	Brewster	Deer Park Rd.	Public	2	30	d
Nickerson State Park: Main	Brewster	3488 Main St.	Public	1	55	c
Nickerson State Park: Park Store	Brewster	Deer Park Rd.	Public	2	40	d
Stony Brook Elementary	Brewster	394 Underpass Rd.	Public	1	93	a

* Parking area has been reconfigured since the parking analysis was conducted. Number of spaces may have been reduced.

Table 18
Parking Areas Identified but Not Characterized

Name	Town	Address
Truro Town Hall	Truro	24 Town Hall Rd.
Cape Cod Disposal Company	Wellfleet	724 Route 6
Cape Cod National Seashore Headquarters	Wellfleet	Marconi Beach Rd.
High Toss Bridge Disturbed Land	Wellfleet	High Toss Bridge Rd & Pole Dike Rd
Our Lady of Lourdes Church	Wellfleet	Route 6
Transfer Station	Wellfleet	370 Cole Neck Rd.
Doane Rock Parking Area	Eastham	Doane Rd.
Great Pond	Eastham	Great Pond Rd.
Parcel(s) between Nauset Light & Coast Guard Beaches	Eastham	Oceanview Dr.
Governor Prence Inn	Orleans	66 Route 6A
Nauset Beach-Side Motel	Orleans	223 Beach Rd.
Nauset Knoll Motor Lodge	Orleans	237 Beach Rd.
Orleans Elementary School	Orleans	46 Eldredge Parkway
CCRT Tubman Road Parking Area	Brewster	Long Pond Rd. at Tubman Rd.
Freemans Way Disturbed Land	Brewster	Freemans Way

4.3 Environmental Conditions

Depending on the current site conditions, there may be environmental implications to using any of the identified sites for satellite beach parking. The Project Team worked with the Cape Cod Commission to conduct a preliminary environmental analysis of each of the areas included in recommended shuttle routes. The analysis for each site includes data regarding water resources, sensitive wildlife habitat, and local zoning. It should be noted that the information provided in this report is preliminary and would not substitute for any more in-depth analysis required by the National Environmental Protection Act (NEPA), the Massachusetts Environmental Protection Act (MEPA), or other relevant statutes.

It should also be noted that for the purposes of this study, sensitive environmental conditions in the vicinity of potential satellite parking areas do not necessarily mean that the site could not be used. In many cases, the recommended routes make use of areas that are already used as parking or already disturbed. In these cases it may be possible to use the site without additional environmental disturbance. In cases of new development and significant environmental concern, the Seashore/town will have to consider the costs of mitigation along with the benefits of using the site for a shuttle service.

A summary assessment for each of the parking areas is provided in Table 19. The criteria by which the parking areas are analyzed are introduced below:

Public and Private Wells

A public well supplies water to a town-managed distribution system or directly serves public institutions. A well's water supply could be contaminated by inadequately filtered stormwater or wastewater, as a result of an improperly sited parking area or restroom facility. A private well typically serves one or a group of private residences or businesses. While they serve a smaller population, the same concerns about public wells are also relevant to private wells.

Lakes, Ponds, and Wetlands

Many different types of lakes, ponds, and wetlands are located throughout the Lower/Outer Cape, providing important freshwater and saltwater resources. Wetlands also serve as important wildlife habitats, particularly as breeding grounds and juvenile development areas. Development and use of many of the study sites as parking areas could potentially negatively impact nearby ponds or wetlands.

Lake, Pond, and Wetland Contributing Areas

A contributing area to a lake or pond is an area where stormwater is able to re-enter the ground, be filtered as it passes through the soil, and eventually recharge the freshwater lake, pond, or wetland with clean water.

Erosion

Parking area development in locations with unstable and/or excessively sandy soils is susceptible to erosion of the parking area. This type of erosion could negatively impact the stability and safety of the parking surface, negatively impact local water quality, and transport sedimentary material to unwanted locations.

Stormwater

In general, any parking area will generate some amount of stormwater runoff. Large, uninterrupted areas of impervious pavement are essentially impenetrable by stormwater, resulting in nearly 100 percent runoff. Alternative parking surfaces such as dirt, gravel, or permeable pavements allow some amount of water to be reintroduced to the ground on-site. Whether paved or not, any parking surface will require a drainage system to carry stormwater to an off-site location, where it is either reintroduced into the ground or dispensed into a water body.

Wildlife Habitat

Virtually all undeveloped areas on the Lower/Outer Cape have been designated as rare species habitats, and as a result, almost every potential parking site is within or adjacent to a rare species habitat zone. Any parking area development should take all measures to avoid habitat impacts; if such impacts cannot be avoided, they would need to be minimized and mitigated.

Table 19
Potential Environmental Concerns for Possible Satellite Parking Areas

Source: Cape Cod Commission

Town	Site	Spaces	Potential Environmental Concerns						
			Public Well	Private Well	Pond Recharge	Wetland Area	Erosion	Stormwater	Wildlife Habitat
Truro	Highland Center	60	X					X	X
Wellfleet	CCRT So. Wellfleet Trailhead	30		X		X		X	X
Wellfleet	Commercial Parking Lot	32		X		X		X	X
Wellfleet	Cove Corner Shopping Center	84		X				X	X
Wellfleet	White Crest Beach	700					X	X	X
Eastham	Elks Lodge	80		X		X		X	
Eastham	Nauset Regional High School	265	X			X		X	X
Eastham	Old Tilcon Plant			X			X	X	X
Eastham	Visitation Church	100		X				X	

The preliminary environmental analysis of each site included in a recommended route, including maps, is provided in Appendix B.

5 Shuttle Route Analysis and Recommendations

This chapter describes the process for developing and analyzing potential satellite parking areas and shuttle routes and identifies routes that are the best opportunities for future shuttle services. The analysis primarily considers routes that would link one beach with one parking area, though there are examples of multiple beaches served by one route (e.g., in Brewster, Eastham bayside, and Wellfleet), or multiple parking areas serving one beach (e.g., Wellfleet). The satellite parking and shuttle route analysis is organized according to the following groupings of beach areas: Truro oceanside, Wellfleet oceanside, Eastham oceanside, Eastham bayside, and Brewster bayside.

The Beach Parking Needs Analysis in Chapter 3 identified 16 beaches for shuttle route consideration based on an estimated future parking deficit of 15 or more spaces or an expectation of losing more than 50 percent of existing spaces to erosion by 2028.

Two additional beaches – Saints Landing Beach in Brewster and Campground Beach in Eastham – are also included in the analysis due to their close proximity to other beaches already considered for shuttle routes. Two beaches that meet the basic criteria are excluded from the analysis – Skaket Beach (bayside) and Nauset Beach (oceanside), both located in Orleans and managed by the town. While Nauset Beach is not expected to experience significant erosion of the parking areas over the 20-year period of this planning study, it is likely to become a critical issue soon after that horizon. The Beach Road access to Nauset Beach is currently heavily congested and Town staff has indicated that shuttle service would be undesirable at this time. Staff has also indicated that the facilities at Skaket Beach are not suited to accommodate the existing number of visitors and that providing access for additional visitors would further overwhelm them. For these reasons, at the request of the Town of Orleans, this analysis does not include shuttle routes for either of the beaches in Orleans.

The complete list of beaches included in shuttle route analysis includes:

- Ballston Beach (Truro)
- Coast Guard Beach (Truro)
- Longnook Beach (Truro)
- Cahoon Hollow Beach (Wellfleet)
- Newcomb Hollow Beach (Wellfleet)
- Maguire's Landing/ Le Count Hollow Beach (Wellfleet)
- White Crest Beach (Wellfleet)
- Campground Beach (Eastham)
- First Encounter Beach (Eastham)
- Nauset Light Beach (Eastham)
- South Sunken Meadow Beach (Eastham)
- Thumpertown Beach (Eastham)
- Breakwater Beach (Brewster)
- Crosby Landing Beach (Brewster)
- Mant's Landing Beach (Brewster)
- Paine's Creek Beach (Brewster)
- Saints Landing Beach (Brewster)

As discussed in Chapter 3, several of the beaches in Brewster have estimated future parking deficits that are quite small and would not support a shuttle service going only to those beaches. For the Brewster beaches and the bayside area of Eastham, the shuttle route analysis included consideration of whether and how a significant portion of the overall demand could be accommodated using satellite parking and shuttles to beaches already included in the analysis. While many beaches have unique characteristics or individual neighborhood use characteristics, the town-managed bayside beaches are assumed to provide a similar calm water experience and be somewhat interchangeable in visitor demand for those driving to the beach. The capacity of any of these beaches to accommodate increased levels of visitation (e.g. beach space, adequacy of public facilities, etc.) is not addressed in this analysis; it is a management issue for NPS and the towns to determine, as appropriate.

5.1 Shuttle Route Development

As described in Chapter 4 and shown in Figure 14, 71 sites were identified as potentially feasible satellite parking areas. The following sections describe the process for developing the potential routes.

Matching Beaches to Parking Areas

Potential parking areas were identified and assessed as satellite facilities for the beaches using the following general approach:

- Identify the parking areas closest to the beach, and compare potentially available capacity with the future needs of the beach parking area. For most beaches potential parking of adequate size was found within two miles of the beach.
- Include all parking spaces in the comparison, though in many cases it is unlikely that all spaces would be available for satellite beach parking.
- Consider potential for the parking area to serve multiple beaches, or to accommodate the parking needs of multiple beaches.
- If applicable, consider potential for linking multiple parking areas to serve the needs of the beach(es) on the route.
- Consider proximity of the parking area to the main roadway (Route 6, 6A, etc.), and the ability of visitors and shuttle vehicles to find and access the parking area.
- Consider known and perceived limitations to being able to use in the future such as ownership and known site constraints. This includes safety constraints such as narrow roadways, turning conditions, or other known or perceived hazards. Note that parking area owners have not been contacted to discuss the feasibility of using their properties – information was gathered from sites visits, web-based resources, and discussions with public officials.

Descriptions of the parking areas and considerations of how they would serve the parking needs of the beaches is included with the more detailed route development discussion provided in Appendix C.

It should be noted that many of these parking areas are privately owned, and speculation about their potential future use for satellite beach parking is a sensitive matter. For this reason the Project Team has not contacted property owners to obtain more detailed information regarding the size and current use of the sites. In the event that NPS and the towns decide to move forward with certain routes and potential satellite parking areas, outreach to the property owners will be essential.

The study also considered several “community shuttle” routes that would not necessarily link directly to satellite parking, but would collect visitors at commercial, lodging, and residential centers. These routes would have the benefit of picking up passengers at their point of origin, thereby eliminating the visitors’ need to drive for a portion of the trip to the beach. These routes could potentially operate independently or as an extension of another route connecting to satellite parking. Because these routes follow a different model than those based on beach parking demand, they are presented only with an overall operating cost per day rather than a per passenger cost. Potential ridership for these routes has not been estimated.

Shuttle Route Operating Assumptions

Once potential parking areas were identified for each beach, the Project Team developed a total of 36 routes, which serve 17 beaches (there are multiple potential routes to serve each beach), as well as a preliminary operations analysis for each potential route. The operations analyses are designed to determine the basic operating characteristics and feasibility of the routes, but would need to be refined prior to any route implementation. In general, the identified routes represent the most direct travel between the parking area(s) and the beach(es). Routes are identified with labels that refer to the town and beach the route serves. Numbers were used to differentiate between multiple options for a given beach. For example, Route “E-N₃” is a route in Eastham, serving Nauset Light Beach, and is the third route considered for this beach. The service operations for each route are based on the following assumptions. Discussion and analysis of all 36 potential routes is available in Appendix C.

- The number of vehicles (and people) using the shuttle route is calculated based on the unmet parking demand at the beach(es) served. If the number of available parking spaces in the satellite locations is less than the demand, the number of spaces is used.
- Total unmet demand within the town-beach grouping includes excess demand and capacity for all beaches, including NPS-managed as well as town-managed beaches.
- Each space is used by 1.1 vehicles per day¹⁷.
- There is an average of 2.8 passengers per car¹⁸.
- Operations and maintenance cost are standard at \$65 per hour¹⁹.
- Each shuttle vehicle runs for nine hours per day of service.
- All routes operate at a frequency of every 15 minutes.²⁰
- Travel speeds are based on posted speed limits, and discounted according to data provided by the Cape Cod Commission on congestion levels.
- Shuttle schedules assume one minute of dwell time per stop.
- Round trip shuttle travel times are increased by 15 percent to ensure schedule adherence.
- Cost per passenger is calculated based on demand at the specific beach(es) served as well as all unmet demand in the town-beach grouping (in so much as that could be accommodated at the parking areas included in the route).

Route Analysis and Prioritization

Based on the analysis of all potential routes, the Project Team recommended nine routes for further consideration. These routes do not necessarily serve every beach; visitors to the beaches not served by shuttle routes would be encouraged to visit an alternate location if they are unable to park at their original destination. The route recommendations are based on the professional judgment of the Project Team, considering the following issues:

- Beach management and location (NPS vs. town)
- Estimated cost per passenger
- Route distance and length
- Parking area land ownership (public vs. private)
- Expected availability of parking areas in the short- and long-term
- Known local political issues and feasibility

5.2 Recommended Shuttle Routes

The recommended routes are discussed below according to their town/beach grouping and the relative priority. The discussion includes a brief description of the route and its strengths and specific key considerations and next steps for its implementation. A broader discussion of implementation considerations is provided in Chapter 6.

Some of the routes are noted as better short- or long-term options based on the characteristics of potential parking areas. For example, there are several potential parking areas that are relatively large and centrally located, and could be good options for satellite parking, but they are not currently developed for parking. Some of these areas have been included in routes that might be good longer term options.

There are also several potential parking areas that are conveniently located and have existing parking, but the lot size may not be sufficient to accommodate future excess beach parking demand, or the current uses require the majority of the parking available, creating competition for the spaces between beach parking and the current use. Some of these areas are included as potential short-term options, as it is possible that an arrangement could be made to use the site for satellite parking while parking at a longer term option is being developed. Such an arrangement could be beneficial in cases where demand already

¹⁷ Based on limited parking data available from NPS and assumptions that visitors would fill available parking at the beaches prior to using satellite parking options

¹⁸ Based on NPS vehicle counting guidelines

¹⁹ Based on professional judgment and general industry standards

²⁰ Less frequent service may be acceptable for some routes and could reduce costs if it would reduce the necessary number of vehicles. Conversely, some routes may have high enough projected ridership to justify more frequent service. However, for purposes of comparison, a standard frequency of 15 minutes is used.

exceeds capacity, or if there is a sudden loss of parking at a beach. Unless the property owner is amenable, it is unlikely that these would work as long-term options.

A summary table of the recommended routes and some operating characteristics is provided in Table 20; the routes are shown in Figure 16, Figure 15, and Figure 17, followed by discussion of recommendations for each town.

Data definitions are provided below:

- **Route ID:** Defined above in Section 5.1.2: first letter identifies the town, second letter identifies the beach, number identifies the specific route variant for that beach.
- **Route Name:** Description of route, generally provided as the beach served and the name of the satellite parking area.
- **2028 Available Parking:** Estimate of parking spaces available at beach in 2028 based on expected erosion.
- **2030 Parking Demand:** Expected demand for parking at given beach based on current use and 2030 growth projections.
- **2030 Satellite Spaces Needed:** Difference between 2030 Parking Demand and 2028 Available Parking.
- **Spaces at Satellites:** Total number of spaces available at satellite parking facilities along route, estimated as described in Chapter 4. Not all of these spaces may be available for use as satellite beach parking.
- **Total Town 2030 Unmet Demand:** The total unmet beach parking demand for all beaches in the town/coast grouping.
- **One Way Scheduled Travel Time:** Estimate of one-way route travel time in minutes. This estimate includes time planned for passenger loading and unloading at stops, and schedule adherence.
- **Shuttle Vehicles:** Number of vehicles required to provide the desired shuttle frequency (default service every 15 minutes).
- **Route Miles:** Measured travel distance between satellite parking and beach along road network. For routes that are loops, this distance is half the total route length.
- **Total Daily Cost:** The daily cost to operate the service. This includes only shuttle operations and maintenance costs.
- **Cost per Pax:** The cost per passenger of providing service assuming ridership based on the 2030 satellite spaces needed for the given beach. This includes only shuttle operations and maintenance costs.
- **Cost per Pax All Town Demand:** The cost per passenger of providing service to all unmet demand in the town/coast grouping, assuming that the satellite parking areas have sufficient capacity to accommodate the demand. This includes only shuttle operations and maintenance costs.

Table 20
Recommended Beach Shuttle Routes

Route ID	Route Name	2028 Available Parking	2030 Parking Demand	2030 Satellite Spaces Needed	Spaces at Satellites	Total Town 2030 Unmet Demand	One Way Scheduled Travel Time (min)	Shuttle Vehicles	Route Miles (One Way)	Total Daily Cost	Cost per Pax	Cost per Pax All Town Demand
E-N1	Nauset Light - Nauset Regional High School	167	206	39	265	19	7	2	0.8	\$1,170	\$9.84	\$19.92
E-N1-N	Nauset Light - Wellfleet Motel/Lodge to Nauset Reg HS via Tilcon	167	206	39	-	19	14	3	3.2	\$1,755	-	-
E-NC	Nauset Light- Coast Guard - Route 6 via Tilcon	167	206	39	-	19	16	3	3.5	\$1,755	-	-
E-C1	Connection - Salt Pond Visitor Center and Route 6	650	669	19	-	19	6	1	1	\$585	-	-
W-M1	Ocean View Drive Shuttle	785	1192	407	Meets demand	366	19	3	3.3	\$1,755	\$1.40	\$1.56
W-M2	Wellfleet Ocean View Beach Loop	785	1192	407	146	366	21	5	4.6	\$2,925	\$6.50	\$6.50
E-F2	First Encounter – Elks Lodge / Hotels	175	241	66	80	101	12	2	2.3	\$1,170	\$5.77	\$4.75
E-F3	First Encounter – Visitation Church	175	241	66	100	101	12	2	2.7	\$1,170	\$5.77	\$3.80

Figure 15
Recommended Wellfleet Oceanside Routes



Figure 16
Recommended Eastham Oceanside Routes

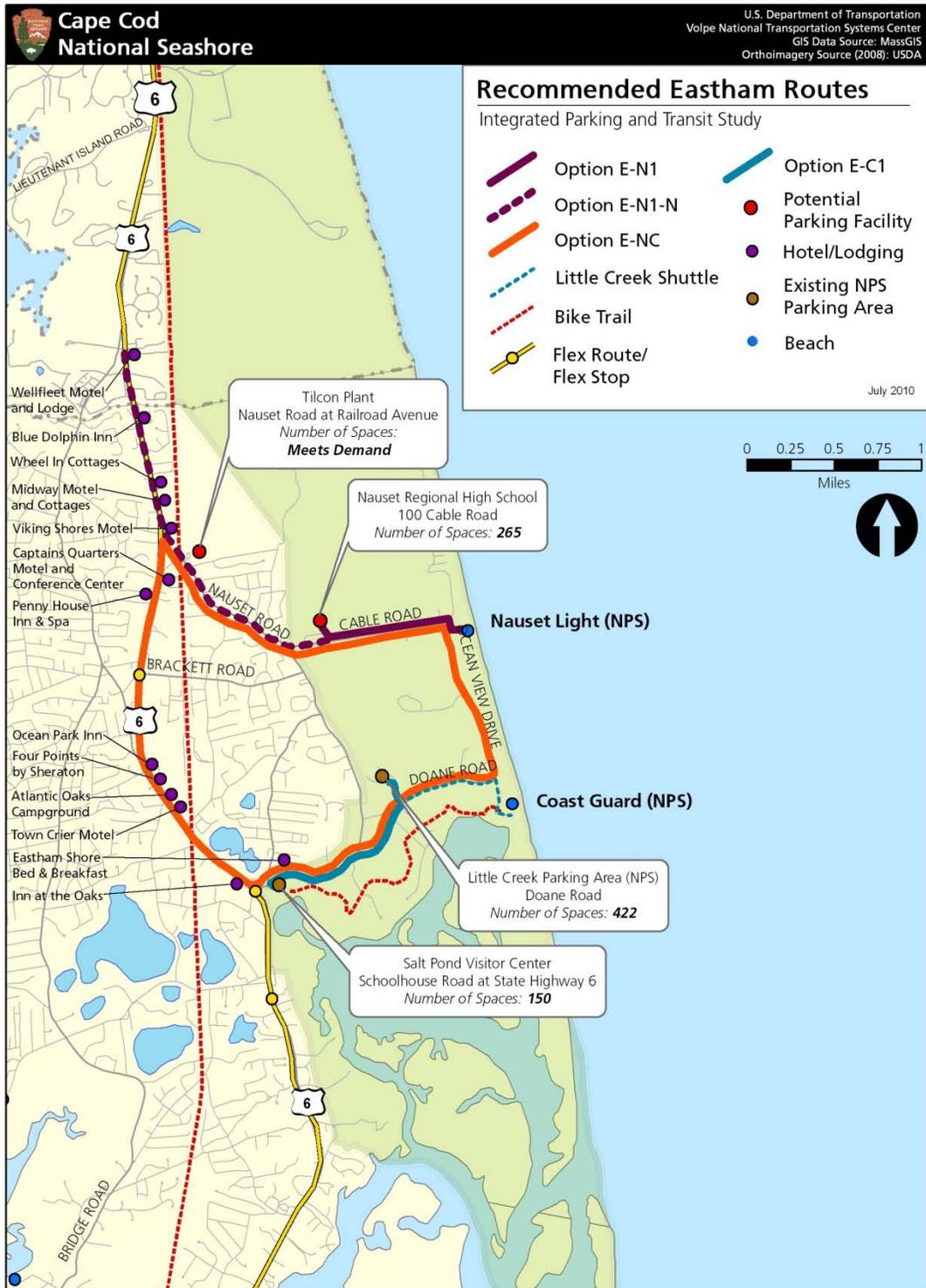


Figure 17
Recommended Eastham Bayside Routes



Truro Oceanside

The Project Team recommends that no shuttle routes be pursued for Truro for the following reasons:

- The estimated unmet demand at the Truro beaches is low and could likely be accommodated through existing capacity at the two Head of the Meadow Beach areas;
- The orientation of the beaches and limited road network preclude development of routes serving more than one beach; and
- The potential satellite parking areas are located relatively far from the beaches. The parking areas closest to Longnook and Ballston are relatively small and may not have available parking; the larger sites are farther away and parking would need to be developed. There are no existing parking areas identified in this study that are located within three miles of Coast Guard Beach.

The Project Team recommends that Truro and the Seashore make use of intelligent transportation systems (ITS) strategies to redirect visitors from the smaller beaches to those with more parking capacity, such as Head of the Meadow. Such an approach may prompt the Seashore and Truro consider alternate permit and fee arrangements for Truro residents. While Head of the Meadow Beach could likely provide sufficient parking to meet the demands for all Truro beaches, the Project Team recognizes the unique character of the other Truro beaches and that many visitors desire the experience of visiting a smaller beach.

If the Town of Truro were to decide to pursue a shuttle service, one of the shorter shuttle routes such as the Highlands Center to Coast Guard Beach (T-C1/T-M1) or Longnook to Truro Central School (T-L1), which are described in Appendix C, would be the most efficient. Use of the Highlands Center for Town beach parking would require integration with long-term plans for the site, and a special agreement between Truro and the Seashore regarding parking revenue issues due to use of land owned by the NPS.

Wellfleet Oceanside

The Wellfleet oceanside beaches are a high priority, given current demand and anticipated erosion. The four beaches addressed in this analysis are all located within the Seashore boundary and are maintained by the Town of Wellfleet. There is sufficient unmet parking demand and threat of erosion to justify pursuing shuttle options immediately. Given the high level of anticipated future parking needs and lack of existing parking areas large enough to meet those needs, the Project Team recommends that the Town of Wellfleet and the Seashore also begin exploring longer term parking options sooner rather than later.

The anticipated beach parking needs and shuttle route opportunities in Wellfleet are unique for several reasons. First, the magnitude of the unmet beach parking demand is considerably higher than in any of the other areas. This is due to the large size of the parking areas, high demand, and high expected erosion. The demand analysis and identification of potential satellite parking areas found that there is no single existing parking area that could accommodate the estimated future beach parking needs in the Town of Wellfleet; the needs would either be only partially met, through a shuttle accessing multiple parking areas, or fully met through development of a new parking area. Another unique condition in Wellfleet is that unlike in other towns considered in this study, the orientation of the beaches and road network allow for development of routes serving more than one beach or more than one parking area. The recommended Wellfleet routes serve all four of the beaches. Single beach routes were found to be less efficient, due in part to the request from the Town that some of the more direct roadways not carry shuttle routes, due to concern over impacts of increased use on sensitive environmental resources. There may be concerns, however, about the future vulnerability to erosion of sections of Ocean View Drive.

The shuttle routes analysis identified two routes recommended for further consideration. The recommended shuttle routes are discussed below and shown above in Figure 15.

W-M1: Ocean View Drive Shuttle

The Ocean View Drive Shuttle would run along Ocean View Drive, linking the four beaches and a newly developed parking area near White Crest Beach. The area on Ocean View Drive across from White Crest Beach is owned by the Town of Wellfleet, which has expressed possible interest in including beach parking in the site development plans. The site is expected to be of adequate size to accommodate all of

the unmet parking demand in Wellfleet, contingent on potential environmental constraints related to site development.

This route has the operational benefit of a relatively short travel time, as the parking area is so close to the beaches. This route could potentially exacerbate traffic congestion on Ocean View Drive, however, due to the addition of shuttle vehicles traveling the roadway on top of visitors parking at the individual beaches and at the new White Crest parking area. Development of the parking area could also potentially overwhelm the facilities at White Crest Beach, if visitors choose not to take the shuttle to the other beaches along Ocean View Drive and instead only access White Crest Beach. Implementation plans should include the following:

- Conduct more detailed environmental assessment of the area and consider whether Wellfleet would pursue parking depending on environmental conditions.
- Consider traffic impacts on Ocean View Drive.
- Consider potential over-use and necessary beach management associated with White Crest Beach.

W-M2: Ocean View Beach Loop

The Ocean View Drive Beach Loop would travel along Gross Hill Road, Route 6, Le Count Hollow Road, and Ocean View Drive. It would utilize the existing parking areas such as the Cove Corner Shopping Center, the South Wellfleet Commercial Lot, and the CCRT Trail Head locations to provide as much satellite parking as possible.²¹ It might also be able to pick up passengers at major hotels, transit transfer points, or other key sites along the route, thereby reducing parking demand. Coordination for this route may be somewhat complicated given that it would link together multiple privately owned parking areas. It would also require more careful operational consideration, as some of the parking areas or other stops may be on opposite sides of Route 6, which would require left turns onto or off of Route 6.

While it would not meet the demand for Wellfleet beaches, this route would not require development of any new parking areas. Remaining parking demand would either be accommodated by other modes such as bicycling or transit connections, redirecting non-town resident use to Nauset Light beach in Eastham via the Nauset Regional High School shuttle (E-N1), or simply not accommodating the expected demand. Implementation plans should include the following:

- Study traffic and operations related to shuttle route and Route 6 crossings.
- Begin discussions with owners of the parking areas regarding use of the areas for satellite beach parking.

Eastham Oceanside

The anticipated additional beach parking needs on the oceanside in Eastham are relatively modest and are based primarily on demand exceeding parking supply, rather than on significant erosion. The needs analysis estimates a small amount of additional capacity available at the Little Creek Parking area in the future, which could accommodate excess demand from the Coast Guard at Beach parking area. This analysis did not consider alternate parking areas to serve Coast Guard Beach, under the assumption that Eastham residents who park in the Coast Guard at Beach lot are unlikely to be willing to travel to an alternate site farther from the beach to take a shuttle; they would be more likely to park in the Little Creek lot or visit Nauset Light Beach instead. The operations and costs of the Coast Guard – Little Creek shuttle are not included in this study. Route E-C1 in Appendix C discusses enhancements to the existing shuttle service.

The shuttle routes analysis identified four routes recommended for further consideration. These routes are discussed below and shown above in Figure 16.

²¹ Since this route was analyzed, the level of retail use at some of the identified existing commercial areas has changed. There may be less parking available for satellite beach parking at previously identified locations. Additional parking may be found at other sites along the route.

Nauset Regional High School

This route would connect Nauset Light Beach with Nauset Regional High School via Cable Road. This route could serve in both the short- and long-term, as it currently has sufficient parking. The route is one of the shortest and most direct routes identified in this study.

Due to the limited need for additional parking for Nauset Light Beach of only 39 spaces, the initial operations analysis estimates a cost of nearly \$10 per passenger. However, the High School parking area has sufficient space that it could potentially accommodate many more additional vehicles if NPS decided to redirect more visitors to this site, under agreement with the Town/School District.

Visitors to the Outer Cape could be directed to a large parking area such as Nauset Regional High School (or Tilcon Plant) that provides service to a beach that has adequate facilities to handle additional visitors. By focusing visitors to a single location, the efficiency of a shuttle service would be maximized and costs kept to a minimum. Eastham bayside beaches or visitors travelling up the Cape to Wellfleet or Truro beaches could be redirected to a facility in Eastham. While higher demand might require additional shuttle vehicles, it could also decrease the cost per passenger.

This route could be implemented in the short term, as the parking area currently exists and is publicly owned. Implementation plans should include the following:

- Determine whether Nauset Light Beach could accommodate additional visitation beyond the current capacity of the parking area, and by how much.
- Begin discussions with the Nauset Regional High School regarding the possibility of using a portion of the school parking area for summer beach parking.

E-N1-N: Northern Eastham Shuttle

This route is designed to provide shuttle service for visitors staying along Route 6 in four lodging facilities north of Nauset Road in Eastham and at the Wellfleet Motel and Lodge just across the town line. All of these facilities are on the east side of Route 6, which will facilitate the return trips from the beach to the lodging facilities, but may complicate southbound travel as the shuttle vehicle would have to cross the heavy northbound traffic along Route 6 to pick visitors up as it travels toward the beach.

This service would operate as an extension of the proposed E-N1 service between Nauset Regional High School and Nauset Light Beach and would run from the Wellfleet Motel and Lodge to the beach via Nauset Road and Cable Road. This service could be provided on every E-N1 trip or on a less frequent basis, with only some of the E-N1 trips extended to Route 6.

This route could be implemented in the short term if the commercial lodging facilities are amenable. As the demand for such a service has not been developed, costs are based on daily operating costs.

Implementation plans should include the following:

- Contact lodging locations to determine interest/feasibility of stopping at each site.
- Conduct test runs of route to determine safety and timing required for picking up visitors from north to south during the morning. Consider pick-up and drop-off only in the northbound direction.

E-NC: Eastham Lodging Loop

This route is designed to provide shuttle service for visitors staying in lodging facilities located between the Salt Pond Visitor Center and Nauset Road. The route would serve the Salt Pond Visitor Center, Nauset Light Beach and Coast Guard Beach and stop at six lodging locations along this portion of Route 6.²² Additional stops would be made at other satellite parking areas such as Nauset Regional High School, Little Creek, or the Tilcon site, as appropriate, and at the North Eastham Village Center complex near the intersection of Route 6 and Brackett Road.²³ Because nearly all of the commercial lodgings are on the east side of Route 6, this route would operate in a clockwise direction all day to minimize left turns.

²² It is expected that Four Points by Sheraton and Ocean Park Inn, which are adjacent, would share a stop and that visitors staying at the Eastham Shore B & B would walk the ¼ mile to the visitor center to access the service, making the route available to visitors staying at eight lodging sites.

²³ The route is currently designed to serve both Nauset Regional HS and Little Creek but not Tilcon.

It may be possible to reduce travel time slightly by eliminating the stops at Coast Guard Beach or Little Creek; alternately this service could supplement both the E-C1 and E-N1 routes.

This route could be implemented in the short term, presuming that the commercial lodging facilities are amenable. As the demand for such a service has not been developed, costs are based on daily operating costs. Implementation plans should include the following:

- Contact lodging locations to determine interest/feasibility of stopping at each site.
- Conduct test runs of route to determine safety and timing required for serving sites on west side of Route 6 and actual traffic conditions.

E-C1: Little Creek Parking Area – Salt Pond Visitor Center

This route would function as a spur from the current Coast Guard – Little Creek shuttle, periodically connecting to the Salt Pond Visitor Center. The purpose of this service would be to provide a connection to the Visitor Center and the Flex Route, though the Visitor Center site would not be used as satellite beach parking. It would make use of existing vehicles and operators, identifying strategic times to connect to the Flex service.

During the summer Flex serves the Visitor Center approximately every hour in each direction. Depending on the coordination of the north- and south-bound service, one to two trams per hour would be sent to the Salt Pond Visitor Center. Depending on the existing Little Creek Shuttle operations and staffing schedule, the extension might require operation of an additional vehicle or might be accommodated through the existing service. Cost estimates for this shuttle are provided on a per-day basis based on the same cost assumptions used to develop the new shuttle services.

The Project Team recommends that NPS conduct a pilot shuttle extension to determine whether this service is effective and the impact on existing shuttle operations. Implementation plans should include the following:

- Determine whether there is currently capacity within the existing Little Creek shuttle operations to divert a portion of the shuttle runs to serve Salt Pond Visitor Center.
- Consider the impacts on parking at Salt Pond Visitor Center. Would visitors try to park there for free rather than paying to park at Little Creek? This may be less of an issue if the shuttle extension runs infrequently.
- Consider the necessary outreach and marketing to facilitate Flex connections to the beach shuttle at Salt Pond. The extension will not be successful if it is not combined with additional efforts to attract beach visitation via Flex.

Eastham Bayside

The Eastham bayside area is not located within the Seashore boundary. While only three beaches met the criteria for additional analysis, overall, there is an anticipated future unmet demand of approximately 100 parking spaces.

One option for addressing unmet demand on the bayside could be to direct visitors to Nauset Light or Coast Guard Beaches. While the beach experience on the bayside is not the same as on the ocean side, this might be a relatively easy way to accommodate a large portion of the beach parking needs.

Another option would be for the Town of Eastham to pursue a shuttle route to serve its beaches. Given the relatively modest unmet demand at most of the bayside beaches, the Project Team recommends that if Eastham decides to pursue a beach shuttle to the bayside, it should be a single shuttle that could accommodate all or most of the parking demand and serve a single beach. While located farther from some of the potential parking areas, First Encounter Beach might be best suited to accept unmet demand from other bayside beaches, due to its larger size and public facilities. Thumpertown is not well-suited for this, as there is a relatively narrow beach area at high tide.

This study provides two possible recommendations for routes to link to First Encounter Beach. The recommended shuttle routes are discussed below and shown above in Figure 17.

E-F2: First Encounter – Elks Lodge / Hotels

This route would connect First Encounter Beach with the Elks Lodge and the Ocean Park Inn and/or Sheraton Four Points Hotel, via McKoy Road, Herringbrook Road, and Samoset Road. While this route would not include specific satellite beach parking at the hotels, it would include stops at one or both locations to serve visitors staying at the hotels. This route could operate in the short term because the parking area at the Elks Lodge currently exists. Implementation plans should include the following:

- Consider coordinating with the Chamber of Commerce or specific businesses about the possibility of partnering to provide shuttle service.
- Work with the Elks Lodge to explore the possibility of using the site for satellite beach parking. Coordinate how to address parking needs at time when the Elks Lodge requires parking for its own events.

E-F3: First Encounter – Visitation Church

This route would connect First Encounter Beach with the former Visitation Church site via Massasoit Road, Herring Brook Road, and Samoset Road. Because the parking area already exists, this route could operate in the short term. The church is located slightly farther from the beach than the Elks Lodge, though the parking area is larger and could potentially accommodate more of the unmet demand on the bayside. It may also be available every day, whereas Elks Lodge events may make that parking area unavailable on some regular days. Implementation plans should include the following:

- Consider the ability to use the Visitation Church site for satellite parking. The Town may need to act quickly to make arrangements for use of site.

Brewster Bayside

Brewster has eight public, bayside beaches, all of which are located close to Route 6A. Most of the Brewster beaches are accessed by individual small roads off of Route 6A or Lower Road. Route 6A and Lower Road run parallel to the coast approximately 0.5 miles inland. While some visitors may not be able to walk from Route 6A to the beach, it may be worth considering improved pedestrian and bicycle connections to the beaches, particularly Linnell Landing and Crosby Landing beaches, which are very close to Nickerson State Park.

The Brewster bayside beach area is not located within the Seashore boundaries and therefore any shuttle routes would need to be initiated and pursued by the town or another partner. Given the relatively modest unmet demand at any given beach and the costs associated with shuttle service operations, the Project Team recommends that if Brewster decides to pursue a beach shuttle to the bayside, it should be a single shuttle that could accommodate all or most of the parking demand and serve a single beach. Identification of a recommended route for Brewster is complicated due to the fact that the use of many of the facilities identified as satellite parking areas are currently in flux. When a plan for the use of town facilities is finalized, the route analysis provided in Appendix C can provide the operating characteristics for routes that use those facilities that are available at that time.

6 Implementation Considerations

There are many issues for the Seashore or one of the Lower/Outer Cape towns (Seashore/town) to consider prior to implementing a beach parking alternative and/or a new beach shuttle route. While each situation is unique, there are common overall themes related to developing a shuttle service.

This chapter discusses some of the key implementation considerations related to operations, vehicles, financing, and satellite parking areas. The discussion outlines basic issues and questions to be considered and provides general information about such services. It does not provide an in-depth study of viability or service planning.

6.1 Operations

There are many components that need to be considered when thinking about how the shuttle service will be managed and operated.

Detailed Service Plan

A detailed service plan is required prior to implementing any of the shuttle routes recommended for further exploration. The analysis in Chapter 5 provides a basic estimate of operational characteristics for each of the recommended routes, with common assumptions for season and hours in which the service will operate, shuttle frequency, necessary vehicles, and operating cost. While these assumptions provide a useful way to compare operations and cost across the routes, they may not represent the most appropriate operating characteristics of each of the routes. The detailed service plan will help determine a more appropriate daily and seasonal schedule and provide more accurate cost estimates.

Operation Model

One key decision for the Seashore/town is whether to operate the service “in-house” or contract or partner with another entity for operations. For instance, the Seashore/town could decide to implement a shuttle route independently and assume all responsibilities. Other scenarios could involve operating the service through a partnership among towns and the Seashore, regional agencies (e.g., Cape Cod Regional Transit Authority or the Nauset Regional School District), local businesses (e.g., Chambers of Commerce or hotels), and local interest groups (e.g., Council on Aging). One of these organizations could choose to operate the service or the organizations could jointly contract the service to a private operator. Alternatively, a private business could provide such a service independently for-profit, such as the Provincetown Trolley.

There are advantages and disadvantages to operating the service “in-house” or with a partner versus contracting with a private provider. Operating independently may be less expensive than a private contract and may allow the Seashore or the town to take advantage of special opportunities like specific grant programs, or benefit from new relationships formed through partnerships with other entities. On the other hand, a private provider with more knowledge and experience in providing shuttle services may be able to run the service more efficiently by using its existing vehicle and staff resources, and may also provide the Seashore or the town with more flexibility. For example, there may be opportunities for a new shuttle service to share resources with existing transportation services, such as regional transit, school, or commercial-related transportation services, which would provide for additional efficiencies. The contract could be set up with the contractor responsible for all aspects of system operations and performance, including staffing, monitoring, and vehicle procurement, maintenance, and storage; or the Seashore/town could take primary responsibility for some of these components, such as vehicle procurement. The sponsoring agency would need to monitor service and oversee the contract to ensure quality of service.

Vehicle Considerations

There are several important considerations in determining the appropriate type of vehicle for providing the alternative transportation service.

Vehicle Size

The projected ridership and desired route will help to determine the necessary vehicle characteristics. Depending on estimated number of passengers on each trip and whether the vehicle will be traveling on

narrow residential roads to access the beach, the Seashore/town might consider using a relatively small vehicle to serve the beaches. For routes serving larger beach parking demand or traveling on main roads, a larger vehicle might be more appropriate. Another important consideration regarding vehicle size will be its turning radius and the space available for turning at the beach and at the satellite parking area. In most cases a typical 30- or 40-foot transit bus will not be appropriate.

Vehicle Design

There are a variety of vehicle designs that could be considered for beach shuttles. The Seashore currently uses open-sided tram vehicles to connect Little Creek to Coast Guard Beach. While this vehicle works well for the Coast Guard Beach route, providing easy entry and exit and the ability to carry beach gear, it cannot be used on Route 6 and would not be appropriate for many of the routes considered in this study. A trolley vehicle may be desirable for routes that travel Route 6, while trying to maintain an open-air, “beachy” feel. Standard cut-away vehicles provide another option for routes with smaller demands that need to travel on Route 6.²⁴ Note that the Little Creek to Coast Guard Beach shuttle initially used school buses, which were found to be inappropriate for a beach shuttle use due to the high-floor height, narrow aisles, seat configuration, and inability accommodate beach gear. Trailers or internal racks should be considered to provide space for visitors to bring their coolers, chairs, and surfboards. Particularly for routes connecting to bike trails, bike racks or trailers should be considered. Examples of tram, trolley, and cutaway vehicle options are shown in Figure 18.

Figure 18
Potential Vehicle Options: Tram, Trolley, and Cutaway Shuttle

Sources: U.S.DOT Volpe Center, Goshen Coach, and U.S.DOT Volpe Center



Fuel

Depending on the characteristics of the shuttle service, the Seashore/town could also determine whether it would be possible to pursue an alternative fuel shuttle vehicle. Such a vehicle might be smaller or

²⁴ A cutaway vehicle is a customized vehicle built using a standard truck or medium-duty chassis. Cutaway vehicles are often smaller and narrower than buses designed for the same number of passengers. Vehicles can be found that are 90 inches wide and 21 feet long.

quieter, and could have lower emissions, thereby improving the visitor and neighbor experience and providing environmental benefits. Special needs for storage and maintenance, as well as the availability of fuel, must also be considered when deciding whether to pursue an alternative fuel vehicle. Currently, access to alternative fuels on the Outer Cape is limited; biodiesel is available in Truro and the Commonwealth of Massachusetts has compressed natural gas for their fleet at Nickerson State Park.²⁵

Vehicle Storage & Maintenance

If the Seashore/town decides to operate the service in-house, it would have to consider where to house shuttle vehicle(s) in the evenings and off-season and where to obtain maintenance. Depending on the number of vehicles, and their size, basic maintenance could be done by the Seashore/town in charge of the service. A vehicle maintenance facility study is currently looking at options to improve access to heavy maintenance for vehicles on the Outer Cape. While each of the towns and the Seashore has basic maintenance facilities, heavier maintenance is still an issue. The RTA's contractor uses a full-service maintenance facility in South Dennis, approximately 23 miles from the Seashore's maintenance facility. If no new solutions are developed based on the Outer Cape vehicle maintenance study, it may be possible to develop an agreement to contract for service from the South Dennis facility. Vehicle storage on the Outer Cape has been an ongoing issue for the Flex service and would likely be an issue for a town-run service unless space is set aside at the satellite parking facility.²⁶

6.2 Funding

There are two general categories of expenses related to providing a shuttle service: (1) capital costs and (2) operating costs. The distinction between the two is significant. Capital costs pay for non-consumable items, which are incurred initially and then intermittently as wear and tear requires replacement. Operating costs, including employee salaries and fuel, are ongoing and related to the amount of service provided.

Capital Expenses

Capital expenses related to shuttle service would include but are not limited to purchase or lease of vehicles, shelters or other amenities at shuttle stops, vehicle storage or maintenance facilities, and information technology systems. Some of these expenses may be eligible for Federal or state grant funding, particularly for routes serving beaches within the Seashore boundary. Appendix D provides more information on potential funding sources. The remainder of the capital costs would need to be paid for out of Seashore/town budgets or by other partners.

Operating Expenses

Though the cost of vehicle acquisition is a high one-time expense, operations and maintenance can be considerably higher in the longer term. Most Federal and state grant programs fund capital expenses but do not fund transit operations. There are some programs that may fund operations for the first few years of a new service, after which time operations would be the responsibility of the implementing agency. These are discussed in more detail in Appendix D. Funding for the pilot period would allow the Seashore/town time to adjust the service plan and prepare for future operations.

The cost of servicing and operating vehicles is directly related to the outcome of the service plans – the necessary number of vehicles, the hours that they will be in service, and the labor required to operate and maintain the system. The Seashore/town should carefully consider the efficiency and estimated cost of any route it may implement, in order to minimize operations costs. If the Seashore/town contracts out the service, capital and operating costs are likely to be incorporated into a single hourly or seasonal rate.

Fares and Fees

The Seashore/town will need to consider whether and how much in fares or fees to charge²⁷. The Seashore/town currently collects fees from visitors who park at the beaches.²⁸ This funding is used for a

²⁵ US Department of Energy, Alternative Fuels & Advanced Vehicles Data Center.
<http://www.afdc.energy.gov/afdc/locator/stations/>

²⁶ Sean Peirce, project manager of Vehicle Maintenance Facility Study, via e-mail, June 3, 2010.

²⁷ Any actions regarding new or revised fees, whether for shuttles, parking, or park entrance, will be consistent with NPS guidelines and requirements regarding fee collection.

variety of purposes including paying for lifeguards, beach and parking area maintenance, and in some cases other Seashore/town expenses unrelated to the beach. With erosion reducing or eliminating parking at the beaches, some or all of this revenue will also disappear. Running a shuttle service will help bring people to the beach but will also present an additional expense to the Seashore/town.

Revenue options include shuttle fares, parking fees, and advertising on the vehicles. Partners may be willing to support some of the shuttle costs as well. If per passenger fees will be charged, the cost per passenger is a particularly useful way to analyze and plan for operating costs. The detailed service planning effort should provide a better expected cost per passenger than those provided in Chapter 5, although those can be used as a starting point.

In setting a fare or fee to support the shuttle service, the Seashore/town will need to balance the need for revenue with the price visitors are willing to pay for the service. The costs of operating and maintaining transit services are such that most transit systems around the world are not self-sufficient and operate with some amount of public subsidy, even if they charge a fare. However, it may be possible that some of the recommended routes could charge fares similar to current beach parking fees to cover their operating expenses. If revenue is not sufficient to match the cost of the service, the Seashore/town would need to consider providing a subsidy or looking to outside funding sources in order to provide shuttle services. These considerations may lead the Seashore/town to only implement selected shuttle routes, primarily those with higher anticipated ridership or lower anticipated operating expenses.

Options for collecting payment include onboard per-person shuttle fares, per car parking fees at satellite locations (either at a manned entry gate or via payment by meter, ticket or fee deposit box), or entrance fees at the beach. The Seashore/town will need to analyze various payment collection options based on whether parking will still be available at the beach destinations, current parking costs, the use of season passes, and staffing costs for implementation. Fee collection could potentially be integrated in the Cape-wide parking technology options explored by the RTA and in the ongoing Cape Cod National Seashore ITS study. On-board collection would require special equipment and training for the driver, and may slow down service; staffed parking areas or even part-time monitoring of passive payment systems would require additional staffing.

6.3 Parking Areas

Assuming that satellite parking is a part of the shuttle service, the Seashore/town will have to secure access to the parking area. Parking may be currently owned by the organization that will operate the service, purchased for the purpose of adding satellite parking, or used through an agreement between the land owner (either a private or public entity) and the Seashore/town for exclusive or shared use. The site may be an existing, paved parking area or an undeveloped site with parking potential. Depending on the current use and layout of the site, it may be necessary for the Seashore/town to make some modifications or improvements to the parking area, including but not limited to signs to direct visitors, designating specific spaces, shuttle waiting areas, fee collection equipment, benches, and trash receptacles. This study provides information about representative parking areas; the information is current as of the publishing of the study. Throughout the course of the study, plans and uses have changed for private and public sites, highlighting the representative nature of the sites identified in this report. For the highest priority routes, the Seashore and towns should monitor potential parking areas to take advantage of opportunities for securing satellite parking or seeking alternative parking options when the use of a potential parking area changes and becomes incompatible with beach shuttle parking.

Shared Use

Consistent with NPS goals for promoting land conservation, this study prioritizes sites that have already been developed or disturbed (whether publicly or privately owned) over developing new parking areas. Administratively, the sites that are likely to be the easiest to use would be publicly owned properties such

²⁸ Most of the beaches in the study area currently charge \$15 per vehicle for one-day use, though rates are lower for weekly or seasonal use, and may be different for residents and non-residents. NPS estimates that there are typically two or three people in each vehicle. See Chapter 2 for more information about parking fees.

as schools, hockey rinks or gymnasiums, or other facilities with limited summer programs. A town managing a shuttle service may already manage some of these sites and be able to arrange for their use. It may also be possible to arrange for their use in routes that would be managed by the Seashore, building upon existing relationships and agreements between the Seashore and the towns.

If existing, publicly owned parking areas are not available, the Seashore/town could consider pursuing an arrangement with a private entity for use of a portion of their parking area during the summer peak season. Some businesses or other organizations may have access to a parking area larger than their current needs and might be willing to allow the Seashore/town to use a portion of the lot, in return for payment or other compensation. Such an agreement may be restricted to specific dates and times, or to a certain number of parking spaces. The private entity may be willing to make the agreement for a limited time or for multiple seasons.

Purchase

If shared use sites are not possible or desired, the Seashore/town could pursue purchase of a site for use as satellite parking. This is the simplest parking management strategy as it allows for the site to be designed and secured for the specific intended use. However, using a site exclusively for surface parking just in the summer peak season may not be cost effective or desirable from a land use perspective.

In addition to the expense, purchase of a site outside of the Seashore boundaries would be administratively complicated for the Seashore, as it would require the United States Congress to approve an expansion of the Seashore boundary. For this reason it might be more appropriate to partner with a town to purchase the site. While town purchase of alternate sites may be less complicated than for the Seashore, it still requires review and approval and may require a Town Meeting vote. Purchase, development, or modifications to any site will require significant funding to be identified.

Private Property

Many potentially desirable satellite parking areas are currently privately owned. For satellite parking areas on private property, the Seashore/town should consider contacting the current property owner to gain a better sense of their short- and long-term plans for the site. However, property owners may be sensitive to such inquiries, and the Seashore/town should proceed very carefully with such outreach. As noted in Chapters 4 and 5, owners of the sites identified as potential satellite parking facilities have not been contacted as part of this study.

Regardless of whether the Seashore/town pursues shared use or purchase of a privately owned site, it should consider contacting property owners at least one to three years in advance, to make sure that there is time to develop the agreement or sale. Depending on the characteristics of the route and site and the relationship with the property owner, developing a shared-use agreement could be done quickly just before a service is needed, or it may require more time. When reasonable alternative parking areas are not immediately available, discussion with the parking owner may need to occur before other agreements (such as vehicle purchase or operating contracts) are in place to be assured that the service will be feasible. If the owners are interested in selling, it may be advantageous to purchase the site even before the shuttle service is needed. It may also be possible to make arrangements more quickly than one to three years in cases of more sudden, dramatic, loss of parking.

Undeveloped Sites

If there are no existing parking areas that could be used for beach shuttle satellite parking, the Seashore/town should proceed carefully in considering use of undeveloped sites. Chapter 4 does identify some undeveloped sites, with a priority to those areas that are already disturbed. There are likely to be environmental and land use considerations related to development of any of these sites.

Environmental Constraints

Depending on the scale of modifications or improvements necessary for any of the satellite parking sites, local, state or Federal environmental review may be required depending on the entity who owns the land. Because water resources are of particular concern on Cape Cod, new impervious surfaces must minimize run-off and/or impacts to groundwater recharge areas. Other concerns include existing potential site

contamination, endangered and threatened species habitat, land stability, cuts and fills, noise pollution, and view obstruction.

Appendix B includes information about basic environmental conditions for each of the parking areas included in the routes identified in Chapter 5. While this information does not substitute for a NEPA review, it can provide some initial insight on the areas that are likely to have additional environmental concerns.

Land Use Constraints

In addition to the natural environment, the built environment is also highly regulated. Every town on the Lower/Outer Cape has its own zoning code, and each set of regulations dictates how land can be used within specifically zoned areas. For every potential parking area, the Seashore/town will need to identify the uses permitted on the site. Parking is frequently regulated as an accessory use, meaning that the parking area may be required to meet certain criteria based on the primary use of the property. An area used explicitly for shuttle parking may be considered a primary—rather than accessory—use, and may only be permitted as a special exception or conditional use. The Seashore/town should include potential land use review in planning for any shuttle service.

6.4 Other Implementation Considerations

Marketing and Advertising

The Seashore/town should consider a strong marketing and information campaign to inform residents and visitors about the parking changes and shuttle system. The information campaign should ensure that there are good connections between the satellite parking areas, shuttles, other transportation options. The Seashore/town should work with local partners such as the business community and schools to inform the public and consider a formal marketing campaign.

Signage & Intelligent Transportation Systems (ITS)

Because any beach parking shuttle is likely to operate for a limited season and limited hours, the Seashore/town will need to provide information to potential users about how to access the shuttle. The Seashore/town should explore use of Intelligent Transportation Systems (ITS) technology, such as variable message signs or highway radio, to communicate traveler information to beach visitors. ITS technologies may also be used for collection of parking or shuttle fees. The Seashore/town should coordinate with other ITS efforts currently in progress on the Cape, including the current NPS study of ITS options.

Beach Capacity

While the capacity of the existing beach parking areas is known, determining the capacity of the beach areas themselves is more complicated and subjective. Some beaches offer restrooms, lifeguards, and other facilities, which may have a capacity limit, and must be considered. The size of the beach area fluctuates from year to year and changes daily with the tide, and the each visitor may have a different feel for when they consider a beach to be overcrowded.

Before implementing any shuttle service, the Seashore/town should consider the desired capacity and level of visitation at the beaches at any given time. Current visitation levels could be too high for the facilities to handle, appropriate for the facility capabilities, or the site could potentially accommodate additional visitors if not for the lack of parking. Beaches that currently are unable to accommodate the demand for restrooms or other services may not be appropriate for shuttle routes, even if the parking areas are expected to erode. The reduction of parking at these beaches may help in re-establishing the appropriate level of visitation.

If a beach can accommodate only an exact replacement of parking spaces lost to erosion, the Seashore/town may need to explore parking management controls at the satellite parking area that limit the number of satellite parking spaces used, particularly if the satellite parking area has more spaces than the total number of people that can be accommodated at the beach. This is especially important to consider for routes that would shuttle visitors to a single beach to accommodate all unmet parking demand within a region, such as on the Eastham bayside.

Other beaches may be able to accommodate additional visitors and are currently limited by the number of parking spaces. The analysis in this study primarily considers replacement of expected parking loss due to erosion and has limited estimates of current and future additional demand. There may be beaches where additional visitation can be accommodated and encouraged, which may make some of the shuttle routes more cost effective, as additional users would reduce the cost per passenger.

Pilot Opportunities

The Seashore/town should consider opportunities to test out a shuttle service prior to committing to a long term investment. There may be grant funds available for pilot project operations (see Appendix D). In particular, the Seashore may consider piloting an extension of the current Little Creek to Coast Guard Beach shuttle to the Salt Pond Visitor Center to connect to the Flex Service. Since the Seashore already has the capital and operating infrastructure in place, coordination with the RTA, marketing and driver training would be all that would be required. Special events, such as the Cape Cod Lifesaving Competition, could also be used to test the operational requirements of some of the routes.

Timing for Initiating Routes

Although it is impossible to predict exactly which beach parking areas will be the first to experience erosion, Chapter 3 does identify beach parking areas that are most vulnerable. It also uses anecdotal information to identify beaches that currently have excess demand for parking based on the fact frequency with which they currently fill up. The largest of those beaches, such as the group of four Wellfleet oceanside beaches or First Encounter or Nauset Light Beach in Eastham, may have sufficient demand now to initiate a shuttle service during peak periods. Shuttle services in Truro and Brewster are likely to be less viable immediately, but may become more viable as erosion reduces the current parking availability and demand grows.

Regional Transportation Network Connections

In order to maximize regional transportation options, any shuttle service initiated by the Seashore/town should provide connections to the broader transportation network on Cape Cod. In particular, whether or not the shuttle is operated by the Cape Cod Regional Transit Authority (RTA), it should provide connections to existing RTA service when possible. This includes joint stop locations and schedule coordination. Shuttle routes should also provide connections to regional on- and off-road bicycle and pedestrian facilities as appropriate. A project is currently underway to identify bicycle project priorities for the Cape. When this list is finalized, the recommended routes should be evaluated against this list to determine if any changes to the routes should be made to improve connectivity to the proposed bicycle network.

7 Conclusions and Recommendations

Erosion and changing patterns of use are going to make currently available beach parking inadequate in the future. The Cape Cod Integrated Parking and Transit Study provides estimates of future beach parking demand and erosion, identifies potential satellite parking areas, and analyzes the operational feasibility of remote parking shuttle services. Of the 36 routes identified, eight routes, serving beaches in Wellfleet and Eastham were considered the most feasible.

Table 21
Recommended Beach Shuttle Routes

Route ID	Route Name	2028 Available Parking	2030 Parking Demand	2030 Satellite Spaces Needed	Spaces at Satellites	Total Town 2030 Unmet Demand	One Way Scheduled Travel Time (min)	Shuttle Vehicles	Route Miles (One Way)	Total Daily Cost	Cost per Pax	Cost per Pax All Town Demand
E-N1	Nauset Light - Nauset Regional High School	167	206	39	265	19	7	2	0.8	\$1,170	\$9.84	\$19.92
E-N1-N	Nauset Light - Wellfleet Motel/Lodge to Nauset Reg HS via Tilcon	167	206	39	-	19	14	3	3.2	\$1,755	-	-
E-NC	Nauset Light- Coast Guard - Route 6 via Tilcon	167	206	39	-	19	16	3	3.5	\$1,755	-	-
E-C1	Connection - Salt Pond Visitor Center and Route 6	650	669	19	-	19	6	1	1	\$585	-	-
W-M1	Ocean View Drive Shuttle	785	1192	407	Meets demand	366	19	3	3.3	\$1,755	\$1.40	\$1.56
W-M2	Wellfleet Ocean View Beach Loop	785	1192	407	146	366	21	5	4.6	\$2,925	\$6.50	\$6.50
E-F2	First Encounter – Elks Lodge / Hotels	175	241	66	80	101	12	2	2.3	\$1,170	\$5.77	\$4.75
E-F3	First Encounter – Visitation Church	175	241	66	100	101	12	2	2.7	\$1,170	\$5.77	\$3.80

The preliminary analysis for each route examines hypothetical operating costs, allowing each route to be compared against the others based on standard operating assumptions. The Seashore, town, or other implementing agency should use this information to analyze the financial implications of a route and the ongoing operational issues that will affect the service’s long-term sustainability. As discussed in Chapter 6, issues such as operations, vehicle selection, financing, and arrangements for satellite parking area use must all be resolved before any shuttle routes can be implemented. Recommended next steps are provided for each route.

W-M1: Ocean View Drive Shuttle

- Conduct more detailed environmental assessment of the area and consider whether Wellfleet would pursue parking depending on environmental conditions.
- Consider traffic impacts on Ocean View Drive.
- Consider potential over-use and necessary beach management associated with White Crest Beach.

W-M2: Ocean View Beach Loop

- Study traffic and operations related to shuttle route and Route 6 crossings.
- Begin discussions with owners of the parking areas regarding use of the areas for satellite beach parking.

E-N1: Nauset Light Beach – Nauset Regional High School

- Determine whether Nauset Light Beach could accommodate additional visitation beyond the current capacity of the parking area, and by how much.

- Begin discussions with the Nauset Regional High School regarding the possibility of using a portion of the school parking area for summer beach parking.

E-N1-N: Northern Eastham Shuttle

- Contact lodging locations to determine interest/feasibility of stopping at each site.
- Conduct test runs of route to determine safety and timing required for picking up visitors from north to south during the morning. Consider pick-up and drop-off only in the northbound direction.

E-NC: Eastham Lodging Loop

- Contact lodging locations to determine interest/feasibility of stopping at each site.
- Conduct test runs of route to determine safety and timing required for serving sites on west side of Route 6 and actual traffic conditions.

E-C1: Little Creek Parking Area – Salt Pond Visitor Center

- Determine whether there is currently capacity within the existing Little Creek shuttle operations to divert a portion of the shuttle runs to serve Salt Pond Visitor Center.
- Consider the impacts on parking at Salt Pond Visitor Center. Would visitors try to park there for free rather than paying to park at Little Creek? This may be less of an issue if the shuttle extension runs infrequently.
- Consider the necessary outreach and marketing to facilitate Flex connections to the beach shuttle at Salt Pond. The extension will not be successful if it is not combined with additional efforts to attract beach visitation via Flex.

E-F2: First Encounter – Elks Lodge / Hotels

- Consider coordinating with the Chamber of Commerce or specific businesses about the possibility of partnering to provide shuttle service.
- Work with the Elks Lodge to explore the possibility of using the site for satellite beach parking. Coordinate how to address parking needs at time when the Elks Lodge requires parking for its own events.

E-F3: First Encounter – Visitation Church

- Consider the ability to use the Visitation Church site for satellite parking. The Town may need to act quickly to make arrangements for use of site.

While some beach parking areas often fill up on the busiest weekends, most beaches currently have adequate parking. It is possible that erosion will happen slowly eliminating parking at approximately one meter per year; or a catastrophic event will destroy all of a beaches parking in one storm. Since when exactly additional parking will be needed is unknown, it may make sense to begin some initial planning for routes sooner rather than later.

While it is not explicitly focused on parking replacement, extending the existing Little Creek parking shuttle to the Visitor Center is the easiest follow-on to consider since it would rely on existing infrastructure and would be entirely operated and managed by the park service and would require minimal coordination with others. This route would allow visitors to access the beach by connecting to regional transit.

Another potentially straightforward next step would be to set up a memorandum of understanding with the Nauset Regional School District to use the high school parking area as a first pilot shuttle route to deal with existing over-capacity on peak weekends, presuming the beach can accommodate additional visitors. If after discussions with the School District, use of the high school parking area does not look like a feasible option, the Park Service should investigate the feasibility of working with Eastham to develop a parking area at the Tilcon site.

Any future efforts to implement satellite parking shuttles should be coordinated with other recent and ongoing study efforts on the Cape, such as the intelligent transportation systems (ITS) study, satellite vehicle maintenance facility study, and regional bicycle study.

Appendix A: Coastal Erosion Maps

As part of the parking supply and demand analysis, the study team employed a geospatial analysis to estimate the loss of parking due to erosion at the priority beaches in the study area that experience bluff erosion and dune migration. Using high-resolution aerial photography from 2008, the edge of the bluff was clearly discernable, allowing analysts to illustrate the inward migration of the bluff at 10-, 20-, and 30-year increments, based on the identified erosion rates. This method was employed to visualize the portions of the beach parking areas expected to be affected by erosion over the horizon of this planning study. For each beach, the study team used the illustrations to approximate a percentage of the parking area lost due to erosion over a 20-year period. The study team then used observations from site visits, discussions with local beach erosion experts, and discussions with the individual towns to confirm these assumptions and estimates, and revise as necessary. Nauset Beach in Orleans and the bayside beaches south of First Encounter (Eastham) were not addressed according to this analysis methodology because they experience a different erosion pattern and thus were evaluated separately as described in Section 3.2 of the report.

This appendix consists of maps of priority beaches in Truro, Wellfleet, and Eastham that contain high resolution photographs, bluff migration lines, and parking area loss estimates. Maps are organized alphabetically by town, from north to south.



Ballston Beach: Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Leading Edge of Migrating Dune
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer
- Dunes



2008 Parking Spaces	77
2008 Peak Utilization	92
2030 Parking Demand	95
Remaining Spaces in 2028	69
Future Peak Availability	(26)



Coast Guard Beach (Truro): Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	57
2008 Peak Utilization	68
2030 Parking Demand	71
Remaining Spaces in 2028	51
Future Peak Availability	(19)



Head of the Meadow (Truro): Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	183
2008 Peak Utilization	110
2030 Parking Demand	113
Remaining Spaces in 2028	146
Future Peak Availability	33



**Head of the Meadow Beach (NPS):
Parking Area Erosion Analysis**

Integrated Parking and Transit Study



- Ten Year Buffer
- Twenty Year Buffer
- - - Thirty Year Buffer

2008 Parking Spaces	285
2008 Peak Utilization	171
2030 Parking Demand	175
Remaining Spaces in 2028	215
Future Peak Availability	40



0 10 20 30 40 Meters

Longnook Beach: Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	92
2008 Peak Utilization	110
2030 Parking Demand	114
Remaining Spaces in 2028	86
Future Peak Availability	(28)



0 20 40 60 80 Meters

**Cahoon Hollow Beach:
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	90
2008 Peak Utilization	108
2030 Parking Demand	114
Remaining Spaces in 2028	36
Future Peak Availability	(78)



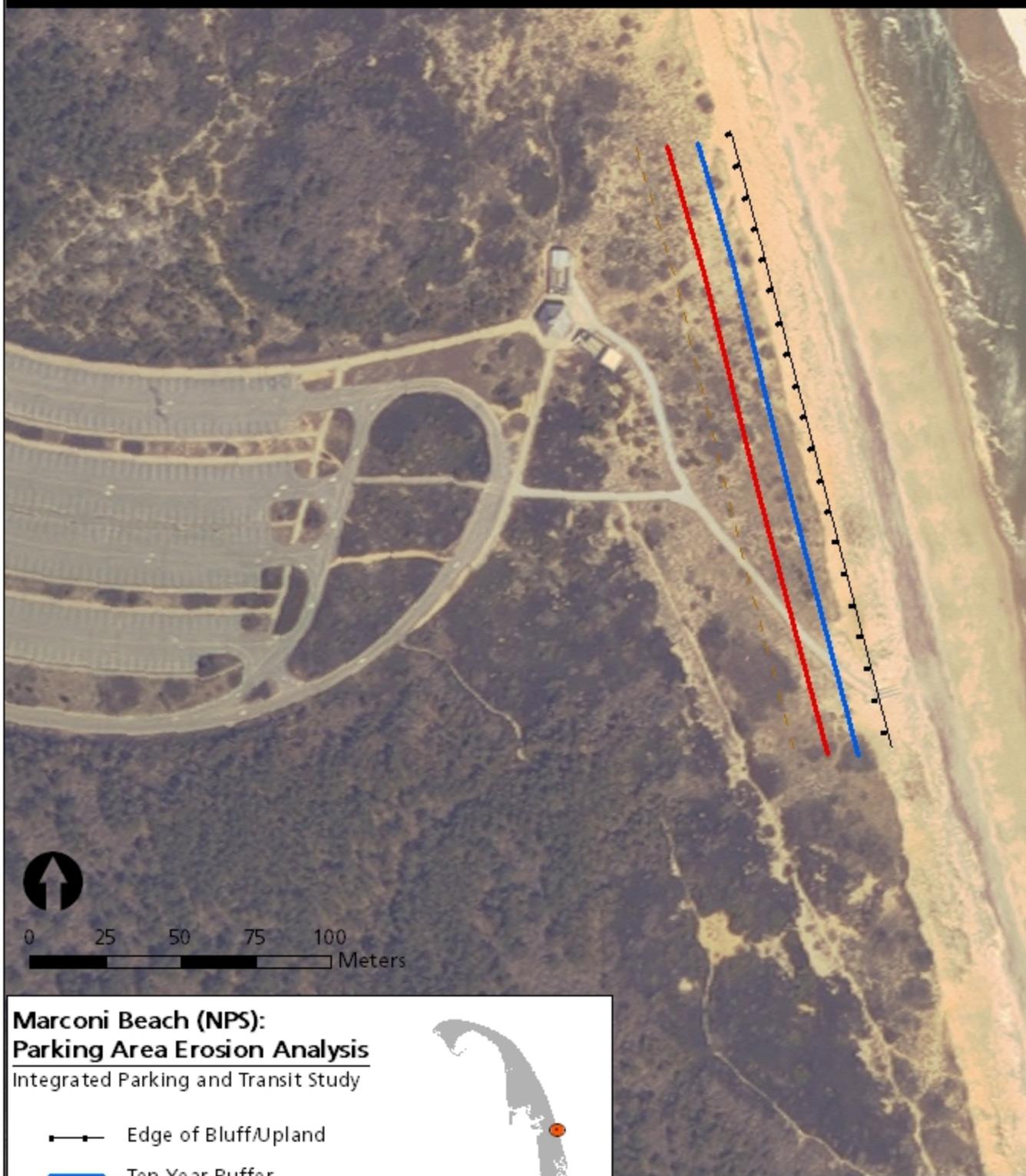
LeCount Hollow (Maguire Landing): Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	167
2008 Peak Utilization	200
2030 Parking Demand	211
Remaining Spaces in 2028	147
Future Peak Availability	(64)



0 25 50 75 100
Meters

**Marconi Beach (NPS):
Parking Area Erosion Analysis**

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	530
2008 Peak Utilization	477
2030 Parking Demand	489
Remaining Spaces in 2028	530
Future Peak Availability	41



0 9 18 27 36
Meters

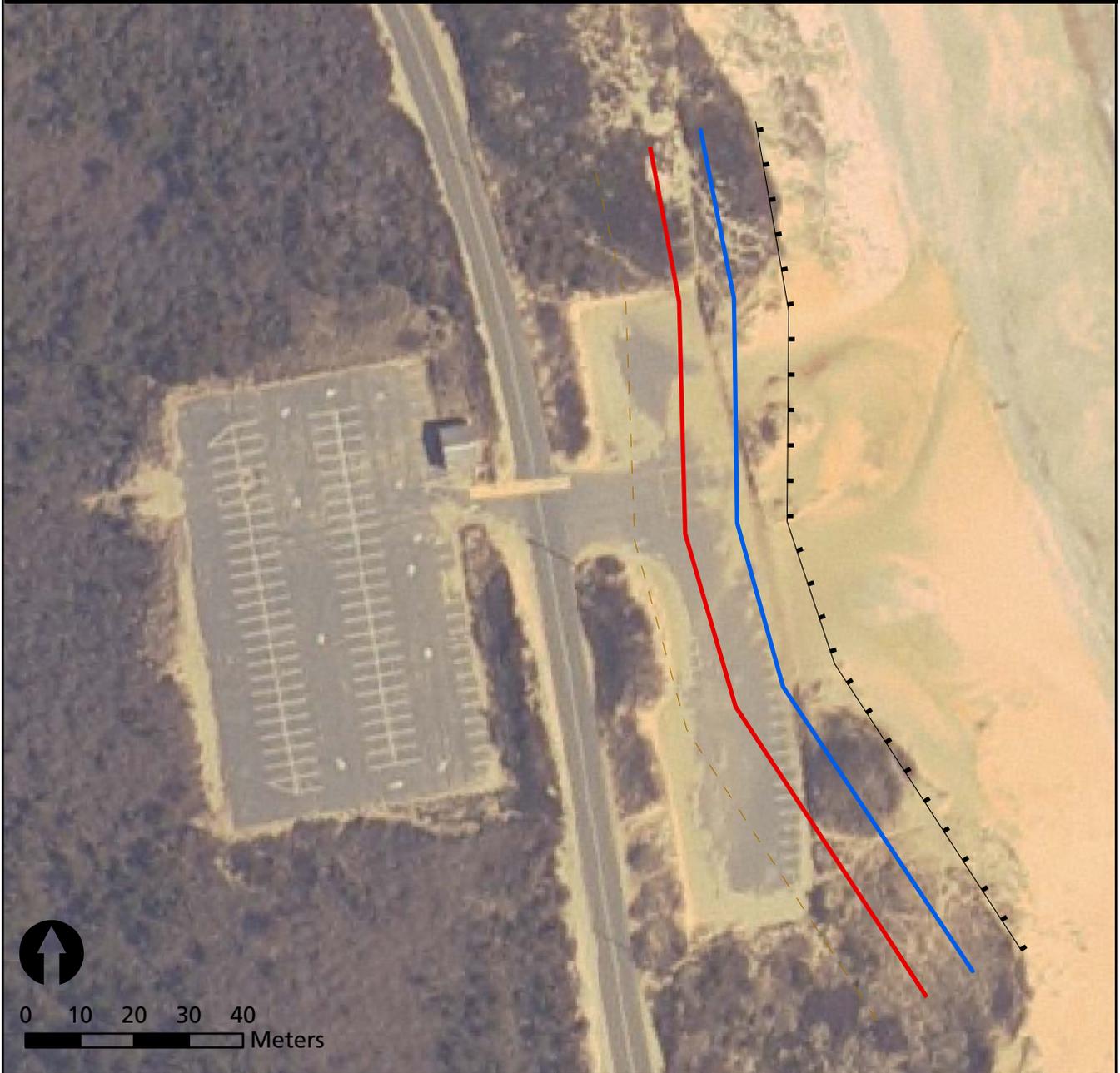
Newcomb Hollow Beach: Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	375
2008 Peak Utilization	338
2030 Parking Demand	356
Remaining Spaces in 2028	319
Future Peak Availability	(37)



**White Crest Beach:
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	404
2008 Peak Utilization	485
2030 Parking Demand	511
Remaining Spaces in 2028	283
Future Peak Availability	(229)



2008 Parking Spaces	119
2008 Peak Utilization	107
2030 Parking Demand	108
Remaining Spaces in 2028	98
Future Peak Availability	(10)

**Campground Beach:
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



0 25 50 Meters

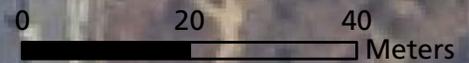




2008 Parking Spaces	12
2008 Peak Utilization	14
2030 Parking Demand	15
Remaining Spaces in 2028	12
Future Peak Availability	(3)

**Cole Road Beach:
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

-  Edge of Bluff/Upland
-  Ten Year Buffer
-  Twenty Year Buffer
-  Thirty Year Buffer





2008 Parking Spaces	85
2008 Peak Utilization	51
2030 Parking Demand	51
Remaining Spaces in 2028	60
Future Peak Availability	8

**Cooks Brook Beach:
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer

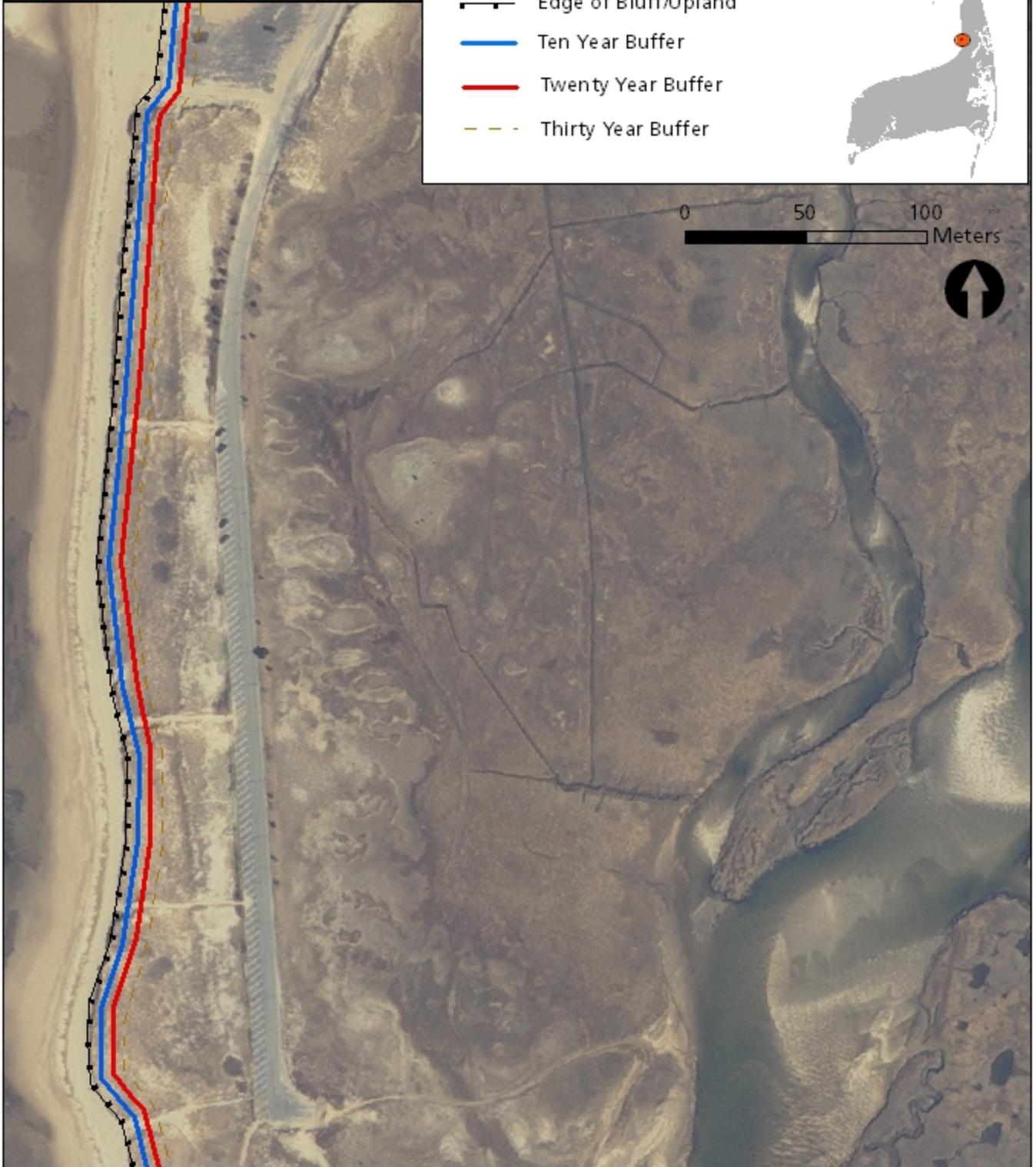




2008 Parking Spaces	199
2008 Peak Utilization	239
2030 Parking Demand	241
Remaining Spaces in 2028	175
Future Peak Availability	(66)

**First Encounter Beach (expanded):
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer





2008 Parking Spaces	26
2008 Peak Utilization	31
2030 Parking Demand	31
Remaining Spaces in 2028	10
Future Peak Availability	(21)

**South Sunken Meadow Beach:
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



0 10 20
Meters

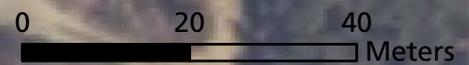




2008 Parking Spaces	18
2008 Peak Utilization	22
2030 Parking Demand	22
Remaining Spaces in 2028	9
Future Peak Availability	(13)

**Thumpertown Beach:
Parking Area Erosion Analysis**
Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer





Coast Guard @ Beach (Eastham): Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	61
2008 Peak Utilization	73
2030 Parking Demand	74
Remaining Spaces in 2028	61
Future Peak Availability	(13)



LeCount Hollow (Maguire Landing): Parking Area Erosion Analysis

Integrated Parking and Transit Study

- Edge of Bluff/Upland
- Ten Year Buffer
- Twenty Year Buffer
- Thirty Year Buffer



2008 Parking Spaces	167
2008 Peak Utilization	200
2030 Parking Demand	211
Remaining Spaces in 2028	147
Future Peak Availability	(64)

Appendix B: Preliminary Site-specific Environmental Analyses

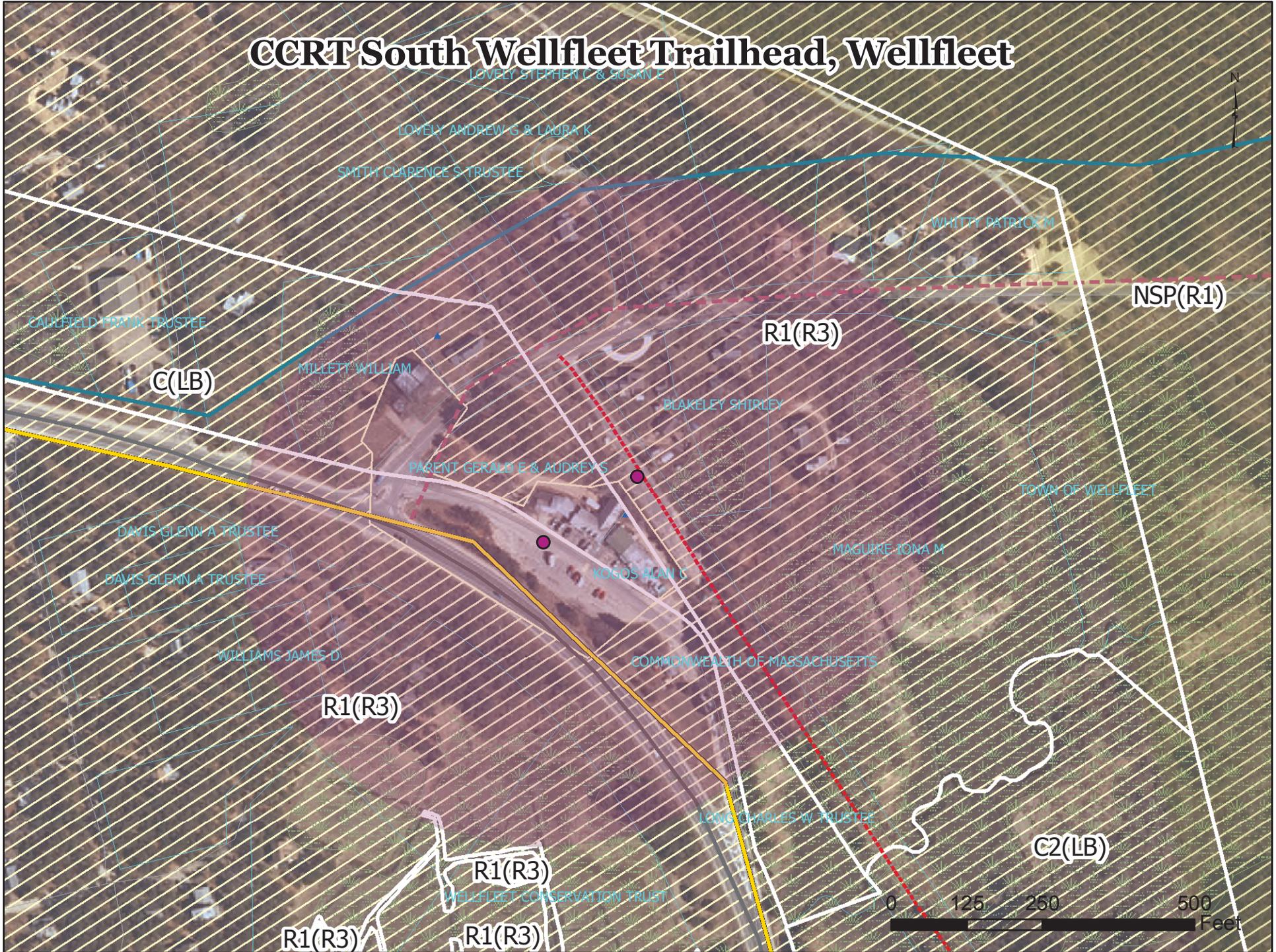
The Volpe Center worked with the Cape Cod Commission to conduct a preliminary environmental analysis of each parking area included in the recommended shuttle routes. It should be noted that the information provided in this report is preliminary and would not substitute for more in-depth analysis required by the National Environmental Protection Act (NEPA), the Massachusetts Environmental Protection Act (MEPA), or other relevant statutes.

This appendix includes site maps and summary tables with data pertaining to water resources, sensitive wildlife habitat, and local zoning. A map legend is found on page B-II.

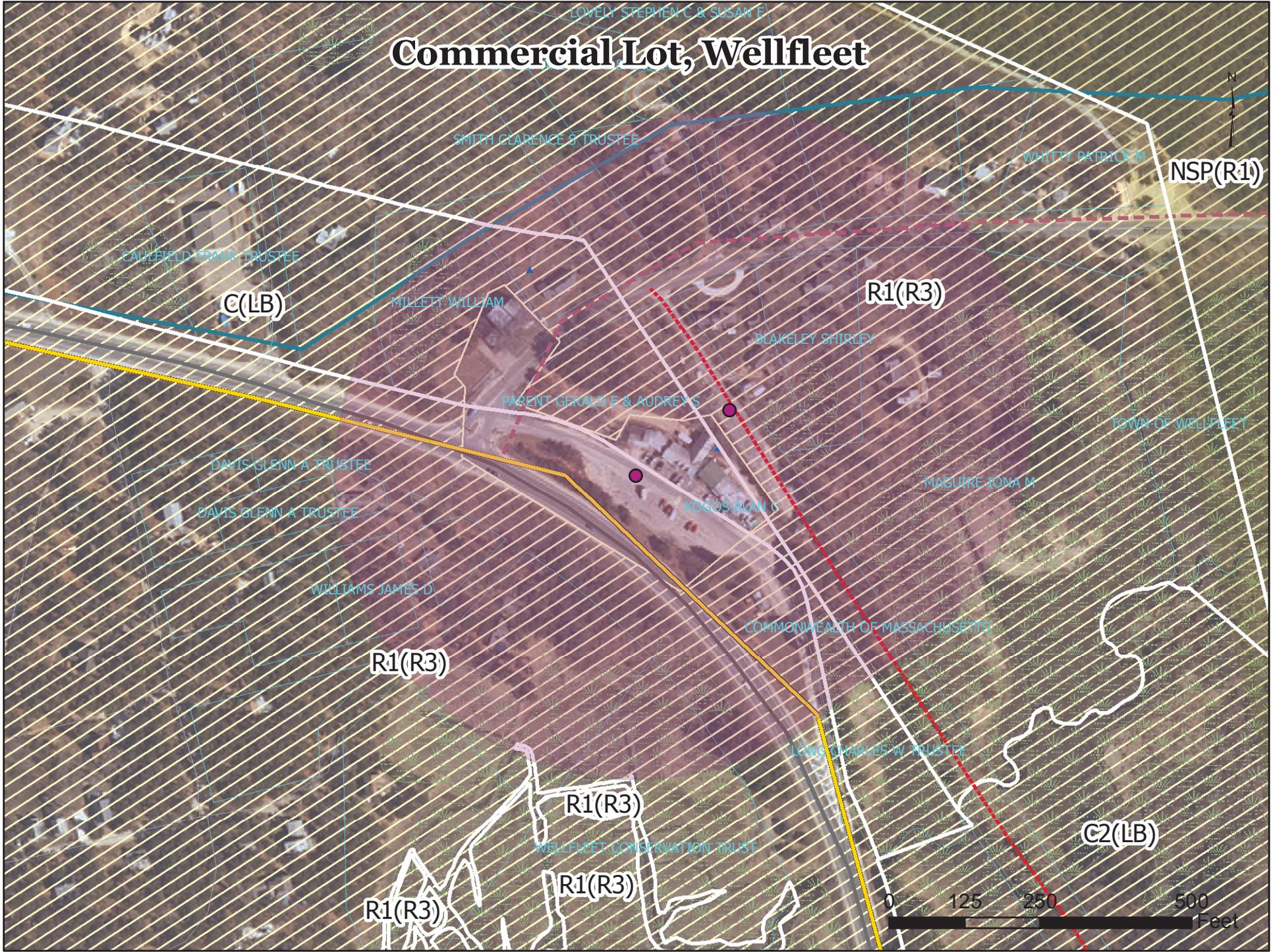
Highland Center, Truro



CCRT South Wellfleet Trailhead, Wellfleet



Commercial Lot, Wellfleet



Cove Corner Shopping Center, Wellfleet

THURESON RONALD & JUDITH

R1(R3)

SCHMIDT BERNADETTE M

PELLEGRINO NORMAN A

MCLEACHLIN JOHN M & MARTHA C

C2(LB)

RISOTTI JAMES A & DEBORAH H

R1(R3)

YOUNG C LORRAINE

DERUYTER PAUL TRUSTEE

PICKARD ALFRED

MAGEE JOHN F & DEBORAH

HORTON DONALD I

PICKARD DONNA TRUSTEE

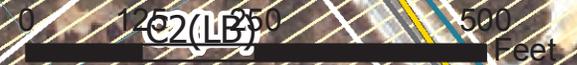
C(LB)

WELLFLEET COMMERCE CENTER LLC

C2(LB)

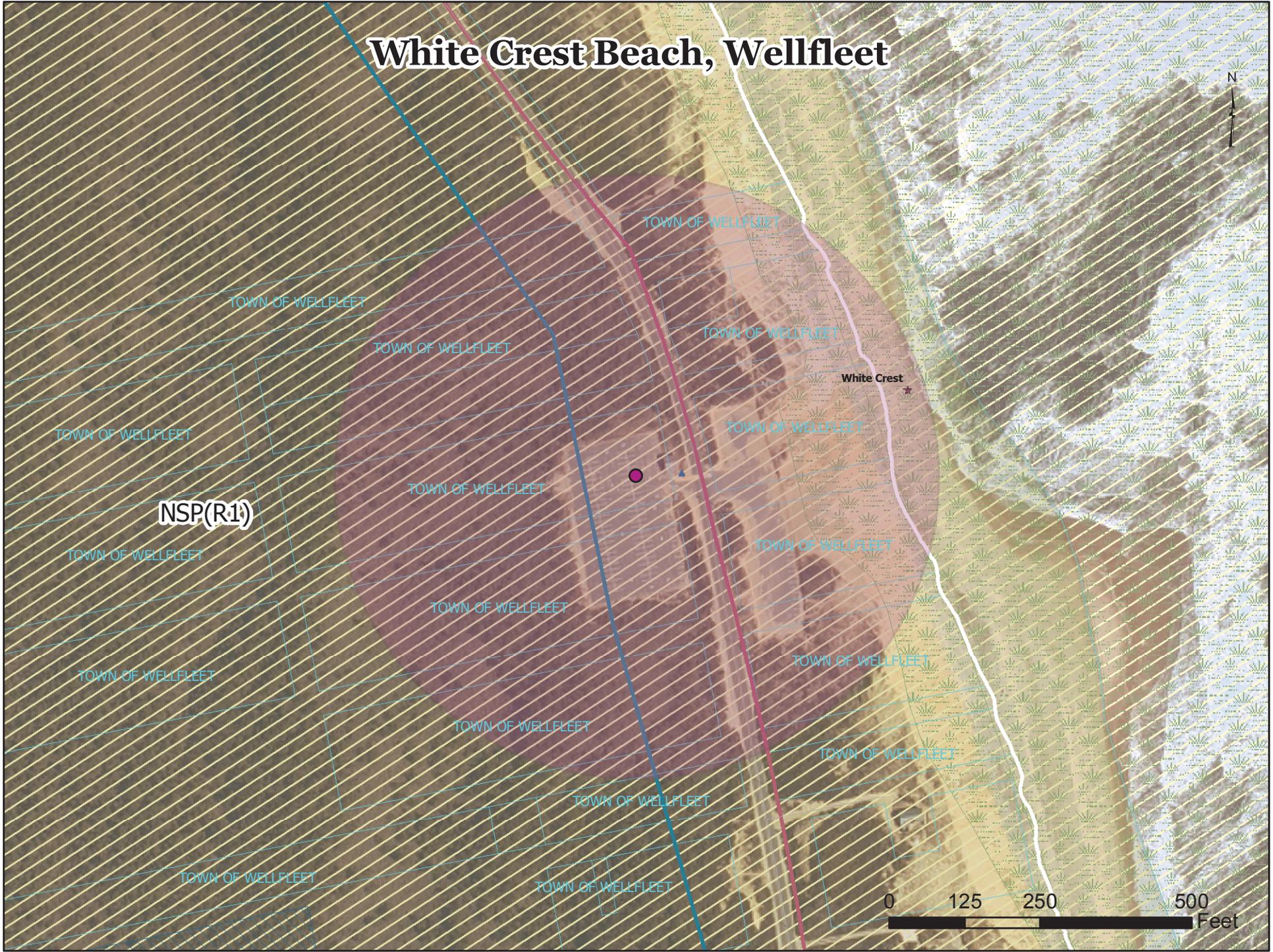
SANCT JAMES THE FISHERMAN

ARNOLD MAJID M



C2(LB)

White Crest Beach, Wellfleet

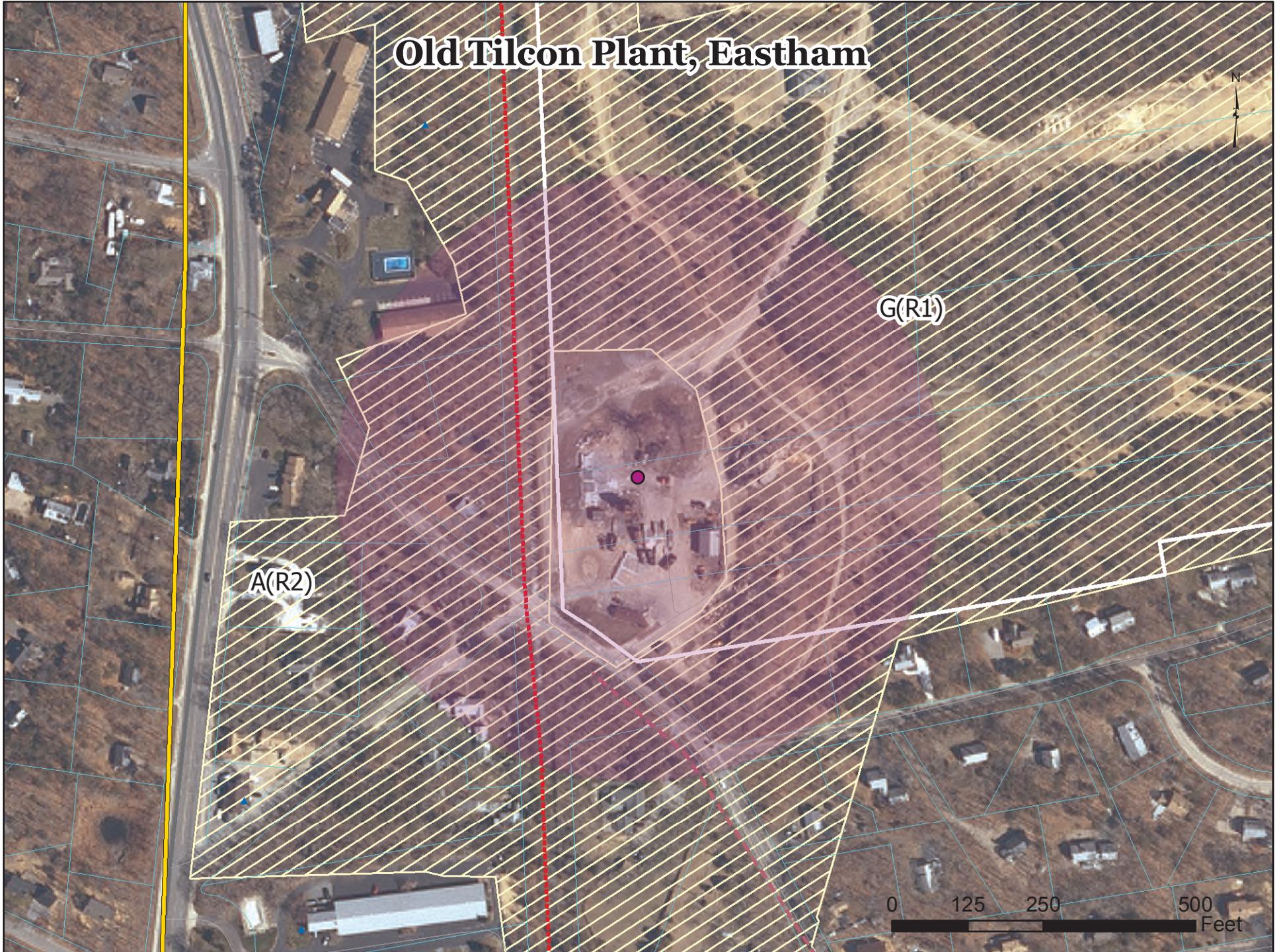




Nauset Regional High School, Eastham



Old Tilcon Plant, Eastham



Visitation Church, Eastham

A(R2)



Parking and Route information compared with Significant Natural, Historic and Water Resources

- Final Parking Sites
- 500' buffer of final parking sites
- ▲ National and State Registered Historic Places
- Flex Stops
- ▬ Flex Routes
- ▬ Town Line
- ⋯ Bike Path
- Zoning Boundary (white outline) *Town zoning abbreviation (MassGIS zoning abbreviation)*
- Final Routes
 - ▬ Option 1
 - ▬ Option 1A
 - ▬ Option 2
 - ▬ Option 2A
 - ▬ Option 4
 - ▬ Option 5
 - ▬ Option X
- DEP Public Supply Well: March 2010
 - ▲ Community Groundwater
 - ▲ Transient Non-Community
 - ▲ Non-Transient Non-Community
 - ▲ Proposed Well
- 150' buffer of DEP Public Supply Wells: March 2010
- Potential Plume from Landfill, Treatment Plant, or Haz. Waste Site
- Presence of Landfill, Treatment Plant, or Haz. Waste Site
- ▨ Identified Freshwater Recharge Area
- ▨ 2008 DEP Wetlands
- ▨ 2008 Potential Public Water Supply Area
- 300' Buffer of Pond Shores
- 350' Buffer of NHESP Certified Vernal Pools: March 2010
- ▨ DEP Zone II: March 2010
- ▨ NHESP Priority Habitats of Rare Species: 2008
- Old Kings Highway Historic District
- National and State Registered Historic Places

Table B-1
Water Resource Concerns at Potential Parking Area

Source: Cape Cod Commission

ID	Town	Site	Parking Spaces	Public Well	Private Well	Pond Recharge	Wetland Area	Erosion	Stormwater	Notes for write up
B-4	Brewster	Drummer Boy	100	no	no	none	none	slight	yes	
B-1	Brewster	Brewster Town Hall	73	no	no	yes	upgradient	no	yes	Multiple resource areas up and downgradient from parking area raise potential concerns with water quality impacts from stormwater.
B-1	Brewster	Eddy Elementary	93	no	no	none	yes	no	yes	Multiple resource areas up and downgradient from parking area, including pond and wetlands raise potential concerns with water quality impacts from stormwater. Drainage may need to be improved.
B-2A	Brewster	Nickerson Park Store	40	no	no	none	yes	no	yes	Multiple resource areas up and downgradient from parking area but enough separation distance will negate any water quality impacts from stormwater.
B-2A	Brewster	Nickerson Park Area 1	40	no	no	yes	yes	no	slight	Multiple resource areas up and downgradient from parking area but enough separation distance will negate any water quality impacts from stormwater.
B-2	Brewster	Nickerson Park Entrance	55	no	no	none	yes	no	yes	No issues concerning water resource other than water quality impacts from stormwater. Wetland across 6A is an active cranberry bog.
	Eastham	Elks Lodge	80	none	yes	none	yes	no	yes	Potential water quality concerns due to proximity of private wells on residential lots. Stormwater quality concerns with multiple surface water bodies adjacent to parking. Drainage design may need to be improved to avoid impacts.
	Eastham	Visitation Church	100	none	yes	none	none	no	yes	Potential water quality concerns due to proximity of private wells on residential lots.
E-2A	Eastham	Salt Pond Visitors Center	150	yes	yes	yes	yes	no	yes	Parking located cross gradient from supply well to visitors center, but downgradient of private wells on residential properties. Potential stormwater quality concerns to Salt Pond.
E-2	Eastham	Little Creek Parking Area	422	none	no	none	none	no	yes	No issues concerning water resource other than water quality impacts from stormwater.
E-1	Eastham	Nauset Regional High School	265	yes	no	none	yes	no	yes	On site supply well, considerations for expanding well to supply community. Stormwater quality concerns. Minor concerns for wetlands.

ID	Town	Site	Parking Spaces	Public Well	Private Well	Pond Recharge	Wetland Area	Erosion	Stormwater	Notes for write up
E-1A	Eastham	Old Tilcon Plant	1000	none	yes	none	none	yes	yes	Potential water quality concerns due to proximity of private wells on residential lots and NTNC supply well serving motel. Erosion and stormwater quality concerns related to conversion of sand and gravel operations, and size of parking area.
	Truro	Highland Center	60	yes	no	none	no	no	yes	Drinking water concerns with adjacent on-site public supply well. Entire lot is within Zone II area for the well. Stormwater quality concerns minimal due to expansive buffers and lack of surface water.
W-1A	Wellfleet	CCRT So. Wellfleet Trailhead	30	none	yes	none	yes	no	yes	Wetlands adjacent and surface water (Blackfish Creek) downgradient from parking area raise potential concerns with water quality impacts from stormwater. Drainage from parking may need to be improved to protect water quality.
W-1A	Wellfleet	Commercial Parking Lot	32	none	yes	none	yes	no	yes	Expansive wetland and surface water (Blackfish Creek) downgradient from parking area raise potential concerns with water quality impacts from stormwater. Drainage from parking may need to be improved to protect water quality.
W-5	Wellfleet	Cove Corner Shopping Center	84	none	yes	none	none	no	yes	Potential water quality concerns with parking lot drainage to private adjacent wells. Stormwater quality concerns minimal due to lack of surface water and wetlands.
W-1	Wellfleet	White Crest Beach	700	none	no	none	none	yes	yes	Major concern will be with erosion from new construction, minor stormwater quality concerns.

Key to Potential Water Resource Concerns:

Public Well- is the site within a zone of contribution to a public or potential well site?

Private Well- is the site within 400 feet of a residential property with a private well?

Pond Recharge- is the site within a contributing area to a lake or pond?

Wetland Area- would the site have potential impacts to a wetland area?

Erosion- would additional parking have an impact on site erosion (potential if the site were to be expanded, or is currently undeveloped)?

Stormwater- does the site generate stormwater runoff?

Appendix C: Detailed Shuttle Route Development

This Appendix describes the full set of potential satellite parking areas and shuttle routes. The analysis primarily considers routes that would link one beach with one parking area, though there are examples of multiple beaches served by one route (e.g., in Brewster, Eastham bayside, and Wellfleet), or multiple parking areas serving one beach (e.g., Wellfleet). The satellite parking and shuttle route analysis is organized according to the following groupings of beach areas: Eastham oceanside, Wellfleet oceanside, Truro oceanside, Eastham bayside, and Brewster bayside.

The Beach Parking Needs Analysis in Chapter 3 identified 16 beaches for shuttle route consideration based on an estimated future parking deficit of 15 or more spaces or an expectation of losing more than 50 percent of existing spaces to erosion by 2028.

Two additional beaches – Saints Landing Beach in Brewster and Campground Beach in Eastham – are also included in the analysis due to their close proximity to other beaches already considered for shuttle routes. Two beaches that meet the basic criteria are excluded from the analysis – Skaket Beach (bayside) and Nauset Beach (oceanside), both located in Orleans and managed by the town. While Nauset Beach is not expected to experience significant erosion of the parking areas over the 20-year period of this planning study, it is likely to become a critical issue soon after that horizon. The Beach Road access to Nauset Beach is currently heavily congested and Town staff has indicated that shuttle service would be undesirable at this time. Staff has also indicated that the facilities at Skaket Beach are not suited to accommodate the existing number of visitors and that providing access for additional visitors would further overwhelm them. For these reasons, at the request of the Town of Orleans, this analysis does not include shuttle routes for either of the beaches in Orleans.

The complete list of beaches included in shuttle route analysis includes:

- Ballston Beach (Truro)
- Coast Guard Beach (Truro)
- Longnook Beach (Truro)
- Cahoon Hollow Beach (Wellfleet)
- Newcomb Hollow Beach (Wellfleet)
- Maguire's Landing/ LeCount Hollow Beach (Wellfleet)
- White Crest Beach (Wellfleet)
- Campground Beach (Eastham)
- First Encounter Beach (Eastham)
- Nauset Light Beach (Eastham)
- South Sunken Meadow Beach (Eastham)
- Thumpertown Beach (Eastham)
- Breakwater Beach (Brewster)
- Crosby Landing Beach (Brewster)
- Mant's Landing Beach (Brewster)
- Paine's Creek Beach (Brewster)
- Saints Landing Beach (Brewster)

C.1 Shuttle Route Development

As described in Chapter 4 and shown in Figure 12, 71 sites were identified as potentially feasible satellite parking areas. The following sections describe the process for developing the potential routes.

C.1.1 Matching Beaches to Parking Areas

Potential parking areas were identified and assessed as satellite facilities for the beaches using the following general approach:

- Identify the parking areas closest to the beach, and compare potentially available capacity with the future needs of the beach parking area. For most beaches potential parking of adequate size was found within two miles of the beach.
- Include all parking spaces in the comparison, though in many cases it is unlikely that all spaces would be available for satellite beach parking.
- Consider potential for the parking area to serve multiple beaches, or to accommodate the parking needs of multiple beaches.
- If applicable, consider potential for linking multiple parking areas to serve the needs of the beach(es) on the route.
- Consider proximity of the parking area to the main roadway (Route 6, 6A, etc.), and the ability of visitors and shuttle vehicles to find and access the parking area.
- Consider known and perceived limitations to being able to use in the future such as ownership and known site constraints. Note that parking area owners have not been contacted – information was gathered from sites visits, web-based resources, and discussions with public officials.

This Appendix provides a description and assessment of all of the potential routes considered in the analysis, and descriptions of the parking areas and considerations of how they would serve the parking needs of the beaches.

An assessment of potential parking areas for each of the beaches is provided. The discussion for each beach begins with a summary table of the relevant parking areas, followed by descriptions and assessments of the parking areas and how they would serve the parking needs of the beaches. Parking areas that are considered for multiple beaches are included in each summary table, but described only under the first beach. It should be noted that many of these parking areas are privately owned, and speculation about their potential future use for satellite beach parking is a sensitive matter. For this reason the Project Team has not contacted property owners to obtain more detailed information regarding the size and current use of the sites. Information that could be easily obtained is included in this report; in cases where such information was not easily obtained, it is marked as currently unknown. In the event that the Seashore and the towns decide to move forward with certain routes and potential satellite parking areas, outreach to the property owners will be essential.

The study also considered several “community shuttle” routes that would not necessarily link directly to satellite parking, but would collect visitors at commercial, lodging, and residential centers. These routes would have the benefit of picking up passengers at their point of origin, thereby eliminating the visitors’ need to drive for a portion of the trip to the beach. These routes could potentially operate independently or as an extension of another route connecting to satellite parking. Because these routes follow a different model than those based on beach parking demand, they are presented only with an overall operating cost per day rather than a per passenger cost.

C.1.2 Shuttle Route Operating Assumptions

Once potential parking areas were identified for each beach, the Project Team developed a total of 36 routes, which serve 17 beaches (there are multiple potential routes to serve each beach), as well as a high level operations analysis for each potential route. In general, the identified routes represent the most direct travel between the parking area(s) and the beach(es). Routes are identified with labels that refer to the town and beach the route serves. Two roadways in Wellfleet, Cahoon Hollow Road and Long Pond Road, are not included due to Town concerns related to their proximity to fresh water ponds. Some of the more direct roadways in Truro were not used because their condition (unpaved) would not be conducive to shuttle service. Numbers were used to differentiate between multiple options for a given beach. For example, Route “E-N₃” is a route in Eastham, serving Nauset Light Beach, and is the third route considered for this beach.

The service operations for each route are based on the following assumptions:

- The number of vehicles (and people) using the shuttle route is calculated based on the unmet parking demand at the beaches served. If the number of available parking spaces in the satellite locations is less than the demand, the number of spaces is used.
- Total unmet demand within the town-beach grouping includes excess demand and capacity for all beaches, including NPS-managed as well as town-managed beaches.
- Each space is used by 1.1 vehicles per day.
- There is an average of 2.8 passengers per car.
- Peak shuttle demand is estimated to be 150 percent of the average passengers per shuttle trip.
- Operations and maintenance cost are standard at \$65 per hour.
- Each shuttle vehicle runs for nine hours per day of service.
- All routes operate at a frequency of every 15 minutes. Less frequent service may be acceptable for some routes and could reduce costs if it would reduce the necessary number of vehicles. Conversely, some routes may have high enough projected ridership to justify more frequent service. However, for purposes of comparison, a standard frequency of 15 minutes is used.
- Travel speeds are based on posted speed limits, and discounted according to data provided by the Cape Cod Commission on congested travel time.
- Shuttle schedules assume one minute of dwell time per stop.
- Round trip shuttle travel times are increased by 15 percent to account for schedule adherence.
- Cost per passenger is calculated based on demand at the specific beaches served as well as all unmet demand in the town-beach grouping (that could be accommodated at the parking areas included in the route).

The routes discussion for each town/beach grouping begins with a table summarizing all proposed routes and the operating analysis for each. Grouped by beach, the potential routes are then described and the operations briefly analyzed and compared.

C.1.3 Route Analysis and Prioritization

Based on the analysis of routes and parking areas, each section includes general findings related to the beaches and potential routes within that town/beach grouping. Some of the routes are noted as better short- or long-term options based on the characteristics of potential parking areas. For example, there are several potential parking areas that are relatively large and centrally located, and could be good options for satellite parking, but they are not currently developed for parking. Some of these areas have been included in routes that might be good longer term options. Use of these sites for a shuttle route would require planning and preparation, as the sites would need to be developed for parking, in addition to acquiring them or implementing agreements for their use.

There are also several potential parking areas that are conveniently located and have existing parking, but the lot size may not be sufficient to accommodate beach demands, or the current uses require the majority of the parking available. Some of these areas are listed as potential short-term options, as it is possible that an arrangement could be made to use the site for satellite parking while parking at a longer term option is being developed. This would be most likely in case of a sudden loss of parking at a beach, as opposed to steady, predictable, loss due to annual erosion. In some cases, potential parking areas identified as short-term options may end up being appropriate long-term solutions. It should be noted that additional visitor information and support may be required to reduce confusion related to changing shuttle routes and satellite parking locations.

A list of “preferred” routes for each town/beach grouping is identified based primarily on route distance, estimated operating cost per passenger, and the potential availability of adequate parking. It should be noted that while these are expected to be the most efficient or viable routes for each town/beach grouping, they may still be relatively inefficient or cost-prohibitive, due to the travel distance and relatively low numbers of passengers served. The “recommended” routes discussed in Chapter 5 represent a further refinement of the “preferred” routes.

The following sections describe and discuss the potential shuttle routes and parking areas for each town/beach grouping by town from north to south. Data definitions for the summary route tables are provided below:

- Route ID: Defined above in Section 5.1.2: first letter identifies the town, second letter identifies the beach, number identifies the specific route variant for that beach.
- Route Name: Description of route, generally provided as the beach served and the name of the satellite parking area.
- 2028 Available Parking: Estimate of parking spaces available at beach in 2028 based on expected erosion.
- 2030 Parking Demand: Expected demand for parking at given beach based on current use and 2030 growth projections.
- 2030 Satellite Spaces Needed: Difference between 2030 Parking Demand and 2028 Available Parking.
- Spaces at Satellites: Total number of spaces available at satellite parking facilities along route, estimated as described in Chapter 4. Not all of these spaces may be available for use as satellite beach parking.
- Total Town 2030 Unmet Demand: The total unmet beach parking demand for all beaches in the town/coast grouping.
- One Way Scheduled Travel Time: Estimate of one-way route travel time in minutes. This estimate includes time planned for passenger loading and unloading at stops, and schedule adherence.
- Shuttle Vehicles: Number of vehicles required to provide the desired shuttle frequency (default service every 15 minutes).
- Route Miles: Measured travel distance between satellite parking and beach along road network. For routes that are loops, this distance is half the total route length.
- Total Daily Cost: The daily cost to operate the service. This includes only shuttle operations and maintenance costs.
- Cost per Pax: The cost per passenger of providing service assuming ridership based on the 2030 satellite spaces needed for the given beach. This includes only shuttle operations and maintenance costs.
- Cost per Pax All Town Demand: The cost per passenger of providing service to all unmet demand in the town/coast grouping, assuming that the satellite parking areas have sufficient capacity to accommodate the demand. This includes only shuttle operations and maintenance costs.

C.2 Potential Parking-Shuttle Scenarios for Truro Oceanside Beaches

This analysis explores shuttles to the oceanside beaches in Truro that are most popular and expected to be most impacted by future erosion. Table C-11 provides a summary of future parking demand and supply at the Truro oceanside beaches.

**Table C-1
Truro Oceanside Future Parking Demand and Supply Summary**

Town	Beach	NPS / Town	2008 Total* Spaces	2030 Typical Needed Spaces	2028 Spaces Remaining AFTER Erosion	Future Excess or Shortfall
Truro	Ballston	town	77	95	69	-26
Truro	Longnook	town	92	114	86	-28
Truro	Coast Guard	town	57	71	51	-19
Truro	Head of the Meadow (town)	town	183	113	146	33
Truro	Head of the Meadow (NPS)	NPS	285	175	215	40
Truro	Total	town	409	393	352	-41
Truro	Total	NPS	285	175	215	40

* total spaces includes regular, handicapped, unstriped, and spaces reserved for residents only

This analysis explores parking needs and potential shuttle routes for each of the beaches within the study area in need of additional parking: Ballston, Longnook, Coast Guard, and Head of the Meadow, those beaches with a shortfall of fifteen or more spaces.

The oceanside beaches in Truro are not connected by internal coastal roadways as they are in Wellfleet; access is provided by one road off of Route 6, and in many cases is over a mile from Route 6. These distances make it unlikely that a single shuttle route could reasonably serve multiple beaches. The analysis primarily focuses on routes to serve individual beaches, though it may be possible that a single parking area could serve two shuttle routes, one to Coast Guard Beach and one to Longnook Beach.

C.2.1 Ballston Beach

The closest potential parking areas to Ballston Beach include: The Truro Center Road Commercial Area, the MassDOT Maintenance Facility near Route 6, and the Transfer Facility near Route 6. The parking areas are listed in Table C-2.

**Table C-2
Ballston Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Truro Center Road Commercial Area	43	1	Site is in active use, unlikely to have capacity for beach parking.	Private	T-B1
MassDOT Maintenance Facility	20	2	Site is in active use, parking probably not developed, but paved areas exist.	Public	T-B2
Transfer Station	20	2	Site has no current parking; site is disturbed.	Public	T-B3

Truro Center Road Commercial Area

The Truro Center Road Commercial Area is the closest of the sites to Ballston Beach and the parking area is large enough to accommodate future additional demand for beach parking. It is currently in active use, however, and this assessment assumes that the existing demands to the parking area would leave only a limited portion, if any, available for beach parking. The site is centrally located in Truro and includes an existing stop on the Flex route.

Analysis: The Truro Center Road Commercial Area is a convenient location and good for multi-modal connections, but is unlikely to have available parking to serve Truro beaches.

MassDOT Maintenance Facility

The MassDOT Maintenance Facility is located reasonably close to Ballston Beach and likely has sufficient capacity to accommodate future beach parking demand, though information about the actual size and capacity are not currently available. It is therefore also unknown if the site would be able to accommodate parking demand from other beaches. The site is located close to Route 6, and is approximately five miles from Newcomb Hollow Beach in Wellfleet.

Analysis: Given the proximity to Route 6 and the assumed available capacity, the MassDOT Maintenance Facility could be a good longer-term location for satellite parking. Space availability is not currently known, however, and a parking area would likely need to be developed.

Transfer Station

The Transfer Station is located reasonably close to Ballston Beach and likely has sufficient capacity to accommodate future beach parking demand, though information about the actual size and capacity are not currently available. It is therefore also unknown if the site would be able to accommodate parking demand from other beaches. The site is located close to Route 6 and is actively used.

Analysis: Given the proximity to Route 6 and the assumed available capacity, the Transfer Facility could be a good longer-term location for satellite parking if the site use were ever to change or be altered to accommodate parking. Space availability is not currently known, however, and a parking area would likely need to be developed.

C.2.2 Longnook Beach

The closest potential parking areas to Longnook Beach include: the Truro Central School, the Truro Downtown Parking area (public), the Sand Pit off Route 6, and the NPS Highlands Center at Cape Cod National Seashore. The parking areas are listed in Table C-3.

**Table C-3
Longnook Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Truro Central School	58	1.6	Site is used in summer months, but a portion may be available.	Public	T-L1
Downtown Parking Area	13	2.4	Site is in active use, unlikely to have capacity for beach parking.	Public	-
Sand Pit	Meets demand	2.4	Site has no current parking; site disturbed; current use unknown.	Private	T-L2
NPS Highlands Center at Cape Cod National Seashore	235	4.2	Site includes parking, educational, and art spaces. Will undergo some redevelopment.	Public	T-L3

Truro Central School

The Truro Central School is the closest of the potential parking areas to Longnook Beach. The site is used during the summer months, though Town officials have indicated that a portion of the parking area could potentially be available for a beach shuttle service. The school is conveniently located on Route 6 and near a main Flex route stop.

Analysis: Given the location on Route 6 and some openness by the Town to use as a remote parking area, the school could be a good option, at least in the short term. Parking availability is limited but it may be sufficient or nearly sufficient to meet the future need.

Downtown Parking Area

The Truro Downtown Parking area is centrally located in downtown Truro, at the intersection of Truro Center Road and Castle Road, near the main Flex route, and easily accessed by Route 6. The exact number of parking spaces is unknown at this time, though it is estimated to be approximately 13. Given the

size of the area and that it is in active use as a public parking area, it is not expected to have significant available capacity for beach parking.

Analysis: The parking area is well located and could be a good shuttle stop, given the potential for multi-modal and mixed-use connections. It is unlikely, however, to be a good candidate for satellite beach parking, due to its size and existing use. For these reasons it is not included in any shuttle routes.

Sand Pit

The Sand Pit is located near Route 6. There is no current parking on site, though the site is disturbed. The current use and potential for an agreement for its use are unknown, though it is assumed that the site would be large enough to accommodate satellite beach parking if it becomes available. This site could potentially also serve Coast Guard beach.

Analysis: Given the proximity to Route 6 and its large size, the Sand Pit has the potential to be a good longer-term option for beach parking. Use of this site would require an ownership arrangement and development of parking spaces.

NPS Highlands Center at Cape Cod National Seashore

The Highlands Center is not located near Route 6, though it is owned by NPS and has sufficient space to serve multiple beaches. It could also reasonably serve Coast Guard Beach, though that service would not likely run on the same leg of a shuttle route. There are several science and arts facilities in use at the site, and there are currently plans for further redevelopment of the site, though the plans do not call for an expansion of parking beyond the approximately 235 spaces currently available.

Analysis: Given that the site is publicly owned and has sufficient space to serve multiple beaches, the Highlands Center could be a good longer-term option. However, access is less convenient than a site closer to Route 6, and use of existing parking spaces would need to be incorporated into the redevelopment plans.

C.2.3 Coast Guard Beach

Coast Guard Beach could potentially be served by some of the same parking areas as Longnook, such as the NPS Highlands Center and the Sand Pit off Route 6 (described above). Another potential site to serve Coast Guard is the Pilgrim Heights site off Route 6. The parking areas are listed in Table C-4.

**Table C-4
Coast Guard Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Highlands Center	235	1.5	Site includes parking, educational, and art spaces. Will undergo some redevelopment.	Public	T-C1
Sand Pit	25	2	Site has no current parking; site disturbed; current use unknown.	Private	T-C2
Pilgrim Heights	~160	3.1	No current information on site.	Public	T-C3

Pilgrim Heights

The Pilgrim Heights site is located near Route 6. There is no information about the site available at this time, though it does appear to be already disturbed and to be large enough that it could potentially provide satellite beach parking.

Analysis: while the site is located close to Route 6, it is furthest from Coast Guard Beach and there is no other information available about its potential use for satellite parking. This site would have to be a longer-term option, and would likely be pursued only if other closer sites were not available.

C.2.4 Head of the Meadow Beach

The parking supply and demand analysis indicates some available parking capacity at both the Town-managed and NPS-managed Head of the Meadow beach parking areas. While the Head of the Meadow beaches may not offer the same experience sought by some visitors of other smaller Truro oceanside beaches, directing visitors to these beaches could potentially offset the need for satellite parking and shuttles. Under such a scenario, the Town of Truro could potentially pursue a fee-sharing agreement with NPS regarding use of the NPS-managed parking area by Truro residents.

C.2.5 Routes

The full list of routes is provided in Table C-5 and shown in Figure C-1; more detailed information and analysis and assessment follows below.

**Table C-5
Potential Truro Shuttle Routes**

Route ID	T-B1	T-B2	T-B3	T-L1	T-L2	T-L3	T-C1	T-C2	T-C3	T-M1
Route Name	Ballston Beach to Truro Center Road Comm. Area	MassDOT Site to Ballston Beach with Detour to Flex Stop (at Truro Ctr. Road)	Transfer Facility to Ballston Beach	Longnook to Truro Central School	Longnook to Sand Pit	Longnook to Highlands Center	Coast Guard to Highlands Center	Coast Guard to Sand Pit	Coast Guard to Pilgrim Heights	Coast Guard to Highlands Center (2)
Beach(es)	Ballston	Ballston	Ballston	Longnook	Longnook	Longnook	Coast Guard	Coast Guard	Coast Guard	Coast Guard, Longnook
Parking Areas	Truro Center Road Comm. Area	MassDOT Maintenance Facility	Transfer Facility	Truro Central School	Sand Pit	Highlands Center	Highlands Center	Sand Pit	Pilgrim Heights Parking Area	Highlands Center
2028 Available	69	69	69	86	86	86	51	51	51	137
2030 Demand	95	95	95	114	114	114	71	71	71	185
2030 Satellite Spaces Needed	26	26	26	28	28	28	20	20	20	48
# Spaces at Satellites	43	20	300	58	Meets demand	Meets demand	Meets demand	Meets demand	160	Meets demand
Total Town 2030 Unmet Demand	1	1	1	1	1	1	1	1	1	1
Spaces Used	26	20	26	28	28	28	20	20	20	48
Total # Cars	29	22	29	31	31	31	22	22	22	53
Total Daily Passengers	80	62	80	86	86	86	62	62	62	148
One Way Travel Time (min)	8	13	10	8	9	17	8	9	10	8
Shuttle Vehicles	1	2	2	1	2	3	1	2	2	1
Total Shuttle Vehicle Hours	9	18	18	9	18	27	9	18	18	18
Avg Pax/Trip	2	2	2	2	2	2	2	2	2	4
Peak Pax/Trip	3	3	3	4	4	4	3	3	3	6
Route Miles (One Way)	1.9	3	2.7	1.6	2.4	4.2	1.5	2	3.1	1.5
Cost per Pax	\$7.31	\$18.99	\$14.61	\$6.78	\$13.57	\$20.35	\$9.50	\$18.99	\$18.99	\$3.96
Cost per Pax All Town Demand	\$189.94	\$379.87	\$379.87	\$189.94	\$379.87	\$569.81	\$189.94	\$379.87	\$379.87	\$189.94

Figure C-1
Truro Oceanside Routes



Ballston Beach

T-B1: Ballston Beach – Truro Center Road Commercial Area

This route would connect Ballston Beach with the Truro Center Road Commercial Area via South Pamet Road. The route is relatively short and would be a quick ride. The parking area at Jam’s Store is not expected to have significant parking available, though it could serve as a multimodal transfer point, as there are stops for the Flex and Plymouth & Brockton services. This route is the only short-term option for Ballston Beach because the parking area currently exists.

T-B2: MassDOT Site - Ballston Beach w/ detour to Truro Center Road Flex stop

This route would connect Ballston Beach with the MassDOT maintenance facility via South Pamet Road and Route 6, with a stop at the Truro Center Road Commercial Area. This would be a longer term route because parking would need to be developed at the MassDOT site. The route could include a stop at Jam’s Store to provide a transfer point to the Flex service, but would not use the store for additional satellite parking.

T-B3: Transfer Facility - Ballston Beach

This route would connect Ballston Beach with the Transfer Facility via South Pamet Road and Route 6. This would be a longer term route because parking would need to be developed.

Longnook

T-L1: Longnook - Truro Central School

This route would connect Longnook Beach with the Truro Central School via Longnook Road and Route 6. While there are some summer uses of the school parking area, there is likely sufficient or nearly sufficient supply to replace the future need at Longnook Beach.

T-L2: Longnook to Sand Pit

This route would connect Longnook Beach with the Sand Pit via Route 6. This route could be a good long term option if the Sand Pit were to become available for parking development.

T-L3: Longnook to Highlands Center

This route would connect Longnook Beach with the Highlands Center via Longnook Road, Route 6, and South Highland Road. This route could be a good long term option if compatible use for parking was included in the Highland Center redevelopment plans. The primary benefit of the Highlands Center is that it is publicly owned, though the location is likely to be less convenient than another site closer to Route 6.

Coast Guard

T-C1: Coast Guard to Highlands Center

This route would connect Coast Guard Beach with the Highlands Center via South Highland Road. This route could be a good long term option if beach parking use was included in the Highland Center redevelopment plans.

T-C2: Coast Guard to Sand Pit

This route would connect Coast Guard Beach with the Sand Pit via South Highland Road and Route 6. It could be a good long term route if parking could be developed at the Sand Pit.

T-C3: Coast Guard to Pilgrim Heights

This route would connect Coast Guard Beach with the Pilgrim Heights Parking Area via Highland Road and Route 6. It could be a good long term route if parking were to be developed at the Pilgrim Heights site.

T-M1: Coast Guard to Highlands Center*

This route would connect Coast Guard Beach with the Highlands Center via South Highland Road. It would assume that excess demand for Longnook Beach would also use this shuttle and be re-routed to Coast Guard Beach. This route could be a good long term option if beach parking use was included in the Highlands Center redevelopment plans.

C.2.6 Findings

- The route identification for each beach in Truro produced the following key findings:
- The town-wide and individual beach parking needs are relatively modest.
- Existing capacity at both the Town-managed and NPS-managed parking areas at Head of the Meadow beach could potentially accommodate the demand from the other beaches within the study area.
- The orientation of the beaches and limited road network preclude development of routes serving more than one beach.
- The parking areas closest to Longnook and Ballston are relatively small and may not have available parking; the larger sites are farther away and parking would need to be developed.
- There are no existing parking areas identified in this study that are located within three miles of Coast Guard Beach.
- Routes serving Truro could be organized to each serve one beach, or could be combined to have one larger parking area serving the needs of multiple beaches, bringing all of the visitors to one beach.
- While some parking areas could reasonably serve both Coast Guard and Longnook beaches, they are located between the two beaches; one service to two beaches would not likely gain efficiency over individual services to each beach.

Ballston Beach

In the short term, the only feasible route to serve Ballston Beach would be to connect to Jam's Store (T-B1). This route is preferred only if short term parking is required, or if multi-modal connections are valued more highly than parking availability. Otherwise, one of the longer term options would provide a more useful service. The route connecting to the Transfer Facility (T-B3) is slightly shorter than the route serving the MassDOT facility (T-B2), and is therefore preferred.

Longnook Beach

In the short term, the only feasible route to serve Longnook Beach would be connecting between the beach and the Truro Central School (T-L1). It is likely to have sufficient or nearly sufficient parking to meet the needs of Longnook Beach. If a larger parking area was needed, the route to the Sand Pit (T-L2) is preferred because it is shorter and the location off of Route 6 is expected to be more convenient for most beach visitors.

Coast Guard Beach

There are no short term routes to serve Coast Guard Beach. Of the longer term options, the Highlands Center route (T-C1) is likely the better option because it is the shortest of the routes and the parking area is publicly owned. If beach parking cannot be included in the site redevelopment plans or a satellite location closer to Route 6 is preferred, then the route connecting to the Sand Pit (T-C2) is also a good option.

Preferred routes:

- T-B1: Ballston Beach to Jam's Store (short-term only)
- T-B3: Ballston Beach to Transfer Facility (long-term)
- T-L1: Longnook to Truro Central School (short- or long-term)
- T-L2: Longnook to Sand Pit (long-term, only if more parking is needed)
- T-C1: Coast Guard to Highlands Center (long-term)
- T-C2: Coast Guard to Sand Pit (long-term)

C.3 Potential Parking-Shuttle Scenarios for Eastham Bayside Beaches

While several bayside beaches are expected to have future parking deficits due to erosion and demand, only three – South Sunken Meadow, Thumpertown, and First Encounter – meet the study criteria for shuttle consideration. The potential shuttle routes consider the possibility of accommodating additional beach parking demand in order to account for the needs of some of the other beaches.

Table C-6 provides a summary of future parking demand and supply at the Eastham bayside beaches. The analysis considers potential shuttle routes for the first three beaches – South Sunken Meadow, Thumpertown, and First Encounter.

**Table C-6
Eastham Bayside Future Parking Demand and Supply Summary**

Town	Beach	NPS / Town	2008 Total* Spaces	2030 Typical Needed Spaces	2028 Spaces Remaining AFTER Erosion	Future Excess or Shortfall
Eastham	South Sunken Meadow	Town	26	31	10	-21
Eastham	Thumpertown	Town	18	22	9	-13
Eastham	First Encounter	Town	199	241	175	-66
Eastham	Cooks Brook	Town	85	51	59	8
Eastham	Cole Road	Town	12	15	12	-3
Eastham	Campground	Town	119	108	98	-10
Eastham	Boat Meadow	Town	10	6	10	4
Eastham	Total	Town	469	474	373	-101

* total spaces includes regular, handicapped, unstriped, and spaces reserved for residents only

Massasoit Road and Herring Brook Road are the primary access roads in the western portion of Eastham, running roughly parallel to Route 6. The closest either of these roads travels to the coast or to any beach is approximately 0.3 miles, which may be too great a distance for beach visitors to walk, especially if carrying beach gear. There is very limited connectivity between the beaches closer to the coast, with no roads directly connecting any of the three beaches identified as meeting the thresholds for shuttle service. One internal route exists connecting Thumpertown and Campground beaches, and is considered in this analysis. All other potential routes would serve only one beach, given the limited connectivity, travel times, and modest if any parking needs at the other beaches. A map showing all the routes and potential parking areas is provided at the end of this section.

The parking areas that could potentially serve more than one beach are described only once under the beach that is best paired with the parking area, with a reference to other routes provided.

C.3.1 South Sunken Meadow Beach

The parking areas included in this analysis are listed below in Table C-7, with their distances from South Sunken Meadow Beach.

**Table C-7
South Sunken Meadow Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Michael's Way	Meets demand	1.0	Parking does not currently exist, but site has been previously developed, disturbed and/or contaminated.	Public	E-S1
Visitation Church	100	1.2	Parking area sees minimal use, even in the summer months.	Private	E-S2, E-T2, E-F3
Tilcon Plant	Meets demand	1.6	Parking does not currently exist, but site has been previously developed, disturbed and/or contaminated.	Public	E-S3, E-T3
Wellfleet Drive-In	850	2.4	Parking area is actively used, particularly in the summer months.	Private	None

Michael's Way

There is an undeveloped site on Michael's Way that is town-owned, and approximately 14-acres in size. It is zoned for multi-family residential use, and portions of the site appear to have been previously disturbed. The site is conveniently located to South Sunken Meadow Beach and could potentially accommodate all unmet beach parking demand on the bayside of Eastham.

Analysis: The site on Michael's Way appears to be previously disturbed and could be a potential long-term site for satellite beach parking. The site is publicly owned and zoned for residential use. Depending on the scope of future development plans, it is possible, though somewhat unlikely, that all or a portion could be dedicated to beach access parking. This would require a change in use and might not be supported by the neighbors or other members of the public.

Visitation Church

Visitation Church is located on Massasoit Road, which runs parallel to Route 6, and is one half mile from Route 6 via Oak Road. It has a large, unmarked paved parking area of almost an acre in size. The building was used by Our Lady of Lourdes Parish from 2000 to 2009; the congregation has since moved to a new building and this site is currently for sale and under consideration by the town. Visitation Church could also potentially serve as a satellite parking location for Thumpertown Beach.

Analysis: The Visitation Church site is well located and the parking area is large enough to accommodate the needs of several Eastham bayside beaches. If the sale can be arranged it might be a good satellite parking option for one or more beaches. However, if the town was to purchase such a large site, including the building, beach parking may not necessarily be the priority use for the site.

Tilcon Plant

The former Tilcon Plant in Eastham is a disturbed site of over 70 acres with a significant amount of open space, impervious surfaces, and industrial ruins. There is a smaller area of approximately eight heavily disturbed acres located less than a quarter mile from the intersection of Nauset Road and Route 6. This area is also adjacent to the Cape Cod Rail Trail. The site's ownership is disputed, with the Town of Eastham one of the potential landholders. This site could potentially be developed for satellite beach and rail trail parking; it is expected to have sufficient space to accommodate the beach parking demand for Eastham beaches on the ocean- as well as the bayside. The site could also potentially serve as a satellite parking location for Thumpertown Beach.

Analysis: The former Tilcon Plant is a large disturbed site located off Route 6 and close to the Cape Cod Rail Trail. Access to this site would be convenient for visitors already traveling from Route 6, though visitors traveling from neighborhoods between Route 6 and the beach would have to go out of their way to access the site. The site provides an important connection opportunity to the Cape Cod Rail Trail and potentially to the Flex service.

Wellfleet Drive-In

The Wellfleet Drive-In is located on Route 6, just north of Eastham. The site houses the Drive-In Theater, cinema building, mini-golf, dairy bar, and the Wellfleet Flea Market. The Flea Market runs from roughly April through October, on weekends and some weekdays. The complex includes approximately 850 parking spaces, though it is unknown how many are required to serve the various uses onsite and how many are used to house the Flea Market. The site is located near a critical traffic choke-point on Route 6, where the road narrows from two to one northbound lane. Given its location and traffic patterns on Route 6, the Cape Cod Commission has voiced concerns over traffic safety and turning to enter or leave the site. There is no signal control at the entrance.

Analysis: Due to the turning safety concerns, the Wellfleet Drive-In has not been considered as a feasible location for satellite parking. If a traffic signal or other improvements were installed it might become a more viable option.

C.3.2 Thumpertown / Campground Beach

Thumpertown is a small beach on the bay in Eastham. While the anticipated deficit in beach parking is only 13 spaces, it is included in the potential shuttle service analysis because it is expected to lose half of its spaces to erosion within the 20-year time frame. Thumpertown is located close to Campground Beach, which is also projected to have a modest unmet beach parking demand. The shuttle routes considered in this analysis to serve Thumpertown Beach would also serve Campground Beach.

One concern with Thumpertown Beach, however, is that there is very little beach space at high tide. For this reason it may be more appropriate to try to direct visitors to alternate beaches. The parking areas included in this analysis are listed below in Table C-8, with their distances from Thumpertown Beach.

Table C-8
Thumpertown Beach Potential Parking Areas

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Elks Lodge	79	0.9	Parking area in active use	Private	E-T1, E-F2
Wiley Park	55	1.1	Parking area is actively used, particularly in summer months	Public	None
Visitation Church	100	1.6	Parking area sees minimal use, even in the summer months	Private	E-S2, E-T2, E-F3
Tilcon Plant	Meets demand	2.1	Parking does not currently exist, but site has been previously developed, disturbed and/or contaminated	Public	E-S3, E-T3

Elks Orleans/Eastham Lodge (#2572)

The Elks Lodge is the site of the Orleans/Eastham Order of Elks, a national fraternal organization focused on community service. The Lodge is the site of social, educational, and volunteer events and programs. The Lodge has 79 parking spaces and is located immediately off of Route 6 on McKoy Road. The Elks Lodge is open every day, 3:00 PM to 11:00 PM during the week and 11:00AM to 11:00 PM on weekends. The facility also includes a large hall that is available for the public to rent for weddings and other events. The Elks Lodge could also potentially serve as a satellite parking location for First Encounter Beach.

Analysis: The Elks Lodge site is conveniently located and has a relatively large parking area. The site is in active use, however, and it is unclear how much of the capacity would be available for beach parking needs. One particular concern would be how to accommodate beach parking on days when there are special events, such as weddings, that would require use of the entire parking area. This is further complicated by the fact that these events do not necessarily follow a regular and predictable schedule. Variable message signs or other dynamic information systems would be particularly important in order to provide information to beach visitors.

Wiley Park

The Wiley Park Conservation Area features a wooded walking trail, freshwater beach, and public restroom facilities. The parking area holds approximately 55 vehicles. The Wiley Park Conservation Area is located close to Thumpertown Beach and is also the closest parking to First Encounter Beach.

Analysis: The parking area is relatively small and actively used for other recreation and not considered available for satellite beach parking for either Thumpertown or First Encounter.

C.3.3 First Encounter Beach

First Encounter Beach is the largest of the Eastham bayside beaches and is the only beach with restrooms. While it is located farther from the potential satellite parking areas identified in this study, it might be the beach best suited to absorb demand from other bayside beaches. The parking areas included in this analysis are listed below in Table C-9, with their distances from First Encounter Beach.

**Table C-9
First Encounter Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Wiley Park	55	1.2	Parking area is actively used, particularly in summer months.	Public	None
Eastham Town Hall	43	1.7	Parking area in active use.	Public	E-F1
Superette	55	1.8	Parking area in active use.	Private	E-F1
Elks Lodge	79	2.3	Parking area in active use.	Private	E-T1, E-F2
Salt Pond Visitor Center	150	2.5	Parking area is actively used, particularly in summer months.	Public	None
Visitation Church	100	2.7	Parking area sees minimal use, even in the summer months	Private	E-S2, E-T2, E-F3

Eastham Town Hall

The Eastham Town Hall is located on Route 6, with 43 on-site parking spaces. The parking spaces are not reserved for specific uses; the Town has indicated potential support of using the lot for satellite beach parking. The site is well connected to regional transit, across Route 6 from a Flex stop, as well as a stop on the Plymouth & Brockton line connecting the Outer Cape and Boston.

Analysis: While the parking lot at the Eastham Town Hall does not have enough spaces to accommodate all the parking needs at First Encounter Beach, it is conveniently located and there is strong potential that a portion of the lot could be available for satellite beach parking. This site could potentially be paired with another for a larger shuttle service.

Superette

The Superette liquor store is located on Route 6, across the street from the Eastham Town Hall. The Flex route and Plymouth & Brockton bus service both have stops at this site. The site is privately owned, with 55 parking spaces. Current demand for and use of the parking spaces is not available.

Analysis: Given the location on Route 6 and the regional bus stops on-site, the Superette could be a good candidate for satellite beach parking, particularly if paired with the Town Hall.

Salt Pond Visitor Center

The Salt Pond Visitor Center is the Cape Cod National Seashore's visitor center. It is located just off Route 6 on Nauset Road. The location includes multimodal connections such as a Flex stop and the start of the Nauset Trail, a multi-use bicycle trail running from the Visitor Center to Coast Guard Beach.

Analysis: The Salt Pond Visitor Center parking area is in active summer use and may not have available capacity for satellite beach parking. While it is conveniently located off Route 6, it may be in the opposite direction from many of the Eastham residents accessing First Encounter Beach. It is not included in the potential shuttle routes analyzed for this study.

C.3.4 Routes

The full list of potential routes is provided in Table C-10 and shown in Figure C-2; more detailed information and analysis and assessment follows below.

**Table C-10
Potential Eastham Bayside Shuttle Routes**

Route ID	E-S1	E-S2	E-S3	E-T1	E-T2	E-T3	E-F1	E-F2	E-F3
Route Name	South Sunken Meadow Beach - Michael's Way	South Sunken Meadow - Visitation Church	South Sunken Meadow - Tilcon	Thumpertown & Campground to Elks Lodge / Ocean Park Inn	Thumpertown & Campground to Visitation Church	Thumpertown & Campground to Tilcon	Eastham Town Hall/ Superette to First Encounter	Elks Lodge / Ocean Park Inn to First Encounter	First Encounter – Visitation Church
Beach(es)	South Sunken Meadow	South Sunken Meadow	South Sunken Meadow	Thumpertown, Campground	Thumpertown Campground	Thumpertown Campground	First Encounter	First Encounter	First Encounter
Parking Areas	Michael's Way	Visitation Church	Tilcon Plant	Elks Lodge	Visitation Church	Tilcon Plant	Town Hall, Superette	Elks Lodge	Visitation Church
2028 Available	10	10	10	107	107	107	175	175	175
2030 Demand	31	31	31	130	130	130	241	241	241
2030 Satellite Spaces Needed	21	21	21	23	23	23	66	66	66
# Spaces at Satellites	Meets demand	100	Meets demand	79	100	Meets demand	98	79	100
Total Town 2030 Unmet Demand	101	101	101	101	101	101	101	101	101
Spaces Used	21	21	21	23	23	23	66	66	66
Total # Cars	24	24	24	25	25	25	72	72	72
Total Daily Passengers	66	66	66	70	70	70	203	203	203
One Way Travel Time (min)	7	7	11	11	13	15	13	13	14
Shuttle Vehicles	1	1	2	2	2	2	2	2	2
Total Shuttle Vehicle Hours	9	9	18	18	18	18	18	18	18
Avg Pax/Trip	2	2	2	2	2	2	6	6	6
Peak Pax/Trip	3	3	3	3	3	3	8	8	8
Route Miles (One Way)	1	1.2	1.6	1.5	2.1	2.7	1.8	2.3	2.7
Cost per Pax	\$8.85	\$8.85	\$17.70	\$16.67	\$16.67	\$16.67	\$5.77	\$5.77	\$5.77
Cost per Pax All Town Demand	\$1.88	\$1.90	\$3.76	\$4.75	\$3.80	\$3.76	\$3.88	\$4.75	\$3.80

South Sunken Meadow Beach

E-S1: South Sunken Meadow Beach – Michael’s Way

This route would connect South Sunken Meadow Beach with the undeveloped area on Michael’s Way via South Sunken Meadow Road and Massasoit Road. This route is relatively short but could only operate in the longer term, if parking were included in development plans for the site.

E-S2: South Sunken Meadow Beach – Visitation Church

This route would connect South Sunken Meadow Beach with the Visitation Church site via Massasoit Road and South Sunken Meadow Road. Because the parking area already exists, this route could operate in the short term, if the site were made available for satellite beach parking.

E-S3: South Sunken Meadow Beach – Tilcon Plant

This route would connect South Sunken Meadow Beach with the former Tilcon Plant site via Aspinet Road, Massasoit Road, and South Sunken Meadow Road. This route could only operate in the longer term, as parking would need to be developed on the Tilcon site.

Thumpertown & Campground Beaches

E-T1: Thumpertown & Campground Beaches – Elks Lodge / Ocean Park Inn

This route would connect Thumpertown and Campground Beaches with the Elks Lodge and the Ocean Park Inn and/or Sheraton Four Winds hotels, via McKoy Road and Thumpertown Road. While this route would not include specific satellite beach parking at the hotels, it would include stops at one or both locations to serve visitors staying at the hotels. This route could operate in the short term because the parking area currently exists.

E-T2: Thumpertown & Campground Beaches – Visitation Church

This route would connect Thumpertown and Campground Beaches with the Visitation Church site via Massasoit Road, Herring Brook Road, and Thumpertown Road. Because the parking area already exists, this route could operate in the short term, if the site were made available for satellite beach parking.

E-S3: Thumpertown & Campground Beaches – Tilcon Plant

This route would connect Thumpertown and Campground Beaches with the former Tilcon Plant site via Route 6, McKoy Road, and Thumpertown Road. To reach Thumpertown and Campground Beaches, the shuttle will have to travel along a heavily congested portion of Route 6. This route could only operate in the longer term, as parking would need to be developed on the Tilcon site.

First Encounter Beach

E-F1: First Encounter Beach – Eastham Town Hall / Superette

This route would connect First Encounter Beach with the Eastham Town Hall and the Superette site via Samoset Road. Careful consideration would be required to determine whether the shuttle would stop at both the Town Hall and the Superette sites, as they are located on opposite sides of Route 6. Stopping at both sites might be difficult in terms of shuttle operations, though requiring a pedestrian crossing between the sites may also be unsafe. The Superette site is larger and has existing multi-modal connections, though it may be more difficult to use for satellite parking, as it is privately owned. This route could operate in the short term because the parking areas currently exist.

E-F2: First Encounter Beach – Elks Lodge / Ocean Park Inn

This route would connect First Encounter Beach with the Elks Lodge and the Ocean Park Inn and/or Sheraton Four Winds hotel, via McKoy Road, Herringbrook Road, and Samoset Road. While this route would not include specific satellite beach parking at the hotels, it would include stops at one or both locations to serve visitors staying at the hotels. This route could operate in the short term because the parking area currently exists.

E-F3: First Encounter Beach – Visitation Church

This route would connect First Encounter Beach with the Visitation Church site via Massasoit Road, Herring Brook Road, and Samoset Road. Because the parking area already exists, this route could operate in the short term, if the site were made available for satellite beach parking.

C.3.5 Findings

The route identification for each beach in Eastham produced the following key findings:

- The anticipated additional beach parking needs on the bayside in Eastham are relatively modest needing less than 15 spaces, with the exception of First Encounter and South Sunken Meadow beaches.
- There are few existing individual parking areas that can meet all of the bayside parking needs, though some could accommodate excess demand for multiple beaches.
- There may be opportunities for shuttle routes to link multiple parking areas to beaches, such as a combination of Town Hall and Superette.
- There may be opportunities for shuttle routes to link to both parking areas and motels/hotels along Route 6, such as Elks Lodge and the Ocean Park Inn and/or Sheraton Four Winds hotel.
- While located farther from some of the potential parking areas, First Encounter Beach might be well-suited to accept unmet demand from other bayside beaches, due to its larger size and public facilities. Thumpertown is not well-suited for this, as there is a relatively narrow beach area at high tide.
- There are several sites for sale or otherwise vacant – the Michael’s Way property, Visitation Church, and the former Tilcon Plant – that could potentially accommodate beach parking demand, if the Town decided to either purchase/lease or dedicate them for such use.

South Sunken Meadow Beach

The beach parking needs at South Sunken Meadow Beach could be easily accommodated at either the Michael’s Way property (E-S1) or the Visitation Church (E-S2). Because Visitation Church is already paved, it is a more feasible short term option. In addition, including satellite beach parking is likely to be undesirable or infeasible in a future multi-family housing development, which is how Michael’s Way is currently zoned. Service from the Tilcon Plant (E-S3) would be more expensive due to longer travel times and the need for additional service vehicles, and would not be possible in the short term.

Thumpertown and Campground Beaches

Given the relatively low demand at Thumpertown Beach, shuttle routes would only be cost effective if they were to also serve Campground Beach. The most feasible routes to serve these beaches would either connect to the Elks Lodge/Ocean Park Inn (E-T1) or to Visitation Church (E-T2). Connection to the Tilcon site (E-T3) is farther, would require additional service vehicles, and would have to travel on a heavily congested portion of Route 6.

Both routes E-T1 and E-T2 are estimated to require the same number of service vehicles, and have comparable levels of available parking. Visitation Church is slightly closer but farther away from Route 6, which may make it more difficult for visitors to find the site. At this time it is recommended that both routes be considered in the future.

Further analysis of routes to serve Thumpertown Beach should consider the availability of beach space at high tide, and whether it is appropriate to try to bring additional visitors to Thumpertown Beach, or if the unmet demand should be accommodated by another beach. If Campground Beach does not face this same constraint related to beach space at high tide, then it could be an adequate substitute for Thumpertown Beach at those times.

First Encounter Beach

There are no nearby parking areas that could accommodate all of the First Encounter Beach parking demand, though there are possibilities for shuttles linking multiple adjacent parking areas. Depending on

availability of the parking areas, this beach could be well served by the Elks Lodge (E-F2) or Visitation Church (E-F3). While farther from the beach than Town Hall and the Superette (E-F1), both the Elks Lodge and Visitation Church have more potential parking availability. The church is likely the best option because of its size and potential to meet the total excess parking demand for all of Eastham's bayside beaches; it also has the best potential to be available every day of the week, if the town can arrange acquisition of the site. Since First Encounter is the largest beach and has restrooms, it makes a good location to focus beach visitors.

Preferred routes:

- E-S2: South Sunken Meadow Beach to Visitation Church
- E-T1: Thumpertown and Campground Beaches to Elks Lodge/Ocean Park Inn; OR
E-T2: Thumpertown and Campground Beaches to Visitation Church
- E-F2: First Encounter Beach to Elks Lodge/Ocean Park Inn
- E-F3: First Encounter to Visitation Church

C.4 Potential Parking-Shuttle Scenarios for Eastham Oceanside Beaches

This analysis explores shuttles to the oceanside beaches in Eastham, Coast Guard and Nauset Light, both of which are managed by NPS. The majority of parking for Coast Guard Beach is located approximately 1 mile inland at Little Creek Parking area. Some parking for Eastham residents and visitors with mobility impairments are available closer to the beach. The parking areas for Nauset Light and Coast Guard Beaches are not expected to experience significant direct erosion during the next 20 years, although the lot for Eastham residents at Coast Guard Beach and the lot at Nauset Light Beach both currently experience demand beyond their capacities. This analysis considers shuttle routes to serve Nauset Light Beach and potential expansion of the Little Creek shuttle at Coast Guard Beach.

It does not consider additional satellite parking areas to serve Coast Guard Beach for several reasons: the deficits at the Coast Guard at Beach lot do not meet the threshold of 15 spaces or 50 percent of the capacity lost; there is additional capacity at the Little Creek Parking Lot; and town residents using the Coast Guard at Beach lot would be unlikely to use a shuttle from an alternate location if Little Creek is available.

Table C-11 provides a summary of future parking demand and supply at the Eastham oceanside beaches.

**Table C-11
Eastham Oceanside Future Parking Demand and Supply Summary**

Town	Beach	NPS / Town	2008 Total* Spaces	2030 Typical Needed Spaces	2028 Spaces Remaining AFTER Erosion	Future Excess or Shortfall
Eastham	Coast Guard @ Little Creek	NPS	422	390	422	32
Eastham	Coast Guard @ Beach	town	61	74	61	-13
Eastham	Nauset Light Beach	NPS	167	206	167	-39
Eastham	Total	town	61	74	61	-13
Eastham	Total	NPS	589	595	589	-6

* total spaces includes regular, handicapped, unstriped, and spaces reserved for residents only

C.4.1 Nauset Light Beach

The parking areas included in this analysis are listed below in Table C-12, with their distances from Nauset Light Beach.

**Table C-12
Nauset Light Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Nauset Regional High School	265	0.5	Parking area is actively used, but may be less active during summer months.	Public	E-N1
Cable Road Parcel	Meets demand	0.5	Parking does not currently exist, and there is no evidence of previous development activity	Public	None (alternative to Nauset Regional HS)
Doane Rock Picnic Area	24	1.5	Parking area is actively used, particularly in summer months.	Public	None
Eastham Senior Center	50	1.5	Parking area is actively used, particularly in summer months.	Public	None
Little Creek Parking Area	422	1.5	Parking area is actively used, particularly in summer months.	Public	E-M1
Tilcon Plant	Meets demand	1.8	Parking does not currently exist, but site has been previously developed, disturbed and/or contaminated.	Public	E-N2

Nauset Regional High School

The Nauset Regional High School is located approximately one-half mile from Nauset Light Beach. The parking lot consists of several distinct parking areas, which are used lightly (administration, summer

classes, etc.) during summer months when school is not in session. Use of this parking area would require cooperation with the Nauset Regional School Board and the Superintendent of Schools.

The High School is a Flex Route on-request stop – while there is no additional charge for this stop, arrangements for pick-up and drop-off must be made at least two hours in advance by calling customer service.

Analysis: The Nauset Regional High School is a good option for short- or long-term satellite parking, given its proximity to the beach and large parking area. It may have adequate capacity to accommodate the needs at multiple Eastham beaches. Special attention to the site layout and separation between the sections of the parking lot is important.

Cable Road Parcel

The Cable Road Parcel is located across the street from the Nauset Regional High School. It is relatively flat, though forested and undisturbed. There are potential nearby wetland, vernal pond, and habitat issues associated with the site.¹

Analysis: While the Cable Road Parcel is expected to be large enough to accommodate beach parking needs at Nauset Light and/or other Eastham beaches, the need to develop it and the potential environmental sensitivities make it undesirable unless all other options are exhausted. This location is not included in any routes, though it could be an alternative to Nauset Regional High School if necessary.

Doane Rock Picnic Area

The Doane Rock Picnic Area is located on Doane Road and Pinecrest Drive. There are two small parking areas – one with approximately eight spaces, and another closer to a walking trail, with approximately 16 spaces. Given the orientation of the site, it may be difficult for a large vehicle to turn around in the parking area.

Analysis: Given the site layout, existing use, and relatively small number of parking spaces, the Doane Rock Picnic area is not included in any potential shuttle routes.

Eastham Senior Center

The Eastham Senior Center is town-owned and operated by the Eastham Council on Aging. It is located on Nauset Road a short distance from the Nauset Regional High School and Nauset Light Beach. The Center has a small front lot and a much larger, expansive rear lot. Access to the rear lot is relatively steep, which could be a potential concern for a shuttle vehicle.

Analysis: The Eastham Senior Center parking area is relatively small and in active use. The Town has indicated that it would prefer not to use this parking area for satellite beach parking. This location is not included in any potential shuttle routes.

Little Creek Parking Area

The Little Creek Parking Area is located off Doane Road and contains 422 parking spaces. It was built to replace the Coast Guard Beach parking destroyed by a storm in 1978. The area currently serves as a park-and-ride for visitors to park and take an NPS-operated shuttle to the Coast Guard Beach.

Analysis: The Little Creek Parking Area is located close to Nauset Light Beach and is estimated to have some additional capacity in 2030. However, the anticipated additional capacity would not be enough to accommodate the needs of Nauset Light Beach. It might be sufficient to accommodate the anticipated need at the beach-side parking area for Coast Guard Beach. It is recommended that Little Creek continue to be used for Coast Guard Beach and not for Nauset Light Beach.

¹ Based on e-mail from Robert Cook, Acting Chief of Natural Resources to Karst Hoozeboom, NPS project manager on 11/19/2009.

Tilcon Plant

The former Tilcon Plant in Eastham is a disturbed site of over 70 acres with a significant amount of open space, impervious surfaces, and industrial ruins. There is a smaller area of approximately eight heavily disturbed acres located less than a quarter mile from the intersection of Nauset Road and Route 6. This area is also adjacent to the Cape Cod Rail Trail. The site’s ownership is disputed, with the Town of Eastham one of the potential landholders. This site could potentially be developed for satellite beach parking; it is expected to have sufficient space to accommodate the beach parking demand for Eastham beaches on the ocean- as well as the bayside.

Analysis: While access to this site may require some visitors to go “past” the Eastham beaches, it is large enough that it could potentially accommodate parking demand for both ocean- and bay-side beaches. The site provides an important connection opportunity to the Cape Cod Rail Trail and potentially to the Flex service. It could be a good longer term option if the ownership is easily resolved and parking could be developed.

C.4.2 Coast Guard Beach

The parking area included in this analysis is listed below in Table C-13, with its distance from Coast Guard Beach.

Table C-13
Coast Guard Beach Potential Parking Areas

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Salt Pond Visitor Center	150	1.5*	Parking area is actively used, particularly in summer months.	Public	E-C1

* Salt Pond Visitor Center is 1.5 miles from Coast Guard Beach, but only 1.0 miles from Little Creek Parking area, the main parking area for Coast Guard Beach. A shuttle currently exists between Little Creek and Coast Guard Beach.

Salt Pond Visitor Center

The Salt Pond Visitor Center is the Cape Cod National Seashore’s main year-round visitor center. It is located just off Route 6 on Nauset Road. Visitors pass by on their way to Coast Guard Beach’s Little Creek parking area and to Nauset Light Beach. The location includes multimodal connections such as a Flex stop and the start of the Nauset Trail, a multi-use bicycle trail running from the Visitor Center to Coast Guard Beach. It is also the site of an existing ITS sign regarding NPS beach parking availability.

Analysis: The Salt Pond Visitor Center parking area is in active summer use and may not be a good candidate for satellite beach parking. However, the site provides important regional multimodal connections and might be a good stop on a shuttle route.

C.4.3 Routes

The full list of routes is provided in Table C-14 and shown in Figure C-3; more detailed information and analysis and assessment follows below. The routes were identified and analyzed according to the general methodology described in the introduction.

**Table C-14
Potential Eastham Shuttle Routes**

Route ID	E-N1	E-N2	E-N3	E-C1	E-N1-N	E-NC
Route Name	Nauset Regional High School – Nauset Light	Tilcon Plant to Nauset Light	Nauset Light – Brackett Road – Tilcon Plant Loop	Salt Pond Visitor Center – Little Creek Parking Area	Wellfleet Motel/Lodge to Nauset Reg HS via Tilcon	Nauset Light-Coast Guard - Route 6 via Tilcon
Beach(es)	Nauset Light	Nauset Light	Nauset Light	Coast Guard	Nauset Light	Nauset Light and Coast Guard
Parking Areas	Nauset Regional High School	Tilcon Plant	Tilcon Plant	Salt Pond Visitor Center	-	-
2028 Available	167	167	167	650	167	650
2030 Demand	206	206	206	669	206	669
2030 Satellite Spaces Needed	39	39	39	19	39	19
# Spaces at Satellites	265	Meets demand	Meets demand	150	-	-
Total Town 2030 Unmet Demand	19	19	19	19	-	-
Spaces Used	39	39	39	19	-	-
Total # Cars	42	42	42	21	-	-
Total Daily Passengers	119	119	119	59	-	-
One Way Travel Time (min)	9	12	24	7	16	18
Shuttle Vehicles	1	2	4	1	3	3
Total Shuttle Vehicle Hours	9	18	36	9	27	27
Avg Pax/Trip	3	3	3	2	-	-
Peak Pax/Trip	5	5	5	2	-	-
Route Miles (One Way)	0.8	1.8	4.0	1	2.2	3.45
Cost per Pax	\$4.92	\$9.84	\$19.68	\$585 total daily	\$1,755 total daily	\$1,755 total daily
Cost per Pax All Town Demand	\$9.96	\$19.92	\$39.83			

Figure C-3
Eastham Oceanside Routes



Nauset Light Beach

E-N1: Nauset Regional High School – Nauset Light Beach

This route would connect Nauset Light Beach with Nauset Regional High School via Cable Road. The route is relatively short and would be the most efficient of the potential routes serving Eastham oceanside beaches. This route could serve in both the short- and long-term, as it currently has sufficient parking.

E-N2: Tilcon Plant to Nauset Light Beach

This route would connect Nauset Light Beach with the Tilcon Plant site via Cable Road and Nauset Road. Because parking does not currently exist on the Tilcon site, this route would be a long-term option only.

E-N3: Nauset Light Beach – Brackett Road – Tilcon Plant Loop

This route would connect Nauset Light Beach with the Tilcon Plant site via Cable Road and Nauset Road, and then travel south on Route 6 to Brackett Road, before rejoining Cable Road. While there may not be available satellite parking on Brackett Road, the route could include stops at existing and future residential and commercial areas. This route could begin in the short term by making connections to existing residential and commercial areas, and include the Tilcon site once parking is developed.

E-N1-N: Northern Eastham Shuttle

This route is designed to provide shuttle service for visitors staying along Route 6 in four lodging facilities north of Nauset Road in Eastham and at the Wellfleet Motel and Lodge just across the town line. All of these facilities are on the east side of Route 6, which will facilitate the return trips from the beach to the lodging facilities, but may complicate southbound travel as the shuttle vehicle would have to cross the heavy northbound traffic along Route 6 to pick visitors up as it travels toward the beach.

This service would operate as an extension of the proposed E-N1 service between Nauset Regional High School and Nauset Light Beach and would run from the Wellfleet Motel and Lodge to the beach via Nauset Road and Cable Road. This service could be provided on every E-N1 trip or on a less frequent basis, with only some of the E-N1 trips extended to Route 6.

E-NC: Eastham Lodging Loop

This route is designed to provide shuttle service for visitors staying in lodging facilities located between the Salt Pond Visitor Center and Nauset Road. The route would serve the Salt Pond Visitor Center, Nauset Light Beach and Coast Guard Beach and stop at six lodging locations along this portion of Route 6.² Additional stops would be made at other satellite parking areas such as Nauset Regional High School, Little Creek, or the Tilcon site, as appropriate, and at the North Eastham Village Center complex near the intersection of Route 6 and Brackett Road.³ Because nearly all of the commercial lodgings are on the east side of Route 6, this route would operate in a clockwise direction all day to minimize left turns.

It may be possible to reduce travel time slightly by eliminating the stops at Coast Guard Beach or Little Creek; alternately this service could supplement both the E-C1 and E-N1 routes.

Coast Guard Beach

E-C1: Salt Pond Visitor Center – Little Creek Parking Area

This route would connect the Little Creek Parking Area with the Salt Pond Visitor Center. It would provide a periodic extension of the current shuttle running between Coast Guard Beach and the Little Creek Parking Area. The purpose of this service would be to provide a connection to the Visitor Center and the Flex Route, though the Visitor Center site would not be used specifically for satellite beach parking. Demand and cost effectiveness for this route are more difficult to estimate, as the route is not based on serving replacement parking for a specific number of vehicles.

² It is expected that Four Points by Sheraton and Ocean Park Inn, which are adjacent, would share a stop and that visitors staying at the Eastham Shore B & B would walk the ¼ mile to the visitor center to access the service, making the route available to visitors staying at 8 lodging sites.

³ The route is currently designed to serve both Nauset Regional HS and Little Creek but not Tilcon.

One possible way to reduce costs and optimize the efficiency of the route could be to run less frequently, scheduled connections to and from the Flex service. Depending on the existing Little Creek Shuttle operations and staffing schedule, the extension might require operation of an additional vehicle or might be accommodated through the existing service.

C.4.4 Findings

The route identification for each beach in Eastham produced the following key findings:

- The anticipated additional beach parking needs on the oceanside in Eastham are relatively modest.
- The needs analysis estimates a small amount of additional capacity available at the Little Creek Parking area in the future, which should be able to accommodate excess demand from the Coast Guard at Beach parking area. This service is not included in the operations estimates.
- Town residents who park in the Coast Guard at Beach lot are unlikely to be willing to travel to an alternate site farther from the beach to take a shuttle; they would be more likely to park in the Little Creek lot or visit Nauset Light Beach instead.
- Shuttle route service to Nauset Light Beach might be more attractive if it could serve more than the estimated 39 needed spaces – either by collecting visitors at residential and commercial areas before they drive to the beach, or by accommodating additional visitors at the beach.

Nauset Light Beach

The beach parking needs at Nauset Light Beach could be accommodated relatively easily through routes connecting to either Nauset Regional High School (E-N₁) or the old Tilcon Plant (E-N₂, E-N₃). The parking area at Nauset Regional High School is closer to the beach and shuttle operations would be less expensive. It is also a good short-term option because the parking has already exists.

Use of the Tilcon site for satellite parking would be appropriate either in the event that the High School is not available, or the for the sake of better regional multimodal connections – to be closer to Route 6, the Flex route, and the Cape Cod Rail Trail. While the Tilcon site could also accommodate additional beach parking needs from the Coast Guard at Beach lot, it is unlikely that Eastham residents who visit Coast Guard Beach would travel to the Tilcon site rather than use the Little Creek shuttle.

The lodging routes, E-N₁-N and E-NC could provide important connections in both the short- and long-term. In addition to serving residence and lodging, E-NC includes a connection to the Flex stop and commercial area on the corner of Route 6 and Brackett Road. This intersection is at the center of a proposed mixed use village center development, which would include retail, office, residential, and civic uses. One benefit of these routes are that they could potentially capture visitors at their homes or more central locations, rather than requiring them to drive to a satellite parking area. Several route variations could be considered depending on the timing and scope of the development plans and expected need for parking at the Tilcon or other sites.

Coast Guard Beach

The Little Creek Parking Area is a well established viable alternative for Eastham residents wishing to visit Coast Guard Beach when there is no parking available in the resident lot at the beach. Future erosion is not expected to decrease parking availability at the beach; any excess demand would come from changing visitor patterns. Little Creek Parking Area will not lose capacity, and should be able to accommodate the unmet demand from the resident parking at the beach.

While there is limited additional parking available at the Salt Pond Visitor Center, a periodic shuttle extension from Coast Guard Beach (E-C₁) could provide a useful regional multimodal connection.

Preferred routes:

- E-N₁: Nauset Light Beach to Nauset Regional High School
- E-N₃: Nauset Light –Brackett Road – Tilcon Plant Loop
- E-C₁: Little Creek Parking Area to Salt Pond Visitor Center

C.5 Potential Parking-Shuttle Scenarios for Wellfleet Oceanside Beaches

The Town-managed oceanside beaches in Wellfleet are the beaches facing the greatest challenges to parking area capacity and erosion. The parking area at Marconi Beach, the only NPS-managed beach in Wellfleet, is not at great risk of erosion, and therefore not included in the shuttle scenarios. While the Marconi parking area is relatively large and protected from erosion, it is not included as a potential satellite parking area for the other Wellfleet beaches, due to its distance from the town-managed beaches and the fact that the parking area sometimes fills.

While each of the beaches off of Ocean View Drive has unique characteristics, the four beaches are more similar than other beaches along the Cape, and their demand is considered to be relatively interchangeable. For example, some demand moved to Newcomb Hollow in 2009, due to a shift in an underwater sand bar, which increased the size of the waves. However, the same wave conditions may not hold in the future, and the desirability of each beach may change over time. Wellfleet is unusual in that all the beaches are located immediately off Ocean View Drive, making it relatively efficient for a single shuttle to serve multiple beaches.

Table C-15 provides a summary of future parking demand and supply at the Wellfleet oceanside beaches.

Table C-15
Wellfleet Oceanside Future Parking Demand and Supply Summary

Town	Beach	NPS / Town	2008 Total* Spaces	2030 Typical Needed Spaces	2028 Spaces Remaining AFTER Erosion	Future Excess or Shortfall
Wellfleet	Marconi Beach	NPS	530	489	530	41
Wellfleet	Maguire's Landing/ LeCount Hollow	town	167	211	147	-64
Wellfleet	White Crest Beach	town	404	511	283	-229
Wellfleet	Cahoon Hollow Beach	town	90	114	36	-78
Wellfleet	Newcomb Hollow	town	375	356	319	-37
Wellfleet	Total	town	1,036	1,193	785	-407
Wellfleet	Total	NPS	530	489	530	41

* total spaces includes regular, handicapped, unstriped, and spaces reserved for residents only

The Wellfleet route development focused primarily on routes and parking areas that would serve all the beaches, with a few representative examples of routes that would serve only one beach. The beach-specific routes use the parking area closest to the individual beach. This approach is most relevant for the northernmost and southernmost beaches, Newcomb Hollow and LeCount Hollow, respectively. While there are several roadways connecting Route 6 with Ocean View Drive, the Town of Wellfleet requested that Long Pond Road and Cahoon Hollow Road not be used for shuttle routes due to sensitive environmental resources. For this reason the analysis does not consider individual routes serving only White Crest or Cahoon Hollow beaches. The routes were identified and analyzed according to the general methodology described in the introduction.

C.5.1 Parking Areas

Given the orientation of the Wellfleet beaches and parking areas, most of the areas identified could potentially serve any or all of the beaches. The parking areas included in this analysis are listed in Table C-16, with their distances from Newcomb Hollow Beach (N) or LeCount Hollow Beach (L), the closest beach on the route to the parking area. The parking areas listed here are representative of the types of existing parking areas located along Route 6; it is possible that these or other similar commercial sites may become available for beach parking over the next 20 years.

Table C-16
Wellfleet Beaches Potential Parking Areas

Site	Spaces*	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Wellfleet Elementary School	40	2.3 (N)	Parking area is actively used, but may be less active during summer months. They are currently planning for year round recreation facilities, which may limit parking availability.	Public	W-N1
White Crest Parking Area	Meets Demand	2.4 (N)	Parking does not currently exist, and there is no evidence of previous development activity.	Public	W-M1
OCHS Wellfleet Health Center	40	2.7 (N)	Site is actively used, including in summer months.	Public	None
Wellfleet Town Hall	97	2.9 (N)	Parking area is actively used, but may experience significant changes in volume throughout the week.	Public	None
Cove Corner Shopping Center	84	3.4 (N)	Parking area redone in 2010; some spaces may have been lost. Current commercial activity uses all parking spaces.	Private	W-M2
Wellfleet Senior Center	45	3.8 (N)	Site is actively used, including in summer months.	Public	None
South Wellfleet Commercial Area	30	0.8 (L)	Site is actively used, including in summer months.	Public	W-M2
CCRT Trail Head	32	0.8 (L)	Site is actively used, including in summer months.	Public	W-M2
Cape Cod Disposal Company	75	2.3 (L)	Site is actively used, including in summer months.	Private	None
CACO Headquarters	50	2.8 (L)	Parking does not currently exist, but site has been previously developed, disturbed.	Public	None
Wellfleet Drive-In	870	3.8 (L)	Parking area is actively used, particularly in the summer months.	Private	None

Wellfleet Elementary School

The Wellfleet Elementary School is closest to Newcomb Hollow Beach and the parking area is likely large enough to accommodate future additional demand for Newcomb Hollow beach parking. It would not be large enough to accommodate the needs of any of the other individual beaches, though it could be included as one of several satellite parking locations on a shuttle route. The site is located close to Route 6 and would be relatively easy to access. One potential concern is that the school is located just off of Long Pond Road, which is one of the roadways that the Town of Wellfleet has requested not be used for a shuttle route, due to sensitivities related to the local ponds.

Analysis: The Wellfleet Elementary School is conveniently located and could potentially provide parking capacity for Newcomb Hollow Beach, or be included as one of several satellite parking areas on a shuttle route. It could be a good short-term location, while larger parking areas are developed.

White Crest Parking Area (town owned land adjacent to the existing parking for White Crest Beach)

The White Crest Area is located on Ocean View Drive, across from White Crest Beach. The existing beach parking includes a smaller area on the ocean-side (east) of Ocean View Drive, as well as a larger area on the opposite (west) side of Ocean View Drive. The existing parking area is flat but is surrounded by undulating topography, heathlands, forest, and adjacent NPS land. Sensitive plant species are known to exist in this area. For the past several years the Town of Wellfleet has studied the possibility of developing an adjoining area for a wind turbine and considered possible additional beach parking; the town recently decided not to pursue the wind turbine. If the town did pursue additional beach parking, depending on the size of a new parking area, it might be able to accommodate beach parking needs for multiple Wellfleet beaches.

Analysis: If it can be developed, the White Crest Area is a good long-term option for providing beach parking as it is town-owned and located in such close proximity to the beaches. Development of a large

new parking area so close to White Crest Beach might overwhelm its beach facilities, unless it is accompanied by a shuttle service to distribute visitors to the other beaches as well. If the additional parking development was scaled to account for the additional level of usage that could be accommodated by White Crest Beach, it might be possible to develop the parking without need for a shuttle service. However, the land that would be used for new parking is set back from Ocean View Drive, and may be at least one-half mile from the beach, a distance that many visitors would not be able or willing to walk. Use of this parking area might necessitate at least a short shuttle to White Crest Beach, of the sort used at Coast Guard Beach and the Little Creek parking area.

OCHS Wellfleet Health Center

The OCHS Wellfleet Health Center is located on Route 6. The parking area is likely large enough to accommodate future additional demand for beach parking at Newcomb Hollow Beach, though it is not large enough to accommodate the needs of any of the other individual beaches; it could be included as one of several satellite parking locations on a shuttle route. There are traffic safety concerns with the site, as the entrance/exit is located at a curve in the road. The site is in active use including during the summer months, though the OCHS is considering relocating to a new site or redeveloping on their current site, in which case parking availability is even less certain. Depending on the future plans for OCHS, it is possible that the town could acquire the site.

Analysis: The OCHS Wellfleet Health Center is not likely to be a good candidate for satellite parking as the lot is relatively small, in active use during the summer, and its location poses safety concerns. For these reasons it is not included in any of the potential shuttle routes.

Wellfleet Town Hall

Wellfleet Town Hall is located in downtown Wellfleet, approximately one-half mile from Route 6. It is located within a commercial district with nearby shops, restaurants, and other destinations. It is also located near an existing Flex Route stop. The parking area is in active use, with some variation throughout the day or the week. It is used by town employees as well as two-hour use by the general public.

Analysis: Wellfleet Town Hall is an attractive location for a shuttle stop, given its proximity to multiple other destinations. However, it is unclear just how much of the parking demand could be accommodated by the parking area, as it is in active summertime use. There may be some resistance to bringing additional vehicles into the congested downtown area if the passengers are not intending to patronize the local establishments, though it is possible that beach visitors might visit local shops either before or after going to the beach. There may also be issues with narrow roadways or vehicle clearance. Wellfleet Town Hall is not included in a route option since it is too far from Route 6 to be part of a loop and farther than other currently available parking areas sized for meeting the demand of a single beach.

Cove Corner Shopping Center

The Cove Corner Shopping Center is located on Route 6 and includes 84 spaces that serve three small local businesses. The parking lot is not in good state of repair. The lot is adjacent to the new Wellfleet Harbor Actors Theater and Wellfleet Post Office, which have a separate entrance but can be accessed via Cove Corner. The site appears to be used as a cut-through for people going to the post office, which has a circuitous access route.

Analysis: The Cove Corner Shopping Center is likely to have some availability to accommodate beach parking needs. Though it could not serve all of the needs of the town beaches, it could be one of several stops on a shuttle route. The site would likely require repair or upgrades in order to be used for satellite parking. This could be a good relatively short- or long-term option.

Wellfleet Senior Center

The Wellfleet Senior Center is located on Old County Road, approximately one-quarter mile from Route 6, and accessible via Cahoon Hollow Rd. or Designers Rd. It has 45 marked spaces as well as a rear, paved

area that could accommodate approximately 20 additional vehicles. The site is in active use, including during the summer months.

Analysis: The Senior Center might be a good short-term option to accommodate the needs of one beach or be one of several stops on a shuttle route. Given its current use and relatively small size, however, it is likely not a good long-term option. Wellfleet Senior Center is not included in a route option due to its small size and given that the distance to the nearest beach is three miles, if Cahoon Hollow Road is not available for a shuttle route.

South Wellfleet Commercial Area

The commercial area at LeCount Hollow Road and Route 6 has 25 marked spaces, which serve several small businesses and the South Wellfleet Post Office. There are also five marked spaces dedicated to the Wellfleet Chamber of Commerce. The state owns most of the parking in this area. It might be possible to reconfigure the paved area to improve traffic circulation and add approximately 20 new spaces. The lot has two access points: a southern entrance for northbound Route 6 traffic only and a northern entrance and exit onto LeCount Hollow Road. There is no traffic signal at the intersection of LeCount Hollow Road and Route 6. CCRTA has indicated that it is willing to consider relocating the Flex stop at Farrell's Market to this location.

Analysis: The Commercial Parking Area is very conveniently located off Route 6 and provides connections to other potential destinations of beachgoers. The area is too small, however, to provide significant replacement parking for beach visitors, and it is unlikely that the businesses would be supportive of limiting parking for their customers. Any shuttle route using this location would need to take into consideration the access limitations from Route 6. This location might serve as a short-term option while other parking is developed, or be a good stop on a shuttle route, even if satellite parking were discouraged.

Cape Cod Rail Trail Head

The parking lot at the South Wellfleet Trail Head for the Cape Cod Rail Trail (CCRT) is owned by the Massachusetts Department of Recreation and Conservation (DCR) and includes 32 parking spaces. Access to the parking area is from LeCount Hollow Road. The narrow layout of the parking area does not permit a vehicle turnaround; a shuttle would have to stop on LeCount Hollow Road or passengers would have to walk 350 feet from the end of the parking area to the Commercial Parking Area at LeCount Hollow Road and Route 6 for a shared stop. The site would permit development of a 60-foot trail from the far end of the parking area adjacent to the end of the rail trail to connect to the commercial development, though a change in elevation between the two areas could prove challenging for trail development.

Analysis: The parking area for the CCRT terminus is small and not designed to accommodate a shuttle vehicle. However, it provides an important multi-modal connection for potential beach visitors. Since it would connect to the bike path, this location might be a good stop on a shuttle route, even if satellite parking were discouraged.

Cape Cod Disposal Company

The Cape Cod Disposal Company is located just off Route 6, south of all the Wellfleet beaches. The site is privately owned, housing a company that provides portable restrooms, onsite storage containers, and open-top rolloff containers used by the construction industry. It also houses recycling collection for the Cape. There is no existing parking area on the site, though it may be possible to develop some parking. While the site is quite large, it is unlikely to be able to accommodate all of the Wellfleet parking needs, and it is unknown how much of the seemingly available space on the site is used for storage of containers or other materials.

Analysis: The Cape Cod Disposal Company site is not likely to be a good candidate for satellite parking any time soon, given its existing use and the fact that parking would have to be developed. It is possible

that the entire site could be redeveloped for future parking if the existing use were discontinued, though even then it may not have sufficient size to accommodate all of the unmet parking demand for Wellfleet’s beaches. For these reasons it is not included in any of the shuttle routes.

Wellfleet Drive-In

The Wellfleet Drive-In is located on Route 6, south of the Wellfleet beaches. The site houses the Drive-In Theater, cinema building, mini-golf, dairy bar, and the Wellfleet Flea Market. The Flea Market runs from roughly April through October, on weekends and some weekdays. The complex includes roughly 850 parking spaces, though it is unknown how many are required to serve the various uses onsite and how many are used to house the Flea Market. The Drive-In site is located near a critical traffic choke-point on Route 6, where the road narrows from two northbound lanes to one northbound lane. Given its location and traffic patterns on Route 6, the Cape Cod Commission has voiced concerns over traffic safety and turning to enter or leave the site. There is no signal control at the entrance.

Analysis: Due to the turning safety concerns, the Wellfleet Drive-In has not been considered as a location for satellite parking. If a traffic signal or other improvements were installed on Route 6, the site might become a more viable option.

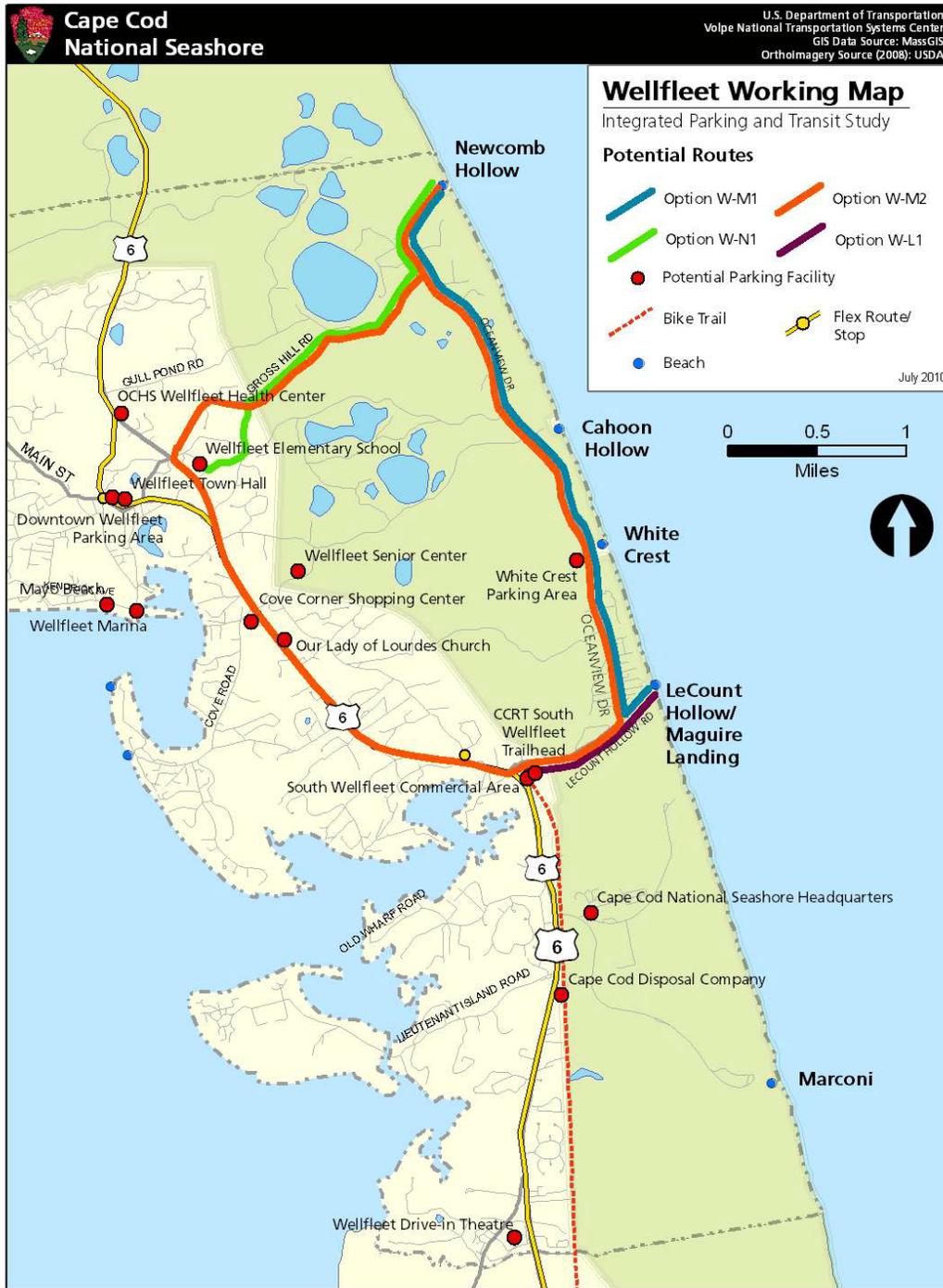
C.5.2 Routes

The full list of routes is provided in **Error! Reference source not found.** and shown in Figure C-4; more detailed information, analysis, and assessment follow below.

**Table C-17
Potential Wellfleet Shuttle Routes**

Route ID	W-N1	W-L1	W-M1	W-M2
Route Name	Newcomb Hollow to Elementary School	Lecount Hollow to CCRT	Ocean View Drive Shuttle	Wellfleet Ocean View Beach Loop
Beach(es)	Newcomb Hollow	Lecount Hollow	Newcomb Hollow, Cahoon Hollow, White Crest, LeCount Hollow	Newcomb Hollow, Cahoon Hollow, White Crest, LeCount Hollow
Parking Areas	Wellfleet Elementary School	CCRT/ Commercial Area	White Crest	Cove Corner, Commercial Lot, CCRT Trail Head
2028 Available	319	147	785	785
2030 Demand	356	211	1192	1192
2030 Satellite Spaces Needed	37	64	407	407
# Spaces at Satellites	40	62	Meets demand	146
Total Town 2030 Unmet Demand	366	366	366	366
Spaces Used	37	62	407	146
Total # Cars	41	68	448	161
Total Daily Passengers	114	191	1,254	450
One Way Travel Time (min)	13	10	23	21
Shuttle Vehicles	2	2	3	3
Total Shuttle Vehicle Hours	18	18	27	27
Avg Pax/Trip	3	5	35	12
Peak Pax/Trip	8	13	87	31
Route Miles (One Way)	2.3	0.8	3.3	4.6
Cost per pax	\$10.27	\$6.13	\$1.40	\$3.90
Cost per Pax All Town Demand	\$9.50	\$6.13	\$1.56	\$3.90

Figure C-4
Wellfleet Oceanside Routes



Beach Specific Routes

One possibility for serving Wellfleet beach visitors would be to pursue small shuttles to serve individual beach needs. The routes would be short and require relatively modest numbers of parking spaces at the satellite locations. This analysis considered two such routes.

W-N1: Newcomb Hollow Beach to Wellfleet Elementary School

This route would travel along Gross Hill Road between Newcomb Hollow Beach and the Wellfleet Elementary School on Lawrence Road. The school is conveniently located near Route 6 and the available parking could potentially provide sufficient capacity for Newcomb Hollow Beach.

W-L1: LeCount Hollow Beach to CCRT

This route would travel along LeCount Hollow Road between the beach and the lots at the Commercial Area and the Cape Cod Rail Trail. These two parking areas combined have almost enough capacity to meet the unmet demand at LeCount Hollow Beach, though it is unlikely that a significant portion of either area would be available for satellite parking. This route could be considered for short-term service while other options are in development, or as a multi-modal connector, bringing people from the Cape Cod Rail Trail or from the Flex service.

Multi-Beach Routes

Given their orientation along the Ocean View Drive and similar characteristics, it is feasible to serve all four Wellfleet beaches jointly. Because no existing parking areas meet all of the demand for the Wellfleet beaches, this would require either development of new parking areas or only partially meeting the parking needs. While a shuttle linking multiple beaches spreads the visitor demand between the beaches, it also lengthens the route travel times, due to the time it takes for passengers to board and disembark at each stop.

W-M1: Ocean View Drive – White Crest Shuttle

This route would run along Ocean View Drive, linking the four beaches and a newly developed parking area near White Crest Beach. The route would have a relatively short travel time and the area at White Crest is expected to be large enough that it could accommodate all of the unmet demand. This route could potentially exacerbate traffic congestion on Ocean View Drive, however, due to the addition of shuttle vehicles traveling the roadway in addition to visitors parking at the individual beaches and at the new White Crest parking area.

W-M2: Ocean View Drive Beach Loop

The Ocean View Drive Beach Loop would travel along Gross Hill Road, Route 6, LeCount Hollow Road, and Ocean View Drive. It would utilize the existing parking such as the Cove Corner Shopping Center, the Commercial Lot, and the CCRT Trail Head locations to provide as much satellite parking as possible. It might also be able to pick up passengers at major hotels or other important sites along the route. While it would not meet the demand for Wellfleet beaches, it would provide some relief and would not require development of any new parking areas. This route would require more careful consideration of the operations, because the parking areas are on opposite sides of Route 6 and might require some left turns onto or off of Route 6.

C.5.3 Findings

The route identification for each beach in Wellfleet produced the following key findings:

There is no single existing parking area that could accommodate the estimated future beach parking needs in the Town of Wellfleet; the needs would either be only partially met, through a shuttle accessing multiple parking areas, or fully met through development of a new parking area.

- The orientation of the beaches and road network allow for development of routes serving more than one beach or more than one parking area.

- Wellfleet has asked that some of the more direct roadways not carry shuttle routes, due to concern over impacts of increased use on sensitive environmental resources.
- Some of the parking areas that could potentially accommodate a significant portion of the parking demand are located several miles south of the beaches – these sites may work well for visitors coming from the Upper Cape or off Cape Cod, but are not likely to be attractive to Wellfleet residents.

Beach Specific

The most attractive single beach route is route W-N₁ connecting Newcomb Hollow Beach to the Elementary School – while the school has fewer parking spaces than the Commercial Area and CCRT lots, which would serve LeCount Hollow Beach (W-L₁), those areas are not likely to have capacity available for beach satellite parking. Individual routes to Cahoon Hollow or White Crest beaches are less feasible if Long Pond Road and Cahoon Hollow Road are not available to carry the shuttles.

Preferred route:

- W-N₁: Newcomb Hollow Beach to Wellfleet Elementary School

Multi-Beach Routes

The two options are to attempt to serve a portion of the demand on a short- or long-term basis using existing parking areas, or to develop a new parking area.

The Ocean View Drive Beach Loop (W-M₂) could utilize the existing locations to provide as much satellite parking as possible. The capacity on the route is relatively limited, however, and additional analysis would be required regarding the route operations and turning on and off Route 6.

For the longer term, development of a larger satellite parking area may be desirable. Development of parking at the White Crest site for route W-M₁ would better serve Wellfleet residents and is recommended from a shuttle operations perspective since the route would be significantly shorter than the other multi-beach shuttle routes, though it would cause the greatest land disturbance.

Preferred routes:

- W-M₂: Ocean View Drive Beach Loop (short term)
- W-M₁: Ocean View Drive – White Crest Shuttle (long-term)

C.6 Potential Parking-Shuttle Scenarios for Brewster Bayside Beaches

Brewster has eight public, bayside beaches, all of which are located close to Route 6A. While several bayside beaches are expected to have future parking deficits due to erosion and demand, four – Breakwater Beach, Crosby Landing, Mant’s Landing, and Paine’s Creek – meet the study criteria for shuttle consideration, with unmet demand for either 15 spaces or at least 50 percent of the size of the parking area. The analysis also includes Saint’s Landing in combination with Mant’s Landing, because they are adjacent to one another on the same access road. The potential shuttle routes consider the possibility of accommodating additional beach parking demand in order to account for the needs of some of the other beaches.

Table C-18 provides a summary of future parking demand and supply at the Brewster bayside beaches; the beaches targeted for potential shuttle services are Breakwater Beach, Crosby Landing, Paine’s Creek, Mant’s Landing, and Saints Landing.

**Table C-18
Brewster Bayside Future Parking Demand and Supply Summary**

Town	Beach	NPS / Town	2008 Total* Spaces	2030 Typical Needed Spaces	2028 Spaces Remaining AFTER Erosion	Future Excess or Shortfall
Brewster	Breakwater Landing	town	5	6	5	-1
Brewster	Breakwater Beach	town	59	77	59	-18
Brewster	Crosby Landing	town	63	82	63	-19
Brewster	Ellis Landing	town	21	27	20	-7
Brewster	Linnell Landing	town	24	31	24	-7
Brewster	Paine's Creek	town	16	21	11	-10
Brewster	Robbin's Hill (Mant's Landing)	town	41	53	27	-26
Brewster	Saints Landing	town	36	47	36	-11
Brewster	Total	town	265	344	245	-99

* total spaces includes regular, handicapped, unstriped, and spaces reserved for residents only

Brewster has eight public, bayside beaches, all of which are located close to Route 6A. Most of the Brewster beaches are accessed by individual small roads off of Route 6A or Lower Road. Route 6A and Lower Road run parallel to the coast approximately 0.5 miles inland. While the distances between the beaches and Route 6A are relatively short, it likely does not make sense from a shuttle operations standpoint to access multiple beaches in a single shuttle trip. The exception is for Mant’s Landing and Saints Landing, both located on Robbins Hill Road, and considered as one beach unit for purposes of this analysis.

Given the relatively modest demand for additional parking for any given beach and the costs associated with shuttle service operations, this analysis also considers the possibility of a single shuttle and satellite parking area that could accommodate the total unmet beach parking demand in Brewster. While some visitors would not have access to their first choice beach, the overall parking demand could be met. This study estimates that approximately 100 additional spaces are needed to meet the 2030 overall beach parking demand in Brewster.

Note that parking areas that could potentially serve more than one beach are described only once under the beach that would be best paired with the parking area. Also, parking sites are labeled by their current use at the beginning of this study (2008). As of early 2010, Brewster has plans in place to consolidate several public offices and move from the existing Town Hall into a former elementary school building. Specifics of these changes are provided below.

C.6.1 Crosby Landing Beach

The closest potential parking areas to Crosby Landing Beach include parking areas at Nickerson State Park and the MassDOT Maintenance Facility in Orleans. The parking areas are listed in Table C-19 and discussed below.

**Table C-19
Crosby Landing Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Nickerson State Park: Main	55	0.7 (C)	Parking area serves visitors of the State Park, as overflow for the nearby Cape Cod Rail Trail Parking and has a Flex Stop. Parking availability is minimal.	Public	B-C1
Nickerson State Park: Area 1	30	1.2 (C)	Use of this lot is unknown. It provides convenient access to the nearby campgrounds.	Public	B-C1
Nickerson State Park: Park Store	40	1.9 (C)	Use of this lot is unknown.	Public	B-C1
Mass DOT Maintenance Facility, Orleans	20*	2.1 (C)	Parking does not currently exist, but site has been previously developed, disturbed and/or contaminated.	Public	B-C2

* The number of parking spaces at the MassDOT Orleans facility is based on the number of current spaces. It is expected that the site could hold approximately 100 spaces if the existing buildings were removed.

Nickerson State Park

There are three parking areas at Nickerson State Park under consideration for potential shuttle stops: the main parking area adjacent to the park entry, and two sites along Deer Park Road. The first is located near the Area 1 campgrounds approximately 0.5 miles from the park entrance. The second, located 1.2 miles from the main entrance at the Park Store is close to campground Areas 2-4. The main parking area at the park entrance is regularly filled with park visitors, users of the adjacent Cape Cod Rail Trail, and Flex transit riders. The extent of the use of the parking areas near the campgrounds, particularly during the day, is unknown.

If the park requires an entrance fee for day visitors, then specific arrangements may be necessary for those entering the park only to use the satellite parking facility.

Analysis: While the main parking area at adjacent to Route 6A is heavily used, it provides an important connection for visitors using either the Rail Trail or Flex service to transfer to a bus to the beach. The beach is only 0.7 miles away, though such a distance may be too far for some people, particularly those with beach equipment or small children, to walk. Depending on the current occupancy, the two parking areas on Deer Park Road might be able to accommodate the total unmet beach parking demand in Brewster. However, for visitors not staying at the park it may be inconvenient to have to travel south into the park in order to reach a beach north of Route 6A.

Orleans MassDOT Maintenance Facility

The Orleans MassDOT Maintenance Facility is located approximately two miles from Crosby Landing Beach, at the intersection of Route 6A and Route 6. The site is actively used by MassDOT for storage and has some paved areas. It appears that the current paved areas would provide sufficient capacity to meet satellite parking needs of Crosby Landing, though it would not be able to meet the total expected demand for all beaches in Brewster. However if the buildings were eliminated, the site may be adequate to meet all future additional beach parking demand for Brewster.

Analysis: The site is a good location for visitors arriving from other points throughout Cape Cod but would require most Brewster residents to travel out of their way in order to reach the parking. This site could be considered as a long term option for attracting non-resident beach visitors but may not be appropriate for meeting the needs of Brewster residents.

C.6.2 Breakwater Beach

The closest potential parking areas to Breakwater Beach include Brewster Senior Center, Brewster Baptist Church, Brewster Town Hall and Eddy Elementary School. The Senior Center and Baptist Church could also potentially serve as satellite parking for Paines Creek or Mant’s Landing and Saints Landing. The parking areas are listed in Table C-20 and described only in this section, though they are listed again in the tables associated with the other beaches.

**Table C-20
Breakwater Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Brewster Senior Center	65	1.0	The senior center has one or two events weekly that fill the lot, but not on weekends. It is planned to move to the new town hall. The Cape Cod Historic Society and possibly Chamber of Commerce may be moving to this site. Parking needs for these new activities are unknown.	Public	B-B1, B-SM1, B-P2
Brewster Baptist Church	99	0.7	The church is in active use on Sundays and has smaller activities during the week.	Private	B-B1, B-SM1, B-P2
Brewster Town Hall	73	1.1	Town hall has active office use that require some but not all of the parking. It is closed on weekends. There are plans to sell the building to the Cape Cod Lighthouse Charter School, which does not appear to have a summer use for its facilities.	Public	B-B2
Eddy Elementary School	93	1.4	Limited current summer use. If this building becomes Town Hall, some but not all of the parking will be required on weekdays.	Public	B-B3

Brewster Senior Center

The Brewster Senior Center is located at 1673 Main Street. The Senior Center has regularly scheduled events throughout the week that use some, but not all of the available parking. Activities on Tuesdays and Fridays typically require all of the spaces on the site. In general, activities are not scheduled on weekends.

There are plans in place for the Senior Center to move into the proposed relocated Town Hall facility, at the current Eddy Elementary School. If the Senior Center does move, it is expected that the Historical Society and possibly the Brewster Chamber of Commerce would use the current facility. Potential use patterns are unknown.

Analysis: Due to its variable scheduled use, the Brewster Senior Center is not currently a good location for satellite parking, unless a weekend-only shuttle is considered. However, this could change based on the future use of the building. It may be possible to use the Senior Center for parking on weekends and the Brewster Baptist Church, ¼ mile east on Main Street, on weekdays if a seven-day shuttle is desired. Variable message signs would be needed to direct visitors to the correct parking location.

Brewster Baptist Church

The Brewster Baptist Church is located just south of the intersection of Lobster Lane/Lower Road and Main Street. Some of the parking is visible from the street, with the majority of the area located behind the church. While this site is not likely to be available on Sundays, there may be an opportunity to use some portion of the parking lot on weekdays and Saturdays (demand for these days is not known at this time). With 99 parking spaces, all of the excess capacity in Brewster could be managed at this site. This site could be combined with the Brewster Senior Center for a seven-day a week shuttle.

Analysis: Due to its central location and large parking area, Brewster Baptist Church could be used for satellite parking to serve one or more beaches in Brewster. An alternate site would likely be necessary for Sunday parking.

Brewster Town Hall & Eddy School

Brewster Town Hall and the Eddy School are located less than ¼ mile from each other on a busy section of Route 6A. Town Hall has regular use during the week, limiting the number of spaces that would be available. This site could likely accommodate the demand for 18 spaces for Breakwater Beach, but not the total demand for Brewster.

The Eddy School facility is not currently used during the summer months and could provide adequate capacity for all excess beach parking demand in Brewster in addition to the demand for Breakwater Beach. Both the Town Hall and Eddy School are oriented such that the buildings and parking facilities are located at the back of the properties, and not visible from the street. Drives into each site are wide and labeled.

There are plans in place to move the students at the Eddy School to Stony Brook Elementary School and repurpose the school facility for use as a relocated Town Hall. The existing Brewster Town Hall building would potentially be sold to the Cape Cod Lighthouse Charter School, which does not currently provide summer school. If this change occurred, it may be more feasible to use the current Town Hall as a satellite parking area for all of Brewster's excess parking demand.

Analysis: The future use of both the Brewster Town Hall and Eddy School facilities are currently unsettled. It may be possible to work with the Town to use one of these facilities in the short term to provide satellite beach parking. While these facilities are slightly farther from Breakwater Beach than Brewster Baptist Church or the Senior Center, the more centralized location may make for a more attractive shuttle. However, use of one of these sites would require that the shuttle travel along a more heavily congested portion of Route 6A. If the current Town Hall is sold, an agreement would need to be arranged with the future owner.

It should also be noted that both sites and Breakwater Beach are located along Cape Cod Regional Transit Authority's Flex Route. While it is possible that visitors would request off-route pick-up and drop-off for these trips, it is unlikely that they would know to do so. The walk from the parking areas to Route 6A to flag the bus (0.2 miles), and then from Route 6A along Breakwater Road to the beach (0.4 miles), are relatively short, but may be too much for a beach visitor, particularly if carrying beach equipment.

C.6.3 Saints Landing / Mant's Landing Beaches

The closest potential parking areas to Saint Landing / Mant's Landing Beaches are the Brewster Senior Center and the Brewster Baptist Church, listed in Table C-21 and both described above. Distances from the parking areas to each of the beaches provided accordingly: Mant's Landing (M) and Saints Landing (S).

**Table C-21
Saints Landing / Mant's Landing Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Brewster Senior Center	65	1.6 (M) 1.3 (S)	The senior center has one or two events weekly that fill the lot, but not on weekends. It is planned to move to the new town hall. The Cape Cod Historic Society and possibly Chamber of Commerce may be moving to this site. Parking needs for these new activities are unknown.	Public	B-B1, B-SM1, B-P2
Brewster Baptist Church	99	1.6 (M) 1.3 (S)	The church is in active use on Sundays and has smaller activities during the week.	Private	B-B1, B-SM1, B-P2

C.6.4 Paines Creek Beach

The closest potential parking area to Paines Creek Beach is Drummer Boy Park. The Brewster Senior Center and Brewster Baptist Church are the next closest potential parking locations and are described under Breakwater Beach. The parking areas are listed in Table C-22.

**Table C-22
Paines Creek Beach Potential Parking Areas**

Site	Spaces	Distance (miles)	Current Status	Ownership	Route(s) Developed Using Site
Drummer Boy Park	25	1.0	Active park. Use of spaces unknown although there are occasional large events at the park during the summer. Potential to have visitors park on grass.	Public	B-P1
Brewster Senior Center	65	1.7	The senior center has one or two events weekly that fill the lot, but not on weekends. It is planned to move to the new town hall. The Cape Cod Historic Society and possibly Chamber of Commerce may be moving to this site. Parking needs for these new activities are unknown.	Public	B-B1, B-SM1, B-P2
Brewster Baptist Church	99	2.1	The church is in active use on Sundays and has smaller activities during the week.	Private	B-B1, B-SM1, B-P2

Drummer Boy Park

Drummer Boy Park, managed by the Town, includes a playground and open space. The park also includes the Higgins Farm Windmill and Harris-Black house, managed by the Brewster Historical Society, and open Thursday – Saturday afternoons July through September. The majority of the park is a grassy field that is not used for organized recreation. There are several major annual events that take place at the park, including an Antique Fair and Craft Show (weekends) and the Craftsmen fair (weekday). While there is paved parking for approximately 25 vehicles, it is possible that some of the grassy areas could be used for parking as well. The park is visible from Route 6A.

Analysis: Drummer Boy Park is located close to Paines Creek and could likely accommodate its unmet beach parking demand. A shuttle route serving this location would be more efficient if the lot was expanded to provide additional capacity to meet a larger portion of the town-wide parking demand, which might require parking on the grass, and coordination associated with the major annual events.

C.6.5 Routes

The full list of routes is provided in Table C-23 and shown in Figure C-5; more detailed information and analysis and assessment follows below.

**Table C-23
Potential Brewster Shuttle Routes**

Route ID	B-C1	B-C2	B-B1	B-B2	B-B3	B-SM1	B-P1	B-P2
Route Name	Crosby Landing to Nickerson State Park	Crosby Landing to Orleans MassDOT Maintenance Facility	Breakwater to Brewster Senior Center/ Brewster Baptist Church	Breakwater to Brewster Town Hall	Breakwater to Eddy Elementary School	Saints and Mant's Landing to Brewster Senior Center/ Brewster Baptist Church	Paines Creek to Drummer Boy Park	Paines Creek to Brewster Senior Center/ Brewster Baptist Church
Beach(es)	Crosby Landing	Crosby Landing	Breakwater	Breakwater	Breakwater	Saints Landing and Mant's Landing	Paines Creek	Paines Creek
Parking Areas	Nickerson State Park	MassDOT Maintenance Facility	Brewster Senior Center	Brewster Town Hall	Eddy Elementary School	Brewster Senior Center	Drummer Boy Park	Brewster Senior Center
2028 Available	63	63	59	59	59	63	11	11
2030 Demand	82	82	77	77	77	100	21	21
2030 Satellite Spaces Needed	19	19	18	18	18	37	10	10
# Spaces at Satellites*	125	20***	65	73	93	65	25	65
Total Town 2030 Unmet Demand	99	99	99	99	99	99	99	99
Spaces Used	19	19	18	18	18	37	10	10
Total # Cars	21	21	19	19	19	41	11	11
Total Daily Passengers	58	58	54	54	54	114	30	30
One Way Travel Time (min)**	11	9	7	8	7	10	5	7
Shuttle Vehicles	2	2	1	1	1	2	1	1
Total Shuttle Vehicle Hours	18	18	9	9	9	18	9	9
Avg Pax/Trip	2	2	2	2	2	3	1	1
Peak Pax/Trip	2	2	2	2	2	5	1	1
Route Miles (One Way) **	1.9	2.1	1	1.4	1.1	1.7	1	2.1
Cost per pax	\$20.24	\$20.24	\$10.81	\$10.81	\$10.81	\$10.28	\$19.45	\$19.45
Cost per Pax All Town Demand	\$3.84	\$18.99***	\$2.92	\$2.60	\$2.04	\$5.84	\$7.60	\$2.92

* when two parking options are given, the lowest number of spaces was used

** when two parking options are given the travel time and distance are based on the farther travel distance

*** The number of parking spaces at the MassDOT Orleans facility is based on the number of current spaces. It is expected that the site could hold approximately 100 spaces if the existing buildings were removed. This would bring the cost per passenger for all town demand to \$3.84.

Figure C-5
Brewster Bayside Routes



Crosby Landing Beach

B-C1: Crosby Landing Beach – Nickerson State Park

This route would connect Crosby Landing Beach with Nickerson State Park via Route 6A and Crosby Lane. One attractive feature of this route is that while the distance to the parking areas is longer than some of the other routes, it only requires travel on the congested Route 6A for 0.1 mile. Access for shuttle users not already visiting the park would be less convenient, but the shuttle would be able to operate on a consistent schedule.

Conceptually, stops at these two parking areas would provide overnight visitors to the State Park with the opportunity to access a saltwater beach without needing to get into their cars. Demand for this shuttle by State Park visitors would need to be estimated to determine expected usage, especially if the shuttle would be provided for more than just overflow beach parking. This route could operate in the short term because the parking area currently exists.

B-C2: Crosby Landing Beach – Orleans MassDOT Maintenance Facility

This route would connect Crosby Landing Beach with the MassDOT Maintenance Facility via Route 6A and Crosby Lane. This route could operate in the short term because the parking area currently exists, though it might be more appropriate if additional parking were developed at the site.

Breakwater Beach

B-B1: Breakwater Beach – Brewster Senior Center / Brewster Baptist Church

This route would connect Breakwater Beach with the Brewster Senior Center / Brewster Baptist Church via Route 6A (Main Street) and Breakwater Road. This route would stop at the Church for satellite parking on weekdays, and at the Senior Center for satellite parking on weekends. Variable message signs or other information technology would be necessary in order to guide beach visitors to the appropriate parking facility. This route could operate in the short term because the parking areas currently exist.

B-B2: Breakwater Beach – Brewster Town Hall

This route would connect Breakwater Beach with the current Brewster Town Hall facility via Route 6A (Main Street) and Breakwater Road. This route could operate in the short term because the parking area currently exists.

B-B3: Breakwater Beach – Eddy Elementary School

This route would connect Breakwater Beach with the current Eddy Elementary School facility via Route 6A (Main Street) and Breakwater Road. This route could operate in the short term because the parking area currently exists.

Saints Landing / Mant's Landing Beaches

B-SM1: Saints Landing/Mant's Landing Beaches – Brewster Senior Center / Brewster Baptist Church

This route would connect Breakwater Beach with the Brewster Senior Center / Brewster Baptist Church via Route 6A (Main Street) and Robbins Hill Road. This route would serve both beaches and stop at the Church for satellite parking on weekdays, and at the Senior Center for satellite parking on weekends. Variable message signs or other information technology would be necessary in order to guide beach visitors to the appropriate parking facility. This route could operate in the short term because the parking areas currently exist.

Paines Creek Beach

B-P1: Paines Creek Beach – Drummer Boy Park

This route would connect Paines Creek Beach with Drummer Boy Park via Main Street (Route 6A) and Paines Creek Road. This route could operate in the short term because the parking area currently exists.

C.6.6 Findings

The route identification for each beach in Brewster produced the following key findings:

- It may be appropriate to use a single satellite parking area to accommodate most of the unmet demand for all Brewster beaches. While only the undeveloped Orleans MassDOT facility has enough spaces for all the expected demand, a number of other locations including Nickerson State Park and Eddy Elementary School come close.
- While all of Brewster bayside beaches are located close to Route 6A, it likely does not make sense from a shuttle operations standpoint to access multiple beaches in a single shuttle trip, with the exception of Mant's Landing and Saints Landing.
- Future uses of potential satellite parking sites in Brewster are currently unknown due to the planned sale of the current Town Hall.
- A beach shuttle at Nickerson State Park would be attractive to visitors of the park and could potentially accommodate much of the excess demand for Brewster beaches. The limited travel on Route 6A is attractive in terms of shuttle operations, though the parking area may be less convenient for beach visitors.

Crosby Landing Beach

The beach parking needs at Crosby Landing Beach could be accommodated at either Nickerson State Park (B-C1) or the MassDOT Maintenance Facility (B-C2). Both routes have similar distances and would require the same number of service vehicles. Preference for one route over the other would depend largely on the origins of the beach visitors and convenience of access to either satellite parking location.

Breakwater Beach

The beach parking needs at Breakwater Beach could be accommodated through any of the identified routes. The routes serving the Senior Center/Baptist Church (B-B1) and Eddy Elementary School (B-B3) are slightly shorter, and would require fewer vehicles than the route serving Town Hall (B-B2). Assuming that the future use of the Eddy Elementary School site is conducive to satellite beach parking, route B-B3 would be preferred over B-B1, as it does not require use of different satellite parking sites depending on the day of the week.

Saints Landing / Mant's Landing Beaches

The route serving Saints Landing/Mant's Landing Beaches (B-SM1) is the most cost-effective of all the identified Brewster routes, as it serves the most vehicles of any of the other routes. While serving two beaches increases the distance and travel time, the route requires only two vehicles in service at a given time, consistent with several other identified routes.

Paines Creek Beach

The routes serving Paines Creek Beach from Drummer Boy Park (B-P1) or the Brewster Senior Center/Brewster Baptist Church (B-P2) both have sufficient parking capacity to meet the relatively modest needs of Paines Creek Beach. Given the more limited parking area at Drummer Boy Park and the periodic use for large festivals, route B-P2 would be preferable, as it would provide a more predictable schedule. Neither route, however, is very cost effective, if they are intended to provide service for only the 10 parking spaces lost to erosion. Service to Paines Creek Beach would be most effective if it included additional service to accommodate other unmet demand throughout Brewster. B-P2 would not be able to accommodate all of the unmet demand, but it would be able to serve a much greater portion than B-P1. While the Brewster Senior Center/Brewster Baptist Church route, B-P2, is the best option for Paines Creek, alternate shuttles from this parking area to Breakwater Beach (B-B1) would be preferable. Unless there are going to be multiple shuttles from Brewster Senior Center/Brewster Baptist Church, this route is not recommended.

Preferred routes:

- B-C1: Crosby Landing Beach to Nickerson State Park, OR
- B-C2: Crosby Landing Beach to MassDOT Maintenance Facility (long-term)
- B-B3: Breakwater Beach to Eddy Elementary School
- B-SM1: Saints Landing/Mant's Landing Beaches to Brewster Senior Center/Brewster Baptist Church

Appendix D: Potential Funding Opportunities

There are a variety of potential funding sources that NPS and its local partners could apply to in order to pursue access (or other) improvements to the Seashore and town beaches on Cape Cod. Preliminary information about several potential sources is provided below.

Paul S. Sarbanes Transit in Parks Program (TRIP)

Congress established the Paul S. Sarbanes Transit in the Parks Program, formerly Alternative Transportation in Parks and Public Lands (ATPPL) Program, to enhance the protection of national parks and federal lands and increase the enjoyment of those visiting them. Administered by the Federal Transit Administration in partnership with the Department of the Interior and the Forest Service, the program funds capital and planning expenses for alternative transportation systems such as shuttle buses and bicycle trails in national parks and public lands. The goals of the program are to conserve natural, historical, and cultural resources; reduce congestion and pollution; improve visitor mobility and accessibility; enhance visitor experience; and ensure access to all, including persons with disabilities.

Funds may be used for projects that are located off-site, if there is an obvious connection to how they support access to the unit by alternate transportation. Federal lands units may partner with local governments or other entities in applying for funds. Cape Cod NS and its partners have received funding for both planning projects and the purchase of vehicles through this program, including the funding of this study. For more information see: http://www.fta.dot.gov/funding/grants/grants_financing_6106.html

Congestion Mitigation & Air Quality Improvement Program (CMAQ)

The Congestion Mitigation and Air Quality Improvement Program (CMAQ) provides funding for projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide (CO), and particulate matter (PM-10, PM-2.5) which reduce transportation related emissions. Funds are eligible for projects that mitigate traffic congestion and improve air quality; transit projects and bicycle and pedestrian projects are eligible. Funds may be available for pilot transit operations projects. The Federal share is typically 80 percent, requiring a 20 percent local match. For more information see:

<http://www.fhwa.dot.gov/safetealu/factsheets/cmaq.htm>

Public Lands Highways Discretionary (PLHD)

The Public Lands Highways – Discretionary (PLHD) Program provides funding for transportation planning, research, and engineering and construction of, highways, roads, parkways, and transit facilities that are within, adjacent to, or provide access to Indian reservations and Federal public lands, including national parks, refuges, forests, recreation areas, and grasslands. PLH funds can be used for any type of Title 23 transportation project providing access to or within Federal or Indian lands and may be used for the State/local matching share for apportioned Federal-aid Highway Funds, as described in 23 USC 120(l). The program is administered by the Federal Highway Administration's Federal Lands Highway Office. Eligible activities include operations and maintenance of transit facilities, parking areas, and provisions for pedestrians and bicycles. For more information see:

<http://flh.fhwa.dot.gov/programs/plh/discretionary/>

Surface Transportation Program (STP)

The Surface Transportation Program provides flexible funding that may be used by States and localities for projects on any Federal-aid highway, including the National Highway System, bridge projects on any public road, transit capital projects, and intra-city and inter-city bus terminals and facilities. The Federal share is generally 80 percent, requiring a 20 percent local match. For more information see:

<http://www.fhwa.dot.gov/safetealu/factsheets/stp.htm>

Park Roads and Parkways (PRP)

The Park Roads and Parkways Program (PRP) provides funding for the design, construction, reconstruction, maintenance, or improvement of refuge roads and bridges that provide access to or are within a unit of the National Park Service (NPS). PRP funds can be used for any type of Title 23

transportation project providing access to or within NPS lands and may be used for the State/local matching share for apportioned Federal-aid Highway Funds, as described in 23 USC 120(l). Eligible activities include operations and maintenance of transit facilities, parking areas, and provisions for pedestrians and bicycles. Typically the backlog of basic maintenance of existing roads requires all of the allotted funding for this program. For more information see: <http://flh.fhwa.dot.gov/programs/prp/>

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6. AUTHOR(S)	5d. PROJECT NUMBER
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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our parks and historic 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.

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