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Special Programs
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Fire Island National Seashore
Waterborne Transportation System Plan

Prepared for:

U.S. Department of the Interior
National Park Service
Fire Island National Seashore

Patchogue, New York

Prepared by:

U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National Transportation Systems Center

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This report assesses the prospects for enhanced alternative transportation services and infrastructure at the National Park Service unit of the Fire Island National Seashore. The park staff believes that enhancement of alternative transportation services can help facilitate access to the resources of Fire Island, and support the needs of year-round residents, seasonal renters, and day visitors. The assessment is based upon a thorough survey of existing services, a market survey, and projections for modest visitation growth.

The survey results and recommendations for system improvements follow descriptions of the current transportation system at Fire Island. Specifically, additional ferry routes are recommended to compensate for unmet visitor demand. Also, the report recommends ferry terminals be built to allow for better usability, and proposes the creation of a learning center in accordance with survey findings.

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Staff and Others

Paul Schimek (U.S. Department of Transportation, Volpe Center)
Jonah Soolman (U.S. Department of Transportation, Volpe Center)
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Executive Summary

This report assesses the prospects for enhanced alternative transportation services and infrastructure at the National Park Service unit of the Fire Island National Seashore (FINS). The Park staff believe that enhancement of alternative transportation services can help facilitate access to the resources of Fire Island, and support the needs of year-round residents, seasonal renters, and day visitors. The assessment is based upon a thorough survey of existing services, a market survey conducted in summer 2000, and projections for modest visitation growth in the coming years.

The survey results and recommendations for system improvements follow descriptions of the FINS and the current transportation system. Table E-1, presented later in Section E.5, shows the phased implementation schedule arrived at in discussions with FINS managers after review of the draft findings of the report. All written recommendations are identified by the relevant phase number per the table.

E.1 Description of the Park Unit

Fire Island is a narrow barrier island 32 miles in length along the south coast of Long Island, separating Great South Bay from the Atlantic Ocean; it includes the authorized areas of the National Seashore, Robert Moses State Park, and private lands in several residential communities. The Park unit includes the Otis Pike High Dunes Wilderness Area, Watch Hill, Talisman/Barrett Beach, Sailors Haven, and the Fire Island Lighthouse Talisman/Barrett Beach, Old Inlet, the Beach, Smith Point County Park, and parks run by the towns of Brookhaven and Islip. The 17 communities on Fire Island have a combined summer resident population of approximately 30,000, which is reduced to only 450 during the off-season winter months.

The Seashore's transportation needs are driven by high visitation (3 to 4 million visitors annually) and the lack of access via conventional ground transport modes and services. Motor vehicle access is limited to the east and west extremes of the Island in the summer; therefore, 80% to 90% of the visitors to the Seashore arrive by either ferry or private boat. Ferry service is provided by three private operators and runs seasonally from Long Island terminals at Bay Shore, Sayville, and Patchogue to 16 terminals on Fire Island. Route distances are from four to ten nautical miles in length through the very shallow waters of Great South Bay. There is also available water taxi service running laterally between Fire Island terminals.

E.2 Existing Transportation Services

Currently, the network of ferry operations and Long Island and Fire Island terminals is finely tuned to the seasonal needs of island visitors (approximately 80% of whom come during the three peak summer months), with a primary orientation to the residents and visitors to Fire Island's communities. The operators' secondary focus is National Seashore visitors, although service to FINS is adequate. Existing ferry services are concentrated to serve Fire Island's western population centers. The east end of the island, served by two Patchogue ferry terminals and the Davis Park Ferry Company, accounts for approximately 15 to 20% of ferry passengers. Routes and fare structures are strictly regulated by Suffolk County and a significant portion of ferry operator revenues come from parking revenues at the Long Island terminals.

A good regional highway network provides automobile access to the Long Island terminals, although there is Friday evening congestion and relatively poor local street access through the three departure terminal towns. Only at the Patchogue NPS ferry terminal is there a good inter-modal connection to the Long Island Rail Road (LIRR). Limousine and charter minibus services from Manhattan are time efficient but costly, and the LIRR/taxi link is cost effective for island community residents.

Service to sites at the eastern and western extremes (Fire Island Lighthouse) of Fire Island is limited to lateral water taxi service, which may be too costly for most FINS site visitors. There is no land-based lateral transportation service.

E.3 Ferry Transportation Survey Findings

A travel survey of all fifteen common carrier ferry routes serving Fire Island (Thursday, August 24th to Saturday, August 26th, 2000) yielded data on ferry passengers, satisfaction with water transportation services, and desired improvements, based upon a sufficient sampling of a broad cross section of visitors. The main findings of the survey are the following:

- Ground access to all Long Island terminals was 55.7% drive and park and 23% via the LIRR, the latter including 44.5% of boardings at the Patchogue terminal.
- Access to terminal sites should include better awareness of the Patchogue LIRR walking link to the Watch Hill ferry, expanded parking opportunities at all mainland terminals, and better signage and information.
- Desired FINS site improvements should include improved amenities at the Watch Hill island site and better FINS access information and signage for first time and infrequent visitors.
- Ferry service enhancements should include expanded Watch Hill service, increased frequency of service during summer, and the shoulder and off seasons, enhanced east-west water taxi service on Fire Island, and better coordination of ferry and Long Island Rail Road schedules.
- Preferences were expressed for routes including Bay Shore to Fire Island Lighthouse and direct New York City to Fire Island service. There was little or no interest in new service to Heckscher State Park.

E.4 Market Demand for Future Ferry Access to Fire Island National Seashore

The Fire Island visitor market consists of two distinct groups: island community residents and visitors (the vast majority), and visitors whose primary destination is the FINS site. Bearing in mind the heavy significance of community residents as users of the FINS, future market demand for transportation to and infrastructure on the FINS sites will be driven by the following factors:

- Residential development is very limited by availability of building sites.
- Primary visitor growth can only occur incrementally by more intensive use of existing community resources and by extending the season. Although there are increasing numbers of year round or extended season residents, the numbers are small fractions of island visitation.
- The need for expanded ferry services for primary visitors is expected to be very limited, largely to accommodate incremental season extension beyond the peak summer months
- Secondary visitor growth for expanded use of the FINS sites has the potential to be greater in terms of attracting more visitors to specific sites, through selective development of underutilized sites (including Talisman/Barrett Beach, Fire Island Lighthouse and the Wilderness Area), extended season, new

programming of existing sites, and new programs for the continuous seashore beach through recreational, educational and eco-awareness programs and selected public access through participating communities

- Secondary visitor growth, including repeat visitation, depends on capital improvements (including public restrooms, changing areas, telephone and water) and new attractions at FINS sites to attract more visitors and improve the quality of the Fire Island experience.

E.5 Recommended Improvements to Ferry and Intermodal Transportation Routes

Based on a projection of limited increased visitation to the islands, the strategy recommended for increasing transportation access is to (1) upgrade the quality of existing services, (2) add new services in phases as the demand increases, and (3) improve intermodal transportation connections. These improvements will provide enhanced access for visitors, and the added benefit of better transportation options for FINS staff and seasonal employees.

The mechanism for upgrading existing mainland ferry services is through current and future concessions agreements. Selected new mainland and lateral routes would be phased in as terminal improvements were completed and as demand increased, including mainland services to FINS sites and selected improvements to community services at designated interface sites including Ocean Beach, Fire Island Pines, and Davis Park. New services would include the following:

- New gateway ferry routes
  - Bay Shore to Lighthouse. Scheduled during operating season and hours of Lighthouse. ***Phase 2.***
  - Patchogue to Talisman/Barrett Beach. Long Island terminal shifted from Sayville to the new Patchogue gateway facility at completion (see E.5). ***Phase 2.***
  - Patchogue to Watch Hill. ***Phase 2.***
  - Patchogue to Old Inlet and Smith Point. Limited excursion service. ***Phase 3.***
  - New and expanded lateral water taxi routes
  - East lateral route Watch Hill to Sailors Haven. Private concession or FINS operated. ***Phase 3.***
  - Central lateral route Talisman/Barrett Beach to Ocean Beach. Extension of the existing eastern water taxi, provided as a private concession. ***Phase 3.***
  - West lateral route Fire Island Pines to Fire Island Lighthouse. The service would be an extension of the existing western water taxi and would be provided as a private concession. ***Phase 3.***
- Channeling of auto visitors at Smith Point County Park and Robert Moses State Park through improved land access and new lateral water taxi access, coordinated with county and state park management.

TABLE E-1: PHASED IMPLEMENTATION OF FIRE ISLAND NATIONAL SEASHORE TRANSPORTATION IMPROVEMENTS

Improvement Program Element[1]	Phase 1 2001 -2004	Phase 2 2005 - 2007	Phase 3 2008 - 2010
Mainland Terminal Sites			
Patchogue Terminal Dock, Site Design & Construction Documents (for both Phases 1 & 2)	●		
Fire Island Terminal at Patchogue - Phase 1 [2]	●		
Fire Island Terminal at Patchogue - Phase 2 [3]	●		
Information/Signage System Design	●		
Information System - all terminals	●		
Signage System - all terminals	●		
Sayville FINS Kiosk		●	
Bayshore FINS Kiosk		●	
FINS Island Sites			
Dock and Site Design	●		
Watch Hill Dock ADA modifications and Support	●		
Sailors Haven Dock ADA modifications	●		
Talisman/Barrett Beach - Docks/Support	●		
Talisman/Barrett Beach - Lodging	●		
Fire Island Lighthouse Dock/Support	●		
Smith Point Dock/Support			●
Old Inlet Dock/Support			●
Community Transfer Sites			
Community Transfer Site Planning		●	
Ocean Beach Dock/support[4]			●
Fire Island Pines Dock/support[4]			●
Davis Park Dock/support[4]			●
Ferry and Intermodal Transportation Services			
Mainland Ferry Concession Prospectuses	●		
Patchogue to Talisman/Barrett Beach		●	
Patchogue to Watch Hill		●	
Bay Shore to Lighthouse		●	
Water Taxi Feasibility Study	●		
Water Taxi Ferry Concession Prospectuses		●	
Central Lateral Water Taxi - adapt existing			●
West Lateral Water Taxi - adapt existing			●
East Lateral Water Taxi - new			●
Far East - Patchogue to Smith Point and Old Inlet			●
Mainland Parking Management Program		●	

Notes:
(1) Design and management tasks are in italics.
(2) Phase 1 of the Patchogue Ferry Terminal project includes construction of ferry loading and unloading areas, a waiting room, ticket booths, storage, public restrooms, bulkhead improvements, and an accessible ferry pier meeting ADA guidelines.
(3) Phase 2 of the Patchogue Ferry Terminal project includes the construction of interactive exhibit spaces and headquarters office space.
(4) If needed.

E.6 Terminal and Support Facility Needs

All improvements to the transportation services are contingent on improvements in FISN services and the mainland terminal and island dock facilities. The phased implementation plans for a new Fire Island Ferry Terminal and Interactive Learning Center at Patchogue should be the first priority, and should include the vessel docking improvements (disability access, and variable freeboards at the dock for larger ferries and water taxis), an expanded multiple use parking lot for FINS visitors and LIRR users, a networked multi-media information system, signage, landscaping and other gateway elements. Phase 1. The Sayville and Bay Shore terminals should have expanded information centers and links to the Patchogue multi-media information system. Phases 1 and 2. Better signage from the regional highway network is recommended to serve both the FINS ferries as well as other community ferry departure sites.

The Park Service can foster expanded use of the Seashore by improving facilities, programs and transportation, but must balance the natural capacity limits at FINS sites while doing so. Recommended improvements are the following:

- Dock repairs and improvements are underway at Talisman/Barrett Beach. Improvements include dock reconfiguration for ferry and recreational boater landings, visitor amenity mini-center, new boardwalk pathways, a self-contained food concession stand, and phased rehabilitation of the various lodging sites. Environmentally fragile surroundings dictate careful building techniques and site restoration measures. ***Phase 1.***
- Facility modifications at the Lighthouse site should include a sheltered, ADA accessible landing, pathway to connect the dock facility to the Lighthouse, and a visitor amenity mini-center. Interpretive trails and beach access are potential new activity choices for visitors. ***Phase 1.***
- Watch Hill and Sailors Haven docks are to have ADA accessibility improvements, likely modest in scope due to a relatively small tidal range. Facilities should accommodate both the mainland ferries as well as the smaller water taxi vessels. ***Phase 1.***
- A new island dock at Smith Point is to provide a water taxi connection to serve the Wilderness Center, trails and the beach. Connections to the existing trail network, a small waiting shelter, and ADA access would be included. ***Phase 3.***
- Vessel landing at Old Inlet for water taxi connections, with a small waiting shelter. ***Phase 3.***

The concept of a potential new mainland ferry terminal at Heckscher State Park is infeasible due to lack of inter-modal connections, competition with existing, nearby operators, and extensive environmental permitting for new dock and terminal facility construction.

E.7 Capital and Operations Cost Implications

The Park Service plans to phase in capital and operations costs for the recommended improvements over a ten year period. Concept designs and initial cost estimates are the next steps, followed by detailed site surveys, final design and cost estimates, and funding and procurement. The FINS unit is now at various stages of design, funding commitment, and construction at three of the dock sites discussed herein: the Watch Hill/Patchogue Terminal, the new Talisman/Barrett Beach landing, and renovations to the Fire Island Lighthouse dock. Other recommended capital transportation and infrastructure improvements will follow similar processes and the Park Service should focus first on the

transportation related elements, including dock facilities, immediate support facilities and intermodal connections. New or modified docks, landings, and terminal facilities must consistently meet ADA access requirements.

The capital improvement program will require a host of financial and project planning, engineering and design, agency coordination, and public communications actions. The transportation systems aspects will include:

- Dock and facility design for mainland and island sites, including detailed site conditions surveys.
- Information and signage system design.
- Dock and support facility planning for community transfer sites, including administrative agreements.
- Cost estimates by phase of proposed capital improvements.
- Identification of sources and procure project funding by phase.
- Detailed mainland ferry route feasibility analysis, RFP preparation and selection of operators.
- Lateral water taxi feasibility analysis, RFP preparation and selection of operators.
- Mainland parking management program design and administrative agreements.
- Preparation of a marketing program to introduce new services and promote visitor use of the FINS resources.

E.8 Management Structure for Preferred System Alternatives

Most of the transportation and infrastructure projects will be initiated by the Park Service through FINS staff, as has been done in currently ongoing capital improvement projects. The FINS staff identified the project needs, sought and obtained funding, hired consultants and contractors as needed, and participated in the construction process to the degree practical within the constraints of personnel availability. Others would involve county and community governments to varying degrees.

Long Island Terminal Sites: The Patchogue terminal ongoing operations and improvement project will continue under FINS management, while operation of the other two terminals will continue under private management. The expanded Patchogue facility will remain under Park Service control, and all ferry operations will likely continue as concessions. The proposed expanded information and signage system design and implementation will be managed by the FINS staff, including a common system for all terminals. In addition, FINS would be responsible for design, construction, installation and management of information kiosks at all Long Island terminals.

FINS Island Sites: The island terminals and support facilities at FINS sites would be designed, implemented and managed (including commercial vessel landing rights) by the FINS staff with funding through NPS sources, continuing the current management patterns. FINS will also manage recreational boating access at Old Inlet, Watch Hill and Sailors Haven.

Fire Island Community Transfer Sites: Community transfer sites for commercial passenger operations will remain under the management and control of the individual communities, with the FINS staff negotiating agreements on an individual community basis to provide more information and support facilities for day visitors. The transfer sites would include Ocean Beach, Fire Island Pines and/or Cherry Grove, and Davis Park. A ferry landing at Robert Moses Park would require an agreement to coordinate and manage the dock and services through the State Park staff.

Ferry Operations and Intermodal Transportation Services: Mainland ferry operations to FINS sites would continue with County-regulated fares, locally negotiated agreements for dockage at municipal facilities, and concessions granted by FINS for the routes serving FINS sites and using FINS dock facilities. New services requiring concession solicitations by FINS would include Patchogue to Talisman/Barrett Beach, Patchogue to Smith Point and Old Inlet, and Bay Shore to Lighthouse, as well as new west, central, and east lateral water taxi operations.

Mainland Parking Management Program: The FINS staff would take the initiative for further evaluating mainland parking management improvement options and coordinate efforts with the mainland host communities to implement such programs as were deemed feasible. FINS might take a more active role in managing joint use parking improvements at Patchogue in collaboration with the town and the Long Island Rail Road (LIRR).

Chapter 1: Inventory of Existing Transportation Facilities and Services

Fire Island is a narrow barrier island 32 miles in length along the south coast of Long Island, separating Great South Bay from the Atlantic Ocean and includes the authorized areas of the National Seashore, Robert Moses State Park, and private lands in several residential communities. The Park unit includes the Otis Pike High Dunes Wilderness Area, Watch Hill, Talisman/Barrett Beach, Sailors Haven, and the Fire Island Lighthouse Talisman/Barrett Beach, Old Inlet, the Beach, Smith Point County Park, and parks run by the towns of Brookhaven and Islip. The 18 communities on Fire Island have a combined summer resident population of approximately 30,000, which is reduced to only 450 during the off-season winter months.

Fire Island National Seashore consists of ocean beaches, dunes, maritime forests, significant portions of the Great South Bay and Moriches Bay, and smaller islands. Principal visitor use areas of the National Seashore include the Fire Island Lighthouse, Sailors Haven and Sunken Forest, Watch Hill Visitor Center, the Fire Island Wilderness Visitor Center, Talisman/Barrett Beach, and on the mainland of Long Island, the William Floyd Estate. Although most areas of the park are open year-round, visitation is highly seasonal, with the vast majority of visitation generally occurring during the summer months. The concession operating season for the Sailors Haven and Watch Hill sites of the park runs from mid-May to mid-October, in part due to limited off-season ferry service. The National Park Service wishes to encourage greater use of the park facilities during the off-season non-summer months.

Located approximately one hour east of New York City, Fire Island is a popular destination for ocean beach recreation, sightseeing, hiking and wildlife viewing. Camping is allowed is designated areas, and the coastal location provides opportunities for canoeing, boating and fishing.

Because the use of motor vehicles is restricted on the Island, approximately 80% to 90% of the estimated 3 to 4 million annual visitors to the federally-managed portions of Fire Island access the Island by either ferry or private boat. Visitors can also access the island by driving over bridges to parking fields located in Robert Moses State Park and Smith Point County Park, and then walking to the federally managed portions of the Island.

Fire Island National Seashore represents a unique situation relevant to transportation needs, given its high visitation and lack of access via conventional ground transport modes and services. All access to the Seashore is either by private boat of ferry, or by foot from parking areas located in the state and county parks at either end of the island. Auto use on the island is prohibited during the summer when visitation is highest, and is allowed only under restricted conditions during the off-peak winter season when ferry operations are reduced. With the exception of limited beach driving permits on the eastern end of the Seashore, driving is permitted only by residents and services to residences and businesses on the island. The Park staff believe that enhancement of alternative transportation services can help facilitate access to the resources of Fire Island, and support the needs of year-round residents, seasonal renters, and day visitors.

This report assesses the prospects for enhanced alternative transportation services and infrastructure at the National Park Service unit of the Fire Island National Seashore (FINS).

1.1 Overview of Fire Island Communities and Development Patterns

There are seventeen communities within the authorized boundary of the Fire Island National Seashore, twelve of which receive direct, common carrier cross-bay ferry service. The total Island population during the summer months grows to approximately 30,000, with the number of permanent year-round residents far fewer, at approximately 450 persons.

In order to obtain an overview of existing development patterns on Fire Island, digital color orthophotos were obtained from the New York State GIS Clearinghouse, an agency operated by the New York State Office for Technology. This imagery presents ground conditions within the period 1994 through 1998. Based on this imagery, an inventory of the number of buildings or structures currently existing on the Island by location was developed. Figure 1-1 presents a graphical overview of the spatial distribution of buildings on Fire Island.

FIGURE 1-1: SPATIAL DISTRIBUTION OF DEVELOPMENT ON FIRE ISLAND

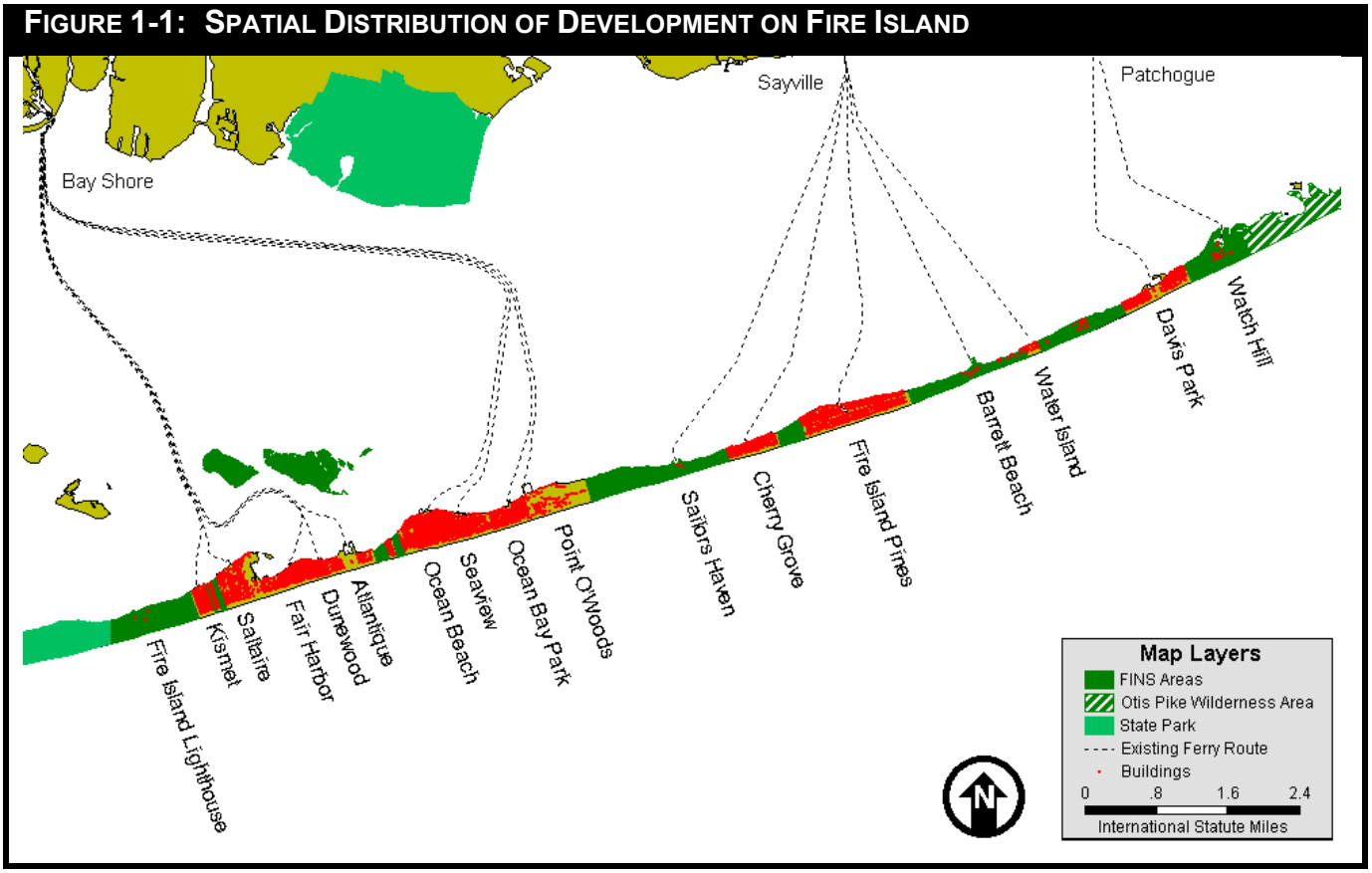


Table 1-1 provides additional detail regarding the spatial distribution of existing development on Fire Island, presented by location, in descending order of the number of buildings that could be identified from the aerial imagery.

TABLE 1-1: NUMBER OF BUILDINGS ON FIRE ISLAND BY LOCATION/COMMUNITY

Location	Number of Buildings
Fire Island Pines	638
Ocean Beach	536
Seaview	377
Saltaire	371
Fair Harbor	354
Davis Park	286
Cherry Grove	276
Ocean Bay Park	273
Kismet	160
Point O'Woods	116
Corneille Estates	115
Dunewood	92
Lonelyville	81
Atlantique	48
Seabay Beach	46
Robbins Rest	38
Water Island	38
NPS Watch Hill	20
NPS Talisman/Barrett Beach	20
NPS / Blue Point Beach	19
NPS Fire Island Lighthouse	4
NPS Sailors Haven	3
Atlantique Beach	2
Smith Piont County Park	1
Bellport Beach	1
NPS Fire Island Wilderness Visitor Center	1
TOTAL	**3,916**

1.2 Waterborne Transportation

There are fifteen common carrier ferry routes and two private ferry routes that currently provide cross-bay service from the mainland of Long Island to Fire Island.[1] Fire Island Ferries, Inc., operating out of Bay Shore, provides service to eight communities on the west end of Fire Island. Sayville Ferry Service, Inc., operating out of Sayville, provides service on five routes to Fire Island, including service to the Fire Island communities of Cherry Grove, Fire Island Pines and Water Island, and service to the NPS Sailors Haven Visitor Center and Barrett Beach, both under a concession agreement with the NPS. Davis Park Ferry Co., operating out of two terminals in Patchogue, provides service to the community of Davis Park on Fire Island, as well as service to the NPS Watch Hill Visitor Center under a concession agreement with the NPS.

The market structure for these three existing cross-bay ferry operators in many ways represents what is known to economists as a "loose oligopoly," in which these leading three operators represent nearly 100% of the cross-bay ferry travel, but market collusion among them to fix prices is impossible, in this case because fares are regulated by the Suffolk County Legislature, as noted in Appendix B.

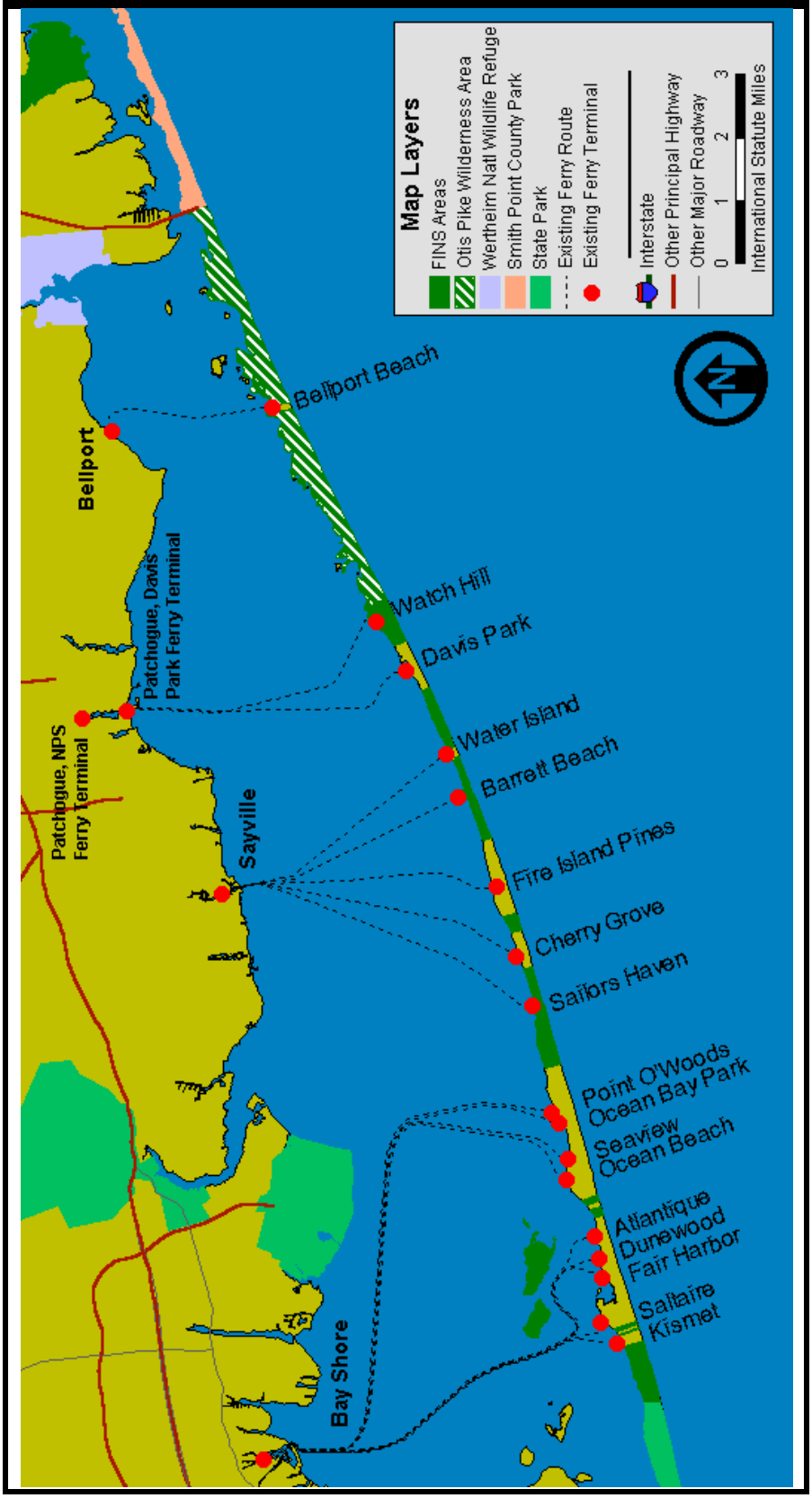
Another two cross-bay routes, one serving Point O'Woods, and the other serving Bellport Beach, are restricted to residents of Point O'Woods and Bellport, respectively.

None of the ferries currently operating in Great South Bay is equipped with onboard passenger toilet facilities. If any new crossbay ferry services with a travel time exceeding 30 minutes were to be considered in the future, these vessel would likely need to be equipped with onboard passenger toilet facilities as required by 46 CFR Ch. 1, Subpart 72.25-15, "Passenger accommodations for excursion boats, ferryboats, and passenger barges." The language in this regulation says in part "On ferryboats and barges having a short run, passenger toilet facilities need not be fitted." A "short run" is generally interpreted as a route of 30 minutes or less.

In addition to these cross-bay services, water taxi service, primarily focused upon lateral, or east-west, service along Fire Island, is provided by South Bay Water Taxi and its subsidiary company, Aqualine, using smaller vessels ranging in size from approximately 10 passengers up to 37 passengers.

[1] Common carrier can be generally defined as “a for-hire carrier that holds itself out to serve the general public at reasonable rates and without discrimination.”

FIGURE 1-2: EXISTING CROSS-BAY FERRY ROUTES



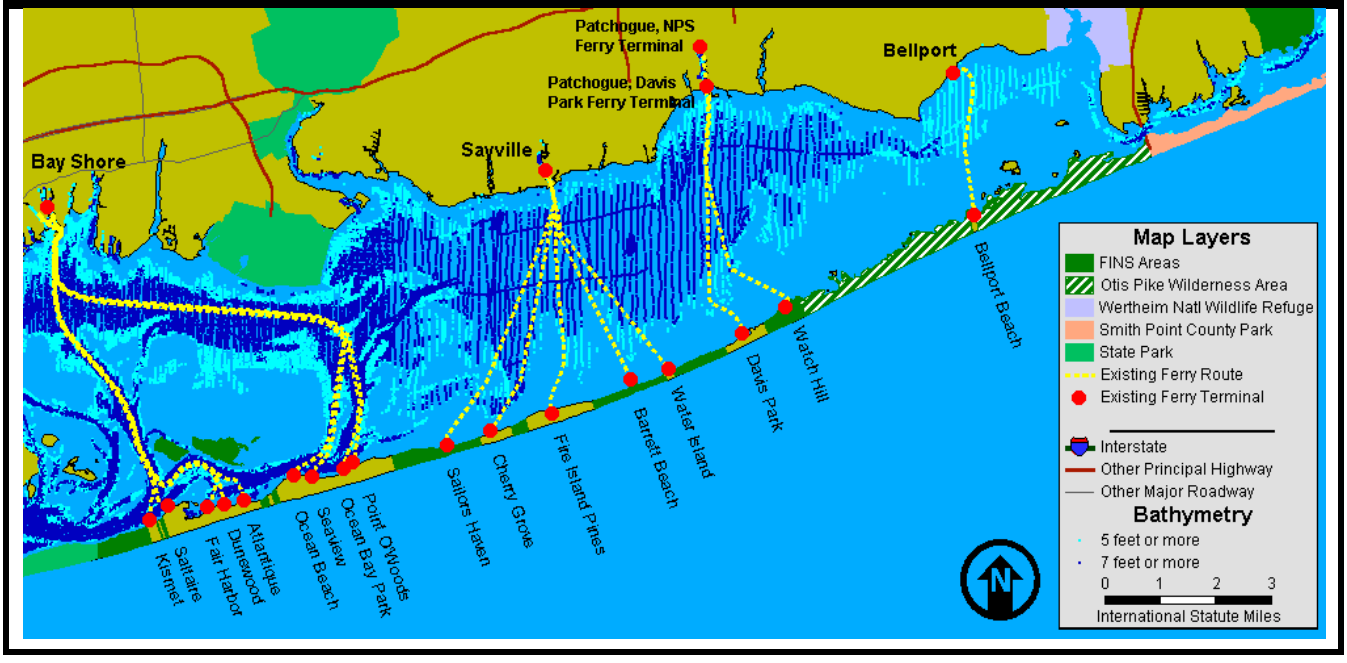
To a greater extent than many other regions in which ferries operate, the large areas of Great South Bay that have limited depths restrict the potential location of any proposed routes. The current fleet of cross-bay passenger ferries typically draft between 4 and 7 feet fully loaded.

Soundings data were obtained from the National Geophysical Data Center (NGDC) Hydrographic Survey Database, which includes bathymetric surveys of the U.S. National Ocean Service. This database provides the most accurate and extensive digital bathymetric data available for the coastal waters of the United States, and because the database contains all depth values obtained during the surveys, more detailed bathymetric information is available than can normally be found on published nautical charts which are compiled from the same surveys. The data provided are, however, an historical data set, and as such it should be noted that they may not always reflect current conditions. These bathymetric data were also supplemented with digital nautical charts (NOAA) for the Great South Bay area.

The tidal range in Great South Bay varies somewhat depending upon the relative distance from Fire Island Inlet on the west end of the bay, with the mean range of tide approximately 0.7 feet near Patchogue, and 1.0 feet nearer to Fire Island Inlet. The soundings data represent conditions at mean low water.

As can be seen in Figure 1-3, shallow and shoal conditions are particularly severe in the eastern portions of Great South Bay, and all along the southern shoreline of Great South Bay on Fire Island.

FIGURE 1-3: GREAT SOUTH BAY BATHYMETRY



1.2.1 Fire Island Ferries, Inc.

Fire Island Ferries, Inc., operating out of Bay Shore, provides service to eight communities on the west end of Fire Island (see Table 1-2). At its mainland ferry terminal in Bay Shore, service to Fair Harbor, Dunewood, Ocean Beach and Atlantique is operated out of the main Fire Island Ferries terminal, located on the east side of Maple Avenue. Service to Seaview and Ocean Bay Park is operated from the "West Terminal," located on the west side of Maple Avenue. Service to Kismet and Saltaire is operated from the Kismet/Saltaire terminal located just east of Maple Avenue, and south of the main Fire Island Ferries terminal. Total annual passenger boardings on all eight routes is approximately 800,000. Service is seasonal on all but two routes, Ocean Beach and Saltaire, for which two daily round trips are operated weather permitted in the off-season.

At the main terminal, there is parking available for a maximum of approximately 900 cars on approximately 6.5 acres of land owned by Fire Island Ferries. At the West Terminal, there is parking for an additional 700 cars on land also owned by Fire Island Ferries, which are valet parked by parking attendants in order to maximize the capacity of this parking facility. Finally, approximately 200 cars can be accommodated at the Saltaire/Kismet terminal, in a parking lot owned by the communities of Saltaire and Kismet. Parking fees are $6 per weekday, and $10 per day Friday, Saturday and Sunday. Season parking passes are available for $400. Additional parking is provided by a private company, the Maple Avenue Marina, located next to the main Fire Island Ferries terminal.

1.2.2 Sayville Ferry Service, Inc.

Sayville Ferry Service, Inc., operating out of Sayville, provides service on five routes to Fire Island, including service to the Fire Island communities of Cherry Grove, Fire Island Pines and Water Island, and service to the NPS Sailors Haven Visitor Center and Barrett Beach, both under concession agreements with the NPS. Service to all locations served is provided from docks located to the east Foster Avenue in Sayville. Seasonal parking passes are available for $430, with a capacity for approximately 450 seasonal pass vehicles. Daily parking is available for an additional 900 to 1,000 vehicles on the west side of Foster Avenue, with fees of $6 per weekday, and $7 per weekend day.

1.2.3 Davis Park Ferry Co.

Davis Park Ferry Co., operating out of two terminals in Patchogue, provides service to the community of Davis Park on Fire Island, as well as service to the NPS Watch Hill Visitor Center under a concession agreement with the NPS. At the NPS Watch Hill Ferry Terminal, parking is available for 191 cars, with no parking fees charged. At Sandspit Park, where service to Davis Park is operated from, there is parking capacity for a total of 729 cars, however multiple uses at this location often result in a lack of adequate parking during summer weekends. Parking facility, which is owned by the Town of Brookhaven, is free for residents of Brookhaven, and $15 per day for non-residents.

TABLE 1-2: SUMMARY ROUTE INFORMATION FOR COMMON CARRIER CROSS-BAY FERRY OPERATORS SERVING GREAT SOUTH BAY

Operator	Mainland Terminal	Fire Island Terminal	Base Fare (adult one-way)	Winter Fare	Route Length (nmi)	Annual Pass. Boardings	Service Start Date	Service End Date	Round Trips per Day			
									Winter	Spring	Summer	Fall
Fire Island Ferries	Bay Shore	Atlantique	$6.00		6.1	49,032	Last wk. Of May	1st week Sept.	0	1	6	2
Fire Island Ferries	Bay Shore	Dunewood	$6.00		6.0	65,376	End of March	October 25	0	4	8	5
Fire Island Ferries	Bay Shore	Fair Harbor	$6.00		5.9	89,892	March 1	December 20	0	8	11	9
Fire Island Ferries	Bay Shore	Kismet	$6.00		5.8	89,892	April	November	0	6	11	6
Fire Island Ferries	Bay Shore	Ocean Bay Park	$6.00		6.6	114,409	March	November	0	6	14	8
Fire Island Ferries	Bay Shore	Ocean Beach	$6.00		6.2	167,097	year round	year round	2	6	18	6
Fire Island Ferries	Bay Shore	Saltaire	$6.00		5.8	101,720	year round	year round	2	6	10	6
Fire Island Ferries	Bay Shore	Seaview	$6.00		6.4	122,581	March	October	0	5	15	5
Sayville Ferry Service	Sayville	Barrett Beach	$5.00		4.3	340	July 1	September 6	0	0	2	0
Sayville Ferry Service	Sayville	Cherry Grove	$6.00	$9.00	4.6	180,000	year round	year round	2**	5	12	5
Sayville Ferry Service	Sayville	Fire Island Pines	$6.00	$9.00	4.3	210,000	year round	year round	2**	5	12	5
Sayville Ferry Service	Sayville	Sailors Haven	$5.00		4.8	60,500	May 12	October	0	3	7	3
Sayville Ferry Service	Sayville	Water Island	$9.00		4.3	3,000	May 12	October 12	0	2	4	2
Davis Park Ferry Co.	Patchogue	Davis Park	$5.50		4.1	no data	no data	no data	no data	no data		
Davis Park Ferry Co.	Patchogue	Watch Hill	$5.50		4.6	25,815	no data	no data	no data	no data	7	
Bay Point Navigation	Bay Shore	Point O'Woods	$6.25		6.9	15,600	April 15	November 1	0	2	8	2

** Winter trips on weekends only.

Vessels currently utilized by the ferry operators in Great South Bay are a mix of steel hulled, aluminum hulled and wood hulled designs. For the more than 22 existing ferry vessels that currently provide cross-bay service to Fire Island, passenger capacities typically range from between 100 passengers, up to about 400 passengers, with an average capacity for the entire fleet of approximately 250 passengers per vessel. Vessels particulars for all passenger ferries operating in Great South Bay during the year 2000 by the three major common carrier ferry operators are presented in Table 1-3. For this particular market area, the existing fleet of vessels are not equipped with onboard public toilet facilities or washbasins. Also, these vessels are not equipped with air conditioning systems, refrigeration equipment for food and beverage storage, and typically rely upon batteries for electrical power, rather than generators. All of these factors contribute to a relatively lower acquisition cost for vessels that serve Fire Island.

TABLE 1-3: VESSEL PARTICULARS FOR FERRIES OPERATING IN GREAT SOUTH BAY

Vessel Operator and Vessel Name		Length Overall (feet)	Beam Overall (feet)	Full Load Draft (feet)	Passenger Capacity	Total Crew Complement	Total Installed Horsepower	Maximum Speed (knots)	Service Speed (knots)	Hull Construction Type	Year Built
Fire Island Ferries, Inc.	Fire Island Belle	62.4	16.6	4	150	3	960	21	17	Wood	1948
	Zee Whiz	62.3	16.7	4	150	3	1,300	22	18	Wood	1964
	Zee Lion	62	16.7	4	150	3	956	21	17	Wood	1966
	Capt. Patterson	70.7	18	4.5	300	3	1,785	23	18	Steel	1972
	Fire Island Miss	70.7	18.2	7.2	300	3	1,785	24	18	Steel	1976
	Fireball	70.6	18.2	4.5	298	3	1,725	24	18	Steel	1981
	Firebird	81.8	20	7.1	375	4	1,530	25	19	Aluminum	1984
	Voyager	79.1	20	4.5	389	4	1,800	25	19	Aluminum	1990
	Explorer	79.1	20	4.5	398	4	1,800	25	19	Aluminum	1991
	Stranger	60.1	17	4	149	3	900	22	17	Aluminum	1985
	Traveler	70.7	18.2	4.5	297	3	1,785	24	18	Steel	1977
Sayville Ferry Service, Inc.	Fire Island Clipper	73.4	21	6.1	344	4	1,575	32	20	Aluminum	1979
	Fire Island Duchess	62.3	16.9	5.9	147	3	1,050	20	15	Wood	1966
	Fire Island Empress	61.2	15	7.5	150	3	1,050	20	15	Wood	1963
	Merrimac II	51.2	14.1	6.2	104	2	660	20	15	Wood	1968
	Monitor II	49	14.1	6.2	105	2	636	20	15	Wood	1963
	Roamer II	51.5	13.7	3.4	97	2	600	20	15	Wood	1940
	South Bay Clipper	76.8	21	5.9	413	5	2,450	30	20	Aluminum	1996
Davis Park Ferry Co.	Quaiapen	63.7	20.3	7.5	250	3	900	18	16	Steel	1967
	Mehsomac	40.8	12.9	5.8	49	2	566	21	18	Steel	1973
	Pathfinder II	65.3	18.7	6.9	249	3	1,300	21	18	Steel	1977
	Kiki	75	18.2	7.2	298	4	1,530	21	18	Steel	1983

1.2.4 Other Waterborne Transportation Services

In addition to the fifteen common carrier cross-bay ferry routes, there are also two private ferry routes that currently provide cross-bay service from the mainland of Long Island to Fire Island. These two private cross-bay routes include one operated by Bay Point Navigation Corp. serving Point O'Woods, and a second operated by the Village of Bellport serving Bellport Beach. Both of these routes are restricted to residents of Point O'Woods and Bellport, respectively.

Similar to the three common carrier ferry companies reviewed earlier, Bay Point Navigation Corp. is an entirely private company, and receives no federal, state or local public operating or capital financial assistance. Fares are $6.25 one-way for adults, and $3.25 one-way for children. Service is seasonal, and is provided from mid-April through early November. Total passenger boardings on this route for 1999 were approximately 15,600. Service frequency is approximately two round trips daily in the Spring and Fall, and approaches eight round trips daily during the summer season.

A single vessel is used to provide this service, the *Point O'Woods VI*. (see Figure 1-4). This vessel is a diesel powered monohull design, 60 feet in length with a certificated passenger capacity of 149 passengers.

FIGURE 1-4: BAY POINT NAVIGATION CORP. FERRY
POINT O'WOODS VI

Source: Bay Point Navigation Corp,
URL at http://www.pagelinx.com/powferry/pow.htm

The Village of Bellport owns and operates the ferry vessel *Whalehouse Point* (see Figure 1-4) which serves the route between the Village of Bellport Marina on the mainland, and Bellport Beach (also known as "Ho-Hum" Beach) on Fire Island.

Service is seasonal, beginning Memorial Day weekend and ending in September. Service operates weekends only between Memorial Day and mid-June when public schools close for the summer. From mid-June through Labor Day weekend, the service operates daily, seven days per week. After Labor Day, additional service may operate until late September, again reverting to a weekend only schedule and contingent upon weather conditions.

FIGURE 1-5: VILLAGE OF BELLPORT FERRY
WHALEHOUSE POINT

Source: Village of Bellport,
URL at http://www.bellportvillage.com/bpresource.html

1.2.5 Water Taxi Services

In addition to the common carrier and private scheduled ferry services that operate across Great South Bay, two for-hire, non-scheduled water taxi services, operating smaller vessels than those of the cross-bay ferry operators, provide primarily lateral water transportation service east-west along Fire Island, as well a limited amount of charter cross-bay water taxi service. These services are provided by South Bay Water Taxi and Aqualine, formerly separate companies which are now under the same ownership, but still operate in somewhat distinct patterns of service.

South Bay Water Taxi is the larger of the two services, providing approximately 80% of the combined water taxi service offered by the two entities. South Bay Water Taxi operates on an "internal," unpublished schedule, with Ocean Beach serving as a service hub. This service also utilizes somewhat larger water taxi vessels than those of Aqualine. Aqualine, which serves the remaining 20% of the water taxi market, provides more of an "on-demand" water taxi service, except for some service between Fire Island Pines and Cherry Grove that operates as a more regular shuttle type of service. Aqualine also uses vessels that are somewhat smaller than those operated by South Bay Water Taxi.

Water taxi service is seasonal, and operates from mid-May to early October, with reduced weekend-only service in the shoulder seasons. During the winter off-season, only cross-bay charter service is provided, weather and ice conditions permitting. The two companies pay a fixed seasonal fee for docking rights at each of the various communities, and also must obtain an incidental use permit from the National Park Service in order to provide service to Fire Island Lighthouse and Watch Hill.

South Bay Water Taxi serves all communities and National Park Service locations between Kismet and Watch Hill that also are served by cross-bay ferry service, as well as Fire Island Lighthouse. During the summer season, service is provided between 9:00AM and 2:00AM, with additional service to 4:00AM Thursday through Saturday. Aqualine provides service primarily in the central part of Fire Island, in the vicinity of Fire Island Pines, Cherry Grove and Sailors Haven.

Fares for lateral water taxi service are distance based, and are generally $4 for the first mile, with additional charges for greater distances. For example, the fare for a run between Fire Island Lighthouse and Watch Hill would be approximately $25 one-way. Cross-bay water taxi service is significantly more expensive, ranging from between $75 for the first six persons carried with 24 hour advance notice, up to $100 for the first six persons carried with no advance notice.

The Volpe Center attempted to obtain ridership and annual boardings data for both South Bay Water Taxi and Aqualine; however, these data were not available from either of the operators.

As of the fall of the year 2000, South Bay Water Taxi and Aqualine operated a combined 10 vessels, with two additional vessels out of service at that time. The passenger capacities of the water taxis operating in Great South Bay range from 15 passengers to 37 passengers. A South Bay Water Taxi vessel is shown departing Fire Island Pines in Figure 1-6, and an Aqualine vessel is shown at the dock in Cherry Grove in Figure 1-7. A water taxi vessel of the type generally operated in Great South Bay can be purchased new for between approximately $100,000 to $250,000 (in year 2000 dollars), depending upon its passenger capacity.

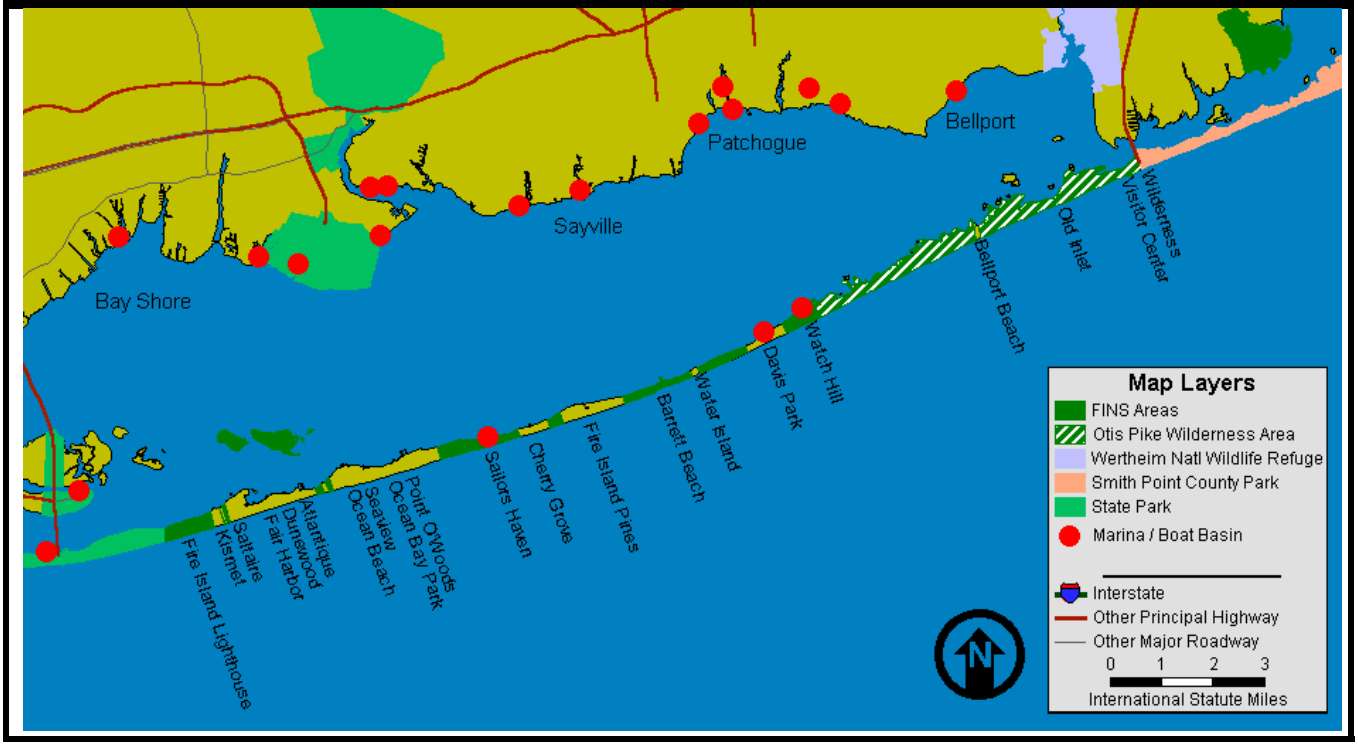
FIGURE 1-6: SOUTH BAY WATER TAXI VESSEL

FIGURE 1-7: AQUALINE WATER TAXI VESSEL

1.2.6 Marinas and Facilities for Private Boats

Figure 1-8 presents an overview of the primary locations in Great South Bay where marinas and other facilities for private boats are located. Data regarding the number of boating facilities and slips presented in the *Patchogue River Maritime Center Plan* (November 1999) for the area of Great South Bay

FIGURE 1-8: LOCATION OF MARINA FACILITIES IN GREAT SOUTH BAY



between Robert Moses Causeway in the west and Smith Point Bridge in the east indicate that in 1997 there were approximately 4,204 total boating slips available.[2]

[2] Suffolk County Planning Department. *Patchogue Maritime Center Plan*. November 1999. Page 20.

Chapter 2: Ferry Route and Dock Site Selection Criteria

Based upon a review of existing documentation and travel data, stakeholder input and the findings from the ferry travel survey reviewed later in Chapter 3, the ferry routes and service alternatives reviewed later in this report were identified and then combined into coordinated system options. The criteria reviewed here were utilized both when attempting to identify the full range of alternatives as reviewed in Chapter 4, as well as in the selection process utilized to focus upon a subset of preferred alternatives for more in-depth analysis in Chapter 5. These criteria were drawn from both marine and transportation planning practice, and where necessary have also incorporated items of particular local concern to the Fire Island and Great South Bay region.

2.1 General Route and Dock Site Selection Criteria

Overall, the criteria used in identifying and selecting route and service alternatives include:

- Financial and economic performance
- Ridership and market potential
- Improved visitor convenience and accessibility
- Alleviating overcrowding at facilities
- Ability to obtain potential funding from both public sector and private sector sources
- Ability to interface with existing public transit, pedestrian and bicycle facilities
- Opportunities to increase visitor understanding and appreciation through improved interpretive opportunities
- Improved integration of regional facilities and services

After selecting a subset of preferred alternatives in this manner, the following elements are reviewed for each recommended alternative:

- Route description and map
- Service characteristics including headways and operating hours by season and weekend/weekday
- Estimated passenger demand (by day visitor / seasonal renter / year-round resident status if possible)
- Vessel requirements (capacity, speed, amenities, etc.)
- Docking facility requirements and interface of existing or proposed vessels with waterways and terminal facilities
- Actions required to achieve ADA accessibility
- Parking currently available and parking requirements
- Service and other improvements required to facilitate access to LIRR commuter rail stations
- Improvements required to circulation system on the Island
- Dredging requirements
- Maintenance and support facilities
- Traveler amenities and passenger information such as shelters, signage, information services, etc.

- Capital costs
- Annual operating and maintenance costs
- Costs that can be recovered through sharing arrangements with other public sector operators or the private sector
- Life cycle costs

2.2 Route Selection Criteria

Criteria specific to identifying and selecting route alternatives include:

- Preference for adaptation and enhancement of existing routes and operators for existing and new destinations
- Keep total trip time under 30 minutes to maintain use of existing fleet (regulation that toilet facilities are required by the Coast Guard for route times over 30 minutes including loading and unloading
- Vessel speeds and wake/wash to be controlled to avoid environmental impacts on shore areas
- All routes and vessels should be ADA compliant including mainland and Island dock facilities
- Gateway routes to maintain a regular schedule of departures during season
- Lateral water taxi routes to operate on an approximate schedule and also be on call to certain dock sites

2.3 Dock Site Selection Criteria

Criteria specific to identifying and selecting terminal and dock sites include:

- Island dock sites need to be within walking distance of FINS destinations
- Mainland dock sites need to be within walking distance of parking and shuttle bus distance of a rail station
- Island and mainland landings need to accommodate a range of ferry and water taxi vessels with freeboards of 2 to 4 feet
- All dock landings need to be modified to meet ADA access requirements
- Landside walkways need to meet ADA access requirements
- Existing dock locations are generally favored over new sites because of waterside environmental considerations and landside walkways and utility conditions
- If new sites are needed, historical pier locations and channel approaches are favored over new sites and approaches
- Landside amenities at NPS sites should include a covered waiting shelter, weather protected information board, telephone, water and restrooms
- Dock siting should minimize initial and/or maintenance dredging requirements, new breakwaters or other alterations to the fragile barrier beach structure
- All dock sites considered are to be on the Bay side
- For sites not managed by FINS, it is assumed that landing rights may need to be sought from the appropriate entity

Chapter 3: Ferry Transportation Survey

As part of the traveler and resident data collection activities for this study, a travel survey of all fifteen common carrier[3] ferry routes serving Fire Island was implemented during the three days of Thursday, August 24th to Saturday, August 26th, 2000. This travel survey was implemented in order to develop a profile of visitor and resident ferry travel characteristics, identify the level of satisfaction with current water transportation services, to obtain information on visitor preferences regarding these existing services, and ultimately to help determine how ferry service to Fire Island National Seashore (FINS) can be improved. The survey was developed and administered in cooperation with Fire Island Ferries, Sayville Ferry Service and Davis Park Ferry Company.

Despite the fact that ferry transportation is critically important for public access to, and use and enjoyment of, the resources of FINS, basic factual and empirical data concerning ferry traveler and trip characteristics in the region was largely unknown. This survey provides critical and otherwise unavailable information that will help guide the decision making process in developing possible modifications to existing ferry services and/or facilities, and the possible introduction of new ferry services and/or facilities, in order to improve public access to, and use and enjoyment of, the resources of FINS.

Prior to the actual implementation of the survey, much effort was directed towards the proper design of the survey instrument and the planning of the administration of the survey. Pursuant to the requirements of the Paperwork Reduction Act of 1995, all necessary approvals required for this data collection were obtained from the Office of Management and Budget (OMB), utilizing the expedited approval process for National Park Service visitor surveys that is overseen and implemented by the National Park Service Social Science Program in cooperation with OMB.

3.1 Survey Methodology and Implementation

3.1.1 Respondent Universe

During the three day survey period, a sample of 93 of the total 432 scheduled ferry vessel departures performed from the three mainland ferry terminals were selected for administration of the onboard travel survey. The respondent universe for this survey is all passengers age 18 and older boarding all ferries to Fire Island during the sample period.

3.1.2 Sampling Plan and Sampling Procedures

Selection of a simple random sample of mainland vessel departures during the three day survey time frame would likely over sample or under sample vessel departures on given days, on given routes and during certain times of the day.

[3] Common carrier can be generally defined as "a for-hire carrier that holds itself out to serve the general public at reasonable rates and without discrimination." Therefore, this excludes the ferry routes operated to Point O'Woods, and to Bellport Beach, which are restricted to residents only.

TABLE 3-1: BAY SHORE FERRY SCHEDULES AND SAMPLED VESSELS

Ferry Company	Mainland Departure Location	Fire Island Destination	Thursday (8/24/2000) Departure Time from Bay Shore	Non-Response Bias Check?	Paired With	Friday (8/25/2000) Departure Time from Bay Shore	Non-Response Bias Check?	Paired With	Saturday (8/26/2000) Departure Time from Bay Shore	Non-Response Bias Check?	Paired With	Total Departures (Thurs. - Sat.)
Fire Island Ferries, Inc.	Bay Shore, Main Terminal	Fair Harbor	7:00 AM			7:00 AM			7:00 AM			33
			9:30 AM	No	Dunewood	9:30 AM			9:45 AM			
			11:00 AM			11:00 AM	Yes	Dunewood	11:15 AM			
			1:00 PM			1:00 PM	Yes	Dunewood	12:20 PM			
			3:00 PM			3:00 PM			1:30 PM	No	Dunewood	
			5:30 PM	Yes	Dunewood	4:00 PM			2:55 PM	Yes	Dunewood	
			7:25 PM	Yes	Dunewood & Salt.	5:30 PM	No	Dunewood	4:10 PM	No	Dunewood	
			9:05 PM			6:45 PM			6:00 PM			
			10:15 PM			8:00 PM			7:30 PM			
						9:10 PM			8:45 PM			
						10:30 PM			10:10 PM			
						11:50 PM			11:30 PM			
		Dunewood	7:00 AM			7:00 AM			9:45 AM	Yes	Atlantique	24
			9:30 AM	No	Fair Harbor	9:30 AM			11:15 AM			
			11:00 AM			11:00 AM	Yes	Fair Harbor	12:20 PM			
			1:00 PM			1:00 PM	Yes	Fair Harbor	1:30 PM	No	Fair Harbor	
			3:00 PM			3:00 PM			2:55 PM	Yes	Fair Harbor	
			5:30 PM	Yes	Fair Harbor	5:30 PM	No	Fair Harbor	4:10 PM	No	Fair Harbor	
			7:25 PM	Yes	Saltaire & Fr. Hrb	6:45 PM	Yes	Atlantique	6:00 PM			
						8:15 PM			7:30 PM			
						9:10 PM						
		Atlantique	11:50 AM	Yes		11:50 AM			9:45 AM	Yes	Dunewood	11
			4:30 PM			3:00 PM			11:15 AM			
						4:30 PM			11:50 AM			
						6:45 PM	Yes	Dunewood	4:30 PM			
						8:15 PM						
		Ocean Beach	7:00 AM			7:00 AM			7:00 AM			49
			8:15 AM	No		8:15 AM			8:55 PM			
			9:30 AM			9:30 AM			9:45 AM			
			11:00 AM			11:00 AM			10:30 AM			
			12:15 PM			12:15 PM			11:15 AM	No		
			1:30 PM			1:25 PM			11:55 AM			
			2:45 PM			2:00 PM	Yes		12:30 PM			
			3:55 PM			3:00 PM			1:00 PM			
			5:30 PM			4:00 PM			1:30 PM			
			6:45 PM			5:00 PM			2:00 PM			
			8:00 PM	Yes		6:00 PM	No		2:30 PM			
			9:05 PM			6:45 PM			3:30 PM	Yes		
			10:15 PM			7:30 PM			4:10 PM			
						8:00 PM			5:10 PM			
						8:50 PM			6:20 PM			
						9:50 PM			7:30 PM			
						10:30 PM			8:45 PM			
						11:50 PM			10:10 PM			
	Bay Shore, West Terminal	Seaview	7:00 AM			7:00 AM			7:00 AM			39
			9:20 AM			9:20 AM	Yes	Ocean Bay Park	9:00 AM	No	Ocean Bay Park	
			10:50 AM	Yes	Ocean Bay Park	10:50 AM			9:45 AM			
			12:10 PM			12:20 PM	Yes	Ocean Bay Park	10:30 AM	Yes	Ocean Bay Park	
			1:35 PM	Yes	Ocean Bay Park	1:50 PM			11:15 AM			
			3:35 PM			3:10 PM			12:00 noon			
			5:00 PM			4:10 PM	No	Ocean Bay Park	12:40 PM			
			6:20 PM			5:10 PM			1:20 PM			
			7:45 PM			6:10 PM			2:50 PM			
			9:00 PM	No	Ocean Bay Park	6:50 PM			3:50 PM			
						7:30 PM			5:50 PM	No	Ocean Bay Park	
						8:10 PM			7:40 PM			
						8:50 PM			9:00 PM			
						9:30 PM						
						10:15 PM						
						11:00 PM						
		Ocean Bay Park	7:00 AM			7:00 AM			7:00 AM			43
			9:20 AM			9:20 AM	Yes	Seaview	9:00 AM	No	Seaview	
			10:50 AM	Yes	Seaview	10:50 AM			9:45 AM			
			12:10 PM			12:20 PM	Yes	Seaview	10:30 AM	Yes	Seaview	
			1:35 PM	Yes	Seaview	1:50 PM			11:15 AM			
			3:35 PM			3:10 PM			12:00 noon			
			5:00 PM			4:10 PM	No	Seaview	12:40 PM			
			6:20 PM			5:10 PM			1:20 PM			
			7:45 PM			6:10 PM			2:00 PM	Yes		
			9:00 PM	No	Seaview	6:50 PM			2:50 PM			
						7:30 PM	No		3:50 PM			
						8:10 PM			4:50 PM			
						8:50 PM			5:50 PM	No	Seaview	
						9:30 PM			6:40 PM	No		
						10:15 PM			7:40 PM			
						11:00 PM			9:00 PM			
									10:25 PM			
	Bay Shore, Kismet/Saltaire Terminal	Kismet	7:00 AM			7:00 AM			7:00 AM			35
			9:30 AM			9:30 AM			9:45 AM			
			11:00 AM			11:00 AM			10:55 AM			
			1:15 PM			1:00 PM			12:05 PM	Yes	Saltaire	
			3:10 PM	Yes	Saltaire	2:55 PM			1:00 PM	Yes	Saltaire	
			5:00 PM	Yes	Saltaire	4:15 PM			2:50 PM			
			6:45 PM	No	Saltaire	5:00 PM	Yes	Saltaire	4:05 PM			
			9:05 PM			6:10 PM			6:00 PM			
			1015 PM			6:40 PM			7:30 PM			
						7:30 PM			8:45 PM			
						8:00 PM	Yes	Saltaire	10:10 PM			
						9:05 PM			11:30 PM			
						10:15 PM						
						11:50 PM						
		Saltaire	7:00 AM			7:00 AM			7:00 AM			32
			9:30 AM			9:30 AM			9:45 AM			
			11:00 AM			11:00 AM			10:55 AM	Yes		
			1:15 PM			1:00 PM			12:05 PM	Yes	Kismet	
			3:10 PM	Yes	Kismet	2:55 PM			1:00 PM	Yes	Kismet	
			5:00 PM	Yes	Kismet	4:15 PM			2:50 PM			
			6:45 PM	No	Kismet	5:00 PM	Yes	Kismet	4:05 PM			
			7:25 PM	Yes	Fr. Hrb & Dune.	6:10 PM			6:00 PM			
			9:05 PM			6:40 PM			7:30 PM			
						7:30 PM			8:45 PM			
						8:00 PM	Yes	Kismet				
						9:05 PM						
						10:15 PM						
Total Scheduled Vessel Departures			**69**			**103**			**94**			**266**
Total Vessels Sampled for Survey			**12**			**12**			**14**			**38**
Total Routes Sampled for Survey			**22**			**21**			**23**			**66**

: Vessel surveyed
: Vessel surveyed by virtue of its being paired with another survey trip destination.

TABLE 3-2: SAYVILLE AND PATCHOGUE FERRY SCHEDULES AND SAMPLED VESSELS

Ferry Company	Mainland Departure Location	Fire Island Destination	Thursday (8/24/2000) Departure Time from Sayville	Thursday (8/24/2000) Non-Response Bias Check?	Friday (8/25/2000) Departure Time from Sayville	Friday (8/25/2000) Non-Response Bias Check?	Saturday (8/26/2000) Departure Time from Sayville	Saturday (8/26/2000) Non-Response Bias Check?	Total Departures (Thurs. - Sat.)
Sayville Ferry Service, Inc.	Sayville	Sailors Haven	9:45 AM	No	9:45 AM	Yes	9:45 AM		19
			11:15 AM		11:15 AM		11:15 AM		
			12:30 PM		12:30 PM		12:30 PM		
			2:30 PM	Yes	2:30 PM		2:30 PM		
			3:45 PM		3:45 PM		3:45 PM		
			5:00 PM		5:00 PM		5:00 PM	Yes	
							6:00 PM		
		Cherry Grove	7:00 AM		7:00 AM		8:15 AM		41
			8:10 AM		8:10 AM		9:25 AM		
			9:30 AM	No	9:30 AM		10:25 AM		
			11:30 AM		11:30 AM	No	11:25 AM		
			1:30 PM		12:30 PM		12:25 PM	Yes	
			3:30 PM	Yes	1:30 PM		1:25 PM		
			5:20 PM		3:30 PM		2:20 PM		
			7:30 PM		4:30 PM	Yes	3:20 PM		
			8:30 PM		5:30 PM		4:20 PM		
			9:30 PM		6:30 PM		5:20 PM		
					7:35 PM		6:20 PM		
					8:30 PM		7:20 PM		
					9:30 PM		8:20 PM		
					10:30 PM		9:20 PM		
					12:15 AM		11:00 PM		
							12:30 AM		
		Fire Island Pines	7:00 AM		7:00 AM		8:15 AM		41
			8:10 AM		8:10 AM		9:25 AM		
			9:30 AM		9:30 AM		10:25 AM		
			11:30 AM	No	11:30 AM		11:25 AM	Yes	
			1:30 PM		12:30 PM		12:25 PM		
			3:30 PM		1:30 PM		1:25 PM		
			5:20 PM	Yes	3:30 PM	No	2:20 PM		
			7:30 PM		4:30 PM		3:20 PM		
			8:30 PM		5:30 PM	Yes	4:20 PM		
			9:30 PM		6:30 PM		5:20 PM		
					7:00 PM		6:20 PM		
					7:35 PM		7:20 PM	No	
					8:00 PM		8:20 PM		
					8:30 PM		9:20 PM		
					9:30 PM				
					10:30 PM				
					12:00 mid.				
		Barrett Beach					10:30 AM	Yes	1
		Water Island			12:30 PM	Yes	9:30 AM		5
					6:30 PM	Yes	3:30 PM	Yes	
					8:30 PM				
Total Scheduled Vessel Departures			26		41		40		107
Total Vessels Sampled for Survey			6		7		7		20

Patchogue Ferry Schedules and Sampled Vessels

Ferry Company	Mainland Departure Location	Fire Island Destination	Thursday (8/24/2000) Departure Time from Patchogue	Thursday (8/24/2000) Non-Response Bias Check?	Friday (8/25/2000) Departure Time from Patchogue	Friday (8/25/2000) Non-Response Bias Check?	Saturday (8/26/2000) Departure Time from Patchogue	Saturday (8/26/2000) Non-Response Bias Check?	Total Departures (Thurs. - Sat.)
Davis Park Ferry Co.	Patchogue, Sandspit Park	Davis Park	6:20 AM		6:20 AM		7:30 AM		39
			7:30 AM		7:30 AM		9:20 AM	Yes	
			10:15 AM		10:15 AM		10:20 AM		
			11:30 AM		11:30 AM		11:20 AM		
			1:25 PM		1:25 PM		12:20 PM		
			3:20 PM		3:20 PM		1:30 PM		
			5:20 PM		5:20 PM		2:25 PM		
			6:30 PM		6:20 PM		3:30 PM		
			8:20 PM	Yes	7:20 PM	No	5:20 PM		
			10:30 PM		8:20 PM		6:20 PM		
					9:20 PM		7:15 PM		
					10:30 PM		8:15 PM		
					11:45 PM		9:15 PM		
							10:15 PM		
							11:15 PM		
							12:15 AM		
	Patchogue, NPS Ferry Terminal	Watch Hill	8:15 AM		8:15 AM		8:20 AM	Yes	20
			9:45 AM		9:45 AM		10:00 AM		
			11:15 AM		11:15 AM		11:45 AM		
			1:15 PM	Yes	1:15 PM	Yes	1:45 PM	No	
			3:10 PM		3:10 PM		3:30 PM		
			5:10 PM		5:10 PM		5:15 PM		
					6:30 PM		7:00 PM		
Total Scheduled Vessel Departures			16		20		23		59
Total Vessels Sampled for Survey			2		2		3		7

■: Vessel surveyed

Therefore, a stratified sample was developed instead, and 93 mainland vessel departures were selected for administration of the onboard survey, representing 21.5% of all scheduled mainland vessel departures during the three day survey time frame. The specific vessel departures that were surveyed are presented in Table 3-1 and Table 3-2.

Based upon vessel operating schedules, discussions with the ferry operators regarding historical patronage data, vessel passenger capacities and historically observed vessel load factors, it is estimated that the total number of passengers boarding this sample of 93 vessel trips was approximately 5,680 passengers.

As can be seen from Table 3-1, for vessels originating from Bay Shore, many of the trips were "paired," meaning a single vessel departure from Bay Shore would visit two different Fire Island ferry terminal destinations. Typical destination pairs included Fair Harbor and Dunewood, Kismet and Saltaire, and Ocean Bay Park and Seaview. This pairing actually served to increase the number of routes surveyed for Bay Shore, since in these cases a single vessel departure allowed surveys to be distributed to travelers on two separate routes at the same time.

The strata of the study population of mainland vessel departures includes route, day of week, and time of day. For each route and day, between one and three vessels were selected for administration of the onboard survey. Specific vessel departures on each day and route were selected so as to acquire a representative set of vessel departures by time of day over the three day survey time frame, while also allowing Volpe Center staff to be present at each sample vessel departure to greet boarding passengers and distribute surveys.

During a typical summer week, approximately 910 vessel departures are scheduled to depart from the mainland ferry terminals on the 15 common carrier cross-bay ferry routes serving Fire Island. Because of this large number of vessel departures and passenger boardings, the survey time frame was restricted to a contiguous three day period (Thursday through Saturday, inclusive). Sampling over three days reduces the overall number of persons in the respondent universe to a more manageable number, while still being representative of the three distinct periods of ferry travel (Weekday, Friday, and Weekend) that are generally thought to occur during a typical summer week for the Fire Island market. This should accurately capture any variation in trip characteristics or traveler characteristics and attitudes that may vary as function of the day of the week (e.g., anecdotal evidence suggests ground access to and from the mainland ferry terminals from nearby commuter rail stations is highest on Friday evenings). Question #1 on the survey allows responses to be coded by the day of the week on which the ferry trip being surveyed was taken.

For each sampled vessel, a systematic interval sampling methodology was used to select boarding passengers for administration of the survey, in which every n^{th} person boarding the vessel was selected and asked to participate. There is no reason to believe that such a sampling order is biased, therefore this approach is essentially equivalent to a simple random sample.

Site visits and discussions with the ferry operators in late June 2000 suggest that each of the Island communities served by the ferries is in many ways distinct in its character. Given that the rate of response is likely to vary somewhat for passengers having different socioeconomic characteristics, it is therefore likely that the response rate may vary for each separate route. Survey questions regarding trip origin and trip destination (Questions #2 and #4) provide for individual route level analysis of the reported data.

3.1.3 Survey Administration

The three ferry service providers operating the 15 ferry routes being surveyed cooperated with the survey effort, and worked with staff from the Volpe Center to implement the required distribution and collection of survey instruments for the sampled vessel departures with a minimum of disruption. For each vessel sampled, every n^{th} boarding passenger was greeted by a Volpe Center staff member on the dock prior to boarding, or as they board the vessel, depending on the total number of passengers being boarded for the particular vessel departure. The surveyor used the following greeting:

> *Good morning/afternoon/evening. The National Park Service and (Ferry Operator Name) are conducting a brief ferry travel survey today. The survey is voluntary, and is being conducted to help determine how ferry service to Fire Island can be improved. All responses are confidential. Would you be willing to participate?* ***If Yes****: Thank you. Pencils are also available on the ferry, and completed survey forms can be deposited in the box located onboard the ferry.* ***If No****: Enjoy your trip to Fire Island.*

Writing implements (golf pencils) were provided both on the dock and onboard the ferries. For those passengers unable to complete the survey while waiting to board the vessel, a sealed box clearly marked "Deposit Completed Ferry Surveys Here" and with a slit on the top large enough for surveys was conspicuously located onboard each surveyed vessel, allowing passengers to complete their surveys onboard and return their completed surveys as they disembarked on Fire Island after their ferry trip. Completed survey instruments were then collected from the return boxes daily by Volpe Center staff. To provide for ease of completion onboard the ferries, the survey instruments were printed on a single, double-sided 8.5"x11" page, using a heavy weight card stock paper. Limited financial resources precluded the use of a business reply mail back option for the survey, however because the typical one-way trip time aboard each ferry on each route of 30 minutes is relatively lengthy compared to the estimated 5 minutes to complete the survey instrument, the lack of a mail back option should not have substantially reduced the survey response rate.

Weather during the survey period was excellent, and anecdotal comments from the ferry operators suggested that the three days surveyed were likely some of the busiest of the entire summer season, especially considered the generally poor weather experienced earlier during the 2000 summer season. Though some very early morning and very late night ferry departures were originally planned to have been surveyed, this proved impractical given staffing constraints. Instead, the first vessel departure of the day surveyed typically occurred between 8:00AM and 9:00AM, and the last vessel departure of the day typically occurred between 7:00PM and 8:00PM.

3.1.4 Response Rate

A total of 397 completed survey forms were ultimately collected (see Table 3-3). Based on response rates encountered historically with similar travel surveys of this type, and considering that each contacted member of the respondent universe will be greeted by a surveyor, an overall response rate across all ferry routes of about 45% was initially anticipated. Actual results revealed that of those persons initially approached and asked to participate in the survey, 93.1% accepted a blank survey form (see Table 3-4). Of these survey participants, 76.1% completed and returned a survey form, as indicated by the non-response bias checks. Overall then, of all persons initially approached and asked to participate in the survey, 70.8% completed and returned a survey form. As shown in Table 3-4, initial contact acceptance rates were highest at Bay Shore (94.0%), and lowest at Patchogue (85.7%). Conversely, par-

TABLE 3-3: NUMBER OF SURVEY RESPONSES RECEIVED BY ROUTE

Mainland Departure Location	Island Terminal Location	Survey Responses
Bay Shore	Kismet	28
Bay Shore	Saltaire	34
Bay Shore	Fair Harbor	51
Bay Shore	Dunewood	33
Bay Shore	Atlantique	10
Bay Shore	Ocean Beach	28
Bay Shore	Seaview	23
Bay Shore	Ocean Bay Park	62
Bay Shore Subtotal		**269**
Sayville	Sailors Haven	12
Sayville	Cherry Grove	32
Sayville	Fire Island Pines	43
Sayville	Barrett Beach	1
Sayville	Water Island	11
Sayville Subtotal		**99**
Patchogue	Davis Park	11
Patchogue	Watch Hill	18
Patchogue Subtotal		**29**
Grand Total		**397**

ticipant response rates were highest at Patchogue (83.3%) and lowest at Bay Shore (74.5%). The result was that overall survey response rates were about the same among the three mainland departure locations, ranging from 70.1% for Bay Shore, up to 72.7% for Sayville.

TABLE 3-4: SURVEY RESPONSE RATES

Mainland Departure Location	Initial Contact Acceptance Rate[(1)]	Participant Response Rate[(2)]	Overall Response Rate[(3)]
Bay Shore	94.0%	74.5%	70.1%
Sayville	92.2%	78.9%	72.7%
Patchogue	85.7%	83.3%	71.4%
ALL	93.1%	76.1%	70.8%

(1) The "Initial Contact Acceptance Rate" is the percentage of persons initially approached who accepted a blank survey form.
(2) The "Participant Response Rate" is the number of completed survey forms as a percentage of the number of persons who accepted a blank survey form.
(3) The "Overall Response Rate" is the number of completed survey forms as a percentage of the number of persons initially approached and asked to particpate in the survey.

3.1.5 Non-Response Bias

For this survey, there are two sources of possible non-response that may occur - one in which a passenger refuses to participate in the survey when initially approached by the surveyor, and one in which a passenger accepts a survey instrument when initially approached by the surveyor but then does not complete and return the survey. As can be seen in Table 3-4 presented earlier, the latter type of non-response was by far the most significant of these two sources. For approximately one vessel departure per route per day, surveyors noted observable characteristics such as gender, an estimate of group size and an estimate of age for all passengers who were initially contacted and asked to participate in the survey. Survey instruments for the particular vessel departures selected for this non-response bias check were marked with the scheduled departure time of the vessel, which in combination with questions #1, #2 and #4 later allowed survey responses for that particular day, route and vessel departure to be identified from among all survey responses during the survey time frame.

In an attempt to identify any apparent systematic distortion in survey responses that may result if the survey respondents are substantially different than the survey non-respondents, a comparison was made between the proportion of respondents in each sex, age and group size category for each of the three mainland departure locations and the proportion of passengers in each sex, age and group size category who were initially contacted and asked to participate in the survey at each of the three mainland departure locations. For the main characteristic of gender, the results presented in Table 3-5 indicate that no significant differences were found between these proportions.

TABLE 3-5: NON-RESPONSE BIAS CHECK - GENDER

Mainland Departure Location	Approached for Survey		Completed Survey	
	Male	Female	Male	Female
Bay Shore Routes	53.8%	46.2%	51.0%	49.0%
Sayville Routes	62.3%	37.7%	59.7%	40.3%
Patchogue Routes	47.6%	52.4%	53.3%	46.7%

3.2 Survey Instrument

As noted earlier, prior to the actual implementation of the survey, much effort was directed towards the proper design of the survey instrument and the planning of the administration of the survey. Guidance regarding the state of the practice in travel and visitor survey design and implementation was obtained from publications such as the *Travel Survey Manual* (July 1996), developed by the U.S. Department of Transportation and the U.S. Environmental Protection Agency.

Extensive comments regarding the survey design were also elicited from the three ferry operators, with modifications made to the survey design as necessary. Pursuant to the requirements of the Paperwork Reduction Act of 1995, all necessary approvals required for this data collection were obtained from the Office of Management and Budget (OMB), utilizing the expedited approval process for National Park Service visitor surveys that is overseen and implemented by the National Park Service Social Science Program in cooperation with OMB. To provide for ease of completion onboard the ferries, the survey instruments were printed on a single, double-sided 8.5"x11" page, using a heavy weight card stock pa-

per. Copies of the actual double-sided survey instrument are presented in Figure 3-1 (page 1) and (page 2).

FIGURE 3-1: FERRY TRANSPORTATION SURVEY INSTRUMENT (PAGE 1)

Ferry Transportation Survey

OMB Control Number 1024-0224 NPS Identification Number NPS00-029
Expiration Date: 03/31/01

This survey is being conducted by the National Park Service in cooperation with Fire Island Ferries, Sayville Ferry Service, and the Davis Park Ferry Company, to help determine how ferry service to Fire Island can be improved. Please help us by answering as many questions as you can. After completing the survey, place it into the receptacle marked "Completed Ferry Surveys" onboard the ferry.

THANK YOU

Please answer some questions about this ferry trip:

(1) What day of the week is today? (check one only)

❑ *Thursday* ❑ *Friday* ❑ *Saturday*

(2) What is the mainland ferry terminal for this ferry route? (check one only)

❑ *Bay Shore* ❑ *Sayville* ❑ *Patchogue*

(3) Which of the following best describes the type of transportation you used to arrive at the mainland ferry terminal before you boarded the ferry? (check one only)

❑ *Drove and parked at ferry terminal*
❑ *Drove and was dropped off at ferry terminal*
❑ *Long Island Rail Road, then walked to ferry terminal*
❑ *Long Island Rail Road, then took taxi to ferry terminal*
❑ *Long Island Rail Road, then took bus to ferry terminal*
❑ *Air travel, then took taxi from airport to ferry terminal*
❑ *Air travel, then drove rental car from airport to ferry terminal*
❑ *None of the above (please specify):* _____
❑ *Taxi only*
❑ *Minibus only*
❑ *Transit Bus only*
❑ *Intercity Bus / Coach Bus only*
❑ *Bicycle*

(4) At what ferry terminal on Fire Island will you be ending this ferry trip? (check one only)

❑ *Atlantique* ❑ *Barrett Beach* ❑ *Cherry Grove* ❑ *Davis Park*
❑ *Dunewood* ❑ *Fair Harbor* ❑ *Fire Island Pines* ❑ *Kismet*
❑ *Ocean Bay Park* ❑ *Ocean Beach* ❑ *Sailors Haven* ❑ *Saltaire*
❑ *Seaview* ❑ *Watch Hill* ❑ *Water Island*

(5) Fire Island is a National Seashore (a unit of the National Park System). Were you aware that you enter a National Seashore when traveling to Fire Island by ferry? (check one only)

❑ *Yes* ❑ *No*

(6) How many people, including yourself, are in your traveling party on this ferry trip?: _____

(7) Several measures of service quality are listed below. Please mark a single box on each line that best indicates your opinion of service on this ferry route.

	very good	good	average	poor	very poor	no opinion	not applicable
(a) Frequency of service	1	2	3	4	5	6	N/A
(b) Travel time	1	2	3	4	5	6	N/A
(c) Comfort of ride	1	2	3	4	5	6	N/A
(d) Availability of seats	1	2	3	4	5	6	N/A
(e) Availability of schedule information	1	2	3	4	5	6	N/A
(f) Convenience of buying tickets	1	2	3	4	5	6	N/A
(g) Vehicle security at parking facilities	1	2	3	4	5	6	N/A
(h) Personal security at ferry terminals	1	2	3	4	5	6	N/A
(i) Safety while traveling on the ferry	1	2	3	4	5	6	N/A
(j) Ferry terminal condition & cleanliness	1	2	3	4	5	6	N/A
(k) Road signs directing you to the mainland ferry terminal	1	2	3	4	5	6	N/A
(l) Availability of parking at ferry terminals	1	2	3	4	5	6	N/A

(CONTINUED ON THE REVERSE SIDE)

FIGURE 3-1: FERRY TRANSPORTATION SURVEY INSTRUMENT (PAGE 2)

(CONTINUED FROM THE REVERSE SIDE)

(8) If new ferry routes were to be introduced, what potential new ferry routes, if any, would you find desirable? (check all that apply - if no opinion leave all blank)

- ❑ No new routes needed, existing routes are sufficient
- ❑ Bay Shore - Fire Island Lighthouse
- ❑ Sayville - Fire Island Lighthouse
- ❑ Heckscher State Park - Fire Island Lighthouse
- ❑ Patchogue - Barrett Beach
- ❑ Patchogue - Fire Island Lighthouse
- ❑ Heckscher State Park - Sailors Haven
- ❑ Coastwise (east-west) water taxi service along Fire Island serving National Seashore areas (for example, Fire Island Lighthouse, Sailors Haven, Barrett Beach, Watch Hill, Otis Pike Wilderness Area)
- ❑ Other Route (please specify):_____

Please answer some questions about yourself:

(9) What is the zip code where your permanent residence is located?: _____
If not a U.S. resident, in what country is your permanent residence located?: _____

(10) Which of the following best describes you on this trip? (check one only)

- ❑ *visiting Fire Island for a single day with no overnight stay*
- ❑ *visiting Fire Island for 1 to 2 nights*
- ❑ *visiting Fire Island for 3 nights to one month*
- ❑ *living continuously on Fire Island for more than 1 month, but less than 12 months per year*
- ❑ *permanently and continuously residing on Fire Island year round*

(11) How many round trips have you taken on this ferry route in the last 12 months? _____

(12) What is your age? (check one only)

❑ *18 to 24* ❑ *25 to 34* ❑ *35 to 44* ❑ *45 to 64* ❑ *65 or over*

(13) What is your gender? (check one only)

❑ *Male* ❑ *Female*

(14) What is your annual household pre-tax income? (check one only)
(this information will be used for statistical purposes only)

- ❑ *Under $25,000*
- ❑ *$25,000 to $49,999*
- ❑ *$50,000 to $74,999*
- ❑ *$75,000 to $99,999*
- ❑ *$100,000 or more*

Additional Comments/Suggestions:

*** ***Please place your completed survey into the receptacle marked "Completed Ferry Surveys" onboard the ferry - THANK YOU*** ***

PAPERWORK REDUCTION ACT STATEMENT

16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by park managers to better serve the public. Response to this request is voluntary. No action may be taken against you for refusing to supply the information requested. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Burden estimate statement: Public reporting for this form is estimated to average 5 minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to the Office of Information and Regulatory Affairs of OMB, Attention Desk Officer for the Interior Department, Office of Management and Budget, Washington, D.C. 20503; and to the Information Collection Clearance Officer, WASO Administrative Program Center, National Park Service, 1849 C Street, Washington, D.C. 20240.

3.3 Corrections and Adjustments

Overall, the completeness and accuracy observed on the returned surveys was greater than was initially expected. Virtually all completed survey instruments that were collected resulted in useable responses. Five survey responses had infeasible combinations of mainland ferry terminal and island ferry terminal (i.e., indicated a route that does not exist). It is thought that in some cases perhaps these respondents were indicating the island community that was their *ultimate* destination for their travel that day (not the community where the ferry was docking). For survey responses that could be identified with a particular vessel departure on the basis of the non-response bias checks, corrections were made accordingly. For Question #6 (travel party size), several respondents state "0." These responses were adjusted to "1" on the assumption that the respondent misunderstood the question and did not include themselves in the party size, as instructed to.

3.4 Findings

3.4.1 Day of Week

As noted earlier, surveys were administered over a three day period, Thursday through Saturday, in order to reduce the overall number of persons in the respondent universe to a more manageable number, while still being representative of the three distinct periods of ferry travel (Weekday, Friday, and Weekend) that are generally thought to occur during a typical summer week for the Fire Island market. As shown in Table 3-6, activity levels on Friday and Saturday, as represented by the number of schedule mainland vessel departures, are approximately equivalent at about 160 mainland vessel departures per day. Activity on Thursday, at 111 mainland vessel departures, is about 33% less than on Friday an Saturday.

TABLE 3-6: VARIATION IN SCHEDULED VESSEL TRIPS AND SURVEY RESPONSES BY DAY OF WEEK

Day of Week	Survey Responses		Scheduled Mainland Vessel Departures	
	Number	% of Total	Number	% of Total
Thursday	91	22.9%	111	25.7%
Friday	150	37.8%	164	38.0%
Saturday	156	39.3%	157	36.3%
TOTALS	397	100.0%	432	100.0%

As one would hope, the distribution of the number of survey responses by day of week, also shown in Table 3-6, corresponds closely to the number of scheduled vessel departures, with approximately 40% of all survey responses received on Friday, another 40% on Saturday, and 20% received on Thursday.

3.4.2 Route

Table 3-7 presents a comparison of the number of survey responses and the annual ridership on each of the ferry routes surveyed. From the table, it appears that passengers from Bay Shore may have been slightly over sampled, since Bay Shore represents 67.8% of all survey responses received, but represents an estimated 56.3% of total annual ridership for all three mainland ferry terminal locations. This may have resulted from the fact that many vessel departures originating in Bay Shore were "paired" trips, as noted earlier, in which a single vessel departure from Bay Shore would visit two different Fire Island ferry terminal destinations, thus allowing two routes to be surveyed with only a single survey distribution for a single vessel departure. For Patchogue, it appears that Davis Park was under sampled. As can be seen in Table 3-2 presented earlier, because of limited staff available to administer the survey, the number of vessels surveyed for Davis Park were approximately half what they would have been ideally, given the fact that vessel departures to Davis Park outnumbered vessel departures to Watch Hill by approximately two to one for the survey period. However, the annual ridership for the Davis Park route is an estimate because actual ridership data for this route was not available, which may make the under sampling for this route appear worse than it actually is. For Sayville, the relative proportion of survey responses by route corresponds closely with the relatively proportion of annual ridership by route.

TABLE 3-7: SURVEY RESPONSES AND ANNUAL RIDERSHIP BY ROUTE

Mainland Departure Location	Island Terminal Location	Survey Responses			Annual Ridership		
		Number	% of Subtotal	% Grand Total	Number	% of Subtotal	% Grand Total
Bay Shore	Kismet	28	10.4%	7.1%	89,892	11.2%	6.3%
Bay Shore	Saltaire	34	12.6%	8.6%	101,720	12.7%	7.2%
Bay Shore	Fair Harbor	51	19.0%	12.8%	89,892	11.2%	6.3%
Bay Shore	Dunewood	33	12.3%	8.3%	65,376	8.2%	4.6%
Bay Shore	Atlantique	10	3.7%	2.5%	49,032	6.1%	3.5%
Bay Shore	Ocean Beach	28	10.4%	7.1%	167,097	20.9%	11.8%
Bay Shore	Seaview	23	8.6%	5.8%	122,581	15.3%	8.6%
Bay Shore	Ocean Bay Park	62	23.0%	15.6%	114,089	14.3%	8.0%
Bay Shore Subtotals		**269**	**100.0%**	**67.8%**	**799,679**	**100.0%**	**56.3%**
Sayville	Sailors Haven	12	12.1%	3.0%	60,500	13.3%	4.3%
Sayville	Cherry Grove	32	32.3%	8.1%	180,000	39.7%	12.7%
Sayville	Fire Island Pines	43	43.4%	10.8%	210,000	46.3%	14.8%
Sayville	Barrett Beach	1	1.0%	0.3%	340	0.1%	0.0%
Sayville	Water Island	11	11.1%	2.8%	3,000	0.7%	0.2%
Sayville Subtotals		**99**	**100.0%**	**24.9%**	**453,840**	**100.0%**	**32.0%**
Patchogue	Davis Park	11	37.9%	2.8%	140,000	84.4%	9.9%
Patchogue	Watch Hill	18	62.1%	4.5%	25,815	15.6%	1.8%
Patchogue Subtotals		**29**	**100.0%**	**7.3%**	**165,815**	**100.0%**	**11.7%**
GRAND TOTAL		**397**	n/a	**100.0%**	**1,419,334**	n/a	**100.0%**

Notes: Route specific ridership for individual routes operating out of Bay Shore are estimates, based on reported total ridership for all routes and allocated based upon vessel operating schedules and community populations. Route specific ridership for Patchogue to Davis Park is an estimate, based on vessel operating schedules.

3.4.3 Transportation Mode Used to Access Mainland Ferry Terminal

The results of the analysis of ground transportation modes of travel used to access the three mainland ferry departure locations being surveyed are presented in Table 3-8. The data is presented by individual route, and by each mainland departure location overall.

As expected, the *"Drove and parked at ferry terminal"* access mode was the most frequently reported by survey respondents at 55.7% overall, ranging from a low of 53.2% at Bay Shore, to a high of 62.1% at Patchogue. Other automobile oriented access modes include the "*Drove and was dropped off at ferry terminal*" access mode, which represented 7.6% of survey respondents overall, followed next by the "*Other - Drove and parked elsewhere*" access mode, with 5.0%, typically representing travelers who parked at a municipal parking lot in Bay Shore then walked or took a taxi to the ferry terminal.

Survey respondents reporting use of the Long Island Rail Road (LIRR) commuter rail represented the ground access mode of nearly 23% of survey respondents overall, with the "*Long Island Rail Road, then took taxi to ferry terminal*" access mode (at 12.9% overall) representing the bulk of those LIRR users. Use of LIRR was highest at Patchogue, with 31% of survey respondents there reporting use of LIRR. Of particular note is the impressive 44.5% of survey respondents on the Watch Hill route who reported use of LIRR as their ground access mode, likely due in large part to the close proximity of the Patchogue NPS Watch Hill ferry terminal to the LIRR station at Patchogue. This is an encouraging result, and indicates that future plans for ferry terminal improvements at the Patchogue NPS Watch Hill ferry terminal are likely to encourage the use of this transit mode for access to the ferry system and to Fire Island, thereby reducing the potential impacts of automobile oriented ground access modes and potential difficulty in providing adequate parking capacity, particularly for peak summer weekends.

A surprisingly small number (0.5% overall) of survey respondents reported the "*Other - Drove and parked at train station*" access mode, perhaps indicating an opportunity to improve traveler awareness of these parking facilities on peak weekends for use as overflow parking facilities when the ferry operator parking facilities are at capacity.

TABLE 3-8: FERRY TERMINAL GROUND ACCESS MODES BY MAINLAND DEPARTURE LOCATION AND ROUTE

Ferry Terminal Ground Access Mode	All Mainland Departure Locations	Bay Shore										
		Bay Shore - All Routes	Kismet	Saltaire	Fair Harbor	Dunewood	Water Island	Atlantique	Ocean Beach	Seaview	Ocean Bay Park
Drove and parked at ferry terminal	55.7%	53.2%	57.1%	55.9%	49.0%	57.6%	18.2%	20.0%	35.7%	82.6%	53.2%
Drove and was dropped off at ferry terminal	7.6%	10.4%	17.9%	5.9%	2.0%	9.1%	---	30.0%	10.7%	---	17.7%
Long Island Rail Road, then walked to ferry terminal	3.5%	2.6%	---	---	3.9%	---	---	10.0%	10.7%	4.4%	---
Long Island Rail Road, then took taxi to ferry terminal	12.9%	10.8%	7.1%	14.7%	19.6%	3.0%	72.7%	30.0%	14.3%	4.4%	4.8%
Long Island Rail Road, then took bus to ferry terminal	6.6%	5.9%	3.6%	8.8%	5.9%	9.1%	---	---	14.3%	4.4%	1.6%
Air travel, then took taxi from airport to ferry terminal	1.3%	0.7%	---	---	3.9%	---	---	---	---	---	---
Air travel, then drove rental car from airport to ferry terminal	---	---	---	---	---	3.0%	---	---	---	---	---
Taxi only	1.8%	1.9%	3.6%	2.9%	---	6.1%	---	---	3.6%	4.4%	---
Minibus only	2.5%	3.7%	---	5.9%	5.9%	---	---	---	3.6%	---	3.2%
Transit Bus only	---	---	---	---	---	---	---	---	---	---	---
Intercity Bus / Coach Bus only	---	---	---	---	---	---	---	---	---	---	---
Bicycle	0.5%	0.7%	---	---	3.9%	---	---	---	---	---	---
Other - Walk Only	1.0%	0.7%	3.6%	---	---	---	---	---	---	---	1.6%
Other - Drove and parked at train station	0.5%	0.7%	---	---	---	---	---	---	---	---	3.2%
Other - Drove and parked elsewhere (e.g., muni. lot, etc.)	5.0%	6.7%	---	---	3.9%	12.1%	---	10.0%	7.1%	---	14.5%
Other	1.0%	1.5%	3.6%	5.9%	2.0%	---	---	---	---	---	---
No Response	0.3%	0.4%	3.6%	---	---	---	---	---	---	---	---
TOTALS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
TOTAL SURVEY RESPONSES	**397**	**269**	**28**	**34**	**51**	**33**	**11**	**10**	**28**	**23**	**62**

Ferry Terminal Ground Access Mode	Sayville						Patchogue			
	Sayville - All Routes	Sailors Haven	Cherry Grove	Fire Island Pines	Barrett Beach	Water Island	Patchogue - All Routes	Ocean Beach	Davis Park	Watch Hill
Drove and parked at ferry terminal	60.6%	58.3%	84.4%	53.5%	100.0%	18.2%	62.1%	81.8%	50.0%	
Drove and was dropped off at ferry terminal	2.0%	8.3%	3.1%	---	---	---	---	---	---	
Long Island Rail Road, then walked to ferry terminal	---	---	---	---	---	---	24.1%	---	38.9%	
Long Island Rail Road, then took taxi to ferry terminal	20.2%	8.3%	6.3%	20.9%	---	72.7%	6.9%	9.1%	5.6%	
Long Island Rail Road, then took bus to ferry terminal	10.1%	---	6.3%	18.6%	---	---	---	---	---	
Air travel, then took taxi from airport to ferry terminal	3.0%	8.3%	---	4.7%	---	---	---	---	---	
Air travel, then drove rental car from airport to ferry terminal	---	---	---	---	---	---	---	---	---	
Taxi only	1.0%	---	---	2.3%	---	---	3.4%	9.1%	---	
Minibus only	---	---	---	---	---	---	---	---	---	
Transit Bus only	---	---	---	---	---	---	---	---	---	
Intercity Bus / Coach Bus only	---	---	---	---	---	---	---	---	---	
Bicycle	---	---	---	---	---	---	---	---	---	
Other - Walk Only	1.0%	8.3%	---	---	---	---	3.4%	---	5.6%	
Other - Drove and parked at train station	---	---	---	---	---	---	---	---	---	
Other - Drove and parked elsewhere (e.g., muni. lot, etc.)	2.0%	8.3%	---	---	---	9.1%	---	---	---	
Other	---	---	---	---	---	---	---	---	---	
No Response	---	---	---	---	---	---	---	---	---	
TOTALS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	100.0%	100.0%	
TOTAL SURVEY RESPONSES	**99**	**12**	**32**	**43**	**1**	**11**	**29**	**11**	**18**	

3.4.4 Awareness of Fire Island National Seashore

Overall, in response to the survey question *"Fire Island is a National Seashore (a unit of the National Park System). Were you aware that you enter a National Seashore when traveling to Fire Island by Ferry?*" (Question #5), nearly 75% of ferry travelers responded in the affirmative (see Table 3-9).

TABLE 3-9: AWARENESS OF FIRE ISLAND NATIONAL SEASHORE BY FERRY TRAVELERS

Mainland Departure Location	Fire Island Destination	Awareness of Fire Island Natl. Seashore			
		Number		% of Total by Route	
		Yes	No	Yes	No
Bay Shore	Kismet	20	8	71.4%	28.6%
Bay Shore	Saltaire	27	7	79.4%	20.6%
Bay Shore	Fair Harbor	37	14	72.5%	27.5%
Bay Shore	Dunewood	27	5	84.4%	15.6%
Bay Shore	Atlantique	8	2	80.0%	20.0%
Bay Shore	Ocean Beach	15	12	55.6%	44.4%
Bay Shore	Seaview	15	8	65.2%	34.8%
Bay Shore	Ocean Bay Park	44	18	71.0%	29.0%
Bay Shore Subtotal		**193**	**74**	**72.3%**	**27.7%**
Sayville	Sailors Haven	10	2	83.3%	16.7%
Sayville	Cherry Grove	23	9	71.9%	28.1%
Sayville	Fire Island Pines	31	12	72.1%	27.9%
Sayville	Barrett Beach	1	0	100.0%	0.0%
Sayville	Water Island	10	1	90.9%	9.1%
Sayville Subtotal		**75**	**24**	**75.8%**	**24.2%**
Patchogue	Davis Park	8	3	72.7%	27.3%
Patchogue	Watch Hill	15	3	83.3%	16.7%
Patchogue Subtotal		**23**	**6**	**79.3%**	**20.7%**
GRAND TOTAL		**291**	**104**	**73.7%**	**26.3%**

Notes: Ocean Beach and Dunewood also had one "No Response" each.

By route, this awareness ranged from a low of 55.6% of travelers on the Bay Shore to Ocean Beach route, to a high of 90.9% on the Sayville to Water Island route. As one would expect, awareness of the National Seashore among passengers traveling on routes to NPS visitor centers such as Sailors Haven and Watch Hill exceeds 80%, and are among the four highest routes in terms of awareness (the other two being Bay Shore to Dunewood at 84.4%, and Sayville to Water Island at 90.9% as noted earlier).

3.4.5 Travel Party Size

As noted earlier, several survey respondents stated "0" in answer to this question, however these few responses were corrected to the value "1" on the assumption that the respondent misunderstood the question and did not include themselves, as instructed, when answering. Findings regarding party size by route are presented in Table 3-10.

TABLE 3-10: TRAVEL PARTY SIZE

Mainland Departure Location	Fire Island Destination	Survey Reponses	Average Party Size	Percent of Responses by Route and Party Size Category					
				1	2	3	4	5	6 or more
Bay Shore	Kismet	28	2.4(1)	42.9%	17.9%	17.9%	10.7%	--	10.7%
Bay Shore	Saltaire	33	1.9	39.4%	42.4%	12.1%	3.0%	3.0%	--
Bay Shore	Fair Harbor	51	1.8	51.0%	33.3%	7.8%	5.9%	--	2.0%
Bay Shore	Dunewood	32	2.0	37.5%	37.5%	12.5%	9.4%	3.1%	--
Bay Shore	Atlantique	10	2.2	40.0%	30.0%	--	30.0%	--	--
Bay Shore	Ocean Beach	27	1.8(2)	37.0%	48.1%	7.4%	3.7%	--	3.7%
Bay Shore	Seaview	23	2.2	43.5%	26.1%	8.7%	13.0%	4.3%	4.3%
Bay Shore	Ocean Bay Park	62	2.0	43.5%	35.5%	8.1%	6.5%	3.2%	3.2%
Bay Shore Subtotal		**266**	**2.2**	**42.9%**	**34.6%**	**9.8%**	**7.9%**	**1.9%**	**3.0%**
Sayville	Sailors Haven	11	3.4	9.1%	45.5%	9.1%	18.2%	9.1%	9.1%
Sayville	Cherry Grove	32	2.0	40.6%	46.9%	3.1%	--	3.1%	6.3%
Sayville	Fire Island Pines	43	2.1	32.6%	48.8%	2.3%	11.6%	--	4.7%
Sayville	Barrett Beach	1	1.0	100.0%	--	--	--	--	--
Sayville	Water Island	11	2.9	18.2%	63.6%	--	9.1%	--	9.1%
Sayville Subtotal		**98**	**2.3**	**31.6%**	**49.0%**	**3.1%**	**8.2%**	**2.0%**	**6.1%**
Patchogue	Davis Park	10	1.7	50.0%	30.0%	20.0%	--	--	--
Patchogue	Watch Hill	18	3.4	16.7%	33.3%	16.7%	22.2%	--	11.1%
Patchogue Subtotal		**28**	**2.8**	**28.6%**	**32.1%**	**17.9%**	**14.3%**	**0.0%**	**7.1%**
GRAND TOTAL		**392**	**2.3**	**39.0%**	**38.0%**	**8.7%**	**8.4%**	**1.8%**	**4.1%**

Notes: Saltaire, Dunewood, Ocean Beach, Sailors Haven and Davis Park each a one "No Response."

(1) The average for Kismet excludes one reported value for party size of 37, in order not to distort the overall average for this route.

(2) The average for Ocean Beach excludes one reported value for party size of 25, in order not to distort the overall average for this route.

As shown in the table, the average party size for routes out of Bay Shore and Sayville are approximately the same at about 2.2 to 2.3 persons per travel party. For routes out of Patchogue, however, the overall average party size is larger at 2.8 persons per travel party. However, this overall average for Patchogue reflects a combination of the lowest party size (for Davis Park) with the highest party size (for Watch Hill). The two NPS routes serving Sailors Haven and Watch Hill have the highest party size of all routes surveyed, at 3.4 persons per travel party on average, perhaps reflecting a greater proportion of family groups visiting these sites than visiting other communities on Fire Island.

3.4.6 Service Quality Measures

As shown on page 1 of the survey instrument presented earlier in Figure 3-1, survey respondents were asked to rank order, from "very good" to "very poor", twelve different measures of service quality. The service measures analyzed, which were selected in cooperation with the ferry operators, included

(1) Frequency of service
(2) Travel time
(3) Comfort of ride
(4) Availability of seats
(5) Availability of schedule information
(6) Convenience of buying tickets
(7) Vehicle security at parking facilities
(8) Personal security at ferry terminals
(9) Safety while traveling on the ferry
(10) Ferry terminal condition & cleanliness
(11) Road signs directing you to the mainland ferry terminal
(12) Availability of parking at ferry terminals

Service quality findings are presented by route and mainland departure location in Table 3-11. The service quality values presented in Table 3-11 may not be entirely comparable among different mainland departure locations or routes because of the characteristics of the different sub-populations of

TABLE 3-11: SERVICE QUALITY FINDINGS

Mainland Departure Location	Fire Island Destination	Average Value for Surveys That Indicated an Opinion											
		Frequency of service	Travel time	Comfort of ride	Availability of Seats	Availability of schedule information	Convenience of buying tickets	Vehicle security at parking facilities	Personal security at ferry terminals	Safety while traveling on ferry	Ferry terminal condition and cleanliness	Road signs directing you to the mainland ferry terminal	Availability of parking at ferry terminals
Bay Shore	Kismet	2.2	2.0	2.2	2.1	1.9	1.9	2.2	2.3	1.9	2.2	2.6	3.3
Bay Shore	Saltaire	2.0	1.8	2.1	1.7	1.8	1.6	2.0	1.8	1.6	2.2	2.4	3.1
Bay Shore	Fair Harbor	2.1	1.7	1.9	1.7	1.5	1.8	1.9	1.7	1.4	2.2	2.4	3.1
Bay Shore	Dunewood	2.4	2.0	1.9	1.8	1.7	1.9	1.8	1.8	1.6	2.1	2.5	3.5
Bay Shore	Atlantique	2.9	1.7	1.9	1.6	1.7	1.9	2.2	1.9	1.4	2.1	2.8	3.6
Bay Shore	Ocean Beach	2.2	2.1	2.4	2.2	1.8	1.9	2.2	1.8	1.7	2.4	2.4	3.5
Bay Shore	Seaview	2.0	2.1	2.3	2.0	1.7	1.6	2.0	2.1	1.9	2.2	2.7	2.5
Bay Shore	Ocean Bay Park	1.8	1.9	2.2	1.9	1.5	1.6	2.0	1.9	1.8	2.0	2.3	3.1
Bay Shore Subtotal		**2.1**	**1.9**	**2.1**	**1.9**	**1.7**	**1.7**	**2.0**	**1.9**	**1.7**	**2.2**	**2.4**	**3.2**
Sayville	Sailors Haven	2.1	2.0	1.9	2.0	1.8	1.5	2.0	2.1	1.9	2.1	2.2	2.8
Sayville	Cherry Grove	1.8	1.6	1.9	2.0	1.9	1.8	2.3	2.1	1.9	2.1	2.3	2.7
Sayville	Fire Island Pines	2.0	1.6	2.0	1.8	1.8	1.7	2.2	1.9	1.7	2.2	2.0	2.2
Sayville	Barrett Beach	5.0	1.0	1.0	1.0	5.0	1.0	3.0	3.0	1.0	1.0	1.0	4.0
Sayville	Water Island	2.9	1.6	2.4	1.6	2.3	1.5	1.7	1.6	1.3	1.7	2.0	1.7
Sayville Subtotal		**2.1**	**1.6**	**2.0**	**1.9**	**1.9**	**1.7**	**2.2**	**2.0**	**1.7**	**2.1**	**2.1**	**2.4**
Patchogue	Davis Park	1.9	1.6	2.0	1.8	1.6	1.7	2.8	2.2	1.7	2.4	2.8	2.2
Patchogue	Watch Hill	2.8	2.2	2.4	1.9	2.5	1.9	2.7	2.2	2.1	2.5	2.3	2.2
Patchogue Subtotal		**2.4**	**2.0**	**2.3**	**1.8**	**2.2**	**1.8**	**2.8**	**2.2**	**2.0**	**2.5**	**2.5**	**2.2**
GRAND TOTAL		**2.1**	**1.8**	**2.1**	**1.9**	**1.8**	**1.7**	**2.1**	**1.9**	**1.7**	**2.2**	**2.4**	**2.9**

Notes: Lower values indictate superior performance, and higher values indicate inferior performance. The original number scheme was:
1 = "very good" 2 = "good" 3 = "average" 4 = "poor" 5 = "very poor"

riders traveling on each route. The findings are best utilized in analyzing the relative service quality measures for a given single route.

Overall, most performance measures fall in the vicinity of the "good" range, extending from an overall low of 2.9 (for availability of parking) up to a high of 1.7 (for safety while on ferry, and convenience of buying tickets). Therefore, in general, travelers appear to be pleased overall with their ferry travel experience. In particular, "*Safety while traveling on ferry*" is tied for best performing service quality area at 1.7, along with "*Convenience of buying tickets*." Some areas of relative concern, however, would appear to be "*Availability of parking at ferry terminals*" (which scored a 2.9 overall) and "*Road signs directing you to the mainland ferry terminal*" (which scored a 2.4 overall). Although both of these areas score above the average value (3), they do exhibit inferior performance relative to the other service quality measures analyzed.

For parking availability, Bay Shore appears to have the most concerns on the part of travelers, with 6 of the 8 routes surveyed scoring just below average in this area. Because the weekend during which the survey was administered experienced exceptionally good weather, parking facilities were full or nearly full at all three mainland departure locations, perhaps resulting in an unusually negative response by travelers regarding a lack of adequate parking capacity.

Overall, "*Travel time*" is tied for second place with "*Availability of schedule information*" scoring a 1.8, which would appear to indicate that having shorter travel times and higher speed ferries is not a particular concern among travelers.

Of particular note, the Patchogue NPS Watch Hill ferry terminal scored the worst among all mainland departure locations on the "*Ferry terminal condition & cleanliness*" service quality measure. Plans to build a new ferry terminal in this location should serve to rectify this situation. This route also scored second worst of all 15 routes surveyed in the "*Frequency of service*" measure, indicating a desire on the part of passengers for more frequent service to this destination. Service from Sayville to Sailors Haven appears to perform well in all service quality areas, except for parking availability.

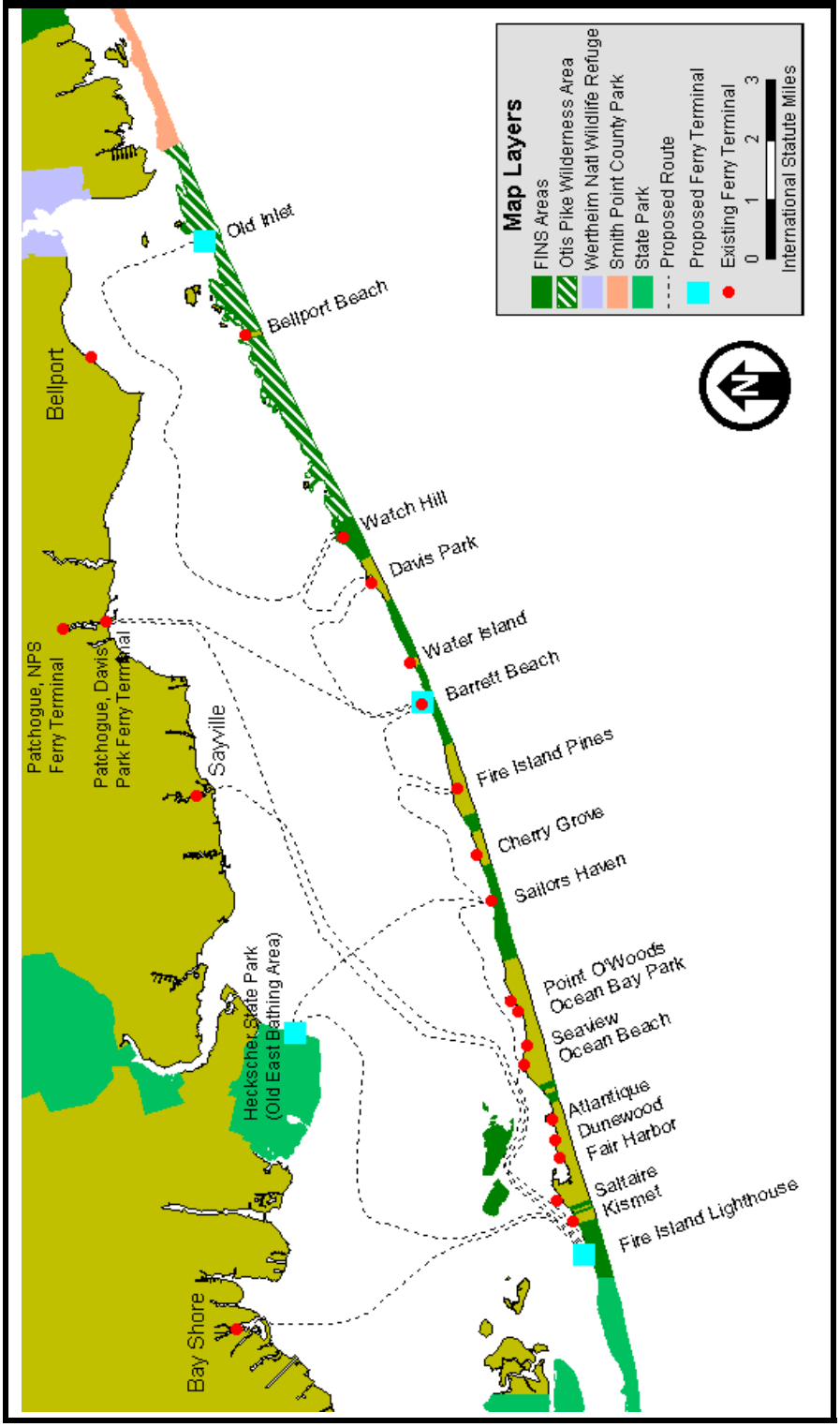
3.4.7 New Routes

Question #9 presented respondents with a list of possible new ferry routes, and asked travelers to provided feedback regarding the potential desirability of these routes. The specific routes indicated on the survey instrument included:

(1) Bay Shore to Fire Island Lighthouse
(2) Sayville to Fire Island Lighthouse
(3) Heckscher State Park to Fire Island Lighthouse
(4) Patchogue to Fire Island Lighthouse
(5) Patchogue to Barrett Beach
(6) Heckscher State Park to Sailors Haven
(7) Lateral (east-west) water taxi service serving National Seashore areas
(8) Other route (specify)

Route options (1) through (7) are presented in Figure 3-2 for reference. A response option indicating that the traveler felt that no new routes were needed and that existing routes were sufficient was also provided. The findings are presented in Table 3-12.

FIGURE 3-2: POTENTIAL NEW FERRY ROUTES FOR WHICH OPINIONS REGARDING DESIRABILITY WERE OBTAINED



Favorable responses regarding the coastwise (east-west) water taxi service received by far the largest number of positive responses, with 67 overall. Of the four proposed routes serving Fire Island Lighthouse, the Bay Shore to Fire Island Lighthouse route received more favorable responses (30) than the other three possible Fire Island Lighthouse routes combined. In particular, the Heckscher State Park to Fire Island Lighthouse route performed particularly poorly, given its relative proximity to Fire Island Lighthouse in comparison to Sayville and Patchogue. The proposed Heckscher State Park to Sailors Haven route also received little support, with only five favorable responses. Somewhat surprisingly, of the "Other" category where respondents could specify a route not listed on the survey form, twelve respondents proposed a route from New York City to Fire Island. This was a greater number of favorable responses than for any other routes that were proposed by survey respondents under the "Other" category. Overall, the New York City to Fire Island route received the fourth highest number of favorable responses, albeit far behind the water taxi route and the Bay Shore to Fire Island Lighthouse route.

TABLE 3-12: FEEDBACK REGARDING POSSIBLE NEW FERRY ROUTES

New Route	Number of Favorable Responses			
	For All Completed Surveys	For Surveys Completed out of Bay Shore	For Surveys Completed out of Sayville	For Surveys Completed out of Patchogue
Bay Shore to Fire Island Lighthouse	30	24	6	--
Sayville to Fire Island Lighthouse	13	7	5	1
Heckscher State Park to Fire Island Lighthouse	7	5	2	--
Patchogue to Fire Island Lighthouse	8	3		5
Patchogue to Barrett Beach	8	3	1	4
Heckscher State Park to Sailors Haven	5	3	1	1
Lateral Water Taxi	67	48	16	8
Other - New York City to Great South Bay/Fire Island	12	8	4	--
Other - Other New Cross-Bay Ferry Service (not listed above)	10	6	4	--
Other - Improvements to Existing Cross-Bay Ferry Routes	5	2	3	--
Other	2	2	--	--
No new routes needed, existing routes are sufficient	144	93	38	13

3.4.8 Location of Permanent Residence

Based on responses to Question #9 (zip code of permanent residence), the spatial distribution of the residential origin of the ferry travelers who were surveyed was determined. Nearly 90% of travelers who responded to the survey indicated that their permanent residence was located in a zip code in the state of New York. In addition to visitors whose permanent residence was located within the state of New York, survey respondents originated from eleven other states, as indicated in Table 3-13. Travelers from New Jersey represent the largest source of visitors outside of the state of New York, with 6% of respondents having a permanent residence located in New Jersey. Though the southern part of the state of Connecticut is located in relative geographic proximity to Fire Island, a one hour and fifteen minute ferry ride across Long Island Sound from Bridgeport, CT to Port Jefferson, NY, costing in excess of $80 for a round trip for a vehicle and a driver, provides more than sufficient disincentive for travelers, as reflected in the low number of respondents originating from this state. In addition to out-of-state visitors, four survey respondents indicated that their permanent residence was located in a foreign country. The countries reported by these respondents included the United Kingdom, Israel, South Korea, and Australia.

TABLE 3-13: LOCATION OF PERMANENT RESIDENCE BY STATE

State	Responses	Percent of Responses
New York	343	88.9%
New Jersey	23	6.0%
Georgia	4	1.0%
Massachusetts	3	0.8%
Florida	3	0.8%
Connecticut	3	0.8%
District of Columbia	2	0.5%
Pennsylvania	1	0.3%
North Carolina	1	0.3%
Maryland	1	0.3%
California	1	0.3%
Arizona	1	0.3%

For travelers originating from within the state of New York, Figure 3-3 shows the spatial distribution of their permanent residence by zip code. The vast majority of New York state-based visitors originate in the metropolitan New York City and Long Island area. The two primary areas from which the greatest absolute number of visitors originate include the communities of western Suffolk County in the vicinity of the three mainland ferry departure locations of Bay Shore, Sayville and Patchogue, and Manhattan in New York City.

Other significant areas from which travelers originate include areas of Suffolk County extending to the north shore of Long Island in the vicinity of communities such as Central Islip and St. James, and

Brooklyn in New York City. Of course, one would expect New York City to be the source of a large number of visitors solely by virtue of its large population. To account for this, Figure 3-4 presents the spatial distribution of the *rate* of response to the survey for each zip code, that is, the number of survey responses for each zip code divided by the population of each zip code.

FIGURE 3-3: PERMANENT RESIDENCE OF FERRY TRAVELERS - NUMBER OF SURVEY RESPONSES

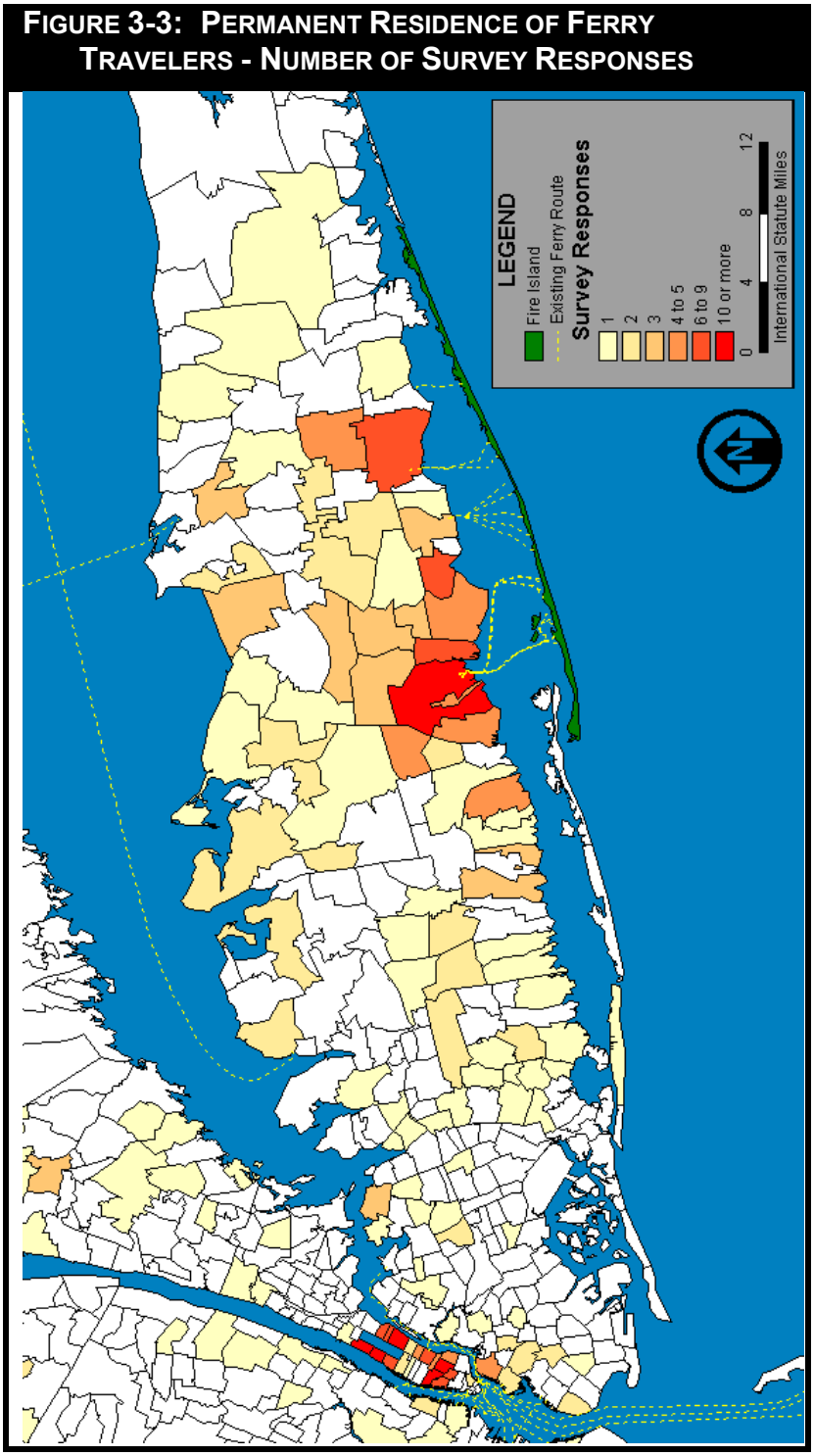
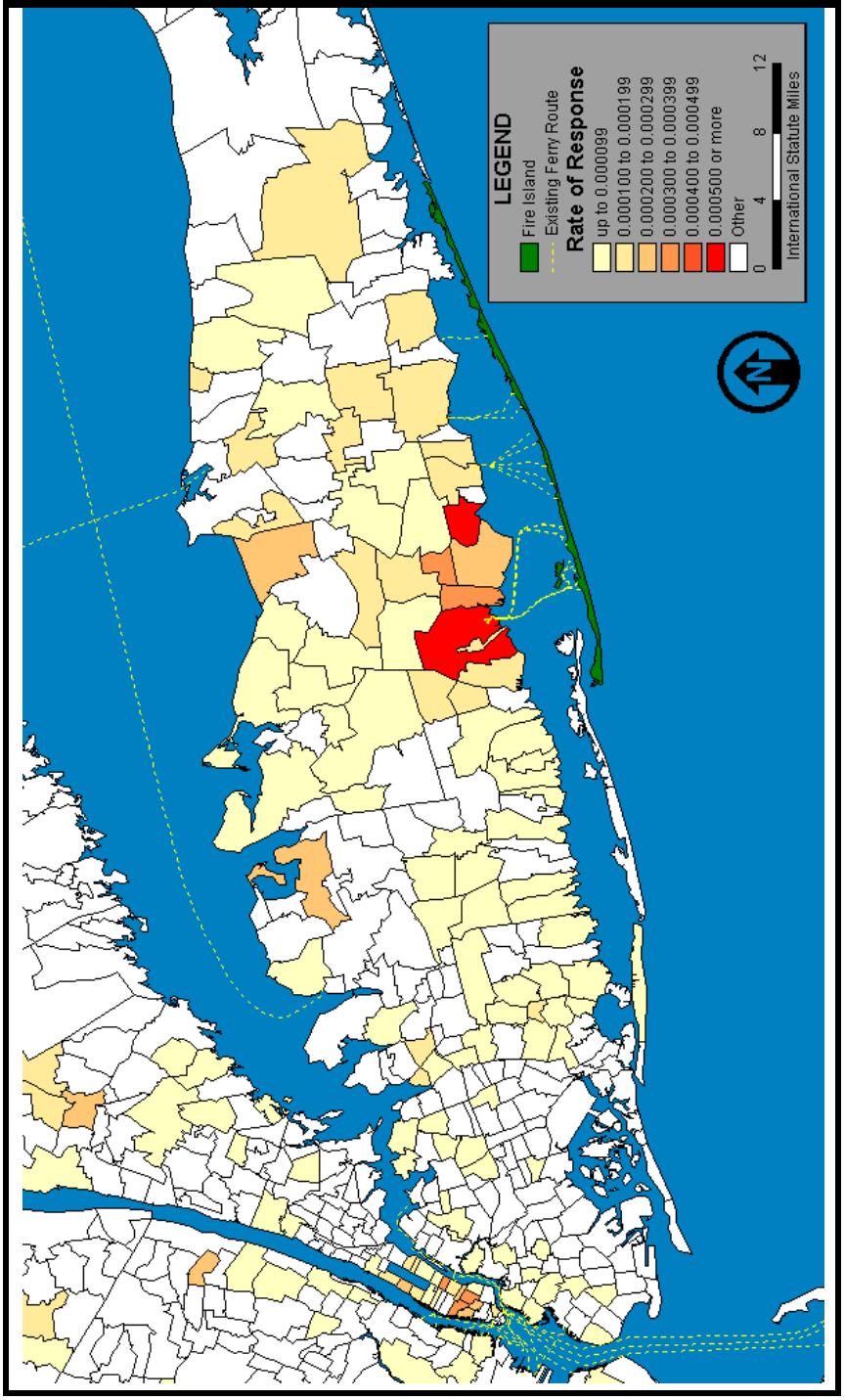


FIGURE 3-4: PERMANENT RESIDENCE OF FERRY TRAVELERS - RESPONSES AS A PROPORTION OF RESIDENT POPULATION



After normalizing for population in this manner, it is evident that the greatest rates of ferry trip making are on the north shore of Great South Bay, in the vicinity of the communities of Bay Shore and Oakdale. Manhattan in New York City still maintains a relatively high trip making rate, however not as high as these two local communities.

3.4.9 Length of Stay

Question #10 on the survey instrument asked respondents to best categorize themselves into one of the following five categories regarding their length of stay.

(1) visiting Fire Island for a single day with no overnight stay
(2) visiting Fire Island for 1 to 2 nights
(3) visiting Fire Island for 3 nights to one month
(4) living continuously on Fire Island for more than 1 month, but less than 12 months per year
(5) permanently and continuously residing on Fire Island year round

As seen in Table 3-14, as one would expect, visitors to the NPS visitor centers at Watch Hill and Sailors Haven are comprised largely of day trips, with some short term (mostly 1 to 2 night) overnight campers likely making up the remainder of visitors. Overall, travelers from Bay Shore indicated a large proportion of 1 to 2 night trips, whereas travelers from Sayville and Patchogue indicated large proportion of day trips. In total, 2.1% of survey respondents indicated that they were year round residents of Fire Island.

TABLE 3-14: LENGTH OF STAY

Mainland Departure Location	Fire Island Destination	Survey Responses	Length of Stay Category				
			Visiting Fire Island for a single day with no overnight stay	Visiting Fire Island for 1 to 2 nights	Visiting Fire Island for 3 nights to one month	Living continuously on Fire Island for more than 1 month but less than 12 months	Permanently and continuously residing on Fire Island year round
Bay Shore	Kismet	27	25.9%	44.4%	18.5%	7.4%	3.7%
Bay Shore	Saltaire	34	11.8%	35.3%	29.4%	23.5%	0.0%
Bay Shore	Fair Harbor	49	22.4%	28.6%	24.5%	18.4%	6.1%
Bay Shore	Dunewood	33	15.2%	33.3%	30.3%	18.2%	3.0%
Bay Shore	Atlantique	10	10.0%	70.0%	10.0%	10.0%	0.0%
Bay Shore	Ocean Beach	28	32.1%	42.9%	7.1%	14.3%	3.6%
Bay Shore	Seaview	22	13.6%	50.0%	18.2%	18.2%	0.0%
Bay Shore	Ocean Bay Park	61	21.3%	49.2%	13.1%	14.8%	1.6%
Bay Shore Subtotal		**264**	**20.1%**	**41.3%**	**19.7%**	**16.3%**	**2.7%**
Sayville	Sailors Haven	12	75.0%	8.3%	16.7%	0.0%	0.0%
Sayville	Cherry Grove	31	61.3%	9.7%	12.9%	16.1%	0.0%
Sayville	Fire Island Pines	43	23.3%	37.2%	18.6%	18.6%	2.3%
Sayville	Barrett Beach	1	100.0%	0.0%	0.0%	0.0%	0.0%
Sayville	Water Island	11	9.1%	81.8%	0.0%	9.1%	0.0%
Sayville Subtotal		**98**	**40.8%**	**29.6%**	**14.3%**	**14.3%**	**1.0%**
Patchogue	Davis Park	11	18.2%	36.4%	9.1%	36.4%	0.0%
Patchogue	Watch Hill	17	64.7%	29.4%	5.9%	0.0%	0.0%
Patchogue Subtotal		**28**	**46.4%**	**32.1%**	**7.1%**	**14.3%**	**0.0%**
GRAND TOTAL		**390**	**27.2%**	**37.7%**	**17.4%**	**15.6%**	**2.1%**

3.4.10 Frequency of Use

Question #11 on the survey instrument asked travelers how many round trips they had taken on that particular ferry route in the last 12 months. The resulting frequency of use data are presented by route in Table 3-15.

Overall the vast majority (nearly 60%) of survey respondents indicated that during the course of a year, they take between 1 and 5 round trips on the ferry route on which they were traveling when surveyed. This would suggest that many travelers are relatively infrequent users of the ferry service, which may have implications related to the provision of improved signage and information for travelers, since many of these infrequency travelers may not be familiar with ferry terminal locations, ferry schedules, parking and other items that affect their perceptions of the level of service that they receive. This is of particular importance to travelers visiting the NPS visitors centers at Watch Hill and Sailors Haven, since as shown in Table 3-15, of all routes surveyed these two have the highest proportion of infrequent travelers in the 1 to 5 round trips per year category.

TABLE 3-15: FREQUENCY OF USE

Mainland Departure Location	Fire Island Destination	Survey Responses	Proportion of Annual Round Trips Reported		
			1 to 5 round trips	6 to 20 round trips	>20 round trips
Bay Shore	Kismet	27	37.0%	37.0%	25.9%
Bay Shore	Saltaire	29	27.6%	44.8%	27.6%
Bay Shore	Fair Harbor	42	40.5%	40.5%	19.0%
Bay Shore	Dunewood	27	37.0%	48.1%	14.8%
Bay Shore	Atlantique	10	60.0%	40.0%	--
Bay Shore	Ocean Beach	27	48.1%	44.4%	7.4%
Bay Shore	Seaview	21	61.9%	14.3%	23.8%
Bay Shore	Ocean Bay Park	62	32.3%	56.5%	11.3%
Bay Shore Subtotal		**245**	**39.6%**	**43.7%**	**16.7%**
Sayville	Sailors Haven	11	63.6%	27.3%	9.1%
Sayville	Cherry Grove	31	48.4%	35.5%	16.1%
Sayville	Fire Island Pines	41	39.0%	41.5%	19.5%
Sayville	Barrett Beach	1	--	100.0%	--
Sayville	Water Island	11	36.4%	45.5%	18.2%
Sayville Subtotal		**95**	**44.2%**	**38.9%**	**16.8%**
Patchogue	Davis Park	11	27.3%	54.5%	18.2%
Patchogue	Watch Hill	16	81.3%	12.5%	6.3%
Patchogue Subtotal		**27**	**59.3%**	**29.6%**	**11.1%**
GRAND TOTAL		**367**	**42.2%**	**41.4%**	**16.3%**

3.4.11 Age and Gender

As noted earlier, the non-response bias checks indicate that the proportion of survey respondents by gender corresponds closely with the proportion of the population of ferry travelers by gender. Table 3-16 reiterates the proportion of survey respondents by gender by mainland departure location.

TABLE 3-16: PROPORTION OF SURVEY RESPONDENTS BY GENDER

Mainland Departure Location	Completed Survey	
	Male	Female
Bay Shore Routes	51.0%	49.0%
Sayville Routes	59.7%	40.3%
Patchogue Routes	53.3%	46.7%

Table 3-17 presents the findings regarding the age groups of survey respondents by route. In general, the routes serving Bay Shore appear to have a fairly even distribution of age groups from age 25 up to age 64, with somewhat fewer respondents in the 18 to 24 and 65 or over categories. The routes serving Sayville have a proportionately greater number of respondents in the 35 to 44 and 45 to 64 age groups. For the routes serving Patchogue, the 25 to 34 age group is the most prevalent.

TABLE 3-17: PROPORTION OF SURVEY RESPONDENTS BY AGE GROUP

Mainland Departure Location	Fire Island Destination	Survey Reponses	Age Category				
			18 to 24	25 to 34	35 to 44	45 to 64	65 or over
Bay Shore	Kismet	28	3.6%	39.3%	21.4%	28.6%	7.1%
Bay Shore	Saltaire	34	8.8%	8.8%	20.6%	29.4%	32.4%
Bay Shore	Fair Harbor	50	10.0%	20.0%	20.0%	44.0%	6.0%
Bay Shore	Dunewood	33	15.2%	12.1%	36.4%	30.3%	6.1%
Bay Shore	Atlantique	10	--	40.0%	20.0%	30.0%	10.0%
Bay Shore	Ocean Beach	27	18.5%	40.7%	14.8%	22.2%	3.7%
Bay Shore	Seaview	22	4.5%	4.5%	27.3%	40.9%	22.7%
Bay Shore	Ocean Bay Park	61	13.1%	39.3%	18.0%	21.3%	8.2%
Bay Shore Subtotal		**265**	**10.6%**	**25.7%**	**21.9%**	**30.6%**	**11.3%**
Sayville	Sailors Haven	12	16.7%	8.3%	25.0%	33.3%	16.7%
Sayville	Cherry Grove	32	3.1%	18.8%	37.5%	40.6%	--
Sayville	Fire Island Pines	43	4.7%	18.6%	32.6%	41.9%	2.3%
Sayville	Barrett Beach	1	--	--	--	--	100.0%
Sayville	Water Island	11	0.0%	18.2%	27.3%	36.4%	18.2%
Sayville Subtotal		**99**	**5.1%**	**17.2%**	**32.3%**	**39.4%**	**6.1%**
Patchogue	Davis Park	11	--	27.3%	9.1%	45.5%	18.2%
Patchogue	Watch Hill	18	16.7%	50.0%	16.7%	16.7%	--
Patchogue Subtotal		**29**	**10.3%**	**41.4%**	**13.8%**	**27.6%**	**6.9%**
GRAND TOTAL		**393**	**9.2%**	**24.7%**	**23.9%**	**32.6%**	**9.7%**

3.4.12 Household Income

The reported distribution of annual pre-tax household income by route is shown in Table 3-18. For the routes operated out of Bay Shore, four (Saltaire, Fair Harbor, Dunewood and Seaview) have 50% or more of the survey respondents reporting an annual pre-tax household income of $100,000 or more. Travelers to Kismet and Ocean Beach reported annual pre-tax household incomes more in the $25,000 to $75,000 range. Atlantique and Ocean Bay Park travelers reported a fairly evenly distributed range of incomes among survey respondents.

TABLE 3-18: DISTRIBUTION OF HOUSEHOLD PRE-TAX INCOME BY ROUTE

Mainland Departure Location	Fire Island Destination	Survey Reponses	Income Category				
			Under $25,000	$25,000 to $49,999	$50,000 to $74,999	$75,000 to $99,999	$100,000 or more
Bay Shore	Kismet	26	7.7%	34.6%	30.8%	3.8%	23.1%
Bay Shore	Saltaire	30	13.3%	6.7%	16.7%	6.7%	56.7%
Bay Shore	Fair Harbor	45	4.4%	6.7%	15.6%	13.3%	60.0%
Bay Shore	Dunewood	29	3.4%	10.3%	20.7%	6.9%	58.6%
Bay Shore	Atlantique	9	--	22.2%	33.3%	11.1%	33.3%
Bay Shore	Ocean Beach	25	4.0%	36.0%	36.0%	16.0%	8.0%
Bay Shore	Seaview	21	--	--	14.3%	14.3%	71.4%
Bay Shore	Ocean Bay Park	57	7.0%	22.8%	21.1%	17.5%	31.6%
Bay Shore Subtotal		**242**	**5.8%**	**16.9%**	**21.9%**	**12.0%**	**43.4%**
Sayville	Sailors Haven	10	10.0%	40.0%	10.0%	--	40.0%
Sayville	Cherry Grove	32	3.1%	31.3%	34.4%	9.4%	21.9%
Sayville	Fire Island Pines	43	4.7%	7.0%	16.3%	18.6%	53.5%
Sayville	Barrett Beach	1	--	--	100.0%	--	--
Sayville	Water Island	10	0.0%	0.0%	30.0%	10.0%	60.0%
Sayville Subtotal		**96**	**4.2%**	**17.7%**	**24.0%**	**12.5%**	**41.7%**
Patchogue	Davis Park	10	--	--	40.0%	20.0%	40.0%
Patchogue	Watch Hill	16	18.8%	31.3%	25.0%	6.3%	18.8%
Patchogue Subtotal		**26**	**11.5%**	**19.2%**	**30.8%**	**11.5%**	**26.9%**
GRAND TOTAL		**364**	**5.8%**	**17.3%**	**23.1%**	**12.1%**	**41.8%**

For the routes operated out of Sayville, Fire Island Pines and Water Island have 50% or more of the survey respondents reporting an annual pre-tax household income of $100,000 or more. Travelers to Cherry Grove reported annual pre-tax household incomes more in the $25,000 to $75,000 range.

Travelers to both the NPS visitor centers at Watch Hill and Sailors Haven appear to have a fairly even distribution of household income categories, though the smaller number of respondents for Sailors Haven makes its income distribution appear less evenly distributed than might otherwise be case if a larger sample of travelers had responded to this question for this route.

3.4.13 Traveler Comments

Table 3-19 summarizes the number of comments received from survey respondents under the "Additional Comments/Suggestions" question on the survey. Comments have been categorized by general topical categories and by route.

TABLE 3-19: COMMENTS BY SURVEY RESPONDENTS

Mainland Departure Location	Fire Island Destination	Survey Responses	Number of Responses by General Category of Comment															
			Service	Schedule	Parking	Bathrooms	Fares	Lateral Ferry	New Routes	Coordination with LIRR	Taxi	Bicycles	Signage	National Park Service	Website	Smoking	Drinking/Alcohol	Noise	Other
Bay Shore	Kismet	13			4		1	2				1	1					1	3
Bay Shore	Saltaire	14		2	3	1	2			3					1		1		1
Bay Shore	Fair Harbor	17		2	4	2	1			2		1				1			4
Bay Shore	Dunewood	12		4	2					2	1					1			2
Bay Shore	Atlantique	5	1	2		1				1									
Bay Shore	Ocean Beach	8		1	1		1			2						1	1	1	
Bay Shore	Seaview	14		4	4					1			2		1		1		1
Bay Shore	Ocean Bay Park	19		4	6		1						1			2	1		4
Bay Shore Subtotal		**102**	**1**	**19**	**24**	**4**	**6**	**2**	**0**	**11**	**1**	**2**	**4**	**0**	**2**	**5**	**4**	**2**	**15**
Sayville	Sailors Haven	8		1	1		1	1	2				1	1					
Sayville	Cherry Grove	15	3	3	1		2		1	1							1		3
Sayville	Fire Island Pines	9		1	2					1									5
Sayville	Barrett Beach	1												1					
Sayville	Water Island	3		3															
Sayville Subtotal		**36**	**3**	**8**	**4**	**0**	**3**	**1**	**3**	**2**	**0**	**0**	**1**	**2**	**0**	**0**	**1**	**0**	**8**
Patchogue	Davis Park	4	2	1				1											
Patchogue	Watch Hill	8	1	3	1	1				2									
Patchogue Subtotal		**12**	**3**	**4**	**1**	**1**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GRAND TOTAL		**150**	**7**	**31**	**29**	**5**	**9**	**4**	**3**	**15**	**1**	**2**	**5**	**2**	**2**	**5**	**5**	**2**	**23**

Comments related to ferry schedules and parking facilities received by fare the greatest number of comments from survey respondents. Comments regarding ferry schedules generally noted that increased frequency of service, or increase in service during the off-season, would be desirable. Likewise, the parking comments generally indicated a lack of adequate parking capacity, and/or dissatisfaction with the cost of parking. Because the weekend during which the survey was administered experienced exceptionally good weather, parking facilities were full or nearly full at all three mainland departure locations, perhaps resulting in an unusually large number of comments regarding a lack of adequate parking capacity. Comments regarding coordination of ferry service with LIRR commuter rail service received the next greatest number of comments with 15, with these comments almost exclusively noting that improved coordination of LIRR schedules and ferry schedules would be desirable.

3.5 Conclusions

Of those persons initially approached and asked to participate in the survey, 93.1% accepted a blank survey form. Of these survey participants, 76.1% completed and returned a survey form, as indicated by the non-response bias checks. Overall then, of all persons initially approached and asked to participate in the survey, 70.8% completed and returned a survey form. No indications of significant non-response bias were detected.

As expected, for ferry terminal access modes the *"Drove and parked at ferry terminal"* access mode was the most frequently reported by survey respondents at 55.7% overall, ranging from a low of 53.2% at Bay Shore, to a high of 62.1% at Patchogue. Survey respondents reporting use of the Long Island Rail Road (LIRR) commuter rail represented the ground access mode of nearly 23% of survey respondents overall, with the "*Long Island Rail Road, then took taxi to ferry terminal*" access mode (at 12.9% overall) representing the bulk of those LIRR users. Of particular note is the impressive 44.5% of survey respondents on the Watch Hill route who reported use of LIRR as their ground access mode, likely due in large part to the close proximity of the Patchogue NPS Watch Hill ferry terminal to the LIRR station at Patchogue. This is an encouraging result, and indicates that future plans for ferry terminal improvements at the Patchogue NPS Watch Hill ferry terminal are likely to encourage the use of this transit mode for access to the ferry system and to Fire Island, thereby reducing the potential impacts of automobile oriented ground access modes and potential difficulty in providing adequate parking capacity, particularly for peak summer weekends. A surprisingly small number (0.5% overall) of survey respondents reported the "*Other - Drove and parked at train station*" access mode, perhaps indicating an opportunity to improve traveler awareness of these parking facilities on peak weekends for use as overflow parking facilities when the ferry operator parking facilities are at capacity.

Nearly 75% of survey respondents indicated that they were aware that they entered a National Seashore when traveling to Fire Island by ferry. As expected, awareness of the National Seashore among passengers traveling on routes to NPS visitor centers such as Sailors Haven and Watch Hill is quite high, exceeding 80%.

The two NPS routes serving Sailors Haven and Watch Hill have the highest travel party size of all routes surveyed, at 3.4 persons per travel party on average.

Responses regarding ferry service quality measures indicate that overall, most performance measures fall in the vicinity of the "good" range. Some areas of relative concern, however, appear to be "*Availability of parking at ferry terminals*" and "*Road signs directing you to the mainland ferry terminal.*" Although both of these areas scored above the "average" value (3), they do exhibit inferior performance relative to the other service quality measures analyzed.

For parking availability, Bay Shore appears to have the most concerns on the part of travelers, with 6 of the 8 routes surveyed scoring just below average in this area. Because the weekend during which the survey was administered experienced exceptionally good weather, parking facilities were full or nearly full at all three mainland departure locations, perhaps resulting in an unusually negative response by travelers regarding a lack of adequate parking capacity.

Overall, "*Travel time*" is tied for second place with "*Availability of schedule information*" scoring a 1.8, which would appear to indicate that having shorter travel times and higher speed ferries is not a particular concern among travelers.

Of particular note, the Patchogue NPS Watch Hill ferry terminal scored the worst among all mainland departure locations on the "*Ferry terminal condition & cleanliness*" service quality measure. Plans to build a new ferry terminal in this location should serve to rectify this situation. This route also scored second worst of all 15 routes surveyed in the "*Frequency of service*" measure, indicating a desire on the part of passengers for more frequent service to this destination. Service from Sayville to Sailors Haven appears to perform well in all service quality areas, except for parking availability.

For new routes, favorable responses regarding the coastwise (east-west) water taxi service received by far the largest number of positive responses, with 67 overall. Of the four proposed routes serving Fire Island Lighthouse, the Bay Shore to Fire Island Lighthouse route received more favorable responses (30) than the other three possible Fire Island Lighthouse routes combined. In particular, the Heckscher State Park to Fire Island Lighthouse route performed particularly poorly, given its relative proximity to Fire Island Lighthouse in comparison to Sayville and Patchogue. The proposed Heckscher State Park to Sailors Haven route also received little support, with only five favorable responses. Somewhat surprisingly, of the "Other" category where respondents could specify a route not listed on the survey form, twelve respondents proposed a route from New York City to Fire Island. This was a greater number of favorable responses than for any other routes that were proposed by survey respondents under the "Other" category. Overall, the New York City to Fire Island route received the fourth highest number of favorable responses, albeit far behind the water taxi route and the Bay Shore to Fire Island Lighthouse route.

Nearly 90% of travelers who responded to the survey indicated that their permanent residence was located in a zip code in the state of New York. The vast majority of New York state-based visitors originate in the metropolitan New York City and Long Island area. The two primary areas from which the greatest absolute number of visitors originate include the communities of western Suffolk County in the vicinity of the three mainland ferry departure locations of Bay Shore, Sayville and Patchogue, and Manhattan in New York City. The greatest rates of ferry trip making are on the north shore of Great South Bay, in the vicinity of the communities of Bay Shore and Oakdale. Manhattan in New York City still maintains a relatively high trip making rate, however not as high as these two local communities.

Regarding length of stay, visitors to the NPS visitor centers at Watch Hill and Sailors Haven are comprised largely of day trips. In total, 2.1% of survey respondents indicated that they were year round residents.

Overall, the vast majority (nearly 60%) of survey respondents indicated that during the course of a year, they take between 1 and 5 round trips on the ferry route on which they were traveling when surveyed. This would suggest that many travelers are relatively infrequent users of the ferry service, which may have implications related to the provision of improved signage and information for travelers, since many of these infrequency travelers may not be familiar with ferry terminal locations, ferry schedules, parking and other items that affect their perceptions of the level of service that they receive. This is of particular importance to travelers visiting the NPS visitors centers at Watch Hill and Sailors Haven, since of all routes surveyed these two have the highest proportion of infrequent travelers in the 1 to 5 round trips per year category.

Travelers to both the NPS visitor centers at Watch Hill and Sailors Haven appear to have a fairly even distribution of household income categories.

Comments related to ferry schedules and parking facilities received by fare the greatest number of comments from survey respondents. Comments regarding ferry schedules generally noted that increased frequency of service, or increase in service during the off-season, would be desirable. Likewise, the parking comments generally indicated a lack of adequate parking capacity, and/or dissatisfaction with the cost of parking. Because the weekend during which the survey was administered experienced exceptionally good weather, parking facilities were full or nearly full at all three mainland departure locations, perhaps resulting in an unusually large number of comments regarding a lack of adequate parking capacity. Comments regarding coordination of ferry service with LIRR commuter rail service received the next greatest number of comments with 15, with these comments almost exclusively noting that improved coordination of LIRR schedules and ferry schedules would be desirable.

Chapter 4: Route and Market Analysis

In this section, possible route and service alternatives are identified and initially developed. The identification and development of these route and service alternatives is based upon a review of existing documentation and travel data, stakeholder input, and the findings from the ferry travel survey reviewed earlier in Chapter 3.

4.1 All Route Options Considered by Mainland or Terminal Site (Long List)

A comprehensive list of potential ferry routes providing access to the Fire Island National Seashore was evaluated to determine if there any trips were preferable to the existing routes or if any additional routes should be considered. It should be noted that the list includes only those services that provide direct service to FINS ferry landings (Fire Island Light, Sailors Haven, etc.) or private community landings (Ocean Beach, Fire Island Pines, Davis Park, etc.) that offer potential for water taxi transfer locations and secondary access to the beach areas. One new mainland departure location, Heckscher State Park, was included to test route distances and market potential. Figure 4-1 presents a summary overview of all route options being considered.

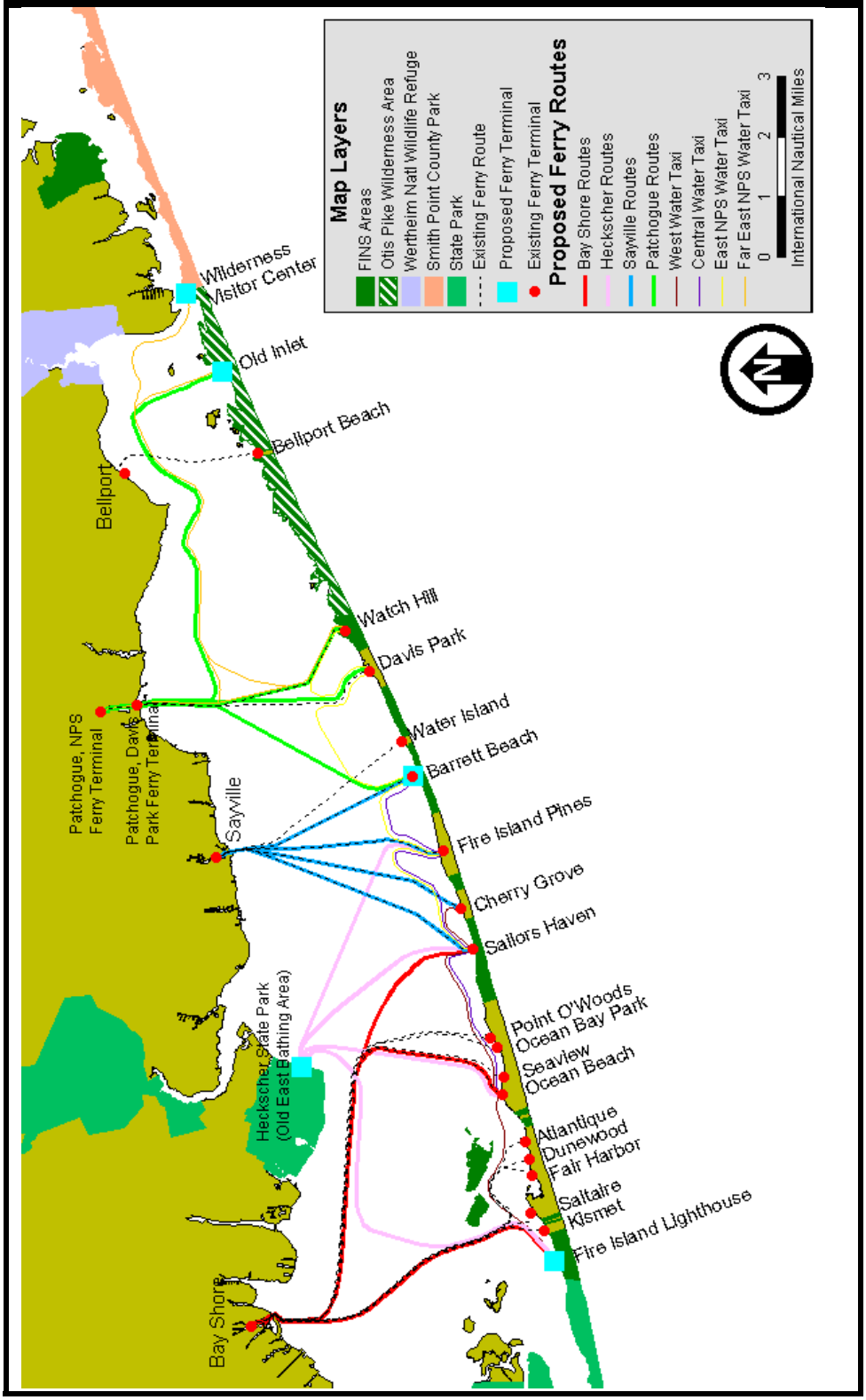
4.1.1 Patchogue

There are currently two existing dock sites for Fire Island ferry departures at (1) the FINS Watch Hill Ferry Terminal site close to the rail station and Route 27A and (2) the jetty a the mouth of the Patchogue River. The current ferry services to Watch Hill and Davis Park are operated by the Davis Park Ferry Company. Options for trip times for route operations for two vessel speeds are shown in Table 4-1. The route options considered from Patchogue are depicted in Figure 4-1. Proposals for a new ferry terminal at Patchogue are consistent with and in compliance with the 1997 General Management Plan, which called for further development of the Patchogue NPS ferry terminal site.

Site Advantages: Patchogue offers several key advantages as a gateway site to Fire Island. The town has long been designated as the focal site for the primary NPS gateway to the Island. The town is the headquarters for the NPS rangers, and the mainland supply port. NPS maintains a fleet of small vessels used to transport rangers to and from the mainland to the eastern half of the National Seashore area. Plans are well advanced for establishing an improved ferry terminal, mainland visitors center and park headquarters at the current ferry terminal site. Site advantages identified include the following:

- Shortest ferry trip distances from the mainland to Watch Hill and the Wilderness area; short trip to Talisman/Barrett Beach.
- Potential ferry connections to Old Inlet and Smith Point.
- Long established ferry service offered by Davis Park Ferry Company.
- Ferry terminal, owned by NPS, within short walking distance of the Patchogue Rail Station: the only walking connection of the ferry of the three existing sites.
- Opportunities to expand ecotourism programs for visitors to the Wilderness via Watch Hill, Talisman, and Smith Point.
- Opportunities for ecotourism programs by water on Great South Bay, linked to visitor exhibits at the proposed gateway center.

FIGURE 4-1: ALL ROUTE OPTIONS CONSIDERED



- Greater potential use of the NPS vessel fleet for visitors.
- Potential for a Wilderness lateral water shuttle connecting Watch Hill and Talisman to Fire Island Pines with links to west end water taxi.

Challenges: The eastern end of the Fire Island National Seashore has far less population than the western end, which limits the need for ferry services, and the current visitation at the park sites is too limited to justify numerous trips. While this lower activity helps conserve the resource, it does not contribute to greater visitation to the designated island sites. There is also a limited spectrum of activities and attractions for visitors at the island visitor sites.

- Limited existing ferry service schedule.
- Limited range of visitor programs and activities on island, particularly at Talisman; requires selective redevelopment of facilities.
- As noted earlier, the eastern end of Great South Bay is very shallow and restricts ferry travel to designated channels; trips between eastern island sites are circuitous and speed constrained.
- Existing dock facilities need modification to become ADA accessible.

Ferry Routes Considered: The long list of Patchogue routes considered included the following potential ferry links.

- **Patchogue/FINS to Talisman/Barrett Beach (New)**: A direct link from the future Patchogue NPS Visitor Center would allow for mainland orientation and marketing.
- **Patchogue/Jetty to Davis Park (Existing)**: While not encouraged as a regular destination because of the private nature of the community, the site could offer a return trip for hikers from Watch Hill or Talisman.
- **Patchogue/FINS to Watch Hill (Existing)**: The most actively used of the NPS sites on Fire Island, the facility has capacity to grow moderately in visitation. An excellent destination for day trippers, with various public facilities.
- **Patchogue/FINS to Old Inlet (New)**: While difficult to get to, the site could offer an attraction for those visitors interested in ecotourism opportunities. The route could be a limited schedule guided excursion type service.
- **Patchogue/FINS to Smith Point/Wilderness Center (New)**: As an extension of the Old Inlet service concept, the longer trip could be offered as a special package with a limited schedule, new dock and path connection would be needed.

TABLE 4-1: MAINLAND FERRY DEPARTURE SITE - PATCHOGUE

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (minutes) with 20 kt Vessel				Trip Time (minutes) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
(1) Patchogue toTalisman/ Barrett Beach	5.6	5	20	8	33	5	17	8	30
(2) Patchogue to Davis Park[(1)]	4.1	5	15	8	28	5	13	8	26
(3) Patchogue to Watch Hill[(1)]	4.6	5	16	10	31	5	14	10	29
(4) Patchogue to Old Inlet	8.8	5	23	12	40	5	19	12	36
(5) Patchogue to Smith Point/ Wilderness Visitor Center	9.7	5	23	14	42	5	19	14	38

(1) Existing scheduled service

4.1.2 Sayville

There are currently two routes to FINS sites including (1) Sailors Haven and (2) Talisman/Barrett Beach. There are also two services operating to private communities including (3) Cherry Grove and (4) Fire Island Pines. The services are operated by the Sayville Ferry Service. Specific departure locations vary with the route and Fire Island destination. Options for trip times for route operations for two vessel speeds are shown in Table 4-2. The route options considered from Sayville are depicted in Figure 4-1.

Site Advantages: Sayville offers other advantages as a gateway site to Fire Island. The terminal is located in good proximity to many of the central island attractions, and offers some of the most direct routes across the Bay, including to the FINS site at Sailors Haven. Sayville is also a short distance by water to the Talisman FINS site. Site advantages identified include the following:

- Shortest ferry trip distances from the mainland to Sailors Haven, Cherry Grove, Fire Island Pines and Talisman/Barrett Beach.
- Water taxi services to multiple sites from Fire Island Pines to the west.
- Potential for water taxi links to Talisman and Watch Hill.
- Long established ferry operations offered by Sayville Ferry Service.
- Opportunities to expand ecotourism programs for visitors to Sailors Haven and Talisman to be coordinated by FINS.
- More frequent scheduled service to communities.

Challenges: The central section of the Fire Island National Seashore has more population than the east end which supports more frequent service, much of which is to somewhat private communities without visitor amenities. As with the Patchogue served sites, the current visitation levels at Sailors Haven is too limited to justify numerous trips. Greater visitation could be achieved to the Sailors Haven attractions including Sunken Forest and the Beach if more parking were available on the mainland, and more activities at the seashore terminal. The recreational boaters almost seem to claim the Sailors Haven

Basin as a private marina during peak use periods. There is also a limited spectrum of activities and attractions for visitors at the island visitor sites.

- Limited existing ferry service schedule.
- Limited range of visitor programs and activities on island, particularly at Sailors Haven and Talisman; requires selective redevelopment of facilities.
- The near shore areas between ferry terminals are very shallow and makes lateral ferry trips circuitous.
- Mainland parking for day trippers is limited and expensive; opportunities for remote parking with shuttle service need to be explored.
- Bus shuttles are required from the rail station.
- Existing dock facilities need modification to become ADA accessible.

Ferry Routes Considered: The long list of Sayville routes considered included the following potential ferry links.

- **Sayville to Sailors Haven**: Route has potential to expand, if the site offers more attractions to visitors.
- **Sayville to Cherry Grove**: A major ferry destination, Cherry Grove offers a return option for hiking loops to Sailors Haven.
- **Sayville to Fire Island Pines**: Another major ferry destination, the Pines offers a potential lateral water taxi link with return service to Sayville.
- **Sayville to Talisman/Barrett Beach**: A short direct route potential exists at such time as more visitor attractions are available.

TABLE 4-2: MAINLAND FERRY DEPARTURE SITE - SAYVILLE

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (minutes) with 20 kt Vessel				Trip Time (minutes) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
(1) Sayville to Sailors Haven[(1)]	5.0	5	18	8	31	5	15	8	28
(2) Sayville to Cherry Grove[(1)]	4.0	5	15	8	28	5	12	8	25
(3) Sayville to Fire Island Pines[(1)]	4.0	5	14	8	27	5	12	8	25
(4) Sayville to Talisman/ Barrett Beach	3.4	5	12	8	25	5	10	8	23

(1) Existing scheduled service

4.1.3 Heckscher State Park (New)

A new ferry terminal and new routes to Fire Island would be developed within the State Park in coordination with the Long Island State Park and Recreation Commission. The new landing and parking area would be located on the east side of the park on Nicoll Bay. A site in the basin was considered and eliminated because of the extensive environmental constraints of the site. Four new Routes were considered including Heckscher to Fire Island Lighthouse, Ocean Beach, Sailors Haven, and Fire Island Pines. The routes would most likely be run by a new ferry operator, since existing operators say they wouldn't want to compete with themselves. Options for trip times for route operations for two vessel speeds are shown in Table 4-3. The route options considered from Heckscher State Park are depicted in Figure 4-1. A possible Heckscher State Park ferry terminal is consistent with and in compliance with the 1997 General Management Plan, which called for continued discussions with the New York State, Office of Parks, Recreation and Historic Preservation concerning the development of a ferry terminal at this location.

Site Advantages: Heckscher State Park offers a different set of advantages as a gateway site to Fire Island. The terminal is located in good proximity to many of the central and western island attractions, and offers relatively direct routes across the Bay, including to the FINS site at Sailors Haven, and the private community of Ocean Beach. Heckscher is also a reasonable distance by water to the Fire Island Lighthouse FINS site. Site advantages identified include the following:

- Short ferry trip distances from the mainland to Sailors Haven, Ocean Beach and Fire Island Light.
- Water taxi services connections are possible at those three sites.
- Ample parking is available near the proposed dock site.
- Direct highway links to the Sunrise Highway and Long Island Expressway.
- Opportunities to expand ecotourism programs for visitors to Sailors Haven and Fire Island Light to be coordinated by FINS.
- Interest by the State Park System in developing a ferry terminal in the park.

Challenges: The western section of the Fire Island National Seashore has the largest population concentration on the island. However there is limited growth in the resident population because of limited land availability and growth controls, indicating that additional ferry operations would need to cut into existing seasonal markets for ridership. A new ferry service would require a new terminal facility tentatively located on the east side of the peninsula on Nicoll Bay. The terminal would require wave attenuation to the exposed eastern fetch and most likely dredging of a channel. The cost of parking combined with park admission and ferry fares could be equal or more expensive than current services.

- Limited range of visitor programs and activities on island, particularly at Sailors Haven and Fire Island Light; requires selective redevelopment of facilities.
- New terminal and parking facilities would need to be developed.
- The near shore areas at the proposed Heckscher ferry terminal site are shallow and would require dredging of a channel, with all permitting and environmental reviews.
- Bus shuttles would be required from the distant rail station.
- Total cost of ferry trip could be high.
- Limited market for new ferry riders at island destinations.
- New dock facilities would need to be ADA accessible.

Ferry Routes Considered: The long list of Heckscher Park routes considered included the following potential new ferry links.

- **Heckscher East to Fire Island Lighthouse (new)**: The route would be considerably longer than the current route from Bay Shore.
- **Heckscher East to Ocean Beach (new)**: The route is more direct and would be shorter than the current Bay Shore route.
- **Heckscher East to Sailors Haven (new)**: The route is more direct and would be shorter than the current Sayville route.
- **Heckscher East to Fire Island Pines (new):** The route would be longer than the current Sayville route.

TABLE 4-3: MAINLAND FERRY DEPARTURE SITE - HECKSCHER STATE PARK

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (minutes) with 20 kt Vessel				Trip Time (minutes) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
(1) Heckscher East to Fire Island Lighthouse	8.0	5	29	8	42	5	24	8	37
(2) Heckscher East to Ocean Beach	4.2	5	15	8	28	5	13	8	26
(3) Heckscher East to Sailors Haven	3.9	5	14	8	27	5	12	8	25
(4) Heckscher East to Cherry Grove	4.0	5	14	8	27	5	12	8	25
(5) Heckscher Boat Basin to Fire Island Lighthouse[1]	--	--	--	--	--	--	--	--	--
(6) Heckscher Boat Basin to Ocean Beach[1]	--	--	--	--	--	--	--	--	--

(1) Routes not considered feasible because of limited depth and environmental constraints of channel to basin and approach channel from Great South Bay.

4.1.4 Bay Shore (multiple existing services)

Fire Island Ferries currently operates a number of routes from multiple terminal sites in the town of Bay Shore to the communities at the west end of Fire Island. The routes considered for access to the seashore and FINS sites included Bay Shore to 1) the Fire Island Lighthouse, 2) Ocean Beach, and 3) Sailors Haven. The departure sites are located at several different points in Bay Shore depending on the destination. Options for trip times for route operations for two vessel speeds are shown in Table 4-4. The route options considered from Bay Shore are depicted in Figure 4-1.

Site Advantages: Bay Shore offers other advantages as a gateway site to Fire Island. The terminal is located in good proximity to many of the western island attractions, and offers some of the most direct

routes across the Bay, including to the FINS site at Fire Island Light, and Ocean Beach. The Bay Shore site is the closest to the Long Island and New York City population centers.

- Shortest ferry trip distances from the mainland to Fire Island Light and Ocean Beach from an existing terminal.
- Water taxi services to multiple sites from Fire Island Light to the east.
- Long established ferry operations offered by Bay Shore Ferry Service.
- Opportunities to expand ecotourism programs for visitors to Fire Island Light and Sailors Haven.

Challenges: The western section of the Fire Island National Seashore has more population than the east end which supports more frequent service, much of which is to somewhat private communities without visitor amenities. As with the Sayville and Patchogue served FINS sites, the current visitation levels at Fire Island Light and Sailors Haven are too limited to justify numerous trips. Greater visitation could be achieved to the Fire Island Light attractions if more parking were available on the mainland, and more activities at the seashore terminal. The pier is in poor shape and would need modifications to provide ADA access.

- Limited existing ferry excursion service schedule to Fire Island Light.
- Limited range of visitor programs and activities on island; requires selective redevelopment of facilities.
- Mainland parking for day trippers is limited, expensive; and hard to find; opportunities for remote parking with shuttle services need to be explored.
- Bus shuttles are required from the rail station.
- Existing dock facilities need modification to become ADA accessible.

Ferry Routes Considered: The long list of Bay Shore routes considered included the following potential ferry links.

- **Bay Shore to Fire Island Lighthouse (New)**: A regularly scheduled route combined with enhanced attractions offers potential for expanded visitation.
- **Bay Shore to Ocean Beach (Existing)**: Ocean Beach has more visitor amenities than any of the private communities and offers a good lateral water taxi connector site.
- **Bay Shore to Sailors Haven (New)**: While a bit longer than the Sayville route, there might be potential for a second route if more attractions were developed.

TABLE 4-4: MAINLAND FERRY DEPARTURE SITE - BAY SHORE

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (minutes) with 20 kt Vessel				Trip Time (minutes) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
(1) Bay Shore to Fire Island Lighthouse	6.5	5	23	8	36	5	19	8	32
(2) Bay Shore to Ocean Beach[(1)]	7.6	5	27	8	40	5	22	8	35
(3) Bay Shore to Sailors Haven	7.5	5	26	8	39	5	21	8	34

(1) Existing scheduled service.

4.1.5 Lateral Routes

There are two existing lateral water taxi services which split up service to the communities into a western group and a central group. The eastern FINS sites are currently not served by the existing water taxis except as a special charter trip because of the limited demand combined with long water distance and trip time. The routes considered were the two overlapping existing east and central routes as well as new eastern route. The new eastern service would serve primarily FINS sites and could be operated as a private concession or as an NPS service. The current water taxis are operating seasonally, and also provide on call charter service across the bay. The routes are grouped by the areas and docks served as well as by management type. Options for trip times for route operations for two vessel speeds are shown in Table 4-5. Asterisks indicate connection points to more frequent mainland service.

- **West – Private**: A western extension of the privately operated water taxi would require an expanded ridership, which would depend on expanded attractions at FINS sites.

- Robert Moses State Park, opposite Parking Field #5
- Fire Island Lighthouse
- Ocean Beach*
- Sailors Haven
- Cherry Grove*

- **West – NPS**: A western extension of the NPS operated water taxi would also require an expanded ridership, which would depend on expanded attractions at FINS sites. The NPS operation might be needed if the expansion of existing services to the Light.

- Fire Island Lighthouse
- Ocean Beach*

- Sailors Haven
- Cherry Grove*

- **Central – Private**: A Central extension of the privately operated water taxi would also require an expanded ridership at Sailors Haven and Talisman, which would depend on expanded attractions at the FINS sites.

- Ocean Beach*
- Sailors Haven
- Fire Island Pines*
- Talisman/Barrett Beach

- **Central – NPS**: A Central NPS operated system in addition to the privately operated water taxi would also require an expanded ridership at Sailors Haven and Talisman, which would depend on expanded attractions at the FINS sites. As with the western service, it is unlikely that there is a strong enough lateral market to justify both public and private water taxi operations.

- Ocean Beach*
- Sailors Haven
- Fire Island Pines*
- Talisman/Barrett Beach

- **East – NPS**: An island based lateral water taxi operation by FINS/NPS might work with a limited ridership if the ferry also was used as an internal ranger shuttle from Patchogue to the FINS island sites.

- Sailors Haven
- Fire Island Pines*
- Talisman/Barrett Beach
- Davis Park*
- Watch Hill

- **East – NPS**: A variation of the NPS operated eastern water taxi might be used to provide scheduled ecotourism programs with routes alternating to Smith Point and Old Inlet, with loop connections back to Patchogue, As with the 1st east option, the vessels would be used for other FINS ranger shuttles. These longer routes would preclude service to Talisman.

- Patchogue
- Watch Hill
- Old Inlet

OR

- Smith Point/Wilderness
- Patchogue

TABLE 4-5: ISLAND LATERAL FERRY ROUTES

Assumptions:

20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

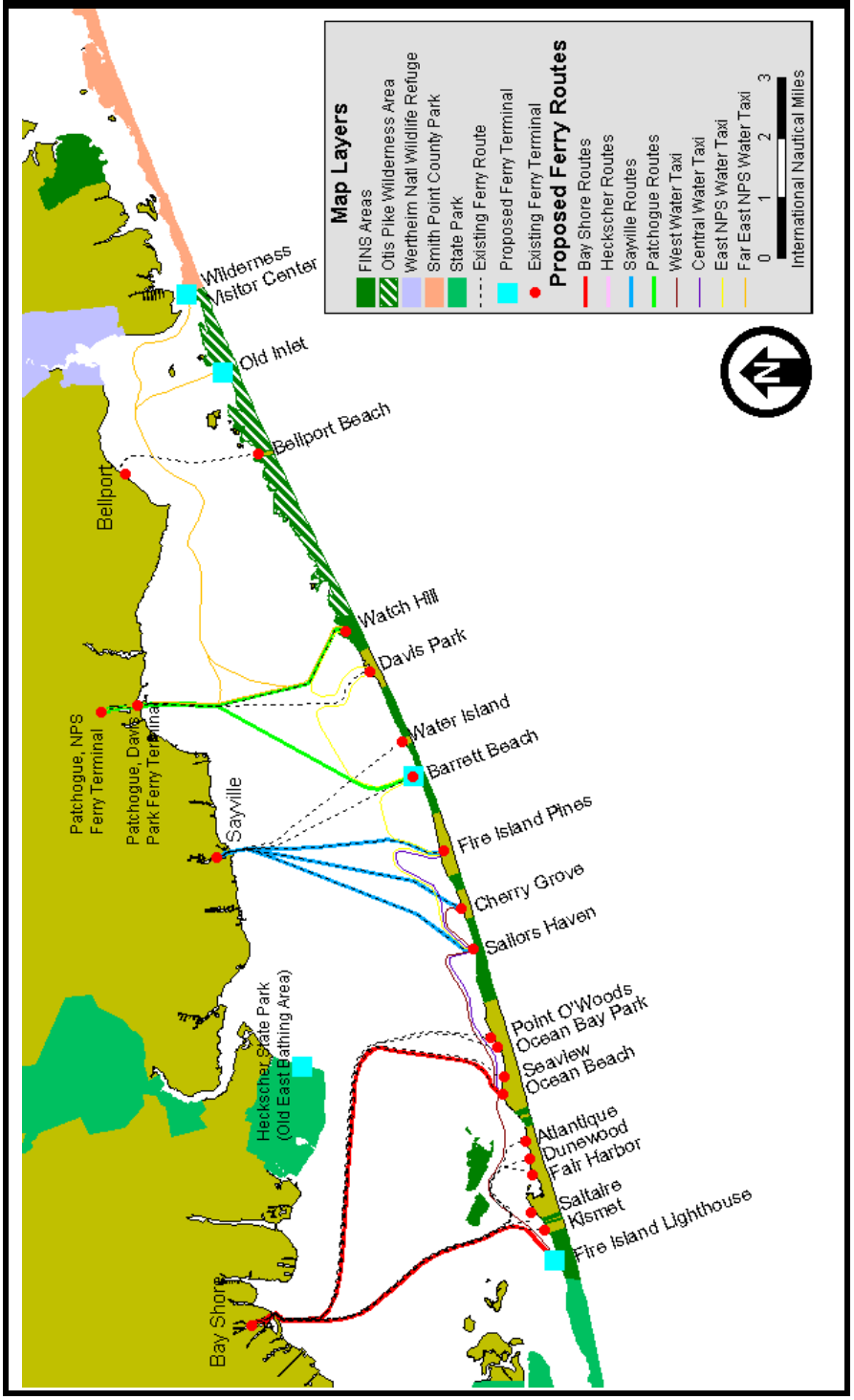
Route / Segment	Distance (nmi)	Trip Time (min.) with 20 kt Vessel				Trip Time (min.) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
West Water Taxi - Existing Private: (1) Robert Moses Field #5 - FI Light - Ocean Beach*- Sailors Haven - Cherry Grove*	10.1	15	38	14	67	15	31	14	60
West Water Taxi - New NPS: (2) FI Light - Ocean Beach- Sailors Haven - Cherry Grove*	9.7	12	35	12	59	12	29	12	53
Central Water Taxi - New Private: (3) Ocean Beach*- Sailors Haven- Fire Island Pines*- Barrett Beach	9.5	12	34	14	60	12	28	14	54
Central Water Taxi - New: (4) Ocean Beach*- Sailors Haven- Fire Island Pines*- Barrett Beach	9.5	12	34	14	60	12	28	14	54
East Water Taxi - New NPS: (5) Sailors Haven- Fire Island Pines*- Barrett Beach - Davis Park*- Watch Hill	12.6	12	45	16	73	12	38	14	64
"Far" East Water Taxi - New NPS: (6) Patchogue - Watch Hill - Old Inlet OR Smith Point - Patchogue	19.8	12	70	18	100	12	60	12	84

* Indicates connection points to more frequent mainland service.

4.2 Recommended Short List of Route Options and Priorities

Figure 4-2 shows the subset of recommended route options selected from those reviewed above. Each recommended route option is discussed further here.

FIGURE 4-2: RECOMMENDED ROUTE OPTIONS



4.2.1 Recommended Patchogue FINS Routes

Three routes are recommended from the Patchogue/Watch Hill FINS Terminal. The Patchogue to Davis Park service would also continue from the jetty terminal, but not as a designated FINS route. The third route might be considered both a water taxi and a gateway route. Recommended routes and trip times are shown in Table 4-6.

- **Patchogue/FINS to Talisman/Barrett Beach (New - Private)**: The restoration of service to Talisman/Barrett Beach would be recommended contingent on the completion of planned improvements to the dock site and to the building complex. As of February 2001, dock improvements were under construction at Barrett Beach. In addition, it is felt that a contrasting mix of programs should be offered to visitors in addition to the traditional beach attractions. Lateral water taxi service is also recommended to Davis Park and Watch Hill to the east, and Fire Island Pines to the west, to make the site accessible to a broader array of users and mainland ferry connections. While a modest level of visitation may be encouraged during the proposed improvement period, the full use of the site would most likely occur in the mid to longer time frame. The Patchogue to Talisman/Barrett service schedule could alternate with service from Sayville utilizing the same or different vessels and operators. The service would be limited to the peak season.

- **Patchogue/FINS to Davis Park (Existing – Private)**: While the mainland service to Davis Park will undoubtedly continue primarily in support of the active residential community, the landing could have a secondary function as a water shuttle transfer site. Establishment of a water taxi transfer for FINS visitors at Davis Park or other privately maintained terminal sites would require the approval and acceptance of the community and its regulatory entities.

- **Patchogue/FINS to Watch Hill (Existing – Private)**: Currently the most developed FINS island destination, the site will continue to be a substantial attraction for visitors. Additional programs in eco-tourism and Wilderness exploration may dictate the types of improvements that might be anticipated for the terminal site.

- **Patchogue/FINS to Old Inlet (New/NPS)**: As a periodic visitation site (weekly limited service schedule) accessed by the Patchogue based water shuttle, the site could be incorporated into an expanded interpretive program. Further analysis would be needed to determine whether dredging would be needed and what landside improvements would be needed to reactivate this site.

  Alternating with

- **Patchogue/FINS to Smith Point/Wilderness Center (New/NPS)**: Another periodic limited schedule site, the trip would provide access to the Wilderness Center and the east end of the National Seashore. The trips could be incorporated into interpretive and hiking programs, providing direct access from the Patchogue rail service.

TABLE 4-6: RECOMMENDED MAINLAND FERRY ROUTES FROM PATCHOGUE

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (minutes) with 20 kt Vessel				Trip Time (minutes) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
(1) Patchogue toTalisman/ Barrett Beach	5.6	5	20	8	33	5	17	8	30
(3) Patchogue to Watch Hill[1]	4.6	5	16	10	31	5	14	10	29
(3a) Patchogue to Old Inlet	8.8	5	23	12	40	5	19	12	36
(3b) Patchogue to Smith Point/ Wilderness Visitor Center	9.7	5	23	14	42	5	19	14	38
(4) Patchogue to Davis Park[1]	4.1	5	15	8	28	5	13	8	26

(1) Existing scheduled service

4.2.2 Recommended Sayville Routes

Four existing routes from Sayville are recommended including services to (1) Sailors Haven, (2) Cherry Grove, (3) Fire Island Pines and (4) Talisman/Barrett Beach. Recommended routes and trip times are shown in Table 4-7.

- **Sayville to Sailors Haven**: The Sayville service would be continued and expanded, contingent on expanded programming and facility development at the terminal facility. The bayside terminal, the Sunken Forest and the beach are all under utilized based on current visitation estimates, and could easily attract more users during the prime and shoulder seasons. Addition of more frequent water taxi service and connections to other FINS sites could also increase visitation.

- **Sayville to Cherry Grove**: Cherry Grove is likely to continue to have more frequent scheduled service from Sayville. As such, the Cherry Grove site would serve as a transfer site for water taxis connecting to Sailors Haven and other FINS sites. Further scheduling and demand analysis would be needed to determine whether the transfer option would be in addition to or alternating with the nearby Fire Island Pines site. Cherry Grove also serves as a secondary access point to the Beach and the mid-island trail connections to Sailors Haven/Sunken Forest, an easy walking distance away.

- **Sayville to Fire Island Pines**: Similar geographically to Cherry Grove, the Pines offers another potential water taxi transfer site, with connections to other FINS sites. In addition to FINS beach access to the east and west, the terminal area also offers public amenities such as food services, restaurants and gift shops. As with other private landings such as Davis Park and Cherry Grove, the establishment of terminal as a water taxi transfer would need to be approved and supported by the community.

- **Sayville to Talisman/Barrett Beach**: Service to Talisman/Barrett Beach is currently limited to only a handful of scheduled ferry trips on peak summer weekend days only, with total annual ridership at only 340 for 1999. When the dock and bulkhead modifications along with expanded visitor attractions are complete, it is recommended that an expanded schedule of peak season services be offered. Utilizing a smaller 60 passenger vessel, multiple roundtrips would be scheduled to serve the needs of both day visitors and occupants of the rehabilitated overnight guest quarters. The route schedule may alternate with a proposed service from the Patchogue ferry terminal.

TABLE 4-7: RECOMMENDED MAINLAND FERRY ROUTES FROM SAYVILLE

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (minutes) with 20 kt Vessel				Trip Time (minutes) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
(1) Sayville to Sailors Haven[1]	5.0	5	18	8	31	5	15	8	28
(2) Sayville to Cherry Grove[1]	4.0	5	15	8	28	5	12	8	25
(3) Sayville to Fire Island Pines[1]	4.0	5	14	8	27	5	12	8	25
(4) Sayville to Talisman/ Barrett Beach	3.4	5	12	8	25	5	10	8	23

(1) Existing scheduled service

4.2.3 Heckscher State Park

No routes or docks are recommended at Heckscher State Park. It was determined that new services provided few if any advantages over existing routes, and that that new services would compete with existing routes from Bay Shore and Sayville. The market analysis indicates that the private communities are not likely to experience any appreciable growth since most are effectively built out, and few unbuilt sites remain outside the National Seashore areas. Since the primary island visitation is to private communities, any new ferry services would need to rely on transfer of existing riders from other existing ferry services at Bay Shore and Sayville. The two FINS sites at Fire Island Lighthouse and Sailors Haven are only expected to generate modest growth over a small base visitation, and would not by themselves support new seasonal services from a Heckscher State Park terminal. As noted earlier in Chapter 3, respondents to the ferry travel survey did not indicate any desire for ferry service from Heckscher State Park.

4.2.4 Recommended Bay Shore Routes

A new route from Bay Shore to Fire Island Light would be recommended in addition to continued operation the service to Ocean Beach for a total of two routes. Recommended routes and trip times are shown in Table 4-8.

- **Bay Shore to Fire Island Lighthouse (New)**: A new ferry service to the Light House terminal would operate on a schedule consistent with the Lighthouse season. Such a service would be contingent on physical improvements to the dock and visitor amenities, as well as to the pathway system connecting to the Lighthouse. As of February 2001, dock plans were being completed and funding was in hand to make improvements to the Fire Island Lighthouse dock. The ferry service might need to offer an interpretive program to attract visitors who might otherwise prefer to drive. While the longer route to the site might suggest a limited round trip schedule, inclusion of water taxi connections to Ocean Beach could provide supplemental access options to the mainland as well as to island communities.

- **Bay Shore to Ocean Beach (Existing)**: The most populous of the island communities offers a good water taxi transfer site as well as a secondary access point to the Seashore beach. With public amenities being more plentiful at this site than at other locations, and the with frequent mainland ferry trips, the site offers an ideal transfer location to other FINS locations. In addition, the larger resident population base may provide a new island based market for visitation to other FINS sites and resources via water taxi to east and west.

TABLE 4-8: RECOMMENDED MAINLAND FERRY ROUTES FROM BAY SHORE

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (min.) with 20 kt Vessel				Trip Time (min.) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
(1) Bay Shore to Fire Island Lighthouse	6.5	5	23	8	36	5	19	8	32
(2) Bay Shore to Ocean Beach[(1)]	7.6	5	27	8	40	5	22	8	35

(1) Existing scheduled service.

4.2.5 Recommended Lateral Water Taxi Routes

Three lateral water taxi services are recommended in addition to the "Far East" service from to Old Inlet and Smith Point. The routes recommended included private west and central routes to be operated by current water taxi providers, and an east route to be operated by the FINS Rangers. The fourth route would be the Patchogue to Watch Hill to Old Inlet or Smith Point loop route. The routes and trip times are shown in Table 4-9.

It is recommended that the west and central components of the water taxi remain as expanded privately offered services, assuming that the proposed additional stops and schedules serving FINS sites are economically sustainable.

- **West – Private**

- Robert Moses State Park, opposite Parking Field #5
- Fire Island Lighthouse
- Ocean Beach*
- Sailors Haven
- Cherry Grove*

- **Central – Private**

- Ocean Beach*
- Sailors Haven
- Fire Island Pines*
- Talisman/Barrett Beach

The less populated east end is more likely to require a new approach to water taxi operations. It is suggested that this service might be owned and operated by the FINS unit, or alternatively out sourced as a concession. The water taxi might run on a schedule which would include routes starting at Patchogue. Two sets of routes would operate with the same fleet of two to three vessels. The lateral shuttle would be the East–NPS route, which would overlap with the Sayville ferries and Central Water Taxi at Fire Island Pines. The second service would be more closely linked with special NPS Wilderness and Great South Bay programs. The route would be a loop connecting through the Patchogue Watch Hill terminal, offered on a limited service schedule, alternating between the two distant destinations at Old Inlet and Smith Point.

Both of the Patchogue based water taxi routes could also serve to provide transportation of rangers to the FINS sites at the eastern end of the island from Sailors Haven to Watch Hill.

- **East – NPS #1**

- Sailors Haven
- Fire Island Pines*
- Talisman/Barrett Beach

- Watch Hill

- **Far East – NPS**

- Patchogue
- Watch Hill
- Old Inlet

OR

- Smith Point/Wilderness Area
- Patchogue

TABLE 4-9: RECOMMENDED LATERAL FERRY ROUTES

Assumptions:
20 knot vessel = 17 knot average cruising speed
25 knot vessel = 20 knot average cruising speed

Route / Segment	Distance (nmi)	Trip Time (min.) with 20 kt Vessel				Trip Time (min.) with 25 kt Vessel			
		Load	Run	Depart / Arrive	Total	Load	Run	Depart / Arrive	Total
West Water Taxi - Existing Private:									
(1) Robert Moses Field #5 - FI Light - Ocean Beach*- Sailors Haven - Cherry Grove*	10.1	15	38	14	67	15	31	14	60
Central Water Taxi - New Private:									
(2) Ocean Beach*- Sailors Haven- Fire Island Pines*- Barrett Beach	9.5	12	34	14	60	12	28	14	54
East Water Taxi - New NPS:									
(3) Sailors Haven- Fire Island Pines*- Barrett Beach - Davis Park*- Watch Hill	12.6	12	45	16	73	12	38	14	64
"Far" East Water Taxi - New NPS:									
(4) Patchogue - Watch Hill - Old Inlet OR Smith Point - Patchogue	19.8	12	70	18	100	12	60	12	84

* Indicates connection points to more frequent mainland service.

Chapter 5: Market Assessment of Route Alternatives

5.1 Market Assessment of Route Options (Short List)

The recommended list of route options included in Chapter 4, Section 4.2, was evaluated in terms of potential future market demand. Factors considered included the following: (1) current visitation levels by ferry, (2) total visitation levels for those sites which have vehicular access, (3) market opportunities for increased visitation, resource capacity for visitation, (4) program and amenity needs to increase visitation, (5) fare structures needed to encourage visitation, (6) vessel service needed to increase visitation, (7) optimum projected visitor capacity by site, and (8) projected ranges of visitation increases by site. A written description of findings on these factors is included in this section. The results of these analyses are summarized in the matrix section which follows.

The market analysis was based on initial findings and assumptions about the future use of the National Seashore as a whole, including the private residential communities, the FINS managed sites and the adjacent Robert Moses and Smith Point parks.

- Residential communities:
  - Towns are essentially built out; only a small amount of resident growth or densification can be expected
  - Moderate increases in day visitors to the more populous and public communities can be expected
  - Some visitor growth will continue as property owners extend the seasons to spring and fall in those communities which can provide basic services including ferry access
  - Recreational boating opportunities at these communities will remain relatively static
  - Ferry services will continue to operate at peak during the summer season, primarily from July 1 to Labor Day
  - Seasonal residents represent one untapped source of expanded visitation to the FINS sites, if improved lateral taxi/shuttle service is provided

- FINS Managed Sites:
  - Existing FINS sites currently have excess capacity and growth potential, but require new program attractions and capital improvements (Watch Hill and Sailors Haven)
  - Fire Island Lighthouse also has additional capacity and can accommodate visitor growth depending on expansion of the season and hours of operation, as well as substantial improvements to the dock and its support facilities
  - Revitalized or improved sites can offer added capacity and diversity of program activity, but require substantial improvements (Talisman/Barrett Beach, Old Inlet, Wilderness/Smith Point)
  - Recreational boating facilities will continue to be in high demand at most NPS sites, and regular marina users have been known to be proprietary and can dominate use of terminal and landing facilities. A balance needs to be achieved between ferry visitor amenities and attractions, and private boater facilities and use patterns in and around the basin area to make all visitors feel welcome

  - Patchogue offers many advantages as the primary mainland gateway; ferry service and terminal facilities need to be expanded and improved to attract new riders
  - Visitor markets for expansion include Long Island residents, New York metro area residents, longer stay mainland summer visitors, summer island residents, and adjacent park visitors

- State and County Parks:
  - Parking resources at the adjacent parks represent a visitor management and control challenge as well as an opportunity for auto access to the east and west ends of the national seashore. Robert Moses State Park at the west end and Smith Point County Park at the east end each require different strategies and cooperative agreements with the managing entities
  - Off peak opportunities exist for programmed group visitation, but may require ground transportation innovations
  - A year round ferry landing facility should be considered adjacent to Parking Field #5 at Robert Moses State Park to allow for seasonal visitors to use the water taxi to get to FINS and other community sites, and to provide off season access via water taxi to communities for property owners seeking to extend their use seasons

Several important market sectors were considered as opportunities for increased use and enjoyment of the FINS sites:

- New day visitors from Long Island (primarily auto) with the primary gateway at Patchogue via scheduled seasonal ferry service
- New day visitors from the New York Metro (primarily rail or bus) from three mainland sites including the primary gateway at Patchogue via scheduled seasonal ferry service
- New day visitors from Fire Island residential communities via expanded lateral water taxi and shuttle service
- New day visitors from adjacent state and county parks via foot, special trolley vehicle, or ferry
- New longer term campers from the mainland through expanded FINS programs
- New recreational boaters through expanded and more diversified mooring and slip arrangements
- Limited longer term rental units in renovated existing lodgings at selected FINS sites (Talisman/Barrett Beach, Watch Hill and other suitable locations)

5.2 FINS Visitation Market Assessment and Route Findings

The market analysis methodology was designed to address the visitation characteristics and market segments unique to Fire Island and its water transportation system. Four categories of FINS visitation were considered, including:

(1) Visitors to FINS sites on regularly scheduled mainland gateway ferry routes
(2) Visitors to FINS sites by way of larger island community ferry services at sites designated as island transfer locations, on regularly scheduled mainland gateway ferry routes
(3) Visitors to FINS sites by way of lateral water taxi routes connecting with mainland services at FINS sites and island transfer sites
(4) Island end visitors to FINS sites at Smith Point Wilderness and Fire Island Lighthouse by way of existing road links and parking areas at the two end parks

Market demand projections were based on site visits, ferry survey feedback, recent visitation and ferry use trends, and interviews with operators and other key stakeholders. For sites which are currently actively used, a visitation base for the year 2000 was estimated based on the most up to date data sources available. For sites not currently actively used or in the case of Fire Island Lighthouse not currently accessible by ferry, base year assumptions were developed based on comparable use patterns where available.

Visitation and ferry ridership growth patterns were estimated for two growth scenarios: for moderate growth levels and for high growth levels. The moderate growth scenario was calculated at 3% per annum and the high growth rate at 6% per annum. Growth target years were assumed to be 2005 and 2010. The resulting multiplier factors for these growth scenarios are presented in Table 5-1.

TABLE 5-1: ESTIMATED GROWTH SCENARIO RATES

	Moderate Growth		High Growth	
Time Frame	Rate	Multiplier Factor	Rate	Multiplier Factor
2000 or start up Baseline	0.0%	1.00	0.0%	1.00
2005	3.0%	1.16	6.0%	1.34
2010	3.0%	1.34	6.0%	1.79

Other aspects affecting market demand projections varied for the 4 different market sectors considered, and are described for each.

5.2.1 Recommended Routes from Mainland Terminals to FINS Sites

The characteristics of ferry routes and visitation projections for mainland gateways to specific FINS recreational sites were evaluated and are summarized in Table 5-2.

Market demand assumptions included the following for Mainland to FINS site routes:

- New route implementation and schedules would apply to the following:

  (1) Bay Shore to Lighthouse; 4 round trips per day each from Bay Shore on week ends from mid-May thru September, and 3 round trips from each mainland terminal per week day during peak season from mid-June through Labor Day

  (2) Patchogue/Sayville to Talisman Barrett Beach; 3 round trips per day each from Sayville and Patchogue on week ends from mid-May thru September, and 2 round trips from each mainland terminal per week day during peak season from mid-June through Labor Day

  (3) Patchogue to Old Inlet and Smith Point; 2 reservation only round trips per weekend day and 1 reservation only round trip per weekday during the peak season from mid-June through Labor Day

- Routes and schedules would remain the same except on the Watch Hill and Sailors Haven routes. Considerable excess capacity exists on these two scheduled routes.
- Services to FINS sites would be provided by private operator in response to NPS FINS ferry operation prospectus as concession agreements.
- Visitation and ridership projections are calculated for two growth scenarios (moderate and high levels), and for each of two target years (2005 and 2010), except for projected services starting in Phase 3 which are calculated only for 2010.
- Ridership growth projections are calculated using current services and estimated ridership obtained from operators, and/or interpolated from previous years.
- For services to FINS sites not currently accessed by scheduled ferry operations, such as Fire Island Lighthouse, Old Inlet and Smith Point, ridership growth projections were calculated using base ridership from comparable sites as well as assumed ferry operation capacity.

TABLE 5-2: SUMMARY OF MARKET FACTORS, ISSUES AND RIDERSHIP PROJECTIONS – MAINLAND TO FINS SITE ROUTES

ROUTE	EXISTING SERVICE/ CURRENT VISITATION (Estimated for 2000)	MARKET OPPORTUN-ITIES	PROJECTED RESOURCE CAPACITY EXPANSION	EXPANDED SERVICE/ PROJECTED VISITATION (Estimated for 2005 or 2010)	TARGET PHASE	FARE ($2001)
1. Patchogue – Watch Hill (WH)	-Mid-May to end Sept. - 27 k visitors	- Day visitors - Campers (by reservation) - Eco-tourism packages - Recreational boaters (Limited slips) - Lateral taxi links	- Expand day visitors - Expand camp sites - Limited slips and moorings	1) 2005 – Mod. Growth: - 31k visitors High Growth: - 36k visitors 2) 2010- Mod. Growth: - 36k visitors High Growth: - 49k visitors	- Phase 1	$10.00 Adult rt $6.00 Child rt $25.00 Fam rt $100.00 Season (Adult) $250.00 Season (Family)
2. Patchogue – Talisman/ Barrett Beach (BB)	- No Service- - - Limited June to Labor Day from Sayville - 0.5 k visitors* - Assume 10k visitor base	- Day visitors - Eco-tourism packages - Recreational boaters (limited moorings) - Limited lodgings - Lateral taxi links	- Expand day visitors - New/ renovated lodgings - Limited moorings	1) 2005 – Mod. Growth: - 12k visitors High Growth: - 14k visitors 2) 2010- Mod. Growth: - 14k visitors High Growth: - 18k visitors	- Phase 2	$10.00 Adult rt $6.00 Child rt $25.00 Fam rt $100.00 Season (Adult) $250.00 Season (Family)
3. Sayville – Sailor's Haven (SH)	-Mid-May to end Sept. - 60k visitors	- Day visitors - Eco-tourism packages - Recreational boaters (Limited slips) - Lateral taxi links	- Expand day visitors - Limited slips and moorings	1) 2005 – Mod. Growth: - 70k visitors High Growth: - 80k visitors 2) 2010- Mod. Growth: - 80k visitors High Growth: - 108k visitors	Phase 1	$10.00 Adult rt $5.00 Child rt $25.00 Fam rt $100.00 Season (Adult) $250.00 Season (Family) - Excludes parking at Sayville Terminal
4. Bay Shore – Fire Island Lighthouse (FIL)	- No Service - Assume 12.5k visitor base	- Day visitors - Eco-tourism packages - Recreational boaters (Limited slips) - Lateral taxi links	- Expand day visitors - Limited slips and moorings	1) 2005 – Mod. Growth: - 15k visitors High Growth: - 17k visitors 2) 2010- Mod. Growth: - 17k visitors High Growth: - 23k visitors	Phase 1	$10.00 Adult rt $5.00 Child rt $25.00 Fam rt $100.00 Season (Adult) $250.00 Season (Family) - Excludes parking at Bay Shore Terminal

5. Patchogue to Smith Point/ (SP)	**No Service**	**- Day visitors - Eco-tourism packages - Recreational boaters (Drop-off) - Lateral taxi links**	**- Expand day visitors - Limited slips and moorings**	**1) 2010 only- Mod. Growth: - 2.6k visitors High Growth: - 3.0 k visitors**	**Phase 3**	**$14.00 Adult rt $7.00 Child rt $35.00 Fam rt - Includes parking at Patchogue Terminal**
6. Patchogue to Old Inlet (OI)	**No Service**	**- Day visitors - Eco-tourism packages - Recreational boaters (Limited slips) - Lateral taxi links**	**- Expand day visitors - Limited slips and moorings**	**1) 2010 only – Mod. Growth: - 2.6k visitors High Growth: - 3.0 k visitors**	**Phase 3**	**$14.00 Adult rt $7.00 Child rt $35.00 Fam rt - Includes parking at Patchogue Terminal**

* Represents limited service and unimproved facilities.

5.2.2 Island Transfer Site Route Options

The characteristics of ferry routes, market factors, and projected visitation for mainland gateway to designated island community transfer sites were evaluated and are summarized in Table 5-3.

Market demand assumptions included the following:

- Existing routes and schedules would apply to the following:
  (1) Bay Shore to Ocean
  (2) Sayville to Cherry Grove
  and/or
  (3) Sayville to Fire Island Pines
  (4) Patchogue to Davis Park

- Routes and schedules would remain the same except on the Patchogue to Davis Park route which might add a stop at the Patchogue/Watch Hill FINS Terminal to the current departure site at Sandspit Park.

- Visitation and ridership projections are calculated for two growth scenarios (moderate and high levels), and for each of two target years (2005 and 2010), except for projected services starting in Phase 3, which are calculated only for 2010.

- Ridership growth projections for FINS users is calculated using current service day visitor ridership as a base, and assuming that a portion of those riders are using the beach and/or other FINS resources as part of their day trips. The percent of day visitors is based on the survey conducted in August of 2000 as part of this study. Proportions of day visitors to each site based on the 2000 survey were as follows:
  - Davis Park: 18% day visitors of 140,000 annual = 25,000 day visitors/yr
  - Fire Island Pines: 23% day visitors of 210,000 annual = 48,000 day visitors/yr
  - Cherry Grove: (61% day visitors reported seemed much to high: a modified number of 40 % was used for base calculation purposes) 40% day visitors of 180,000 annual = 72,000 day visitors/yr
  - Ocean Beach: 32% day visitors of 167,000 annual = 53,000 day visitors/yr.

- Base visitor numbers are speculative, since there are no available breakdowns of FINS users compared to community visitors. However, for purposes of visitation projections, it is assumed conservatively that at least 20 % of the day visitors would be using the FINS resources. These numbers are included in the current visitation column as a base for future growth.
  - Davis Park: 20% of the 25,000 day visitors/yr = 5,000 FINS site visitors/yr.
  - Fire Island Pines: 20% of the 48,000 day visitors/yr = 9,600 FINS visitors/yr
  - Cherry Grove: 20% of the 72,000 day visitors/yr = 14,400 FINS visitors/yr
  - Ocean Beach: 20% of the 53,000 day visitors/yr = 10,600 FINS visitors/yr

- For purposes of projecting future ridership, it is assumed that there will be moderate increases in day visitors, but that the longer term visitors will remain relatively constant.

- The increase in FINS site visitors through the Island Transfer sites would include a subset of visitors who would use the water taxi to travel laterally to sites: such as Ocean Beach to Sailors Haven, or Fire Island Pines to Watch Hill.

- Moderate and high growth rates are calculated for target years 2005 and 2010 at the same rates shown earlier in Table 5-1.

TABLE 5-3: SUMMARY OF MARKET ISSUES, OPPORTUNITIES AND RIDERSHIP PROJECTIONS – MAINLAND TO TRANSFER SITES

ROUTE/ ESTIMATED TOTAL DAY VISITORS	EXISTING SERVICE/ CURRENT FINS VISITATION (Estimated)	MARKET OPPORTUN-ITIES	PROJECTED RESOURCE CAPACITY	EXISTING SERVICE/ PROJECTED VISITATION (Estimated for 2005 and 2010)	TARGET PHASE	FARE ($2001)
1. Patchogue – Davis Park - 25,000 Total Day Visitors	May thru October 5,000 FINS Visitors	- East water taxi transfer - WH/BB walking destination - DP visitors to WH &BB	- Subject to Community Approval	May – Sept 1) 2005 : Mod- 5,800 High – 6,700 2) 2010: Mod - 6,700 High – 8,900	Phase 1	Market Rate
2A. Sayville – Fire Island Pines (FIP) - 48,000 Total Day Visitors	May thru October 9,600 FINS Visitors	- East and Central water taxi transfer - SH & BB walking destination - FIP visitors to BB &WH	- Subject to Community Approval	May – Sept 1) 2005: Mod - 11,100 High – 12,900 2) 2010: Mod - 12,900 High – 17,200	Phase 1	Market Rate
2B. Sayville – Cherry Grove (CG) - 72,000 Total Day Visitors	May thru October 14,400 FINS Visitors	- West and Central water taxi transfer - SH walking destination - CG visitors to LH	- Subject to Community Approval	May- Sept 1) 2005: Mod - 16,700 High – 19,300 2) 2010: Mod - 19,300 High – 25,800	Phase 1	Market Rate
3. Bay Shore – Ocean Beach (OB) - 53,000 Total Day Vistors	May thru October 10,600 FINS Visitors	- West and Central water taxi transfer - LH & SH walking destination - OB visitors to LH & SH	- Subject to Community Approval	May – Sept 1) 2005: Mod - 12,300 High – 14,200 2) 2010: Mod - 14,200 High – 19,000	Phase 1	Market Rate

5.2.3 Lateral Water Taxi Route Options

The characteristics of lateral water taxi ferry routes and visitation for island community transfer sites to FINS sites were evaluated and summarized in Table 5-4.

The proposed water taxi routes include the following. The island transfer sites are indicated with an asterisk (*).

- **West – Private**
  - Robert Moses State Park, opposite Parking Field #5
  - Fire Island Lighthouse
  - Ocean Beach*
  - Sailors Haven
  - Cherry Grove*

- **Central – Private**
  - Ocean Beach*
  - Sailors Haven
  - Cherry Grove*/Fire Island Pines*
  - Talisman/Barrett Beach

- **East – Private with NPS Concession**
  - Sailors Haven
  - Fire Island Pines*
  - Talisman/Barrett Beach
  - Davis Park*
  - Watch Hill

- **Far East – Private with NPS Concession** (ridership projections were shown in Table 5-2, and are not repeated in this section)
  - Patchogue
  - Watch Hill
  - Old Inlet

  OR

  - Smith Point/Wilderness Area
  - Patchogue

Market demand assumptions for water taxi ridership increases were somewhat more speculative since there were no recent water taxi ridership figures available. The base numbers were derived from those shown in Table 5-3 for day visitors to FINS sites. The missing factor would be the use of the water

taxi by longer stay visitors to the various communities, particularly the island transfer towns. It was assumed that there would be occasional use of the water taxi to access FINS sites by such long term visitors. For example, a family staying in Ocean Beach for a week or more might make a trip to the Fire Island Lighthouse if the schedule and fare were attractive. Other assumptions regarding water taxi ridership included the following:

- Routes would be expanded to include those described above. Schedules would be altered to include regular stops at the designated Island transfer sites and at the FINS destinations.
- The Far East route would serve as both a mainland connection and a lateral water taxi for points east of Watch Hill. Since ridership was already reported in section 5.2.1, this route is not described further in this section. Visitation and ridership projections are calculated for a moderate growth level, and for the target year of 2010 since the projected services start in Phase 3.
- Ridership growth projections for water taxi FINS users is calculated as a percentage of the FINS day visitor projections shown in Table 5-3. Water taxi ridership was drawn from the nearest sites.

  - East Route: Base draws from
    1) Davis Park: 10% of FINS day visitors = 500 visitors/yr., and
    2) 5% of Fire Island FINS day visitors = 480 visitors/yr,
    for a total of 980 visitors/yr.
  - Central Route: Base draws from
    1) 10% of Fire Island Pines FINS day visitors = 980 visitors/yr, and
    2) 10% of Cherry Grove day visitors = 1,440 visitors/yr,
    for a total of 2,420 visitors/yr
  - West Route: Base draws from
    1) 10% of Ocean Beach FINS day visitors = 1,060 visitors/yr., and
    2) 5% of Cherry Grove day visitors/yr = 720 visitors/yr.,
    for a total of 1,780 visitors/yr.

- Since there is currently no regularly scheduled water taxi service on any of the three routes and no reported annual ridership, the base figures for 2000 are hypothetical based on the above ridership assumptions.
- Ridership growth was calculated at moderate and high rates, based on those shown in Table 5.1, for the target year 2010.

TABLE 5-4: SUMMARY OF MARKET ISSUES, OPPORTUNITIES AND RIDERSHIP PROJECTIONS – LATERAL WATER TAXI ROUTE OPTIONS

ROUTE	EXISTING SERVICE/ CURRENT VISITATION (Estimated)	MARKET OPPORTUN-ITIES	PROJECTED RESOURCE CAPACITY	EXPANDED SERVICE/ PROJECTED VISITATION (Estimated 2010)	PHASE	FARE ($2001)
1. East: Sailor's Haven – Watch Hill	No scheduled service Estimated Base Ridership: - 980 riders/yr	- Day visitors - Eco-tourism packages - Lateral taxi links	- Expand lateral visitors from East, Central and West taxis - Expand Fire Island resident visitors	2010 May – Sept 1) Moderate Growth: - 1,310 visitors 2. High Growth: - 1,750 visitors	Phase 3	$10.00 Adult rt $5.00 Child rt $25.00 Fam rt (off-peak – peak may be higher)
2. Central: Ocean Beach – Talisman	No scheduled service Estimated Base Ridership: - 2,420 riders/yr	- Day visitors - Eco-tourism packages - Lateral taxi links	- Expand lateral visitors from West, Central and East taxis - Expand Fire Island resident visitors	2010 May – Sept 1) Moderate Growth: - 3,240 visitors 2. High Growth: - 4,330 visitors	Phase 3	$10.00 Adult rt $5.00 Child rt $25.00 Fam rt (off-peak – peak may be higher)
3. West: Robert Moses Field Five to Cherry Grove	No scheduled service - Estimated Base Ridership: - 1,780 riders/yr	- Day visitors - Eco-tourism packages - Lateral taxi links	- Expand lateral visitors from West, Central taxis - Expand Fire Island resident visitors	2010 May – Sept 1) Moderate Growth: - 2,390 visitors 2. High Growth: - 3,190 visitors	Phase 3	$10.00 Adult rt $5.00 Child rt $25.00 Fam rt (off-peak – peak may be higher)

5.2.4 Summary of Ridership Projections for Different Route Types

The ridership projections are summarized in Table 5-5. The implications for new or expanded services vary depending on the route category as follows:

- Mainland to FINS Site routes include expansion of existing scheduled services from Sayville (to Sailors Haven and Talisman/Barrett Beach) and Patchogue (to Watch Hill), as well as new routes from Bay Shore (to Fire Island Lighthouse) and Patchogue (to Old Inlet and Smith Point). New or altered existing NPS concessions would cover these routes.

- Mainland to Transfer Site routes assume use of current and future scheduled services, which are likely to expand or alter schedules based on cumulative increases in demand. No new services or NPS concessions would be anticipated.

- Lateral Water Taxi routes would include alterations for the existing West and Central routes to include island transfer sites and FINS sites, and expansion of services to cover the new East route. NPS concessions would apply to the new East route and to the FINS sites for the altered Central and West routes.

TABLE 5-5: SUMMARY OF RIDERSHIP PROJECTIONS FOR ROUTES SERVING FINS SITES

Route	2000 Estimated Ridership/Yr	2005 Ridership Projections		2010 Ridership Projections	
		Moderate Growth	High Growth	Moderate Growth	High Growth
Mainland to FINS Routes					
1. Patchogue – Watch Hill (WH)	27,000	31,000	36,000	36,000	49,000
2. Patchogue – Talisman/ Barrett Beach (BB)	500*	12,000	14,000	14,000	18,000
3. Sayville – Sailor's Haven (SH)	60,000	70,000	80,000	80,000	108,000
4. Bay Shore – Fire Island Lighthouse (FIL)	No Service**	15,000	17,000	17,000	23,000
5. Patchogue to Smith Point(SP) & Old Inlet (OI)	No Service	-0-	-0-	2,600	3,000
Mainland to Island Transfer Routes					
1. Patchogue – Davis Park	5,000	5,800	6,700	6,700	8,900
2A. Sayville – Fire Island Pines	9,600	11,100	12,900	12,900	17,200
2B. Sayville – Cherry Grove	14,400	16,700	19,300	19,300	25,800
3. Bay Shore – Ocean Beach	10,600	12,300	14,200	14,200	19,000
Lateral Water Taxi Routes					
1. East: Sailor's Haven – Watch Hill	980	-0-	-0-	1,300	1,700
2. Central: Ocean Beach – Talisman	2,420	-0-	-0-	3,200	4,300
3. West: Robert Moses Field Five to Cherry Grove	1,780	-0-	-0-	2,400	3,200
TOTALS	**132,280**	**173,900**	**200,100**	**209,600**	**281,100**

* Limited schedule at present: assumed base ridership of 10,000
** No service currently offered; assumed base ridership of 12,500

5.3 Other Transportation Services and Intermodal Improvements

5.3.1 Mainland Improvements

The surveys and interviews indicated three areas of ferry user concern regarding mainland transportation: 1) parking supply and proximity to ferries at Bay Shore and Sayville, 2) rail/ferry schedule coordination at all three sites and 3) highway and street signage to the ferry terminals at all three sites. The concerns are shared by both longer term and day visitors. However, the impacts on Fire Island National Seashore visitors may be somewhat greater, particularly for first time users, since the regular community visitors are much more familiar with the facilities and access modes, and the operators quite naturally tend to cater to the longer term and repeat users. There are several approaches to each of these concerns which may be worth pursuing in greater detail in the next round of planning.

- Expand parking supply and improve proximity to ferries at Bay Shore and Sayville. Space for additional parking at Bay Shore is limited by the combination of surrounding residential areas and wetlands. At Sayville the wetlands tend to limit the opportunities to expand parking near the terminals. While parking is adequate at Patchogue for current needs, expansion may be required in the future with new services and increased visitation. Several techniques to improve parking availability include:
  - Identify sites and provide remote park and ride sites with van shuttle service at Sayville and Bay Shore for longer term visitors at a reduced daily rate.
  - Seek agreements between towns, LIRR and ferry operators to share commuter rail parking use between weekday commuters and weekend Fire Island visitors.
  - Seek agreements with operators at Bay Shore and Sayville to reserve a small portion of the parking near terminals for day visitors on weekends, to assure that there will be an opportunity for short term Saturday and Sunday users.
- Improve rail and ferry schedule coordination at all three sites
- Improve highway and street signage to the ferry terminals at all three sites

5.3.2 End Park Improvements

The purpose of such improvements would be to provide expanded and more orderly user opportunities from the two expansive parking areas.

- Robert Moses State Park / Fire Island Lighthouse Shuttle Bus and Water Taxi
- Smith Point County Park pedestrian improvements and shuttle bus
- Transportation and resource information system at both sites.

5.3.3 On Island Improvements

Continuation of ongoing maintenance of lateral and transverse trails and pathways with particular attention to signage, wayfinding, and where appropriate, interpretive information. All of the existing and new trails, and wayfinding improvements would be keyed into guide maps and programs for increased hiking and access options for visitors.

5.4 Route Operations Factors and Analysis

5.4.1 Route and Vessel Characteristics

The recommended routes and operating characteristics by and large are reflective of the existing navigation patterns and passenger vessels that have evolved over decades of service. While faster or larger vessels might be able to reduce trip crossings by 5 to 10 minutes, a considerable cost premium would be needed for both capital investment and fuel consumption. The evaluation of existing operations indicated that within the navigational constraints, the geography of mainland and island sites, and the fare restrictions imposed by the County, the current cross bay operations are quite efficient, and there is little reason to recommend significant changes.

- Route Characteristics: The actual navigation options are very limited by the many shoal areas in the Bay, for connecting either Mainland to Island routes, or lateral island community links by water taxi. The current trip patterns seem to be efficient and relatively economical utilizing the three mainland terminal locations.
- Vessel Characteristics for Existing and New Routes: The vessels operating on the existing mainland routes have been optimized in terms of capacity, shoal draft, and speed to match the needs of the various crossings. Similarly the water taxis seem to be well suited for the variety of lateral and charter mainland crossings needed. While emerging technologies may in some cases appear to offer improved performance, it usually at a considerable cost in terms of operations which the current fare limits would not allow, even if there were a market for faster trips, for example. The Coast Guard requirement for toilets on board for trips over 30 minutes in duration has had a significant impact on vessel speed and trip length.

5.4.2 Permit and Regulatory Factors

As with any fragile barrier island context, as exemplified by Fire Island, and a low lying mainland in a tidal salt water environment, there are always numerous environmental restrictions on shoreline development. As with the vessel and route recommendations, the terminal facility proposals tend to favor the existing sites over new ones, and renovation or expansion over new construction. Among other reasons, the development of a new terminal at Heckscher State Park was rejected because of the anticipated impacts of dredging and breakwater construction, which would have been both costly and time consuming in terms of environmental permits from the State DEP and possibly the Army Corps of Engineers. Recommended additions and alterations of existing terminals on the mainland and Fire Island were limited at the specific sites because of the bay shore wetlands and tidal conditions. At the

proposed new sites at Smith Point and Field Five at Robert Moses, the environmental conditions will need to be considered carefully in selecting specific sites for the dock facilities and the designs will need to be tailored to the conditions to minimize shoreline impacts.

Additional descriptions of the permit and regulatory requirements are to be found in Appendix A.

5.4.3 Landside Signage, Information and Promotional Needs

A critical need in improving visitor access to the Seashore resources is the acceleration of efforts now underway by FINS to improve roadway signage, local signage, information on activities and experiences at the Island, and presenting a higher profile through selective promotion to target markets. The survey was useful in identifying some new characteristics and demographics of current user groups which should be helpful with future promotional efforts. There is a sense that the public park lands at Fire Island are a well guarded secret, and that general public awareness of the park and the varied experiences offered is very limited. While the capacity of the FINS resources are necessarily limited in contrast to the two major end parks at Smith Point Park and Robert Moses Park, considerably more annualized visitation seems possible and likely with a modest promotional out reach in conjunction with the phased facility improvements underway. The key to higher visibility and visitation seems to be linked to the implementation of the Patchogue/Watch Hill Terminal and Interpretive Center.

5.4.4 Cost Factors for Route Options (Fare vs. Operations Costs)

The report identified a range of potential visitation projections for the Mainland and lateral water taxi uses. It is possible to use the ferry operations cost model as described in Appendix B to test the economic feasibility of the proposed routes, assuming certain fare rates. This task is left for the next phase of planning and design. Several factors are worth considering in such an evaluation, however.

- The cost of visitor travel from Mainland to Fire Island terminals varies considerably depending on the departure site and the mode of travel.
    - For visitors arriving by car, the total trip price is considerably higher from Sayville or Bay Shore than from Patchogue because of the combined cost of ferry fare and parking fee.
    - For visitors arriving by rail or bus, the combined cost may be more comparable from the three sites, depending on the transfer cost from the rail station.
- The cost of visiting the Seashore at either of the end parks seems to be considerably less than the total cost from any of the ferry sites, particularly for a family, based on the parking fees. While the more natural areas of the seashore are accessible from either end park, it requires a considerable walking effort. The FINS sites may need to be promoted as offering more of a wilderness experience to justify the higher cost and multimodal trip.
- Ultimately there will need to be enough ferry riders on each of the existing and new ferry routes to offer the operators a profit under the constraints of the fare cap imposed by the County. If the cap is too much of a constraint, the County may need to be persuaded that gradually increasing fares is necessary for the ferries to stay in business.

Chapter 6: Selection of Preferred Dock Sites

The purpose of the dock site analysis was to identify a list of recommended sites for expanded existing service and/or new services. The analysis was limited to mainland and island sites which would be used by visitors to the specific FINS sites, and did not include all of the privately or publicly managed community ferry terminals. While it was recognized that the residents and visitors to the various communities are in fact users of the National Seashore, it was beyond the scope of the project to address each community's needs with the exception of those which might serve as water taxi transfer sites. Dock sites were identified and evaluated based on review of existing documentation and travel data, stakeholder interviews and input, site visits by the Volpe team, and survey data collection efforts.

6.1 Description of All Dock Sites Considered (Long List)

An analysis of the potential dock sites was conducted in parallel with the evaluation of potential ferry routes. A long list of mainland gateway site options were considered as well as island terminal options. As in the route description, the focus of the analysis was on those mainland and island terminal sites which directly served the FINS managed resources and a limited number of private community docks that might serve as transfer sites for lateral water transportation services. While the full range of mainland and island terminals and routes serving them were of interest to the study, the more limited set of sites served as the focus.

6.1.1 Mainland Gateway Sites

Four general mainland gateway site locations were considered, including the three existing town locations at Patchogue, Sayville, and Bay Shore, as well as a new potential location at Heckscher State Park. Within each general location, several specific site locations were considered.

Patchogue (Existing)

There are currently two ferry terminal sites operating in Patchogue along the protected waters of the Patchogue River; the Park Service terminal near the train station which provides ferry service to Watch Hill, and the Davis Park Ferry Terminal at the Brookhaven Town Recreation Park which accommodates service to Davis Park. The Davis Park Ferry Company provides services from both terminals.

The Watch Hill terminal location has several major landside advantages over other mainland sites as a FINS access point. The existing ferry landing is located within easy walking distance of the Long Island Rail Terminal, providing the only such walking distance site among the existing mainland terminals. The site is owned by the National Park Service, including the current parking area. The FINS unit has prepared a plan for a visitors center with expanded parking and ferry terminal facilities to act as the primary NPS orientation center for the Seashore, and is currently seeking capital funding for the initial phases of construction. From the waterside the terminal is less advantageous, being nearly a mile up the Patchogue River, and requiring a slow speed departure and arrival by ferry. The geographical location of Patchogue as the eastern most of the mainland gateways requires a somewhat

longer auto or train trip for visitors from New York City, but is well situated for the broader market of Long Island residents. A major advantage of the NPS terminal site is that it does not require that day trippers to the Seashore compete with Fire Island community residents for parking spaces, since the Davis Park ferry leaves from the Brookhaven terminal.

The Brookhaven terminal is located approximately 1.3 miles from the railroad station, but is near the mouth of the Patchogue River on a jetty, and is therefore closer by water to Fire Island. The public recreation area has a much larger public parking area and a modest seasonal terminal building. The ferry operation serving Davis Park is focused primarily on local residents who own most of the residences. The site is well suited to the Davis Park service, but would be less desirable for the FINS Watch Hill ferry.

Sayville (Existing)

The ferry terminal sites in Sayville along Brown Creek exist as a string of interconnected departure sites along Foster Avenue. The Sayville Ferry Company offers services from multiple landings to the FINS site at Sailors Haven, as well as to the private communities of Cherry Grove, and Fire Island Pines. For purposes of the analysis, the series of connected ferry landings is considered to be a single terminal site.

The Sayville terminal is located over 1.5 miles from the rail station, and has good highway connections. The terminal provides a substantial amount of well organized parking adjacent to the respective landings serving the various destinations. However, the weekend parking pressures can result in full lots and limited opportunities for day travelers to the Seashore. Weekday parking is less of a problem. The location of the terminal some distance from the major shore road, Montauk Highway/Route 27A, with access through residential areas, makes finding the ferry landings somewhat difficult for new users. From the waterside, the Sayville terminal is geographically well situated with relatively short crossings.

Heckscher State Park (New)

As described in the route analysis, Heckscher State Park was also considered as a possible location for a new terminal site. Two sites were investigated within the park, including the boat launch basin and an east side site on Nicoll Bay. Both sites would have the landside advantage of limited access highway connections to the Long Island expressway system. Each site would have ample parking availability for a limited set of ferry routes. The State Park Service expressed interest in the possibility of a new ferry terminal, but also reserved the right to share in the revenues form parking or other concession related sources.

The basin site offers a well protected terminal location. However, there seem to be a number of constraints on bringing ferry service into the basin. The basin is currently used by smaller recreational vessels including personal watercraft, which would conflict with the larger ferry operation. The basin is also quite shallow and surrounded by a fragile marsh border. Dredging would be appear to be required according to the nautical charts. A new ferry landing would also be required, separate from the recreational boating facilities. Therefore, the cost of adapting this site for ferry service would be substantial and considerable environmental permitting would be needed.

The alternative site on Nicoll Bay would require a different set of improvements. A new channel from deeper water would be required as well as a turning basin for the terminal site, necessitating as substantial amount of "out-shore" dredging. A breakwater would be needed around a shoreside terminal basin. A new terminal dock and pier connection to the upland area would be needed. The parking area might be adapted from existing asphalted areas, but some degree of repair appears to be required. In short many of the same costs would be incurred for the land and water components of a new terminal facility.

While the Nicoll Bay site appears to be technically feasible as a new mainland departure site, and would be an acceptable addition to the park based on conversation with state officials, the location of a new mainland terminal poses difficulties in relationship to the market analysis of future route demands and needs as described in Chapter 4. Viewed strictly from a site feasibility standpoint with respect to access to FINS sites as opposed to community sites, there are advantages and disadvantages to the Nicoll Bay site. Advantages over other mainland terminal locations are largely on the landside. Subject to approval from the State Park System, the location would offer good auto and bus access, as well as ample space for parking next to the ferry landing. From the waterside, the disadvantages are more apparent. The siting of a dock would most likely require a combination of a breakwater and substantial dredging of an approach channel and basin area. The state and federal permits required to achieve such a terminal construction would be time consuming, and the construction required to minimize environmental impacts would most likely be costly.

When comparing capital investments in upgrading existing mainland terminal facilities at Sayville and Bay Shore to building a new competing facility at Heckscher Park, it appears that the more cost effective approach to improving facilities and expanding the capacity is to upgrade the existing terminals. Therefore, it is recommended that the Heckscher sites be dropped from further consideration based on both the operations feasibility and terminal construction analyses.

Bay Shore (Existing)

Further east, the existing Bay Shore ferry terminals are located in multiple locations on inlets on the Pentaquit Creek. The terminals are dispersed and have different street connections to Montauk Highway and the rail station. The rail station is a long walk at about 0.75 miles from the nearest terminals. The numerous waterways and marshes make the approaches to the various landing sites the most complex of the three existing mainland gateways. Parking is also scattered about the various landings, and is in short supply on season weekends.

If additional services were to be offered from Bay Shore, an important issue would be the selection of a landing site with additional parking. At present, based on reports of current parking usage, such a site might require remote parking with shuttle service, or a reallocation of current parking resources.

6.1.2 FINS Island Sites

Both of the existing FINS island sites currently served by regularly scheduled service were considered as options for enhancement and expanded service, including Sailors Haven, and Watch Hill. Three FINS sites were considered which would require substantial improvement to landings and shoreside amenities, including Fire Island Lighthouse, Talisman/Barrett Beach and Old Inlet. Two new sites were evaluated at Smith Point near the FINS Wilderness Visitor Center on the east end and at Robert

Moses State Park near the eastern most parking area at Parking Field #5. The sites are listed east to west.

Smith Point/FINS Wilderness Center (New)

The Wilderness Center at the east end of the largest portion of uninterrupted National Seashore is currently difficult to get to, with visitors obliged to drive and park in the sprawling county beach lot. A new landing just west of the bridge would allow for a boat connection to Patchogue and other south shore gateways. The potential site is near the Intracoastal Waterway channel and could be connected into the existing Wilderness loop trail which in turn links to the Visitors Center. The site would also provide access to the eastern end of the Seashore which includes and extends beyond the Smith Point County Park. Some environmental issues would need to be addressed along the naturally vegetated shore, and the precise site would need to be carefully determined.

Old Inlet (New)

While the site was not actually visited, it is reportedly used by recreational boaters, and has an older landing facility that could be improved for the proposed Far East water taxi service and 60 passenger vessels. The long approach channel to Old Inlet limits the size of entering vessels, and may preclude full size ferry service. However a smaller, shoal draft water taxi would probably have no problem navigating the channel approaches and dock area. The site has the advantage of being located well into the Wilderness area and would be well suited for interpretive programs.

Watch Hill (Existing)

The current visitors center and amenities at the site make Watch Hill the most attractive of the current active FINS Island sites. The harbor is well protected and offers a good landing area for the Patchogue ferry services. As with many other sites the actual ferry landing is not fully accessible based on ADA standards. In the case of Watch Hill there are two aspects of the terminal which are non-compliant: (1) the fixed freeboard height for ferries requires overly steep transfer ramps at some tide conditions, and (2) an overly steep ramp leads from the landing to the higher elevation board walk. Both of these conditions could be modified with relatively small adjustments. Since the tide range is so small in the Great South Bay, access modifications would be relatively easy to achieve.

Talisman/ Barrett Beach (New)

Currently used primarily as a weekend destination for recreational boaters, the Talisman site offers great potential in terms of existing facilities and building resources that could be adapted and fixed up to offer a diversified environment for visitors. There are detailed plans for improving the landing configuration and facilities for ferries and recreational boaters. There is no protected basin, or breakwater, existing or proposed at Talisman, necessitating an exposed landing site. The narrowest section of Fire Island at present, there are ongoing debates on how or whether to strengthen the beach and bay sides to avoid a potential breach.

Sailors Haven/Sunken Forest (Existing)

Although the site does have regularly scheduled ferry service, visitation is relatively low during the high season. The protected basin with its marina type slips attracts a sizable crowd of recreational boaters on weekends and gives the site the feel of a private marina. The dock facility needs to be made accessible, and additional visitor amenities would be appropriate. The unique sunken forest lends itself to a variety of interpretive programs, and increase visitor use.

Fire Island Lighthouse (New)

The well maintained Fire Island Lighthouse provides a major visual icon at the west end of the Seashore, which is currently accessed through Robert Moses State Park. An existing wood pier is available for recreational users and the occasional charter ferry. It is not accessible and requires stabilization. The trail connections between pier and Lighthouse are minimal and might also be considered for improvement as part of a terminal reconstruction project.

Robert Moses State Park Parking Field #5 (New)

The eastern most parking area at the Park provides and opportunity for alternative parking and access for Island community residents and potential FINS visitors, particularly during the shoulder seasons and peak season weekdays when the parking area is underutilized. With the increasing number of Fire Island property owners wishing to use their residents over an extended season, the water taxi landing would provide an alternative to hiking or backpacking into the communities at times when mainland routes are discontinued or are on a limited schedule. The dock could be used as an extension of the west water taxi route for FINS day visitors during the peak summer season, and be used by residents and visitors during the shoulder seasons. The siting of a dock at Field Five in the Park would need to be managed in order to avoid conflicts of resident parking and ferry use during peak summer periods.

6.1.3 Island Transfer Sites (Lateral Service)

Davis Park (New)

The privately maintained landing could serve as a useful water taxi transfer site at the east end of the island. Being located midway between Watch Hill and Talisman, the site is well suited as an optional point of embarkation after a seashore walk from either adjacent site. As previously described such use would require a formal approval by the community .

Fire Island Pines (Existing)

The current harbor area offers another attractive lateral water taxi transfer terminal subject to approval by the residents. The harbor is well protected and has an extensive usable bulkhead/boardwalk perimeter edge which currently accommodates the water taxis and ferries. The food shops and restaurants provide ample visitor amenities.

Cherry Grove (Existing)

The nearby Cherry Grove site has a finger pier which is used by the water taxi and scheduled ferry services. It offers an alternative central water taxi transfer site with the added benefit of being within walking distance of Sailors Haven and Sunken Pines.

Ocean Beach (Existing)

The Ocean Beach town center and ferry terminal offers a west end water taxi transfer location. The site could also be used as a secondary beach access point along the relatively wide pedestrian streets. Since the current ferry landing is actively used for the extensive scheduled ferry service, accommodation of more frequent water taxi use would require some coordination. As with the other transfer candidates, approval by the community would be essential.

6.2 Dock Site Options Analysis and Conditions Evaluation (Short List)

6.2.1 Site Conditions and Needs Checklist

The feasibility analysis of the short list of sites included application of a basic checklist of conditions and was used including the following:

- Existing Facilities and Conditions: What terminal and dock facilities are currently operational at each site and what are the general physical conditions.
- ADA Accessibility for Docks and Upland: How well do the present facilities meet ADA requirements based on the consultant team experience with standards in other states (in the absence of specific marine facility requirements in New York) and in anticipation of expected federal standards to be released.
- Existing or New Routes to be Accommodated at the Site: Description of existing or proposed services including mainland gateway or lateral water taxi routes.
- Vessel Sizes to be Accommodated by Dock Facilities: The range of vessel sizes to be accommodated by the dock facilities ranging from water taxi to scheduled mainland routes.
- Terminal Construction or Modification Priority and Phasing: Based on factors such as the route operation phasing recommendations and NPS FINS timetables for terminal improvements, the appropriate phasing and priority assignments were applied to each of the recommended facilities.

6.2.2 Matrix Analysis: Sites and Issues

A summary table of site conditions, issues and recommendations is provided for each of the three types of dock uses: Mainland Gateway Sites (see Table 6-1), Island FINS Sites (see Table 6-2), and Island Lateral Water Taxi Transfer Sites (see Table 6-3). The sites evaluated are those included in the short list of recommended sites.

TABLE 6-1: MAINLAND GATEWAY SITES – SUMMARY OF CONDITIONS AND ISSUES

Dock Site	Existing Condition	Dock/Upland ADA Access	Existing/New Routes	Vessel Capacity Needs	Priority and Phase
(1) Patchogue - NPS Watch Hill Ferry Terminal	Poor dock and terminal building condition - needs bulkhead stabilization and accessible new dock	Dock - No; Upland -Yes	Existing seasonal routes to Watch Hill	60, 149, 250 passenger	(Phase 1) Requires new accessible dock and ramp system; new terminal facility and expanded parking
(2) Patchogue - Town of Brookhaven, Sandspit Park	Poor condition; needs new accessible dock	Dock - No; Upland -Yes	Existing service to Davis Park	60, 149, 300 passenger	(Phase 2) Requires modified accessible dock and ramp system; new terminal facility
(3) Sayville	Fair condition; needs new accessible dock and parking	Dock - No; Upland -Yes	Existing services to Sailor's Haven. Cherry Grove and Fire Island Pines	60, 149, 300 passenger	(Phase 1) Requires modified accessible dock and ramp system; additional parking
(4) Bay Shore	Fair condition; needs new accessible dock and parking	Dock - No; Upland -Yes	Existing services to Ocean Beach	60, 149, 300 passenger	(Phase 1) Requires modified accessible dock and ramp system; additional parking

TABLE 6-2: FINS ISLAND SITES – SUMMARY OF CONDITIONS AND ISSUES

Dock Site	Existing Condition	Dock/Upland ADA Access	Existing/New Routes	Vessel Capacity Needs	Priority and Phase
(1) Smith Point/ Wilderness Center	No dock facilities; limited exposure site without breakwater	Dock - No: Upland - No	Proposed new route from Patchogue; Other routes possible to east	60 passenger, water taxi	(Phase 3) Requires new accessible dock and landside access
(2) Old Inlet	Existing marina slips and dock in fair condition; protected basin	Dock - No: Upland - No	Proposed new route from Patchogue; Other routes possible to east	60 passenger, water taxi	(Phase 3) Requires modified accessible dock and landside access
(3) Watch Hill	Existing dock and separate marina slips in good condition; protected basin	Dock - No: Upland - No; initial steep ramp from landing	Existing route from Patchogue/ Watch Hill; proposed new water taxi stop	60, 149, 250 passenger, water taxi	(Phase 1) Requires modified accessible dock, landside ramp modification, and water taxi landing
(4) Talisman/ Barrett Beach	Existing dock and landing area to be replaced; exposed dock site	Dock - No; Upland - No: requires pathway modifications	Existing limited service route from Sayville; expanded Sayville service and new route from Patchogue/Watch Hill	60, 149, 250 passenger, water taxi	(Phase 1) Requires new accessible dock, landside pathway links and modification, and water taxi landing
(5) Sailors Haven	Existing marina slips and dock in good condition; Protected basin	Dock - No; Upland - No	Existing service route from Sayville; expanded Sayville service and new water taxi stops	60, 149, 250 passenger, water taxi	(Phase 1) Requires modified accessible dock, landside ramp modification, and water taxi landing
(6) Fire Island Lighthouse	Existing dock and landing area to be modified: exposed site without breakwater	Dock - No; Upland - No; sand and gravel paths from dock to Lighthouse	On-call water taxi, no existing mainland service: proposed route from Bay Shore, added water taxi service.	60, 149, 250 passenger, water taxi	(Phase 1) Requires new accessible dock, landside pathway links and modification, and water taxi landing
(7) Robert Moses State Park / opposite Parking Field #5	No dock; limited exposure site without breakwater	Dock - No; Upland - No	No existing service: proposed water taxi and off season lateral service	60, 149, 250 passenger, water taxi	(Phase 2) Requires new accessible dock, new landside pathway links, and water taxi landing

TABLE 6-3: ISLAND TRANSFER SITES – SUMMARY OF CONDITIONS AND ISSUES

Dock Site	Existing Condition	Dock/Upland ADA Access	Existing/New Routes	Vessel Capacity Needs	Priority and Phase
(1) Davis Park - East End	No specific water taxi dock	Dock - No[(1)] Upland - Yes	Limited existing on call service; proposed new east end service stop	15 to 35 passenger	(Phase 3) requires agreement by community and designated existing or new dock site
(2A) Fire Island Pines - Central [(2)]	Multiple water taxi dock landings in good condition	Dock - No[(1)] Upland - Yes	Expanded existing central service and proposed east and west end stop	15 to 35 passenger	(Phase 3) requires agreement by community and designated existing dock site
(2B) Cherry Grove - Central [(2)]	Water taxi landing in good condition	Dock - No[(1)] Upland - Yes	Expanded existing central service and proposed east and west end stop	15 to 35 passenger	(Phase 3) requires agreement by community and designated existing or new dock site
(3) Ocean Beach - West End	Water taxi landing in good condition	Dock - No[(1)] Upland - Yes	Expanded existing west and central service	15 to 35 passenger	(Phase 3) requires agreement by community and designated existing or new dock site

(1) Water taxi vessels are not accessible and may not need to be depending on promulgation of federal ADA vessel requirements. Therefore, existing docks may not need to be accessible, but new docks should be designed so as good practice.

(2) Fire Island Pines and Cherry Grove are listed as alternative central transfer sites. Both will continue to serve as water taxi sites based on high demand.

6.3 Recommended Dock Sites and Programs

6.3.1 Mainland Gateway Sites

All recommended mainland sites are at existing terminal locations in Patchogue, Sayville and Bay Shore. There are several common needs among the various terminal sites. Primary modifications needed for existing docks include provision of ADA access at such time as federal regulations are issued clarifying the requirements for maritime facilities, as well as improvements to upland pathways and vehicular dropoffs for ADA access based on current state code requirements. General landside improvements needed at various locations include improved waiting areas, directional signage, and information about the National Seashore, as well as parking modifications.

Documentation of existing conditions at the recommended sites is very limited and precluded any efforts to prepare concept sketches as part of this report. It is recommended that the FINS mainland and island sites be systematically and sequentially documented through GIS or direct survey means to allow for more detailed design and construction. This would allow for schematic designs and cost estimates for the terminal sites. For non FINS mainland and island transfer sites the responsibilities for such documentation and design would need to be arranged with private owners or communities. The alternative for the FINS would be to use a design build approach, much the same as has been used by NPS for the Talisman/Barrett Beach site.

The following mainland terminal sites are recommended including specific issues and program elements as described.

Patchogue/Watch Hill Terminal (Existing)

The current terminal includes a fixed freeboard landing along an aging wood bulkhead. The existing waiting shelter provides minimal sun and weather protection, limited information and few amenities. While the tide range is minimal at the site, in the range of 1 to 2 feet for average conditions, the dock would not be considered ADA compliant according to maritime standards expected to be issued shortly by the federal government. It is likely that at Patchogue as well as other mainland and island sites, modifications will be required to allow for unassisted access from the shoreside to the vessel. The parking area appears ample for current usage, but may need an expansion plan to accommodate future demand, such as partial use of the adjacent bowling alley site. This could also be achieved through a formalization and promotion of the current shared parking with the rail station to accommodate overflow weekday commuters at the ferry lot and overflow park visitors at the rail lot.

Many of the needed improvements are incorporated in the preliminary plans for the Fire Island Ferry Terminal/Interactive Learning Center plans prepared for the NPS in 1995. Plan refinements as the plan is finalized might include the following:

- Ferry landing facilities: (1) multiple freeboard landing levels for smaller and larger vessel types, (2) capacity for two vessels to berth (approximately 150 feet of dock frontage), (3) ADA compliant access based on future federal requirements.
- Improved exterior pedestrian access: (1) from the train station to the site, (2) through the center of the parking lot to the entrance, which might require re-striping and landscaping, perimeter pathways and

landscaping around the Learning Center to allow direct access to the ferry landing without requiring passage through the Center, and outdoor programming areas related to the waterfront and ferry landing.
- A sheltered waiting area at the ferry landing edge with benches and information which could either be a renovation of the existing structure or a new canopied shelter.
- A signage design and implementation plan for the site and for the approaches to the site from Main Street in Patchogue and the surrounding highway network.

With respect to the ferry landing area itself, there are more specific requirements which will need to be considered in the next phase of design. Initially the dock will need to accommodate the existing vessels used for the Watch Hill route, consisting of a berth approximately 100 feet in length. Eventually, an additional berth may be needed to accommodate a smaller 35 to 60 person vessel. One example of how the ADA requirements may be met would be through re-building of a portion of the bulkhead with fixed ramps connecting several boarding platforms at height intervals of 8 to 12 inches, allowing the various vessels to find their appropriate niche depending on the tide conditions. Since the bulkhead may need to be stabilized or replaced in the near future, such improvements could be incorporated at the time. The components needed for the renovation and expansion of the existing terminal facility include the following:

(1) Bulkhead stabilization
(2) Expanded vessel berthing to approximately 150 feet
(3) ADA access modifications (pending new federal requirements)
(4) Covered waiting area (renovated existing or new)
(5) Pathway connections to the ferry landing from the parking area through and around the Terminal / Learning Center
(6) Signage within the site and for access from streets and highways to the site

Sayville (Existing)

Since the Sayville terminal site for the Sailors Haven and Barrett Beach routes is maintained by Sayville Ferry, the recommendations are recommended for discussion purposes. A specific "gate" is currently used for the Sailors Haven and Barrett Beach services. The dock configuration will need to be modified for ADA access at such time as the regulations are established. The terminal site is generally well marked by signage locally but could benefit from more explicit highway signage referencing the National Seashore. It is recommended that a new Fire Island National Seashore information kiosk be installed at an appropriate location for the benefit of the park visitors. The kiosk would include ferry information, specific site information, references to other FINS departure sites and an interactive information retrieval system for Fire Island as a whole. It is understood that NPS FINS is currently designing such an initial kiosk, and that implementation will follow.

The components needed for the renovation and expansion of the existing terminal facility include the following:

(1) ADA access modifications to ferry landing (pending new federal requirements)
(2) Covered waiting area (renovated existing or new)
(3) ADA pedestrian path of travel assessment and modifications to connections to the ferry landing from the parking area through and around the terminal
(4) Signage for streets and highways to the site

(5) Addition of NPS FINS information kiosk

Bay Shore (Existing)

While the Bay Shore Terminal currently exists, there is no designated NPS FINS departure point since there are no FINS sites served directly by Bay Shore ferries. It is assumed that a site will be designated at such time as a new service to the Fire Island Lighthouse is implemented. The central terminal would be the recommended location assuming that some provision could be made for parking availability. The signage and directional issues are somewhat different at a central terminal with multiple slips but can be incorporated into the Bay Shore Ferries system. ADA access modifications will also be needed pending federal regulations. A standard NPS FINS information kiosk would also be recommended at the Bay Shore terminal site.

Most of these terminal issues will need to be addressed in performance specifications contained in the prospectus for ferry services which would be issued by NPS FINS for the Fire Island Lighthouse service.

The components needed for the establishment of a new dock facility at the Bay Shore Ferry Terminal would include the following:

(1) ADA access modifications to ferry landing (pending new federal requirements)
(2) Covered waiting area (existing or new)
(3) ADA pedestrian path of travel assessment and any modifications needed to connections from the parking area to the ferry landing through and/or around the terminal
(4) Signage for the terminal area, parking, local streets and along highways to the site
(5) Addition of NPS FINS information kiosk

6.3.2 FINS Island Sites

The sites maintained by NPS FINS on the island are diverse and have largely differing needs. The configuration and wind/weather exposure for the existing landing sites vary from the protected basins at Old Inlet, Watch Hill and Sailors Haven to the more exposed sites at Talisman/Barrett Beach and Fire Island Lighthouse. New dock sites are proposed at the exposed locations at Smith Point and Field Five at Robert Moses Park. Therefore, needed modifications and additions to these sites are likely to require specific design solutions. Generic needs for the sites include ADA dock modifications, pathway connections from docks, protected waiting areas, and information boards.

The following FINS island terminal sites are recommended with specific issues and program elements as described.

Smith Point/Wilderness (New, Phase 3)

A new dock site would need to be identified within 1000 feet and to the west of the bridge abutment. Locating a site with the least impact on the natural shoreline and intertidal zone may require an environmental analysis prior to final design and implementation for purposes of permitting. In addition to a dock capable of handling up to a 60 foot/75 passenger vessel and a small waiting facility, a path or

boardwalk connection would be needed to link with the existing boardwalk system. No parking or vehicular access would be needed for the pedestrian oriented site.

The components needed for a new terminal facility would include the following:

(1) ADA accessible ferry landing for a 60 foot/75 passenger vessel (pending new federal requirements)
(2) Covered waiting area (new)
(3) ADA pedestrian path connection to the ferry landing from the existing boardwalk trail
(4) Signage for pathways to the site

Old Inlet (Existing/New, Phase 3)

The existing dock site would be renovated to provide ADA access to a 60 foot / 75 passenger vessel within the existing basin area. Improvements would be made as needed to the path system connecting to the beach and other resource locations. A small waiting shelter and information board would be provided. The dock site would be kept distinct from the existing recreational boat slips and support area, with strict prohibitions at the dock for recreational berthing use.

The components needed for a renovated terminal facility would include the following:

(1) Modify existing dock space as an accessible ferry landing for 60 foot/75 passenger 15-30 passenger water taxi vessels (pending new federal requirements)
(2) Covered waiting area (new)
(3) ADA pedestrian path connection to the ferry landing from the existing boardwalk trail
(4) Signage for pathways to the site visitor resources

Watch Hill (Existing, Phase 1)

The existing dock at the Watch Hill site is well located within a protected basin and separated from the recreational boat slips. There are visitor waiting and concession facilities nearby, and the dock is well connected to other site resources by a boardwalk system. Primary needs for the site are to modify the dock to meet pending ADA access requirements including provision of landing freeboard heights to meet large and small ferry as well as water taxi needs. In addition, the steep slope of the ramp connection from the boardwalk to the dock bulkhead needs to be made more gradual to meet ADA requirements.

Talisman/ Barrett Beach (Existing/New, Phase 1)

The construction plans for the Talisman/Barrett Beach ferry landing and bulkhead reconfiguration were well underway at the time of the study completion. The dock location is exposed to wind and weather and therefore may require a different design approach than those sites that are within basins. A floating spud barge with moveable ramp connection to the top of the bulkhead may be more appropriate than a fixed bulkhead landing, and can more easily achieve ADA access needs. Multiple freeboard heights are still needed to meet the larger ferry and water taxi heights. Other support needs include a waiting area, pathway connections to other resources, local signage, and information board.

The components needed for the new terminal facility would include the following:

(1) ADA accessible ferry landing for 60 foot/75 passenger and 15-30 passenger water taxi vessels (pending new federal requirements)
(2) Covered waiting area (new)
(3) ADA pedestrian path connection to the ferry landing from the new and existing pathways, and to other resources
(4) Signage for pathways to the site

Sailors Haven/Sunken Forest (Existing, Phase 1)

The existing dock at the Sailors Haven site is well protected within a basin, and is located in the middle of the recreational boat slips. There are visitor waiting and concession facilities nearby, and the dock is well connected to other site resources including the Sunken Forest and the ocean beach by a boardwalk system. Primary needs for the site include the modification of the dock to meet pending ADA access requirements. This would include provision of multiple landing freeboard heights to meet large and small ferry as well as water taxi needs.

Another concern at Sailors Haven is the atmosphere created by regular visiting recreational boaters that the basin is their private marina. Some ferry visitors have expressed experiencing an atmosphere of hostility from the boaters at slips, as if the boaters had a proprietary right to the basin and visitors were not welcome. The visitors may have felt uncomfortable using the dockside facilities such as restrooms and changing areas. It is possible that such an atmosphere may discourage repeat use of the site by mainland Seashore visitors by ferry. There are several approaches which may help alleviate the situation. One would be to reorganize the basin to have fewer visiting vessel slips and provide a larger area around the ferry berth. The second would be to implement a visiting boater policy which limits the frequency of slip use by transient boaters, so that such proprietary behavior is less likely, which would require new regulations with either stricter NPS monitoring and/or a slip reservation system. A third tactic, which may take more time, would be to increase visitation by Seashore ferry visitors to such levels that the ferry visitors significantly outnumbered the boaters and effectively seized the turf.

Fire Island Lighthouse (Existing/New, Phase 2)

The existing dock is used by the water taxi to transport visitors to the site, but is woefully inadequate regarding ADA or even general access, particularly during lower tide cycles when visitors may need to climb vertical ladders to get to the top of the fixed pier. This condition is partially due to the age of the pier and partially due to the exposed location. Remedies to make the dock more user friendly and accommodating to larger ferry vessels would appear to require substantially refitting of the dock to include pier mounted wave attenuation devices and floating docks with ramps to the top of pier. On the landside there are also issues regarding limitations on ADA access relating to the lack of continuity of hard surface walkways from the pier to the Fire Island Lighthouse and ocean beach. Currently substantial segments of the pathway link are loose sand trails. These areas are relatively flat and the main pathway could be covered with a boardwalk

Robert Moses State Park/Field Five (New, Phase 3)

A new landing is proposed for a site to be determined on the Bay side of the parking lot to provide a park and ride opportunity for east end communities. It is anticipated that users would include two groups: summer State Park day visitors wishing to visit the island NPS sites and communities by water

taxi, and island community residents for water taxi access to their residences during off season periods when scheduled mainland service was no longer operating. Any new dock site is likely to be somewhat exposed without a breakwater. The selected site should be close to parking at north east corner of the parking field, an area which generally would be the last to be filled by beachgoers. The dock could be a combination of a fixed pier and floating dock. It needs to be designed for year round use, to cater to the off-season community residents. Site and marine engineering design studies will need to be conducted to determine the best site, and assess any environmental issues to be addressed.

6.3.3 Island Transfer Sites (Lateral Service)

The following island terminal transfer sites are recommended with references to specific design issues and program elements needed. It should be noted that most sites have active water taxi landings that would be first priority locations depending on approval by the operators and the host communities. Most existing water taxi docks are within proximity to the scheduled mainland ferry landings.

Davis Park (Existing)

Like all proposed transfer sites, the designated water taxi landing would need to have NPS site information and directional signage, as well as ferry schedule information. The community would need to approve such a service variation, and identify preferred visitor pathways through the community to the ocean beach. Davis Park would serve as the transfer location for the Patchogue mainland terminal.

Fire Island Pines (Existing)

There are currently two water taxi operations and service landings at this popular water taxi site. Information and signage would be needed at the designated site. Community approval and designated public ways from ferry and water taxi landings would be needed. Fire Island Pines and/or Cherry Grove would serve as transfer locations for the Sayville ferries

Cherry Grove (Existing)

Like the other transfer sites, the water taxi site is a short walk and within view of the mainland ferry landing. Community acceptance of the site as a designated NPS transfer would be needed and appropriate information designating public ways. Cherry Grove has a high proportion of day visitors and could be a relatively busy transfer location.

Ocean Beach (Existing)

With an extensive “town center” (relative to other Fire Island communities) with many visitor and resident services, Ocean Beach would also be a potentially active transfer location, subject to community acceptance. The water taxi would be likely to attract substantial numbers of residents to use the taxi to get to NPS sites such as the Lighthouse and Sailors Haven, particularly family groups. It would also serve as the primary transfer location for the Bay Shore mainland terminal.

6.4 Dock Design Concepts and Capital Cost Factors

Important next steps in implementing improved ferry services will be to upgrade the dock facilities. The sequence of steps required will include the following:

(1) Surveys of specific sites to be improved
(2) Preparation of dock designs
(3) Estimates of construction costs
(4) Securing funding for the improvements
(5) Agreements with island communities or vessel
(6) Operators at dock sites not owned by NPS
(7) Construction at sites, preferably during shoulder seasons rather than peak periods.

Design of dock facilities and cost estimating was beyond the scope of this feasibility study. There is virtually no survey information available for the for the island and mainland dock sites. NPS experience has been that information is gathered on a site by site basis at such time as a project is funded. Estimates for construction work on the island are challenging, since all materials, equipment and personnel need to be transported to the site from the mainland, adding a substantial cost premium to the work. The distance between sites means that there are limited economies of scale for site based construction. However, if there are components that are used repeatedly that can be manufactured remotely and shipped to the sites such as prefabricated ramps, floats or support facilities, substantial savings may be realized.

It is recommended, therefore, that during the next design phase, efforts be made to identify components of the island and mainland terminal site developments that can be standardized and manufactured off-site to reduce the high costs of custom construction on island. There are added advantages in a pre-manufactured component approach in terms of potentially lower maintenance depending on the durability of materials selected, and added economies of scale if multiple sites can be addressed simultaneously and multiple components ordered at one time. Examples of component candidates applied in other settings would include the following:

- Floating dock units which are manufactured in standard shipping unit sizes (i.e. 20'x 10', 40'x10' etc.)
- Gangways and Ramps in standard lengths and widths
- Canopies and waiting shelters
- Rest rooms, showers and plumbing systems
- Boardwalk units
- Marina floats and dock equipment
- Signage and information systems
- Lighting, benches, picnic tables, etc.

There will still need to be substantial amounts of custom construction at various sites, but standardization of appropriate component parts can help lower life cycle costs for many of the dock sites.

Chapter 7: Recommendations and Conclusions

7.1 Summary of Findings and Recommendations

7.1.1 Ferry Transportation Survey Findings

As noted earlier, as part of the traveler and resident data collection activities for this report, a travel survey of all fifteen common carrier ferry routes serving Fire Island was implemented during the three days of Thursday, August 24th to Saturday, August 26th, 2000. This travel survey was implemented in order to develop a profile of visitor and resident ferry travel characteristics, to identify the level of satisfaction with current water transportation services, to obtain information on visitor preferences regarding these existing services, and ultimately to help determine how ferry service to Fire Island National Seashore (FINS) can be improved. The results of this survey proved quite useful in terms of preparing the route analysis and recommendations. An excellent overall response rate of 70.8% was achieved, with a sample deemed sufficient to indicate preferences and trends by a broad cross section of Fire Island visitors. A full report on the survey methodology and results can be found earlier in Chapter 3 of the main body of this report. Salient findings relating to user responses and perceptions of existing services and future needs include the following:

- Ferry terminal ground access preferences in order of frequency of use:
  (1) Overall, the "*Drove and parked at ferry terminal*" access mode represented 55.7% of all survey respondents
  (2) Overall, travelers reporting use of the Long Island Rail Road (LIRR) to access the mainland ferry terminals represented nearly 23% of all survey respondents
  (3) For those ferry passengers boarding at the Patchogue NPS Watch Hill ferry terminal, LIRR represented 44.5% of survey respondents

- Potential opportunities for expanding access from terminal sites:
  (1) Increase awareness of the Patchogue LIRR walking link to the Watch Hill ferry
  (2) Expand parking opportunities at all mainland terminals
  (3) Improve signage and information regarding parking and terminal locations at all sites

- FINS site improvements desired:
  (1) Expanded facilities, parking and improved appearance at the Patchogue NPS Watch Hill Terminal
  (2) Expanded Watch Hill service
  (3) Improved amenities, maintenance and appearance at the Watch Hill island site
  (4) Expanded parking at the Sayville/Sailors Haven Terminal
  (5) FINS access information and signage for first time and infrequent visitors

- Preferred new ferry routes:
  (1) East-West water taxi expansion
  (2) Bay Shore to Fire Island Lighthouse
  (3) Direct New York City to Fire Island service
  (4) Little or no interest in new routes from Heckscher State Park

- Enhanced existing ferry service needs:
  (1) Increased frequency of service in season
  (2) Increased service in the shoulder and off seasons
  (3) Increased parking capacity at most terminal locations
  (4) Better coordination of the ferry and Long Island Rail Road schedules

7.1.2 Existing Ferry and Landbased Transportation Analysis

The analysis of the current ferry operations and mainland dock sites revealed a finely tuned seasonal ferry network with three operators that has evolved over a number of years to meet the needs of the island visitors. The mainland services are primarily oriented to the residents and visitors to the island communities, and secondarily oriented to the specific Fire Island National Seashore visitors. The findings regarding particular aspects of the existing ferry system and intermodal links are described as follows:

- Existing Mainland to Island Routes and Departure Points:
  - The largest island population centers receive the most service
  - The three mainland departure points including Bay Shore, Sayville and Patchogue are efficiently dispersed to serve in terms of routes and destinations
  - The community population is greatest at the west end of the Island and is the least at the east end
  - The two Patchogue ferry terminals, served by the Davis Park Ferry Company, provide access for only approximately 15 to 20% of all island visitors by ferry

- Mainland Auto Access:
  - There is a good regional highway network, except for the inherent conflicts of Friday PM commuters and island destined visitors
  - There is poor local street access through the three departure terminal towns
  - The Patchogue NPS ferry terminal provides the only mainland departure site within an easy two minute walk of the Long Island Rail Road (LIRR)

- Existing and Potential Ferry Routes:
  - The routes served and fare structures are regulated by Suffolk County
  - A significant portion of ferry operator revenues can come from parking revenues
  - Heckscher State Park has pros and cons as a potential new mainland ferry terminal:
    + Ample parking areas
    + Good dedicated highway access
    + Competitive ferry route distances to west end of island sites
    (-) Poor proximity and access to Long Island Rail Road (LIRR)
    (-) Would compete with Bay Shore and Sayville operators for the same routes and riders
    (-) Would require extensive permitting for new dock, dredging and breakwater improvements
  - Services to FINS sites from the mainland are good, but have relatively modest annual ridership
  - Existing lateral water taxi service is too costly to serve FINS site visitors

- Mainland intermodal transit connections are critical for the many Fire Island community visitors who travel from the New York City area
  (1) Mainland terminals vary with respect to rail and bus service to ferry links:
    - The limo/charter minibus services from Manhattan are time efficient but costly
    - LIRR/Taxi link is cost effective for island community residents
    - LIRR/Walk to ferry and free parking is cost and time efficient for the east end
    - Park and Walk at Robert Moses State Park and at the Smith Point County Park are cost effective but are not time effective when considering total trip times
  (2) On Island transit services
    - Limited to the lateral water taxi. Existing regular service does not typically extend westward to the Lighthouse or eastward beyond Fire Island Pines to Davis Park or Watch Hill. There are no stops at Sailors Haven because of the long approach
    - There are no land-based inter-community transit services

7.1.3 Market Demand for Future Ferry Access to Fire Island National Seashore

The visitor market consists of two distinct groups of visitors to Fire Island National Seashore: (1) island community residents and visitors who are by volume the vast majority of the more than 2 million annual users, and (2) FINS site visitors including the Otis Pike Wilderness Area (from Smith Point County Park), Watch Hill, Talisman/Barrett Beach, Sailors Haven, and the Fire Island Lighthouse (from Robert Moses State Park). It is important to consider the community residents as significant users of the National Seashore in evaluating current and future market demands on the FINS sites and transportation system. At the risk of restating many obvious characteristics of the dynamics of Fire Island visitation patterns, the salient findings from the market analysis for transportation demands for Fire Island include the following:

- Water transportation provides the primary transportation mode for the great majority of the annual visitors
- Approximately 80% of the visitors come to the island during the peak summer months of June, July and August
- Island development potential for new residences or lodging is very limited by availability of building sites – the island is for the most part built out
- Primary visitor growth can only occur incrementally by more intensive use of existing community resources and by extending the season. Although there are increasing numbers of year round or extended season residents, the numbers are small fractions of island visitation
- Expanded ferry services for primary visitors are expected to be very limited, largely to accommodate incremental season extension beyond the peak summer months
- Secondary visitor growth for expanded use of the FINS sites has the potential to be greater in terms of activating the specific sites
- While the site specific resources have natural capacity limits, expanded use could be expected in several demand areas contingent on improved facilities, programs and transportation. More visitor use of the resources could be expected with a focus on six target marketing areas:
  (1) Establish a major mainland FINS presence through the new Fire Island Ferry Terminal and Interactive Learning Center at Patchogue, expanded FINS gateway kiosks at Bay Shore and Sayville, and a new coordinated multimedia information system
  (2) Additional ferry services would be phased in to improve access to the east end sites

(3) Increased attraction of mainland visitors through selective development of underutilized sites (including Talisman/Barrett Beach, Fire Island Lighthouse and the Wilderness Area), extended season and new programming of existing sites
(4) Increased use by primary island community visitors through improved lateral transportation and new programming
(5) New programs for the continuous seashore beach through recreational, educational and eco-awareness programs and selected public access through participating communities
(6) Channeling of auto visitors at Smith Point County Park and Robert Moses State Park through improved land access, new ferry access, and programs coordinated with county and state park management
(7) Limited recreational boating expansion through improved facility management

- Capital improvements and new attractions are needed at existing and new sites to attract more visitors and improve the quality of the Fire Island experience. Repeat visitation depends on both a positive initial experience and a strong desire to return for new activities. A variety of programs are needed to enhance the experience at different resources

o Existing FINS sites:
  (1) Patchogue/Fire Island Ferry Terminal Center
  (2) Smith Point/Wilderness Center
  (3) Watch Hill
  (4) Sailors Haven
  (5) Fire Island Lighthouse

o Enhanced Underutilized Sites
  (1) Talisman/Barrett Beach
  (2) Old Inlet
  (3) The Beach

o General Island and Mainland Outreach
  (1) Multimedia Information System
  (2) Island, Bay, and Seashore Interpretive Program
  (3) "Amenity centers" (including at a minimum public restrooms, changing areas, telephone and water) at all designated FINS sites on the mainland and on island.

7.1.4 Recommended Improvements to Ferry Routes and Intermodal Transportation

Based on a limited projection of increased visitation to the islands, the strategy recommended for increasing transportation access is to (1) upgrade the quality of existing services, (2) add new services in phases as the demand increases, and (3) improve intermodal transportation connections. All improvements to the transportation services will require upgrades to the mainland terminal and island dock facilities. It should be noted that most of the water transportation improvements will have a primary purpose of providing enhanced access to visitors, and a secondary function of providing better transportation options for FINS staff and seasonal employees.

- Enhancement of Existing Services. The mechanism for upgrading mainland ferry services is through current and future concessions agreements. Selected new mainland and lateral routes would be phased in as terminal improvements were completed and as demand increased. Included

would be all mainland services to FINS island sites as well as selected improvements to community services at designated interface sites including Ocean Beach, Fire Island Pines, and Davis Park.

- Addition of new services would fall into two categories: mainland gateway routes and lateral water taxi routes.

  (2) New Gateway routes would include:
  - Bay Shore to Lighthouse. The new service would be provided to coincide with the season and hours of operation of the Lighthouse.
  - Patchogue to Talisman/Barrett Beach. The mainland departure location would be shifted from Sayville to the Patchogue once the new Gateway facility was completed.
  - Patchogue to Old Inlet and Smith Point. The service would be provided as an excursion on a limited schedule basis.

  (3) Lateral Water Taxi routes would consist of three routes and would include expansion of existing services as well as new services operating on a general schedule
  - The East Lateral route would connect Watch Hill to Sailors Haven. The service would be provided either as a private concession or as a FINS-operated water taxi.
  - The Central Lateral route would connect from Talisman/Barrett Beach to Ocean Beach. The service would be an extension of the existing eastern water taxi and would be provided as a private concession.
  - The West Lateral route would connect from Fire Island Pines to Fire Island Lighthouse. The service would be an extension of the existing western water taxi and would be provided as a private concession.

7.1.5 Terminal and Support Facility Needs

Mainland docking and support facilities need to be improved at the Watch Hill terminal at Patchogue. Modest improvements are proposed at the Sayville and Bay Shore mainland terminals to provide better FINS information and signage. Various improvements are needed at all existing FINS island facilities.

The plans for a new Fire Island Ferry Terminal and Interactive Learning Center at Patchogue should be the first priority. In addition to phased implementation of the attractively designed center, a transformation of the vessel docking and waiting area is needed. ADA access needs to be provided for the higher freeboard dock for larger ferries, and a lower freeboard dock provided for new Far East water taxi service. Other support facility improvements would include an expanded multiple use parking lot, to be shared between FINS visitors and LIRR users. Signage, landscaping and other gateway elements need to be incorporated in the new park setting at this highly visible town center location.

For the other two mainland terminals, it is recommended that FINS information centers be expanded and a multi-media information system be coordinated with the Patchogue Ferry Terminal and Interactive Center. Better signage from the regional highway network is recommended to serve both the FINS ferries as well as other community ferry departure sites.

As of February 2001, dock improvements were under construction at Barrett Beach. The Talisman site is in general disrepair and needs to be reconfigured for both ferry landing and recreational boater uses. New and rehabilitated support facilities would include a visitor amenity mini-center, new boardwalk pathways, a self-contained food concession stand, and phased rehabilitation of the various lodging sites. Since the Talisman site is located at an environmentally fragile, narrow point in the island which

has experienced ocean and bay side erosion, site restoration measures are needed to preserve the resource.

The Fire Island Lighthouse site needs a substantially modified dock facility to provide a sheltered and ADA accessible landing for visitors. As of February 2001, dock plans were being completed and funding was in hand to make improvements to the Fire Island Lighthouse dock. Pathway improvements are recommended connecting the dock facility to the Lighthouse. In addition, a visitor amenity mini-center is needed, either expanding present facilities at the lighthouse or adding a new facility near the dock area. Bay side interpretive trails and beach access could also be added to provide new activity choices for visitors.

Upgrades of docks for ADA accessibility are proposed at Watch Hill and Sailors Haven. Because the tide range is relatively small these modifications are likely to be minimal. Facilities should accommodate both the mainland ferries as well as the smaller water taxi vessels. Some upgrades to the existing amenity centers may be needed to update and freshen up the existing facilities.

A new island dock is proposed at Smith Point to provide a water taxi connection to serve the Wilderness Center, trails and the beach. The proposed site would be located near the bridge at a site with good access to the channel. Connections to the existing trail network would be needed and a small visitor waiting shelter provided at the dock site. All facilities would provide ADA access and be similar in character and appearance to those at other sites.

If it proves feasible or desirable to provide a vessel landing at Old Inlet for water taxi connections, a new or renovated dock facility would be added. Trail connections to the beach and other existing trail segments would be proposed, as well as a minimal visitor waiting shelter.

7.1.6 Capital and Operations Cost Implications

Capital and operations costs for the recommended improvements would need to be phased in over a ten year period. A design and cost estimating task is described in Chapter 6. Concept designs and cost estimates were beyond the scope of this study and will need to proceed as an immediate next step. The task will require more detailed site surveys, concept and final design, cost estimates, funding procurement and strategic approaches to construction. It should be reiterated that the FINS Park Unit is at various stages of design, funding commitment and construction at three of the dock sites discussed in this report: the Watch Hill/Patchogue Terminal, the new Talisman/ Barrett Beach landing, and renovations to the Fire Island Lighthouse dock.

The report recommends a number of capital improvements at various island and mainland dock sites, including transportation related improvements and other related visitor amenities. The capital cost estimates (to be further developed) should focus primarily on the transportation related elements including dock facilities, immediate support facilities and intermodal connections. Docks would be either new or modifications to existing facilities, with an emphasis on providing consistent ADA access. Support facilities would include generally basic visitor waiting and convenience facilities where needed, and in some cases the amenity mini-centers recommended. Intermodal transportation improvements would include mainland signage, parking and information systems. On the island such improvements would consist of signage, boardwalks and trails.

Operations costs for new ferry services are addressed in more detail in Chapter 5. Operating costs were estimated on an annualized basis for two new mainland to island services including Patchogue to Talisman/Barrett Beach and Bay Shore to Lighthouse assuming the use of existing cross bay ferries. Operating costs were not estimated for either the new West Lateral water taxi service or Patchogue to Old Inlet and Smith Point, assuming use of smaller capacity vessels, since sufficient baseline information for the operating costs of existing water taxi vessels was not available.

7.1.7 Phasing and Implementation Plan

The proposed new facilities and transportation services would be implemented over a ten year period in three phases. While there is certainly some flexibility in the sequence of projects depending on funding sources and levels, the implementation plan is intended to reflect the general priority sequence of the recommended projects. The components of the implementation plan focus primarily on transportation investments and programs, but also include the phased implementation of the combined Fire Island Ferry Terminal and Interactive Learning Center at Patchogue.

The general phasing strategy would be to complete mainland and island projects in tandem, emphasizing a strengthened FINS presence on both sides of the bay. The initial phases would start with the much needed improvements and expansion of existing ferry dock facilities, combined with improved signage and information systems. The initial components of the Fire Island Ferry Terminal and Interactive Center at Patchogue would be included in Phase 1. The second phase would add new transportation access to underutilized facilities in parallel with an expanded array of activity programs both on the island and at the completed Patchogue Center. The third phase would include development of new island dock sites and transportation services, along with further expansion of island-wide interpretive and recreational programs. The objectives of each phase of improvements would include the following:

- ***Phase 1***: Strengthening the existing visitor base, including both FINS and island community visitors, by establishing a new island Gateway at the Patchogue Center, and improving access to existing major FINS island attractions.

- ***Phase 2***: Expand the FINS visitor base and attract more island community visitors by improving underutilized FINS sites, adding new programs and providing new mainland ferry services.
- ***Phase 3***: Further expand visitor base and island use by adding new island docks and visitor programs, providing new lateral ferry services, and completing the mainland and lateral ferry routes.

An overall summary of the proposed phased implementation plan is presented in Table 7-1.

TABLE 7-1: PHASED IMPLEMENTATION OF FIRE ISLAND NATIONAL SEASHORE TRANSPORTATION IMPROVEMENTS

Improvement Program Element[1]	Phase 1 2001 -2004	Phase 2 2005 - 2007	Phase 3 2008 - 2010
Mainland Terminal Sites			
Patchogue Terminal Dock, Site Design & Construction Documents (for both Phases 1 & 2)	●		
Fire Island Terminal at Patchogue - Phase 1 [2]	●		
Fire Island Terminal at Patchogue - Phase 2 [3]	●		
Information/Signage System Design	●		
Information System - all terminals	●		
Signage System - all terminals	●		
Sayville FINS Kiosk		●	
Bayshore FINS Kiosk		●	
FINS Island Sites			
Dock and Site Design	●		
Watch Hill Dock ADA modifications and Support	●		
Sailors Haven Dock ADA modifications	●		
Talisman/Barrett Beach - Docks/Support	●		
Talisman/Barrett Beach - Lodging	●		
Fire Island Lighthouse Dock/Support	●		
Smith Point Dock/Support			●
Old Inlet Dock/Support			●
Community Transfer Sites			
Community Transfer Site Planning		●	
Ocean Beach Dock/support[4]			●
Fire Island Pines Dock/support[4]			●
Davis Park Dock/support[4]			●
Ferry and Intermodal Transportation Services			
Mainland Ferry Concession Prospectuses	●		
Patchogue to Talisman/Barrett Beach		●	
Patchogue to Watch Hill		●	
Bay Shore to Lighthouse		●	
Water Taxi Feasibility Study	●		
Water Taxi Ferry Concession Prospectuses		●	
Central Lateral Water Taxi - adapt existing			●
West Lateral Water Taxi - adapt existing			●
East Lateral Water Taxi - new			●
Far East - Patchogue to Smith Point and Old Inlet			●
Mainland Parking Management Program		●	

Notes:

(1) Design and management tasks are in italics.

(2) Phase 1 of the Patchogue Ferry Terminal project includes construction of ferry loading and unloading areas, a waiting room, ticket booths, storage, public restrooms, bulkhead improvements, and an accessible ferry pier meeting ADA guidelines.

(3) Phase 2 of the Patchogue Ferry Terminal project includes the construction of interactive exhibit spaces and headquarters office space.

(4) If needed.

7.2 Overview of Public Funding Available for Waterborne Transportation

Federal funding is currently being pursued under the Federal Lands Highway Program (FLHP) Alternative Transportation Program (ATP) for the development and construction of a new NPS ferry terminal at Patchogue. In addition to the potential for acquiring FLHP ATP funding, there are a variety of other public sector funding sources that could potentially be utilized for developing improved and enhanced ferry services in Great South Bay serving Fire Island. Of the available programs, federal-aid highway funding programs for ferry services and Maritime Administration loan guarantee programs are likely to provide the best opportunity for acquiring additional funding. Further detail regarding the eligibility and program requirements for the various public funding programs can be found in Appendix C.

7.3 Management Structure for Preferred System Alternatives

Most of the recommended facilities and operations need to be initiated by the NPS through the FINS staff. The capital improvement projects already underway, including the Talisman/Barrett Beach landing and support renovations and the dock modifications at Fire Island Lighthouse, have been initiated by the FINS staff an serve as a model for implementation of other recommended projects. The FINS staff identified the project needs, sought and obtained funding, hired consultants and contractors as needed, and participated in the construction process to the degree practical within the constraints of personnel availability.

The management structure for the implemented facilities and ferry operations would also follow the current institutional framework for similar project components. The following types of management approaches would be recommended, following the order listed in Table 7-1.

Mainland Terminal Sites: The Patchogue/Watch Hill terminal would continue to be directly managed by FINS, while the remaining terminals would continue under private management. The Patchogue terminal dock and site design, and phased construction, would continue under FINS direction, including all facets of implementation. The expanded terminal facility would remain under NPS control, and all ferry operations would continue as concessions.

The proposed expanded information and signage system design and implementation would be managed by the FINS staff, including a common system for all terminals. In addition, FINS would be responsible for design, construction, installation and management of information kiosks at all terminals including Sayville and Bay Shore as well as Patchogue.

FINS Island Sites: The island terminals and support facilities at FINS sites would be designed, implemented and managed by the FINS staff with funding through NPS sources, continuing the current management patterns. Additional FINS management techniques would be recommended for recreational boating slips to ensure equal access by boaters and other visitors at Old Inlet, Watch Hill and Sailors Haven. Mainland ferry and water taxi operations landing rights would be managed by FINS through concession agreements.

Community Transfer Sites: Establishment of community transfer sites for water taxi and mainland ferry operations would remain under the management and control of the individual communities, with

the FINS staff negotiating agreements on an individual community basis to provide more information and support facilities for day visitors. The transfer sites would include Ocean Beach, Fire Island Pines and/or Cherry Grove, and Davis Park. In order for a Robert Moses Park/ Field Five ferry landing to be implemented, the FINS staff would need to coordinate management of the dock and services through the State Park management.

Ferry Operations and Intermodal Transportation Services: Mainland ferry operations to FINS sites would continue to have several levels of management including the County regarding fare levels, and FINS regarding concessions for the individual routes. New services requiring concession solicitations by FINS would include Patchogue to Talisman/Barrett Beach, Patchogue to Smith Point and Old Inlet, and Bay Shore to Lighthouse.

Water Taxi management responsibilities by FINS would include new landing agreements and marketing coordination with existing operators for FINS sites including the West Central, and East Lateral Water Taxis.

Mainland Parking Management Program: The FINS staff would take the initiative for further evaluating mainland parking management improvement options and coordinate efforts with the mainland host communities to implement such programs as were deemed feasible. FINS might take a more active role in managing joint use parking improvements at Patchogue in collaboration with the town and the Long Island Rail Road (LIRR).

7.4 Scope for Additional Planning and Design Activities

Steps are needed to finalize and implement the highest priority improvements, including a preliminary implementation plan for service with action items, responsibilities, schedule and coordination activities required with other agencies.

The implementation of the recommended projects will require a series of preparatory planning and design tasks prior to construction and in some cases prior to funding. A detailed description of the scope and cost of additional planning and design activities will need to be developed following review and prioritization of recommendations in this report. A summary list of the key recommended planning and design tasks includes the following:

(1) Dock and support site facility design for mainland and island sites including detailed site conditions surveys
(2) Information and signage system design
(3) Dock and support facility planning for community transfer sites, including administrative agreements
(4) Cost estimates by phase of proposed capital improvements
(5) Identify sources and procure project funding by phase
(6) Detailed mainland ferry route feasibility analysis, RFP preparation and selection of operators
(7) Lateral water taxi feasibility analysis, RFP preparation and selection of operators
(8) Mainland parking management program design and administrative agreements
(9) Preparation of a marketing program to introduce new services and promote visitor use of the FINS resources

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List of Acronyms

ADA	Americans with Disabilities Act
ATP	Alternative Transportation Program
BRO	Budget Review Office
CBI	Consensus Building Institute
CMAQ	Congestion Mitigation and Air Quality
DBE	Disadvantaged Business Enterprise
DCF	Discounted Cash Flow
DOC	Direct Operating Costs
DOQ	Digital Orthophoto Quad
DOT	Department of Transportation
DRG	Digital Raster Graphic
DSC	Denver Service Center
EFLHD	Eastern Federal Lands Highway Division
FHWA	Federal Highway Administration
FINS	Fire Island National Seashore
FLHP	Federal Lands Highway Program
FTA	Federal Transit Administration
GIS	Geographic Information System
GMP	General Management Plan
IRR	Internal Rate of Return
LIRR	Long Island Rail Road
MARAD	Maritime Administration
MPO	Metropolitan Planning Organization
MTA	Metropolitan Transportation Authority
NGDC	National Geophysical Data Center
NHS	National Highway System
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
OMB	Office of Management and Budget
P&I	Protection and Indemnity
PMIS	Project Management Information System
PRA	Paperwork Reduction Act
STP	Surface Transportation Program
USCG	United States Coast Guard
USGS	United State Geological Survey

Appendix A: Local Regulatory Issues

A telephone interview was conducted with the Suffolk County Budget Review Office during the course of this project. The objective of this interview was to obtain a better understanding of the regulatory environment that currently exists with regards to commercial waterborne passenger transportation service in Suffolk County, New York, and how this regulatory environment could potentially affect alternatives for providing improved ferry and water taxi service in Great South Bay. Meeting minutes from this telephone interview are summarized below.

A.1 Suffolk County Budget Review Office

Volpe Center staff conducted a stakeholder interview on December 4, 2000, with Mr. Duffey of the Suffolk County Budget Review Office. Items of information gathered from this interview include:

- The Volpe Center received a copy of Chapter 287 of the Suffolk County Code, which reviews the role of Suffolk County in the regulation of ferry service.

- The rates and fares charged on intrastate ferry routes in the state of New York are subject to the review and approval of the individual New York counties. Although the actual statutory authority for this regulatory oversight is derived from state law, the state delegates this authority to the county legislatures (apparently this delegation is simply a matter of convenience for the state). Previously (approximately 30+ years ago), the state delegated this authority to the county judiciaries.

- The Suffolk County Legislature has 18 members. At least 14 of these 18 members must vote in the affirmative in order to obtain a new license, or approve a ferry rate increase or other change to an existing ferry license. Also, in addition to legislative approval, a public hearing must be held.

- The process of obtaining a new license or changing an existing license consists primarily of the ferry operator submitting a petition to the county legislature, followed by the Budget Review Office then reviewing this petition and making a recommendation to the legislature. Each case is treated on an ad hoc basis, since almost every situation is different.

- A license granted by the county legislature can extend for a time period of between 30 days, up to 15 years. Typically, a license is granted for a period of 5 years.

- During the time period that the license is in effect, if the operator wishes to changes the rates charged, they must submit a "ferry rate increase petition" to the county legislature. This is true even if the operator wants only to *reduce* ferry rates from those specified in the license. Historically, the rates set forth in the license were interpreted by the ferry operators as caps or maximums, and they were allowed to change their rates as long as they were less than the rate set forth in the license. This was subsequently changed, however, and currently the licenses require that the rates be kept at the exact rates that are specified in the license, and require the submittal of a petition to the county legislature if any change is desired.

- Historically, the legislature also would incorporate conditions into the licenses, such that the license would become effective as long as a certain set of conditions (e.g., improvements to revenue control mechanisms) were met by the ferry operator. However, because a condition was once challenged by a Suffolk County ferry operator and the state judiciary found in favor of the ferry operator, the county legislature will no longer include conditions in a license. Instead, if any deficiencies are identified in any aspect of a company's ferry operation, the petition is simply turned down, and the operator is informed as to what items need to be addressed before they can petition again.

- Historically, there was a cost of living adjustment for rates incorporated into the license agreement, which provided for periodic, automatic adjustment of rates according to changes in the cost of living. The operator would simply be required to notify the legislature when such an automatic increase was implemented. Although the language regarding the use of cost of living adjustments remains in the code, as a practical matter such adjustments are no longer incorporated into a license. As with any change to a license, at least 14 of the 18 county legislators would need to vote in favor of such a cost of living adjustment for it to be incorporated into a license.

- The ferry operations are largely a cash business, and one of the aspects of a ferry operation that the Budget Review Office reviews when there is a license application is the revenue control mechanisms that are in place. The former cost of living adjustments that were incorporated into licenses were eliminated in part because of concerns over revenue control.

- Any application for a new license or a license review by the legislature costs an operator a fee of $2,500, and the following items must also be submitted:

    (1) audited financial statements
    (2) a peer review of the audited financial statements carried out by a second accounting firm
    (3) USCG vessel certificates
    (4) an operator must be "ready, willing and able" to begin service the day that the license is granted (e.g., proper local zoning approvals received, all USCG certificates in place)

- Regarding Item #4 above, recently a company wished to begin water taxi service operating out of the boat yard in Bay Shore located just south of the main Fire Island Ferries terminal. However, this parcel of land was not appropriately zoned for this type of land use, and therefore a license could not be granted by the Suffolk County Legislature.

- As for how a specific fare is arrived at by the Budget Review Office, it is largely an issue of "reasonable profit," as determined from the audited financial statements that are required to be submitted with the license application. For example, even if a ferry operator and a community were mutually agreeable on a fare that was relatively high, if this fare level provided the operator with an unreasonably high profit, then the Budget Review Office would be inclined to reject the license application. A high fare in and of itself may not be reason alone to reject a license application, since if a high fare is required to earn a reasonable profit, and the ferry operator and the community are agreeable on the fare, then such an application might be approved.

- Historically, a "cross-bay" license was all that was required, and water taxi services could operate without a license. However, several years ago Ocean Beach began requiring water taxi operators to obtain a "water taxi" license in order to obtain permission to dock at Ocean Beach. In reality, the distinction between a "cross-bay" license and a "water taxi" license is largely an artificial one, since the licenses are the same except for the portion that specifies what routes and landing points you are allowed to serve.

- Even for a currently licensed operation, to add any new route or new landing point, the operator must petition the Suffolk County legislature as per the usual regulatory mechanism.

- An operator with multiple routes and landing points applies for a single license that comprehensively covers all of the routes and landing points. There are not separate licenses for each separate route or landing point.

- Cross-subsidization between and among an operator's routes that are covered under a license is acceptable, largely because the Budget Review Office is concerned more with the overall profitability of the ferry operator, and because financial statements and costs/revenue allocations are generally not available at the route level, making it difficult to determine the actual profitability of an individual route with any accuracy.

- Varying degrees of temporal variability in rates (e.g., different fares by season, day of week, time of day), is allowed, as long as it is specified in the license agreement. Current examples of this include somewhat higher fares being charged in the off-season, and somewhat higher fares being charged on late night trips after midnight on certain routes.

- Even though the Bellport to Bellport Beach ferry is owned and operated by the town of Islip, they are also required to have a license from the Suffolk County legislature.

- It is unclear whether or not a National Park Service water taxi / lateral ferry service, operating solely to NPS sites, would require a license, or if such a service were operated directly by the NPS (not contracted out as a concession) whether it would even fall under the jurisdiction of the Suffolk County legislature.

Appendix B: Ferry Operator Financial Performance Model

For the purposes of evaluating the relative economic performance of the various ferry route alternatives proposed in this waterborne transportation plan, the financial performance of the different vessel types and operating scenarios is measured by calculating the rate of return on required equity investment over the estimated project life cycle on a discounted cash flow (DCF) basis. The project life cycle refers here to the time period over which a new vessel is introduced and operated, which is based here largely upon reasonable estimates of vessel service life. Even in the case of government subsidized ferry services, minimizing the subsidy amount required to generate a positive return on equity investment is an appropriate measure of the economic performance of the ferry operator, even though the operation might not be considered a strictly commercial enterprise. Therefore, the financial analysis approach outlined below is applicable to a broad spectrum of ferry operations.

The income statement known as a *statement of cash flows* is used here as the basis for determining the return on equity investment on a discounted cash flow basis. A series of annual cash flow statements are estimated for every year of the project life cycle, under the various operating scenarios, using different vessel types and with estimated levels of ridership. The net cash flows before taxes (sometimes referred to as the residual) for each year of the project are then compared to the required equity investment over the project life, all on a discounted basis.

Required equity investment typically includes a portion of the vessel purchase price (i.e., the down payment), start-up expenses and provision of working capital for new routes, and any cash deficits experienced during the project life cycle. Start-up expenses and provision of working capital represent one-time costs associated with the start-up of a completely new service (e.g., marketing and advertising, accounting, legal, permitting, licensing, etc.). This category of required equity investment is discussed in more detail later under the section entitled Indirect Operating Costs.

The stream of annual cash flows is compared to the required equity investment on a discounted basis, resulting in the calculation of the project's internal rate of return (IRR). The internal rate of return is the discount rate or interest rate that equalizes the expected positive cash flows with the negative cash flows (equity investment) of the project. That scenario which yields the greatest internal rate of return provides the greatest return on required equity investment over the project life cycle, and is therefore considered superior in its economic performance to other scenarios that yield lesser internal rates of return.

In keeping with generally accepted principals and methods for the financial analysis of transportation business entities, total expenses (cash outflows) are classified into three mutually exclusive categories of *vessel debt repayment*, *direct operating costs* and *indirect operating costs*. Vessel debt repayment includes principal and interest payments on the portion of the vessel purchase price not funded by the equity investment of the owners. Direct operating costs are defined here as vessel direct operating costs, which are generally considered to include crew costs (in this case deck and engine crew only, excluding passenger service crew), fuel and lubricant costs, hull insurance, and vessel maintenance. Indirect operating costs are defined here as including items that are not included under the direct oper-

ating costs category, for example, passenger service crew costs (if applicable), terminal related costs such as passenger facility charges and docking fees, marketing and advertising, and general administration.

In evaluating vessel attributes that affect operator financial performance (e.g., fuel consumption, vessel maintenance, vessel purchase price), historically observed data were obtained whenever possible from sources such as the current operators of the vessel(s) or operators of similar vessel(s), or vessel designers and shipyards.

In evaluating the economic performance of a particular vessel type and operating scenario, operating and financial data obtained from various ferry operators, including ferry operators currently providing service to Fire Island, as well as data from other ferry service feasibility studies, were used to develop plausible estimates of unit costs that were subsequently utilized in arriving at the estimated annual income statements for each alternatives analysis. Wherever possible, estimates based on actual operating experience were utilized.

Certain cost elements, such as labor expense, and to a lesser extent vessel debt repayment, usually represent a disproportionately large share of total expenses, whereas certain indirect cost elements are quite modest and in some cases relatively insignificant relative to overall expenses. Therefore, when necessary, priority was placed upon obtaining reasonable and accurate estimates for those cost elements that represent the largest share of overall operating costs, since it is here where any variation would result in the greatest relative change in financial performance. Also, for many of the indirect cost categories, it is not clear that there is any basis for assuming that the costs incurred would vary as a function of different vessel types.

Table B-1 presents the discounted cash flow analysis expense and revenue categories examined for each case study. Unless otherwise noted, all dollar values noted in this report represent year 2000 U.S. dollars.

The definition of each individual element of expense and revenue reviewed, and how each varies as a function of items such as vessel hours, number of passengers, or other factors, is presented in the remainder of this chapter, and follows in the order they are presented in Table B-1.

B.1 Vessel Debt Repayment

Vessel debt repayment represents principal and interest payments on the portion of the vessel purchase price not funded by the equity investment of the owners. Leasing expense, for example under a bareboat charter arrangement, would be an alternative method of accounting for ownership expenses, and in some cases, leasing allows for the indirect realization of certain tax advantages. In many instances, leasing is used primarily as a mechanism for the ferry company to limit its potential liability, in which a leasing company that is separate from, but related to, the ferry company is set up in order to protect the vessels against any lawsuits that may be brought against the ferry company.

Three possible scenarios are possible with respect to this expense element:

(1) a newly built or existing used vessel may be purchased by the operator in order to provide service on the route being studied

TABLE B-1: FERRY OPERATOR EXPENSE AND REVENUE CATEGORIES

EXPENSES
Annual Vessel Debt Repayment
Annual Vessel Debt Repayment (combined principal and interest)
Direct Operating Costs
Salaries, Wages and Benefits (Deck and Engine, Officers & Crew)
Vessel Fuel and Lubricants
Vessel Maintenance Costs
Marine Hull Insurance
Indirect Operating Costs
Salaries, Wages and Benefits (Onboard Passenger Service Crew)
Marketing and Advertising
Reservations & Sales
Dockage Fees / Passenger Facility Charges / Shore Operations
Protection and Indemnity (P&I) Insurance
General Administration
Outside Professional Services
Onboard Food & Beverage Sales - Cost of Sales
REVENUES
Passenger Fares
Ancillary Sales - Onboard Food & Beverage Sales
Ancillary Sales - Parking Revenues
Federal, State or Local Operating or Non-Operating Subsidy
NET CASH FLOW BEFORE TAXES
Net Cash Flow Before Taxes

(2) an existing vessel already owned and operated by an operator may be used to provide service on the route

(3) in certain scenarios, it is possible that the proposed vessels will be in excess of 30 years old or older, and therefore perhaps owned outright and fully depreciated, such that ownership cost per se is virtually zero. However, in such cases maintenance and overhaul expenses are often higher than if a newer vessel were to be utilized, and changes to the maintenance expense category should be made accordingly.

Regardless of which of these three scenarios is likely to be the case for a given alternatives analysis, unless the vessel in question is used entirely and exclusively only on the ferry route being studied, care must be taken to properly allocate vessel debt repayment expense among the different routes on which the vessel is being operated.[1]

In an attempt to arrive at reasonable purchase price estimates for new vessels, the observed purchase prices for recently acquired vessels of varying types and capacities can be used for guidance. Alternatively, for existing vessels already in operation on other routes by an operator, the amount of existing vessel debt repayment for a given existing vessel could be used as the basis for this expense element.

[1] For example, if a new vessel is purchased and is to be operated on two separate routes, the total vessel debt repayment expenses should be allocated to each route accordingly, using vessel hours operated on each route as a suitable basis for the allocation.

For the acquisition of a newly built vessel, in industry practice, various vessel financing terms are possible, including various amortization schedules, loan terms, and interest rate amounts and types (fixed, variable, etc.). For vessels receiving a loan guarantee under the Title XI program of the U.S. Maritime Administration (discussed in Appendix D), a minimum ownership equity contribution (down payment) of 12.5% is required, and a level principal, rather than equal payment, amortization schedule is used in almost all cases. This results in larger payment amounts earlier in the loan term, when the interest component is the largest.

For the more than 22 existing ferry vessels that currently provide cross-bay service to Fire Island, passenger capacities typically range from between 100 passengers, up to about 400 passengers, with an average capacity for the entire fleet of approximately 250 passengers per vessel. For this particular market area, the existing fleet of vessels are not equipped with onboard public toilet facilities or washbasins. Also, these vessels are not equipped with air conditioning systems, refrigeration equipment for food and beverage storage, and typically rely upon batteries for electrical power, rather than generators. All of these factors contribute to a relatively lower acquisition cost for vessels that serve Fire Island.

Vessels currently utilized by the ferry operators in Great South Bay are a mix of steel hulled, aluminum hulled and wood hulled designs. Based on a review of available data and discussions with existing ferry operators, purchase prices for *newly built* vessels suitable for serving Fire Island, and lacking the amenities and equipment mentioned above, are estimated as function of the passenger capacity of the vessel and the vessel hull material, as follows:

Aluminum hull:	$3,950 per passenger seat
Steel hull:	$3,000 per passenger seat
Wood hull:	$2,300 per passenger seat

all of which are expressed in year 2000 dollars. Therefore, for example, for the purposes of this study, a newly built 250 passenger vessel with an aluminum hull would be assumed to have an acquisition price of approximately $987,500.

To estimate the value of a *used vessel*, its value as a new vessel is estimate as above, and is then depreciated by an amount equivalent to 2.3% of the new vessel purchase price annually, for vessels that are 37 years old or younger. For older vessels, 15% of the new vessel price is assumed as the value of the vessel. Therefore, for example, a 15 year old, 250 passenger vessel with a steel hull is estimated to have a current value of $469,000.

To calculate the debt repayment expense in each of the case studies, unless otherwise specified for a particular scenario, an equal payment amortization schedule is assumed, with a required owner equity (down payment) of 20% of the purchase price, a loan term of 15 years, and a fixed interest rate of 10%. Alternatively, for existing vessels already in operation on other routes by an operator, the amount of existing vessel debt repayment for a given existing vessel should be used as the basis for this expense element.

B.2 Direct Operating Costs (DOC)

B.2.1 DOC - Salaries, Wages and Benefits (Deck and Engine, Officers & Crew)

In a typical analysis of direct operating costs for a ferry operation, the total crew complement required for the operation of each vessel is classified into the three functional categories of *deck crew*, *engine crew*, and *passenger service crew*, with the passenger service crew category reviewed later under indirect cost elements. For the purpose of assigning appropriate rates of compensation, both the deck crew and engine crew functional categories are then assigned the further job classifications of either *officer* or *general crew*. Depending upon the vessel type and size, the deck crew labor category typically may include positions such as the captain, deck officers, navigator and other bridge crew, and deckhands. Similarly, the engine crew labor category typically may include a chief engineer, other engineering officers and engineering crew.

For the ferry routes serving Fire Island, vessel sizes, route lengths and the location of the routes in a protected bay result in a relatively simple set of crew labor categories that consist of *captains* and *deck hands*. For vessels that are both greater than 65 feet in length and have a certificated passenger capacity of 150 passengers or greater, one deck hand is designated as a *senior deck hand*.

Hourly compensation rates by labor function and job classification represent the cost of salaries, wages and benefits (i.e., fully burdened rates). Total expense for this income statement category is therefore a function of the hourly compensation rate by job function and job classification, vessel operating hours or block hours, plus an additional amount of time equal to 25% of vessel operating hours, added to account for labor time required for vessel preparation and vessel turnaround activities.

For the analysis of ferry routes serving Fire Island, fully burdened labor rates of $37.50 per hour are utilized for *captains*, $10.00 per hour for *senior deck hands*, and $6.00 per hour for *deck hands*.

The total crew complement for each labor category and for each vessel type analyzed was determined on the basis of the observed manning requirements of existing vessel types.

B.2.2 DOC - Vessel Fuel and Lubricants

Vessel fuel and lubricant expenses represent the capital, maintenance, and administrative costs associated with the provision of fuel and refueling services, including fuel taxes. For a specific vessel type, total annual fuel and lubricant expense is a function of total vessel hours by operating mode, fuel consumption rate by operating mode, and the unit fuel and lubricant cost. Fuel consumption at idle is accounted for by assuming that vessel hours at idle are equal to 15% of vessel operating hours or block hours.

Route profiles detailing the distance traveled and operating speed over each segment of a route for each vessel type can be used if desired, and are developed using electronic charting software and digital nautical charts. Less detailed route descriptions can also be specified if desired. Fuel consumption rates by vessel and by operating mode (e.g., service speed, intermediate speed, slow speed, idle, etc.) are based on detailed data obtained for existing vessels, with fuel consumption rates for various operating speeds estimated based on vessel powering data and the specific fuel consumption of various marine diesel engine types. The resulting fuel consumption rates by operating mode were then further

verified by comparing the resulting estimates to actual data for a sample of ferry vessels that currently serve Fire Island.

There is a wide variety of commercially available diesel fuel oil. Diesel No. 2 (low sulfur) is currently utilized for ferry vessels serving Fire Island, and is assumed here for all analyses. Purchased in bulk at a wholesale price, as is done by the three primary ferry operators serving Fire Island, the price per gallon for Diesel No. 2, including all taxes, was $1.41 in late 2000. Fuel is stored in private storage tanks maintained by each of the three ferry operators, and is also available to others commercially at Bay Shore, Sayville and Patchogue in late 2000 at a somewhat higher retail price of approximately $1.70 per gallon. Diesel fuel is not available at any of the Fire Island communities. Vessel serving cross-bay routes generally require refueling after completing eight round trips, with most vessels having a fuel capacity of between 275 and 600 gallons depending upon the specific vessel.

Based on discussion with shipyards and vessel operators, the quantity of lubricant consumed is assumed to be 0.4% of the quantity of fuel consumption, with the unit cost of lubricant assumed to be $8.00 per gallon.

B.2.3 DOC - Vessel Maintenance Costs

Vessel maintenance expenses represent the cost of vessel hull and engine repairs and preventative maintenance, including periodic replacement of engines and related systems. Maintenance is assumed to be carried out either in-house, or contracted to an outside service provider, with the maintenance expense representing all components of total maintenance cost, including labor, materials and parts, and burden (overhead).

In general, it is thought that maintenance for high speed vessels such as catamarans is more preventative, more proactive, and done more frequently than for conventional vessels. Despite this, maintenance expense for older conventional monohull vessels may not necessarily be less than for a high speed vessel, due in large part to the age of these older vessels and the possibility of more frequent upgrades and overhauls being required.

Whenever possible, observed values for vessel maintenance expense were used, data were obtained on observed maintenance expenditures for similar vessels operating elsewhere, or maintenance cost information provided by shipyards was used.

In order to refine these maintenance costs estimates, and provide estimates for vessels for which limited data was available, the existing data were reconciled and combined into the following maintenance cost estimation methodology, based in part upon maintenance cost methodologies used in other ferry service feasibility studies.

Total annual maintenance expense per vessel is hypothesized to be partially dependent upon total vessel hours per year, especially for engine maintenance. Based on the observed data, total annual vessel maintenance expense for a new vessel is estimated to be equal to 3.5% of the purchase price of the vessel, for a vessel operating a nominal 1,000 hours annually. To account for variation in total annual maintenance expense resulting from different levels of annual vessel operating hours and different vessel ages, the following formula is then used to estimate total annual maintenance expenses for a vessel:

$$[M * F * P] + [(M * V * P) * (H_a / H_n)]$$

M = estimated total annual maintenance cost for new vessel, expressed as a percentage of the new vessel purchase price
F = percent of maintenance cost that is fixed (does not vary with vessel hours)
P = new vessel purchase price
V = percent of maintenance cost that varies with vessel hours
H_a = actual annual vessel hours operated
H_n = nominal annual vessel hours (1,000 hours)

In this formula, 60% of total maintenance expenses is essentially fixed, with the remainder varying as a function of total vessel hours, with nominal annual vessel hours assumed to be 1,000. For a vessel operated less than 1,000 hours annually, total maintenance expense is reduced somewhat, and above 1,000 hours, it is increased. Note that the resulting value for vessel maintenance, expressed as a per hour rate, may actually be less for higher operating hours, since although total maintenance expense increases, it increases at a slower rate than do total annual operating hours, resulting in somewhat lower hourly figures for maintenance.

Finally, to account for variations in maintenance expense resulting from the age of a vessel, the result of the above formula is then increased for each year of vessel age by a value equal to 2% of the new vessel annual maintenance expense, for each year of vessel age. Therefore, a ten year old vessel would have an annual maintenance expense that is 20% more than that for a similar new vessel.

B.2.4 DOC - Marine Hull Insurance

Hull insurance primarily represents property insurance coverage for the vessel and equipment, although it often includes collision liability coverage for damage to other vessels and their cargo as well. In determining insurance premiums, a variety of factors are usually taken into consideration. These include: (1) size of vessel, (2) age of vessel, (3) hull value, (4) area of navigation, (5) years of operating experience, (6) completion of USCG safety courses, and (7) extent of fire protection equipment on the vessel. Although high speed craft do not currently seem to have a substantially greater insurance risk than conventional vessels, some industry observers agree that the risk issues with high speed craft are different than with conventional vessels, and that the insurance underwriting market has yet to fully assess high speed craft for the potential risks that may be associated with them.[2]

Based on discussion with ferry operators, policies are treated here as "actual cash value" policies, which pay the depreciated value of the vessel, rather than the full replacement value of a new vessel, in the event of a loss. The hull insurance expense element is calculated here as a function of the current estimated value of the vessel. The current value of the vessel is estimated as described earlier in Section B.1 , "Vessel Debt Repayment," and assumes that vessels are depreciated by an amount equivalent to 2.3% of the new vessel purchase price annually. Estimates obtained from shipyards, existing ferry operators, and other ferry service feasibility studies suggest that annual marine hull insurance expense typically equals between 1% to 3% of the value of the vessel being insured. A value of 2% of the vessel value is used here as a reasonable estimate of annual hull insurance expense.

[2] *Fast Ferry International*. July-August 1997. Page 21.

B.3 Indirect Operating Costs (IOC)

As noted earlier in the discussion of required equity investment, although not applicable to many of the alternative scenarios evaluated as part of the National Park Service studies currently being conducted by the Volpe Center, start-up expenses and provision of working capital represent one-time costs associated with the start-up of a completely new service (e.g., marketing and advertising, accounting, legal, permitting, licensing, etc.). Where applicable, start-up expense and provision of working capital for completely new ferry operators and services are assumed to equal 11% of total year 3 (equilibrium patronage) passenger revenues, including any ancillary revenues, and is assumed to be provided from owner equity in year zero (before project start-up).

B.3.1 IOC - Salaries, Waves and Benefits (Onboard Passenger Service Crew)

As noted earlier, the total crew complement required for the operation of each vessel is classified into the three functional categories of *deck crew*, *engine crew*, and *passenger service crew*, with the deck crew and engine crew categories reviewed earlier under direct cost elements. Depending upon the vessel type, size, and typical voyage length, the passenger service crew category may include positions such as cabin attendants, pursers, and stewards, although for the scenarios evaluated as part of the National Park Service studies currently being conducted by the Volpe Center, would be limited to staff engaged primarily in the onboard sales of food and beverage, if applicable. In most if not all scenarios, such duties may be carried out deck crew members in addition to their other tasks, and therefore there would be no dedicated onboard passenger service crew.

As with deck and engine crew, hourly compensation rates for passenger service crew represent the cost of salaries, wages and benefits (i.e., fully burdened rates). Total expense for this income statement category is therefore a function of the hourly compensation rate, vessel operating hours or block hours, plus an additional amount of time equal to 25% of vessel operating hours, added to account for labor time required for vessel preparation and vessel turnaround activities.

B.3.2 IOC - Marketing and Advertising

This indirect cost category represents the production and distribution of marketing materials and costs associated with the purchase of print, radio, television or other media advertising. This category is of particular importance to new startup services in creating awareness and building ridership. Based on previous ferry feasibility studies and information from ferry operators including those currently serving Fire Island, this expense category is assumed to vary as a function of total passenger revenues, including ancillary revenues (and thus indirectly as a function of total ridership), and to be equal to 2% of these revenues. For a completely new operator and route, a higher value of 4% of these revenues is more appropriate.

B.3.3 IOC - Reservations & Sales

This cost category includes labor costs of reservations and sales personal, and commissions costs, or direct charges arising from sales of passenger tickets. Based on previous ferry feasibility studies and information from ferry operators including those currently serving Fire Island, this expense category is assumed to vary as a function of passenger revenues (and thus indirectly as a function of total ridership), and to be equal to 1.5% of passenger revenues.

B.3.4 IOC - Dockage Fees / Passenger Facility Charges / Shore Operations

For ferry terminal facilities owned by the ferry operator, shore operations costs represent the direct and indirect costs to the ferry operator (terminal operator) of operating, manning (e.g., ticket sales), maintaining, insuring, and providing security for the terminal facilities. For ferry terminal facilities owned by another party (a port authority, municipality, private entity, etc.), shore operations costs are typically reflected as a terminal usage fee, often assessed as a flat annual fee or a per passenger charge, and in some cases a vessel docking fee that is often assessed per foot of vessel length. For each case study, the specific method of calculating total expenses for this cost category may vary based on whether the shore facilities are owned by the ferry operator or not, and the manner in which terminal usage fees are assessed (e.g., as an annual fixed fee, or as a per passenger boarding charge). For the Fire Island analyses, island communities that do charge a dockage fee generally assess an annual, flat fee that typically ranges between approximately $40,000 to $100,000 annually depending upon the specific community.

B.3.5 IOC - Protection and Indemnity (P&I) Insurance

This expense category includes insurance against passenger liability, crew liability, and other liabilities (which often include liquor liability, pollution liability, premises liability and medical payments). P&I covers a wide range of liability exposures and miscellaneous expenses that a vessel owner might incur. Injuries to crew members and other persons on board the insured vessel are generally the most common claims. Coverage is typically provided for injury to persons aboard other vessels struck by the insured vessel, and for damage to property (other than vessels) struck by the insured vessel. Accidental pollution from the discharge of fuel oil or other similar substances is also often covered, unless due to negligence by the operator.

Based on previous ferry feasibility studies and information from ferry operators including those currently serving Fire Island, this expense category is assumed to vary as a function of the number of passengers carried, and to be equal to $0.35 per passenger boarding.

B.3.6 IOC - General Administration

This expense category represents costs of a general corporate nature that are incurred in performing activities which contribute to more than a single operating function. Specific examples include leasing of office space, telephone & communications costs, office supplies, travel, and management and administrative personnel compensation and benefits.

Based on previous ferry feasibility studies and information from ferry operators including those currently serving Fire Island, for a completely new operator and route, this expense category is assumed to be equal to a fixed annual amount of $70,000, plus an additional amount equal to $0.50 per passenger boarding. For an existing route or an existing operator adding a new route that would contribute only marginally to the overall general administration expenses of that operator, this expense category is assumed to be equal to $0.50 per passenger boarding only, without the upfront expense element of $70,000.

B.3.7 IOC - Outside Professional Services

Based on previous ferry feasibility studies and information from ferry operators including those currently serving Fire Island, this expense category represents costs for outside professional service such as accounting, legal services, financial services and banking, and professional consulting. This cost is assumed to vary as a function of the total number of passengers, with an amount of $0.40 per passenger assumed here.

B.3.8 IOC - Onboard Food & Beverage Sales - Cost of Sales

Although not applicable to most of the alternative scenarios evaluated as part of the National Park Service studies currently being conducted by the Volpe Center, the financial performance model can accommodate scenarios in which ancillary revenues are earned from onboard food and beverage sales. This cost category represents the costs associated with the purchase of supplies and onboard food and beverage sales operations. Based on previous ferry feasibility studies and standard food service industry practice, it is assumed here that the cost of sales for onboard food and beverage sales is equal to 65% of onboard food and beverage revenues.

B.4 Revenues

B.4.1 Revenues - Passenger Fares

Passenger fare revenues are estimated for the projected levels of passenger patronage, and estimated fare levels, which for the Fire Island analyses must take into consideration the regulatory powers of the Suffolk County Budget Review Office. Passenger fares are the primary source of revenue for all routes, and revenues from the sale of advertising space either onboard the vessel or at the ferry terminals is not considered here, since even in transportation operations where this practice tends to be widespread (e.g., bus and rail public transit), revenues received from advertising are only a small fraction of overall revenues. The model can accommodate a full adult fare, as well as a discount fare level (e.g., adult, child). Fares are generally represented as half of the round trip fare level, and for current routes serving Fire Island, round trip ticket sales are by far the most popular fare product utilized by passengers. If one-way fares of an amount greater than half of the round trip fare are charged and make up a significant portion of passenger fare revenues, then the model can be modified to accommodate this scenario if necessary. Similarly, if more complex multi-trip discount ticket scenarios are necessary, the model can be modified to accommodate this as well.

B.4.2 Revenues - Ancillary Sales - Onboard Food & Beverage Sales

Although not applicable to most of the alternative scenarios evaluated as part of the National Park Service studies currently being conducted by the Volpe Center, the financial performance model can accommodate scenarios in which ancillary revenues are earned from onboard food and beverage sales. This revenue category represents revenues from food and beverage sales, including bar sales of liquor and vending machine revenues, if applicable. This revenue category is assumed to vary as a function of total passenger boardings, and can be specified at various amounts depending upon experience in similar or related routes or markets.

B.4.3 Revenues - Parking Revenues

For ferry operators who maintain ownership and control of parking facilities at or near their ferry terminals and at which ferry passengers will park their vehicles for a fee, parking revenues may contribute significantly to the financial viability of a proposed ferry route or service. In order to properly calculate the magnitude of these revenues, an estimate must be made both of the mode of ground access to the ferry terminal for patrons of the new ferry service, and of the length of stay of these passengers. Consideration must also be given, however, to the fact that necessary capacity must be available at the parking facilities in order to accommodate the number of vehicles that would result during the seasons, days of week, or times of day being studied.

B.4.4 Revenues - Federal, State or Local Operating or Non-Operating Subsidy

If applicable, the financial performance model can accommodate scenarios in which federal, state or local operating or non-operating subsidies are provided for the service. As noted earlier, for government subsidized ferry services such as these, minimizing the total net cost (the difference between total revenues and total expenses), and thus the required subsidy, is an appropriate measure of the economic performance of the ferry operator even though the operation might not be considered a strictly commercial enterprise.

B.5 Net Cash Flow Before Taxes

The net cash flow before taxes is the total revenues earned by the ferry operator, net of expenses and before taxes, and represents a summary measure of the financial performance of the operator under a given operating scenario for a particular year of the project period. Negative values for annual net cash flow before taxes are, by implication, considered here to be additional funds provided by the equity investors to cover these cash deficits. Net cash flow is considered here before taxes largely as a matter of convenience, since the explicit incorporation of the many federal, state and local taxes which a ferry operator would be subject to extends beyond the scope of this study. Also, for the comparative operational analyses for which this financial performance model is meant to be applied, it is assumed that the exclusion of taxes, though perhaps affecting the absolute financial performance of various alternative analyses, will not significantly affect the relative financial performance of these alternative analyses to any significant extent.

Appendix C: Potential Funding Sources for Ferry Service Enhancements

Federal funding is currently being pursued under the Federal Lands Highway Program (FLHP) Alternative Transportation Program (ATP) for the development and construction of a new NPS ferry terminal at Patchogue. In addition to the potential for acquiring FLHP ATP funding, there are a variety of other public sector funding sources that could potentially be utilized for developing improved and enhanced ferry services in Great South Bay serving Fire Island. This appendix is meant to serve as a general overview of the available programs, and includes information regarding eligibility and other program requirements. Federal-aid highway funding programs for ferry services and Maritime Administration loan guarantee programs are reviewed in-depth, since it is felt that of the available programs, these two are likely to provide the best opportunity for acquiring additional funding.

C.1 Federal-Aid Highway Funding of Ferry Boats and Ferry Terminals

The Federal Highway Administration (FHWA) oversees the Federal-aid highway program. Under this program, Federal-aid highway funds are available, through the State transportation departments, for designing and constructing ferry boats and for designing, acquiring right-of-way, and constructing ferry terminals. Ferry boats and terminals that serve vehicular travel as links on public highways (other than Interstate highways), as well as ferry boats and terminals that serve passengers only, may be eligible for certain types of Federal-aid highway funding.

The following discussion covers:

- The basic eligibility criteria that must be satisfied if Federal-aid highway funding is to be used for improvements to ferry boats and ferry terminals.
- The various types of Federal-aid highway funding sources that are available for improvements to ferry boats and ferry terminals.
- The general procedures that are followed to advance ferry improvement projects funded under the Federal-aid highway program.

C.1.1 Eligibility

The basic criteria that must be satisfied for a ferry boat or ferry terminal to be considered eligible for Federal-aid highway funds are established in Federal law and set forth in Section 129 of title 23, United States Code. These eligibility criteria are:

Location

The ferry facility must not operate in International waters except for ferry service in Hawaii, Puerto Rico, and Alaska and for ferry service between any State and Canada.

Ownership

The ferry boat or ferry terminal to be improved must be either:

- publicly owned (this means the title for the boat or terminal must be vested in a Federal, State, county, town or township, Indian tribe, municipal or other local government or instrumentality),
- publicly operated (this means that a public entity operates the boat or terminal, either with public employees or by paying others to do so, even though the boat or terminal may be privately owned), or
- majority public owned where it is demonstrated that the ferry operation provides substantial public benefits (this means that more than 50 percent of the ownership is vested in a public entity and that the substantial public benefits of the ferry operation are documented).

The ownership test is applied to the specific facility being improved. For example, if a ferry system has privately owned and operated boats but the terminal is publicly owned, Federal-aid highway funds could be used for improvements to the ferry terminal but could not be used for improvements to the ferry boats.

Operation

The operating authority for the ferry facility must be under the control of the State or another public entity.

Fares

The fares charged for passage must be under the control of the State or another public entity. Further, all revenues derived from the ferry operation must be applied to actual and necessary costs of operation, maintenance and repair, debt service, negotiated management fees, and in the case of a privately operated toll ferry, for a reasonable rate of return.

As a general rule, Federal-aid highway funds are available for capital improvements to existing ferry facilities as well as construction of new ferry facilities. Additionally, cost-effective preventive maintenance activities which extend the useful life of the ferry facility are an eligible activity. However, operational costs of a ferry facility, such as costs of crews and fuel, are not eligible for Federal-aid highway funding.

Leasing of ferry boats may be partially eligible for Federal-aid highway funding. First, all the eligibility criteria noted above would need to be satisfied. If a public entity pays for leasing of a ferry boat, the "ownership" criterion is met as this is viewed as a publicly operated boat. Second, Federal-aid funds will only participate in the portion of the lease associated with the providing the boat as this is viewed as the "capital" cost. The portion of the lease associated with paying for the operation of the boat would not be eligible for Federal-aid highway funding.

If Federal-aid highway funds have been used to purchase a new ferry boat or improve an existing one and it is desired to later sell or otherwise disposed of the ferry boat, this action requires approval from the FHWA. The Federal share of any proceeds from this disposition is credited back to the appropriate Federal-aid highway funding account.

C.1.2 Funding

Most Federal-aid highway funds are made available to the State transportation departments, primarily by statutory formula. The State transportation department, in cooperation with local officials, selects the projects by priority for Federal-aid highway funding. Thus, ferry boat and ferry terminal improvement projects will be competing with other highway improvements needed within the State.

A small amount of the funding under the Federal-aid highway program is authorized in what is described as a "discretionary" account where the Federal Highway Administrator selects the projects to be funded. One discretionary account covers improvements to ferry boats and ferry terminals, and State transportation departments can apply for these discretionary funds.

Federal-Aid Highway Funding Sources

National Highway System (NHS) Funds

These are formula Federal-aid highway funds available for improvements to the designated NHS, a network composed of approximately 163,000 miles of the nation's most important highways, including connections to intermodal facilities such as ferry terminals. During the 6-year period from fiscal year 1998 through fiscal year 2003, $28 billion in NHS funds are authorized for formula distribution to the States.

NHS funds can be used for *vehicular* ferry boats and terminals provided:

- The ferry facility is providing a link on the designated NHS (other than Interstate). Under Section 118(e) of Title 23, United State Code, Alaska and Puerto Rico have the flexibility to use NHS funds on roads off the designated NHS.
- It is not feasible to build a bridge or tunnel or other normal highway structure instead of a ferry.
- The criteria listed under "Eligibility" are satisfied.

In the case of an NHS connector route to a vehicular ferry terminal, only the ferry terminal (which can serve either vehicles or passengers) that lies at the end of the connector route is eligible for NHS funding. The ferry boats serving this terminal are not eligible for funding.

Surface Transportation Program (STP) Funds

These are formula Federal-aid highway funds available for improvements to Federal-aid highways, a network composed of about one-quarter of the nation's public roads, and for improvements to bridges on any public road. During the 6-year period from fiscal year 1998 through fiscal year 2003, $33 billion in STP funds are authorized for formula distribution to the States.

STP funds can be used for vehicular ferry boats and terminals provided:

- The ferry facility is providing a link on any public highway route (other than Interstate).
- It is not feasible to build a bridge or tunnel or other normal highway structure instead of a ferry.
- The criteria listed under "Eligibility" are satisfied.

STP funds can also be used for capital improvements to *passenger* ferry boats and terminals provided:

- The ferry facility is an eligible transit project under Chapter 53 of Title 49 of the Federal Transit Administration's (FTA) program. In this case the Federal-aid highway funds are transferred to the FTA for project administration.

Congestion Mitigation and Air Quality (CMAQ) Program Funds

These are formula Federal-aid highway funds available for transportation projects and programs to help meet the requirements of the Clean Air Act. During the 6-year period from fiscal year 1998 through fiscal year 2003, $8 billion in CMAQ funds are authorized for formula distribution to the States.

CMAQ funds can be used for transit projects, which could include *passenger* ferry boats and terminals. Similar to STP funding of a transit project, CMAQ funds for a transit facility are transferred to the FTA for project administration.

Ferry Boat Discretionary Funds

These discretionary funds are specifically available for improvements to ferry facilities. During the 6-year period from fiscal year 1998 through fiscal year 2003, $220 million is authorized for this discretionary program. These funds can be used for improvements to both vehicular ferry boats and terminals that serve as links on any public road (other than Interstate) and for passenger ferry boats and terminals. Additionally, the ferry facility must satisfy the criteria listed under "Eligibility." Discretionary funding is only considered for projects or phases of a project that are ready to be advanced in the same fiscal year the discretionary funding is provided.

Federal-Aid Funding Share

Federal-aid highway funding sources available for ferry improvements—NHS, STP, CMAQ and ferry boat discretionary funds—have a basic Federal share of 80 percent. The non-Federal share must be provided by the State or local entity and may include private contributions.

Access to Federal Funds

Formula Funds

NHS, STP and CMAQ funds are only available through the State transportation department. The State, in cooperation with local officials, selects the projects that will be federally funded. Project selection is accomplished through a transportation planning process conducted cooperatively by the States, Metropolitan Planning Organizations (MPOs), and transit operators with all governmental levels, public and private organizations, and the general public participating in the planning process. Thus, to gain access to formula Federal-aid highway funds, the key contact points are the State transportation department, and the MPO if a proposed project lies within an urbanized area having an MPO.

Ferry Boat Discretionary Funds

Annually, the FHWA Headquarters solicits candidates from the State transportation departments for these discretionary funds. Information on this discretionary program including the solicitation process and requirements for applications is available through an FHWA Discretionary Programs website at

http://www.fhwa.dot.gov/discretionary. Only the State transportation departments may submit candidate projects for discretionary funding. Thus, to gain access to ferry boat discretionary funds, the key contact point is the State transportation department.

C.1.3 Development of a Federal-Aid Highway Funded Ferry Project

Once a ferry boat or ferry terminal project is selected to receive either Federal-aid highway formula or discretionary funding, this project *must* be developed in accordance with Federal requirements and procedures that apply to Federal-aid highway projects. The Federal-aid highway funding is not provided as a direct grant to the ferry operator; rather, this funding is administered through the State transportation department which is responsible for ensuring that Federal requirements and procedures are followed.

One important requirement is that Federal-aid highway funding can only be used to pay for costs incurred after the FHWA has authorized the State to proceed with the work. Therefore, for any phase of work on the ferry project where it is intended to use Federal-aid funds, from preliminary engineering through right-of-way acquisition to construction, prior authorization of this work by the FHWA is essential to allow for reimbursement of the Federal share of incurred costs.

As a ferry boat or ferry terminal project is developed, requirements from Federal highway statutes and other Federal laws must be satisfied. Several of the key requirements follow:

Environmental Review

A project must comply with the National Environmental Policy Act. This requires that each project be evaluated to determine its impact on the environment. Some projects involving rehabilitation or safety upgrades may have minor impacts and are considered Categorical Exclusions not requiring preparation of an Environmental Impact Statement (EIS) or an Environmental Assessment (EA). For those projects that are not a Categorical Exclusion, an EA is usually prepared. If the EA reveals that the impacts are not significant, then a "Finding Of No Significant Impact" (FONSI) is prepared. However, if there will be significant impacts, a draft EIS is prepared in cooperation with the State transportation department.

Right-of-Way Acquisition

Acquisition of needed right-of-way for a project must comply with the requirements of the Uniform Relocation Acquisition and Real Property Acquisition Policies Act of 1970 (as amended by title VI of the Surface Transportation and Uniform Relocation Assistance Act of 1987). Every eligible resident who is displaced because of the project must be offered a comparable replacement dwelling that is decent, safe, sanitary, and adequate to accommodate the displaced person. Relocation advisory services are furnished and payments are made to cover costs incurred for moving, replacement housing, and certain incidental costs. Businesses, farms, and nonprofit organizations also are reimbursed for moving and related expenses.

Project Construction

Competitive Bidding

The physical construction of a project is to be done by a contract awarded by competitive bidding unless some other method, such as force account, is approved by the FHWA as more cost effective. The State transportation department assures there is an opportunity for free, open, competitive bidding, including adequate publicity of the advertisement or call for bids.

Davis-Bacon Wage Rates

The Davis-Bacon Act requires the payment of predetermined minimum wage rates on certain Federally funded contracts. It applies to all Federal-aid highway contracts exceeding $2,000 and located on a Federal-aid highway. If the ferry boat or ferry terminal project is not on a route functionally classified as a Federal-aid highway, then Davis-Bacon does not apply. The State transportation department planning office can provide information on the functional classification of a roadway or ferry system.

For ferry boat projects involving the building, alteration and repair of a ship, the Department of Labor (DOL) position is that inclusion of Davis-Bacon requirements in the contract are only necessary if the location of contract performance is known when bids are solicited. If Davis-Bacon is not included in a ferry boat project, the DOL requires that the contract provisions include:

- a statement clause that explains why the wage rate determinations are not included,
- a reminder that the contractor must pay at the very least the Federal minimum wage rate,
- a reminder that the contractor must submit weekly certified payroll statements, and
- a reminder that the contractor must comply with all other DOL labor standards.

Buy America

The Buy America provisions require the use of domestic steel and iron in Federal-aid highway construction projects. However, waivers can be granted by the FHWA. In February 1994 the FHWA issued a nationwide waiver of the Buy America requirements for certain steel items used in the construction of ferry boats. The items included in the waiver were marine diesel engines, electrical switchboards and switch gear, electric motors, pumps, ventilation fans, boilers, electrical controls, and electronic equipment. Not included in the waiver were products readily available in the United States, such as steel pipe and tubing, and galvanized steel products. Additionally, items not included in the waiver remain subject to the Buy America requirements.

Disadvantaged Business Enterprise (DBE)

The main objective of the DBE program is to ensure that DBE firms have an opportunity to participate in Federal-aid funded contracts. Each State's DBE program and its annual goals are approved by the FHWA. State transportation departments are required to meet statewide DBE goals as defined in their annual program. The DBE goals and contract special provisions may be inserted on individual projects as necessary to meet the State's annual goal.

Use of Engineering Consultants

Consultant contracts used to provide engineering and design related services may be financed with Federal-aid highway funds. When this occurs, these consultant contracts must result from negotiations which utilize qualifications-based selection procedures, commonly referred to as the Brooks Act requirements. Qualifications-based selection procedures do not allow for price to be used as a factor in the selection process. States may enact their own statutes which govern consultant selection procedures. These procedures can be based on qualification, price, or any combination of the two. If enacted, State procedures take precedence over the qualification-based requirement in the Brooks Act. Local governments must use the same procedures used by the State. Additionally, contracting agencies may use small purchase procedures for the procurement of engineering and design services when the contract does not exceed $100,000, as specified in the Federal Highway Administration regulations (23 CFR 172). Small purchase procedures are the procedures that the State would use with its own funds for this type of purchase. If small purchase procurements are used, price or rate quotations shall be obtained from an adequate number of qualified sources.

Design-Build

The design-build method of contracting is an alternative to the traditional design-bid-build contracting method. With the design-build procurement, the contracting agency identifies the end result parameters and establishes the design criteria. The prospective bidders then develop proposals that optimize their construction abilities. The submitted proposals may be rated by the contracting agency on factors such as design quality, timeliness, management capability and cost, and these factors may be used to adjust the bids for the purpose of awarding the contract. Federal-aid highway funds may participate in design-build contracts when approved under Special Experimental Project SEP-14 (currently requires FHWA Headquarters approval) and awarded using competitive bidding procedures.

Maintenance

Federal highway law requires that all federally assisted projects be properly maintained. For ferry facilities, proper maintenance includes operating the ferry boats in accordance with Federal as well as State and local laws and regulations.

C.2 Maritime Administration Title XI Federal Ship Financing Program

This program, established pursuant to Title XI of the Merchant Marine Act, 1936, as amended (Act), provides for a full faith and credit guarantee by the U.S. Government of debt obligations issued by (1) U.S. or foreign shipowners for the purpose of financing or refinancing either U.S. flag vessels or eligible export vessels constructed, reconstructed or reconditioned in U.S. shipyards and (2) U.S. shipyards for the purpose of financing advanced shipbuilding technology and modern shipbuilding technology (Technology) of a privately owned general shipyard facility located in the U.S. The Program is administered by the Secretary of Transportation acting by and through the Maritime Administrator (Secretary). Under the Federal Credit Reform Act of 1990, appropriations to cover the estimated costs of a project must be obtained prior to the issuance of any approvals for Title XI financing. The primary purpose of the Program is to promote the growth and modernization of the U.S. merchant marine and U.S. shipyards. The Program enables owners of eligible vessels and eligible shipyards to obtain long-term financing with attractive terms.

C.2.1 Eligibility Requirements

Vessels eligible for Title XI assistance generally include commercial vessels such as passenger, bulk, container, cargo, tankers, tugs, towboats, barges, dredges, oceanographic research, floating power barges, offshore oil rigs and support vessels, and floating drydocks.

Eligible technology generally includes proven technology, techniques and processes to enhance the productivity and quality of shipyards, novel techniques and processes designed to improve shipbuilding and related industrial production which advances the U.S. shipbuilding state-of-the-art.

The design of the vessels must be approved from an engineering standpoint. A U.S.-flag vessel must meet the American Bureau of Shipping standards or other such standards approved by the U.S. Coast Guard or in the case of an eligible export vessel, standards imposed by an International Association of Classification Societies member to be ISO 9000 series registered or other standards acceptable to MARAD. The shipowner or shipyard must have sufficient operating experience and the ability to operate the vessels or employ the Technology on an economically sound basis. The shipowner or shipyard must meet certain financial requirements with respect to working capital and net worth, both of which are based on such factors as the amount of the guaranteed obligations, the shipowner's or shipyard's financial strength, intended employment of the vessels or Technology, creditworthiness of the applicant and export country, etc. These factors also affect the terms of the MARAD guarantee, continuing Title XI financial covenants, guarantee fees, reserve fund, etc. All guarantees under this Program must be determined by the Secretary to be economically sound.

C.2.2 Application Procedure

Application forms and the regulations governing the Program may be obtained upon request from MARAD at the above address. Prior to filing an application, a preliminary meeting(s) should be arranged with the Director, Office of Ship Financing to discuss the Title XI application and requirements.

Approval of the application will be contingent upon the determination by the Secretary as to whether the vessels or Technology and the overall project meet all the applicable requirements of the existing statutes and regulations. If the application is approved, a letter commitment to guarantee the obligations will be issued, stating the requirements necessary for closing. If the application is not approved, the applicant will be notified in writing. Implementation of the approval of the application is accomplished through the execution of formal documentation of the transaction satisfying all the conditions in the letter commitment. At such time the guaranteed obligations (notes, bonds or other debt obligations) may be issued and sold and a secured interest or a mortgage on the vessels or Technology will be granted to the Secretary.

Completed sets of the application, including schedules and exhibits as required, should be sent to MARAD accompanied by the filing fee of $5,000, which is not refundable. Generally, application processing will take 60 days from the date the application is determined to be complete by MARAD.

C.2.3 Amount Guaranteed

The amount of the obligations guaranteed by the Government is based on the "actual cost" of the vessels or the Technology as determined by the Secretary. The actual cost of a vessel generally includes those items which would normally be capitalized as vessel costs under usual accounting practices, such

as the cost of construction, reconstruction, or reconditioning (including designing, inspection, outfitting and equipping) of the vessel, together with construction period interest and the guarantee fee. The actual cost of Technology generally includes those items which would normally be capitalized as shipbuilding technology under usual accounting practices including construction period interest and the guarantee fee but excludes amounts payable to the manufacturer for early delivery of equipment and predelivery expenses which may not be properly capitalized as the cost of the Technology. All items of actual cost must be determined to be fair and reasonable by the Secretary. Some costs are excluded from actual cost (although sometimes considered capitalizable costs) such as legal and accounting fees, printing costs, vessel insurance and underwriting fees, and any interest on borrowings for the shipowner's equity in the vessels or shipyard's equity in the Technology.

The Act permits guarantees in an amount not exceeding 87 ½ percent of the actual cost of (1) passenger vessels, designed to be not less than 1,000 gross tons and capable of a sustained speed of not less than 8 knots, to be used solely on inland rivers and waterways, (2) ocean-going tugs or more than 2,500 horsepower (hp), (3) barges, (4) vessels of more than 2,500 hp designed to be capable of a sustained speed of not less than 40 knots, (5) other vessels of not less than 3,500 gross tons and capable of a sustained speed of 10 knots, (6) ferries engaged solely in point-to-point transportation, not less than 75 gross tons, and capable of sustained speed of not less than 8 knots, and (7) Technology. Certain other vessels are limited to 75 percent financing.

If a Title XI guarantee of obligations for a vessel is documented after delivery or for refinancing, the actual cost must be depreciated from the date of delivery to the documentation date of the guarantee. If a Title XI guarantee of obligations for Technology is approved after the Technology has been placed in service or for refinancing, the actual cost must be depreciated from the date placed in service to the documentation date of the guarantee.

C.2.4 Source of Funds for the Obligations

Since the Program is a guarantee program, funds for the guaranteed debt obligations are obtained in the private sector. The main sources for such funds include banks, pension funds, life insurance companies, and notes or bonds sold to the general public.

The maximum guarantee period is the lesser of 25 years or the remaining economic life of the vessel or the lesser of the life of the Technology or remaining economic life of the Technology, as determined by the Secretary. The actual financing period will be based on the financial, economic and other critical aspects of the project. Amortization in equal payments of principal is usually required; however, other amortization methods such as a level debt (equal payments of principal and interest) may be approved if sufficient security is offered such as long term charters, reduction of the amount of guarantee and/or length of guarantee period.

The interest rate of the obligations guaranteed is determined by the private sector. Generally, in establishing the interest rate the prospective obligee would utilize as a benchmark rate the interest rate carried by U.S. Treasury obligations comparable to the average life of the proposed debt issue. The rate must be determined to be fair and reasonable by the Secretary. Historically, the interest rate has been fixed for the financing period. However, the Program has recently approved floating interest rates with certain restrictions.

C.2.5 Program Fees

There are a number of MARAD fees associated with using the Program. The applicant must pay a non-refundable filing fee of $5,000 when the application is filed. Prior to issuance of the letter commitment, the applicant must pay an investigation fee of one-half of 1 percent on obligations to be issued up to and including $10,000,000 plus 1/8 of one percent on all obligations to be issued in excess of $10,000,000. The $5,000 filing fee previously paid upon filing the original application will be credited against the investigation fee.

The guarantee fee is calculated by (1) determining the amount of obligations outstanding during each year of the financing and mutiplying that amount by the guarantee fee rate applicable to the project and (2) applying a present value analysis to the amount calculated in (1) above. The guarantee fee rate is generally based on a ratio of net worth to long-term debt of the shipowner or shipyard. The rate is (1) between ½ of one percent to one percent for the period after vessel delivery or Technology placed in service and (2) between 1/4 of one percent to ½ of one-percent prior to vessel delivery or during the construction or development of Technology. Amounts on deposit for the vessel or Technology in an escrow fund held pursuant to Title XI are excluded in the computation of this fee.

The one time guarantee fee is to be paid prior to the documentation date of the guarantee. No guarantee fees paid will be refunded. The guarantee fee may be included in actual cost and is eligible to be financed.

C.2.6 Refinancing

Amounts outstanding on existing Title XI obligations, or amounts outstanding on obligations not previously guaranteed and applicable to vessels may be refinanced up to the applicable financing level (87 ½ percent or 75 percent) of the depreciated actual cost of the Title XI vessels but not exceeding the amount of the existing obligations being refinanced. Only amounts outstanding on existing Title XI obligations applicable to Technology will be eligible for refinancing not exceeding the amount of the existing obligations being refinanced. Refinancing under Title XI must meet all the applicable requirements of the existing statutes and regulations, and the original debt must have been issued within one year after vessel delivery or within one year of the date the Technology was placed in service. Vessels or Technology purchased as "used" are not eligible under this provision.

C.3 Federal Transit Administration

The Federal Transit Administration (FTA) is the principal source of federal financial assistance for public transportation in the U.S. The major FTA programs under which ferry services sometimes receive federal financial assistance include:

- Urbanized Area Formula Grants under Section 5307[3]
- Nonurbanized Area Formula Grants under Section 5311
- Grants for fixed guideway modernization projects (including ferryboats) and new start projects (including ferryboats) under Section 5309

[3] Sections refer to the statutory references found in the U.S. Code.

Eligible recipients for FTA financial assistance are, however, generally limited to public bodies such as states, municipalities and local governments, local public transit operators and in some cases local non-profit agencies or entities (e.g., Indian Tribes) and certain public corporations established under state law. Therefore, the private ferry operators currently providing service to Fire Island would be ineligible for these FTA programs.

C.4 State of New York

The New York State Department of Transportation distributes approximately $1.6 billion annually to approximately 130 transit operators through the State Transit Operating Assistance (STOA) program, including one ferry operator (Staten Island Ferry). Eligible recipients are limited to transit operators that primarily serve the journey-to-work market. Therefore, because of the lack of a major journey-to-work market segment, as well as the seasonal nature of the ferry service to Fire Island, the private ferry operators currently providing service to Fire Island would be ineligible for funding under this program.

Finally, in order to promote job creation and economic development, the State of New York also offers various forms of assistance to private companies through the Empire State Development Corporation. The mechanisms by which assistance is provided can include tax credits and exemptions, grants, loans and interest rate subsidies, which are meant to strengthen and support business expansion, thus contributing to economic development. A brief review of the eligibility criteria for certain of the programs offered by the Empire State Development Corporation suggests that the existing ferry operators serving Fire Island, or potential new ferry operators, could potentially be eligible for certain of the assistance programs offered.

Appendix D: Overview of Marine, Coastal and Terrestrial Species in the Great South Bay Ecosystem

The Great South Bay habitat complex is that segment of the barrier beach and backbarrier lagoon on the south shore of Long Island, east of South Oyster Bay and west of Moriches Bay, about 60 kilometers (37 miles) east of New York City.[4]

The Great South Bay habitat complex includes the entire 25,920-hectare (64,000-acre) aquatic environment of Great South Bay, including all salt marsh islands, dredged material islands, undeveloped sections of the Jones Beach/Gilgo Beach and Fire Island barrier islands, Fire Island Inlet, and the nearshore waters of the New York Bight. The western boundary is the Gilgo Cut boat channel in Babylon separating Great South Bay from South Oyster Bay, and the eastern boundary is the Smith Point Bridge in Brookhaven. Developed portions of the barrier islands, exclusive of the beaches, and developed islands in the bay are not included in the habitat complex. This habitat complex also includes the major rivers, creeks, and marshes draining into Great South Bay from the Long Island mainland including, from west to east: Orowoc Creek wetlands and uplands, Champlin Creek estuary and tidal wetlands, Connetquot River estuary and watershed, Swan River, Beaverdam Creek, and Carmans River estuary. This boundary encloses regionally significant habitat for fish and shellfish, migrating and wintering waterfowl, colonial nesting waterbirds, beach-nesting birds, migratory shorebirds, raptors, and rare plants.

D.1 Ownership, Protection and Recognition

Great South Bay riparian and underwater land ownerships include federal, state, county, town (Babylon, Islip, and Brookhaven), and private holdings. Heckscher and Connetquot River State Parks (on the Long Island mainland) and Gilgo, Captree, and Robert Moses State Parks (on the barrier islands) comprise the major state holdings. On the western barrier island (Jones Beach/Gilgo Beach), Islip and Babylon town lands are interspersed with state-owned parklands. On the eastern barrier island (Fire Island), Robert Moses State Park comprises the western end of the island, a mix of villages and the 7,689-hectare (19,000-acre) Fire Island National Seashore comprise the middle part of the island, and the 526-hectare (1,300-acre) Fire Island Wilderness Area managed by the National Park Service comprises the eastern end of the habitat complex. On the mainland, the shoreline is heavily developed to private residences, marinas, and marine-related industries. Undeveloped areas are primarily in federal and state ownerships, but a few parcels are either privately owned or in town ownership. Connetquot River State Park covers approximately 1,620 hectares (4,000 acres) in the southcentral part of Islip. The 972-hectare (2,400-acre) Wertheim National Wildlife Refuge along the Carmans River estuary and the 79-hectare (196-acre) Seatuck National Wildlife Refuge at the mouth of Champlin Creek are both managed by the U.S. Fish and Wildlife Service. Private preserves include the Finlay-Wolf Pond Preserve, Hollins Preserve, Orr Preserve, and Thorne Preserve owned and managed by The Nature Con-

[4] The information contained in this Appendix is adapted from the report *Significant Habitats and Habitat Complexes of the New York Bight Watershed*. U.S. Fish and Wildlife Service. November 1997.

servancy. Significant Coastal Fish and Wildlife Habitats recognized by the New York State Department of State include, from west to east: Great South Bay-West, Gilgo Beach, Cedar Beach, Sore Thumb, Orowoc Creek, Champlin Creek, Connetquot River, Great South Bay-East, Swan River, Beaverdam Creek, and Carmans River. The New York State Department of State is developing a regional coastal management plan for the south shore of Long Island (South Shore Estuary Reserve) that includes this area. Wetlands are regulated in New York under the state's Freshwater Wetlands Act of 1975 and Tidal Wetlands Act of 1977; these statutes are in addition to federal regulation under Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act of 1977, and various Executive Orders.

Several wetland parcels are recognized by the U.S. Fish and Wildlife Service as priority wetlands under the federal Emergency Wetlands Resources Act of 1986; these include Swan River, Beaverdam Creek, and the Carmans River. The Connetquot River has been designated as a recreational river, and segments of the Carmans River have been designated as Scenic and Recreational Rivers under the New York State Wild, Scenic, and Recreational Rivers Act. Suffolk County and the town of Brookhaven recognize parcels along the Carmans River and the coastline of Great South Bay as Critical Environmental Areas under the State Environmental Quality Review Act. The Atlantic Coast Joint Venture of the North American Waterfowl Management Plan identifies the South Shore Mainland Marshes as a focus area. A focus area plan identifies 39 marsh sites for acquisition and/or restoration along the mainland from the Robert Moses Causeway east to Shinnecock Bay, including 22 sites along Great South Bay. The headwaters of the Carmans River are within the boundaries of the Long Island Pine Barrens Reserve. Fire Island, including parts of Jones Beach, has been designated and mapped as an undeveloped beach unit as part of the Coastal Barrier Resources System pursuant to the federal Coastal Barrier Resources Act, prohibiting federal financial assistance or flood insurance within the unit. Other parts of Fire Island have been designated and mapped as otherwise protected beach units pursuant to the Coastal Barrier Resources Act. The New York State Natural Heritage Program, in conjunction with The Nature Conservancy, recognizes several Priority Sites for Biodiversity within the South Fork Atlantic Beaches habitat complex. These sites are listed here along with their biodiversity ranks: Jones Beach Island Macrosite (B2 - very high biodiversity significance), Sunken Forest (B2), Bow Drive Marsh (B3 - high biodiversity significance), Connetquot River State Park Site (B3), Fair Harbor (B3), and Fire Island Wilderness (B3).

D.2 General Habitat Description

The Long Island barrier beach/backbarrier lagoon system extends for 145 kilometers (90 miles) along the south shore from Coney Island in New York City east to Southampton at the eastern end of Shinnecock Bay. The bay complex occurs in the Outer Coastal Plain physiographic province. The bay and barrier beach sediments are composed predominantly of sand and gravel derived from glacial outwash and marine sources. The Great South Bay complex as defined here includes 47 kilometers (29 miles) of this system from South Oyster Bay east to Moriches Bay. This part of the Long Island backbarrier system is characterized by shallow open water habitat with extensive salt marshes along the backside of the barrier beach and along tidal creeks and rivers feeding into the bay from the mainland. Great South Bay occupies an area of 243 square kilometers (151 square miles) and has an estuarine drainage of 1,360 square kilometers (845 miles), with a daily average freshwater inflow of 19.8 cubic meters per second (700 cubic feet per second). The majority of this flow originates from six groundwater-fed bodies: Orowoc Creek, Champlin Creek, Connetquot River, Swan River, Beaverdam Creek, and Carmans River. Great South Bay is the only one of the Long Island south shore bays that has major river-

ine input (from the Carmans and Connetquot Rivers). In addition, the bay receives as much as 11% of its freshwater input directly from groundwater flows through its floor. The semidiurnal tides average from 0.2 to 4.0 feet, depending on location, and are highest at the inlets and lowest in the far reaches of the system furthest from the inlets. Fire Island Inlet is the only direct connection to the sea, with several indirect connections through South Oyster Bay and Moriches Bay. Fire Island Inlet is dredged biannually by the U.S. Army Corps of Engineers. Sand is pumped out of the inlet and deposited downdrift to the west for about 8 kilometers (5 miles).

A number of benthic habitats make up the bay bottom; the dominant eelgrass (Zostera marina) community is one that has been most extensively studied. Benthic habitat in Great South Bay can be classified as muddy sandflat and sandflat habitats. Dominant benthic species that are found in both habitats include polychaetes such as yellow-jawed clam worm (Nereis succinea), orbiniid worm (Haploscoloplos fragilis), opal worm (Lumbrineris brevipes), and thread worm (L. tenuis), and the bivalves northern dwarf-tellin (Tellina agilis) and Atlantic awningclam (Solemya velum), amphipods Lysianopsis alba and Paraphoxus spinosus, and the isopod Idotea balthica. Sandy bottom types characteristically contain populations of polychaetes (Platynereis dumerillii), feather-duster worm (Sabella microphthalma), opal worm (Arabella iricolor), and common bamboo worm (Clymenella torquata), bivalves such as northern quahog (Mercenaria mercenaria), Morton egg cockle (Laevicardium mortuni), slipper shell (Crepidula fornicata), and blue mussel (Mytilus edulis), and mud crab (Dyspanapeus sayi). Muddy sandflats are dominated by polychaetes of the genus Harmothoe and the bivalve amethyst gemclam (Gemma gemma). Atlantic oyster drill (Urosalpinx cinerea), a predator of bivalves, is abundant in eelgrass beds in Bellport Bay, and rock crab (Cancer irroratus) occurs in the higher salinity areas of Islip, South Oyster, and Hempstead. The distribution and abundance of benthic species in the bay's eelgrass community is likely controlled by a number of factors that include eelgrass stem density, water temperature and salinity, sediment type, predation, food supply, and human harvest.

Great South Bay is the largest shallow saltwater bay in New York State, and one of the largest in the study region. Much of the bay is open water, but as the bay narrows at its western end near the Captree Bridge, open water merges into an extensive series of tidal salt marshes, salt marsh islands, and intertidal mudflats. These marshes and flats have developed on the protected northern edge of the barrier beach that shelters Great South Bay and the mainland from the Atlantic Ocean. Extensive tidal marshes and flats have developed on the bay side of Fire Island as well. Eelgrass beds are concentrated in the shallow waters along the back side of Fire Island, especially at the eastern end, north and east of East and West Fire Islands and north of Captree and Cedar Island. Cordgrasses (Spartina alterniflora and S. patens) dominate the salt marshes. Common reed (Phragmites australis) borders portions of the high marsh, grading to dense thickets of bayberry (Myrica pensylvanica) and poison ivy (Toxicodendron radicans) in drier areas. On the barrier beaches bordering the Atlantic Ocean and in swales behind primary dunes are found plants characteristic of stabilized older dune and coastal shrub communities. These include American beachgrass (Ammophila breviligulata), beach plum (Prunus maritima), bayberry, winged sumac (Rhus copallinum), beach heather (Hudsonia tomentosa), and Virginia creeper (Parthenocissus quinquefolia). The Sunken Forest on Fire Island is a regionally rare maritime oak-holly forest dominated by American holly (Ilex opaca), sassafras (Sassafras albidum), and shadbush (Amelanchier canadensis), with black gum (Nyssa sylvatica) in wetter depressions. The western barrier island from Captree to Jones Beach is divided roughly in half along its lengthwise axis by a four-lane, east-west roadway that separates salt marsh on the north from beach dune/swale plant communities on the southern portion of the barrier island.

D.3 Ecological Significance and Uniqueness of Site

The Great South Bay habitat complex supports regionally significant populations of marine and estuarine fish, migrating and wintering waterfowl, rare plants, and other species associated with open water marshes, barrier beaches, and estuarine watersheds and the largest undeveloped barrier beach in the New York Bight study area. There are 210 species of special emphasis in the Great South Bay complex, incorporating 43 species of fish and 101 species of birds, and including the following federally and state-listed species. (Living resources and their habitats are dynamic; therefore, the ecological significance and species information presented here may not be complete or up-to-date.)

Federally listed endangered
peregrine falcon (Falco peregrinus)
roseate tern (Sterna dougallii)
Atlantic (=Kemp's) ridley sea turtle (Lepidochelys kempi)
green sea turtle (Chelonias mydas)

Federally listed threatened
loggerhead sea turtle (Caretta caretta)
piping plover (Charadrius melodus)
seabeach amaranth (Amaranthus pumilus)

Federal species of concern
northern diamondback terrapin (Malaclemys t. terrapin)
black rail (Laterallus jamaicensis)

State-listed endangered
least tern (Sterna antillarum)
Barratt's sedge (Carex barrattii)
slender nutrush (Scleria minor)
St. Andrew's cross (Hypericum hypericoides ssp. multicaule)
pygmyweed (Tillaea aquatica)
pixies (Pyxidanthera barbulata)
slender marsh-pink (Sabatia campanulata)
yellow milkwort (Polygala lutea)

State-listed threatened
eastern mud turtle (Kinosternon subrubrum)
northern harrier (Circus cyaneus)
osprey (Pandion haliaetus)
common tern (Sterna hirundo)
button sedge (Carex bullata)
angled spikerush (Eleocharis quadrangulata)
long-tubercled spikerush (Eleocharis tuberculosa)
few-flowered nutrush (Scleria pauciflora var. caroliniana)
weak rush (Juncus debilis)
crested yellow orchid (Platanthera cristata)
purple milkweed (Asclepias purpurascens)
swamp sunflower (Helianthus angustifolius)
pinweed (Lechea pulchella var. moniliformis)
shrubby St. John's-wort (Hypericum prolificum)

sandplain flax (Linum intercursum)
southern yellow flax (Linum medium var. texanum)
golden dock (Rumex maritimus var. fueginus)

State-listed special concern animals
coastal barrens buckmoth (Hemileuca maia maia)
short-eared owl (Asio flammeus)
eastern bluebird (Sialia sialis)

State-listed rare plants
Collin's sedge (Carex collinsii)
necklace sedge (Carex hormathodes)
red-rooted flatsedge (Cyperus erythrorhizos)
whip nutrush (Scleria triglomerata)
southern twayblade (Listera australis)
grassleaf ladies'-tresses (Spiranthes vernalis)
purple everlasting (Gnaphalium purpureum)
Nuttall's lobelia (Lobelia nuttallii)
pinweed (Lechea racemulosa)
slender pinweed (Lechea tenuifolia)
comb-leaved mermaid-weed (Proserpinaca pectinata)
fibrous bladderwort (Utricularia fibrosa)
small floating bladderwort (Utricularia radiata)

The shallow waters of Great South Bay are a highly productive and regionally significant habitat for marine finfish, shellfish, and wildlife. This productivity is due, in part, to the many salt marshes and mudflats fringing the mainland and the barrier islands; the estuarine habitats around stream and river outlets on the mainland; and the sandy shoals and extensive eelgrass (Zostera marina) beds that characterize the open water areas of the bay. As a result, Great South Bay has a commercial and recreational fishery of regional importance, affording essential habitat to many economically valuable finfish species that are estuarine-dependent during at least one stage in their life histories. Annual fish surveys in the bays by the New York Department of Environmental Conservation have shown a great diversity of fish species; during eight years of surveys, 85 species have been identified, about 40 of which occur regularly in the bay. The most abundant fish species in the bay, accounting for over 90% of all fish caught, are silversides (Menidia spp.), killifish (Fundulus spp.), menhaden (Brevoortia tyrannus), and bay anchovy (Anchoa mitchilli). Forage fish species are found throughout the various aquatic habitats in the bay at different times of the year. Atlantic silverside, the most dominant member of the ichthyofauna throughout much of the year, is found virtually everywhere in the bay. Bay anchovy is the major mid-bay water column occupant in the summer during its spawning time in late June and July. Killifishes include mummichog (Fundulus heteroclitus) in the salt marsh habitats, striped killifish (Fundulus majalis) over sandy habitat, and sheepshead minnow (Cyprinodon variegatus) in both habitats. Sticklebacks, including fourspine (Apeltes quadracus) and threespine (Gasterosteus aculeatus), are spring and summer spawners associated with submerged aquatic vegetation (SAV); although they are very abundant, their use as prey for other fish and birds is limited due to spines, body armor, and close association with vegetative cover. Northern pipefish (Syngnathus fuscus) is a zooplankton consumer preyed upon by both striped bass (Morone saxatilis) and summer flounder (Paralichthys dentatus). American sandlance (Ammodytes americanus), probably the most abundant winter species, provides important forage for many species of special emphasis in the Bight.

The abundance of forage species makes the bay an important feeding and nursery area for a number of estuarine-dependent, commercially and recreationally important species, including summer flounder, winter flounder (Pleuronectes americanus), bluefish (Pomatomus saltatrix), striped bass, weakfish (Cynoscion regalis), tomcod (Microgadus tomcod), and tautog (Tautoga onitis). The bay is a particularly significant nursery area for young-of-the-year and juvenile Hudson River striped bass and juvenile bluefish, as well as for striped bass from older age classes during the summer. Adult striped bass and bluefish congregate in the deeper waters of Fire Island Inlet. Bluefish is the most abundant piscivore (fish eater) in the Great South Bay. Winter flounder spawn in the bay from March to May and migrate offshore in the summer to avoid high temperatures. Summer flounder enter the bay in winter and spring and grow rapidly in the productive waters. Reef species, including tautog, cunner (Tautogolabrus adspersus), and black sea bass (Centropristis striata), use Great South Bay as a nursery area because the vegetative areas provide cover and are rich in prey species; all three species can also be found at an artificial reef in the bay. The bay supports an economically significant shellfishery for northern quahog and is a major spawning, nursery, and foraging area for blue crab (Callinectes sapidus). Other common aquatic species occurring in the backbarrier lagoon systems of Long Island include blue mussel (Mytilus edulis), bay scallop (Argopecten irradians), eastern oyster (Crassostrea virginica), horseshoe crab (Limulus polyphemus), American eel (Anguilla rostrata), spot (Leiostomas xanthurus), Atlantic croaker (Micropogonias undulatus), northern kingfish (Menticirrhus saxatilis), and northern puffer (Sphoeroides maculatus). There are a number of significant trout resources in streams that drain into Great South Bay. Nine of the twelve verified wild brook trout populations of Long Island occur in the Great South Bay drainage. The Connetquot River, Swan River, Beaverdam Creek, Carmans River, Tuthills Creek, Brown Creek, Mud Creek, Patchogue Creek, and Terrel Creek all contain naturally reproducing populations of brook trout. Orowoc and Champlin Creeks no longer contain suitable habitat for brook trout due to stormwater runoff and flow reductions.

Today, hard clams are the bay's principal commercial resource, but this was not always the case. The once well-known eastern oyster (Crassostrea virginica) fishery collapsed in the 1940's and 50's; that collapse was linked to algal blooms of a minute species that inhibited shellfish growth. These blooms were believed to be the result of high inputs of organic wastes, primarily from large-scale duck farms located on tributaries of the bay, especially in Moriches Bay. Although these discharges were reduced, the oysters failed to regain commercial population status; this was due, in part, to the reopening and maintenance dredging of Moriches Inlet in the 50's. That action forever changed the salinity regime of the bay, which now favors the more saline-tolerant hard clam. Studies conducted in the bay conclude that today's limiting factor controlling primary production is turbidity, or the suspension of solids, which limits light penetration in the photic zone. Light-limited phytoplankton productivity is a relatively common phenomenon in high energy estuarine environments; this, in turn, determines or limits the success of higher trophic levels. Anadromous fish in the area include alewife (Alosa pseudoharengus), blueback herring (Alosa aestivalis), American shad (Alosa sapidissima), and Atlantic sturgeon (Acipenser oxyrhynchus). Their abundance varies from year to year, with both herring and shad at somewhat steady, but low, levels. Considering the size of the south shore bays system, there are relatively few free-flowing, spring-fed streams in the south shore bays, and barriers to fish passage exist on most. There are 40 water control/dam structures within the Atlantic drainage portions of the study area of Long Island that impede the passage of fish; there are no fish passage facilities on Long Island.

The waters of Great South Bay support large concentrations of migrating and wintering waterfowl, particularly Canada goose (Branta canadensis), American black duck (Anas rubripes), brant (Branta bernicla), scaup (Aythya spp.), red-breasted merganser (Mergus serrator), and common goldeneye

(Bucephala clangula). Based on aerial surveys, Great South Bay supports the largest wintering waterfowl concentrations in New York State. The flocks of waterfowl are not evenly distributed in the bay. Dabbling ducks are concentrated in the shallow water and marsh areas behind Fire Island, the shoals near the East and West Fire Islands, Sexton Island, and Captree Island, as well as in the Carmans and Connetquot River estuaries (see below). Diving ducks are distributed more evenly throughout the bay, with consistent use areas including Bellport Bay, the south shore behind Fire Island, and along the north shore of the bay west of Blue Point. Eastern Great South Bay is one of the most important areas for diving ducks in the region. Sea ducks and diving ducks are also concentrated in Fire Island Inlet. In summer, the bay is an important feeding ground for least, roseate, and common terns, ducks and herons, many of which nest locally (see below). Nuisance species nesting in this area and of increasing concern include great black-backed (Larus marinus) and herring (Larus argentatus) gulls.

Harbor seals (Phoca vitulina) are frequently sighted in the bay during winter and consistently use haulout sites along both sides of Fire Island Inlet; grey seal (Halichoerus grypus) sightings have increased in recent years in similar locations. Cetaceans include minke whale (Balaenoptera acutorostrata), which occur in the nearshore waters throughout the year, and bottlenosed dolphin (Tursiops truncatus) which occur inshore during the summer and fall. Individual beluga whales (Delphinapterus leucas) have been consistently sighted in and off Fire Island Inlet. Sea turtles regularly using Great South Bay include juvenile Atlantic ridley sea turtles, juvenile loggerhead turtles, and juvenile and adult green sea turtles. Leatherback sea turtles (Dermochelys coriacea) occur offshore of Fire Island Inlet, and loggerhead sea turtles occur in nearshore waters all along the Long Island barrier islands.

D.4 Focus Areas in Great South Bay

In addition to the waters and intertidal areas of Great South Bay itself, there are several focus areas within this complex.

Fire Island Inlet: Fire Island Inlet is critical to maintaining the high productivity levels of Great South Bay. Through daily tidal flushing the inlet maintains the necessary conditions, especially those related to salinity and water quality, that foster the diversity of marine and wildlife species throughout the bay ecosystem. Specific salinity levels are crucial to the continued production of hard clams and may be essential to spawning weakfish and other finfish. The inlet is also habitat for adult finfish of commercial and recreational value, especially striped bass and bluefish that congregate in areas of deep water, and the plankton-eating American sandlance, important as a forage base for both predatory fish and roseate terns. The inlet is the most important foraging area for roseate terns on western Long Island. Fire Island Inlet is a concentration area for sea turtles and marine mammals as noted above.

Western Great South Bay Marshes: This area includes all adjacent salt marsh, associated islands, and tidal flats in the western reaches of Great South Bay. Salt marsh islands from the Gilgo Cut boat channel east to Sexton Island are an uninhabited and expansive area of tidal salt marsh, mudflats, shallow pools, and manmade ditches. Dominant marsh vegetation includes the cordgrasses and, in drier areas, common reed, poison ivy, groundsel-bush (Baccharis halimifolia) and marsh elder (Iva frutescens). Several pairs of northern harrier nest in the dense common reed and poison ivy stands, while seaside and sharptailed sparrows (Ammodramus maritimus and A. caudacutus), marsh wren (Cistothorus palustris), clapper and Virginia rail (Rallus longirostris and R. limicola), and willet (Catoptrophorus semipalmatus) nest on the marshes. The mosaic of tidal pools, marshes, and mudflats provides a rich feeding area in summer for wading birds, especially snowy and great egrets (Egretta thula and Casmerodius

albus), tricolored and little blue herons (Egretta tricolor and E. caerulea), glossy ibis (Plegadis falcinellus), and American oystercatcher (Haematopus palliatus), and during migration for shorebirds such as whimbrel (Numenius phaeopus), yellowlegs (Tringa spp.), and black-bellied plover (Pluvialis squatarola). Migrating raptors, including peregrine falcon (Falco peregrinus), and merlin (Falco columbarius), use the Captree Islands as foraging habitat. The islands have supported nesting by least tern, common tern, and wading birds. A large heronry occurred on Nazeras Island in recent years, although no birds nested there in 1995. A few smaller heronries occur on islands in this area, including Pipe Island and Sand Island in 1995; the most abundant nesting waders are glossy ibis, black-crowned night-heron (Nycticorax nycticorax), snowy egret, and great egret, with lesser numbers of tricolored heron, little blue heron, and yellow-crowned night-heron (Nyctanassa violacea). Several of the islands have been used for nesting by common terns, including a large rookery on Captree Island (Seganus Thatch). Short-eared owl and northern harrier are common winter residents.

Oak Beach: Oak Island is an inhabited marsh island with 54 homes built on land leased from the town of Babylon. The island is accessible only by boat. Development is limited to the southernmost fringe of the 39-hectare (96-acre) island. The remaining natural area is used as foraging habitat by northern harriers, wading birds, and waterfowl. Oak Beach is directly south of Oak Island, and is part of the main western barrier island. It is composed of salt marsh and dune-swale habitats, and is in both town of Babylon and state of New York (Gilgo State Park) ownerships. The Oak Beach marsh is extremely productive, and is distinctive as one of the few remaining unditched salt marshes in the Northeast. Northern harriers here may reach their highest breeding densities in the state and, possibly, the region. There is also evidence that seaside and sharptailed sparrow densities are higher at Oak Beach than on adjacent ditched marshes. This is the only known location on Long Island where black rail are regularly heard or observed and the only documented breeding location for sora (Porzana carolina). The marsh also supports nesting American black duck, mallard (Anas platyrhynchos), Canada goose, and clapper rail, and is important as a spawning and/or nursery ground for weakfish, blue crab, and forage fish species. The extensive tidal mudflats support high concentrations of shorebirds during migration, especially sanderling (Calidris alba), sandpipers, dowitchers (Limnodromus spp.) and plovers, while the shallow tidal pools are used as a feeding area by resident and migratory waterfowl and wading birds.

Fire Island Inlet Beaches: The barrier island beaches on both sides of Fire Island Inlet, from Gilgo Beach to Captree on Jones Beach Island and Democrat Point on Fire Island, are undeveloped barrier beaches and dunes that support significant numbers of beach-nesting birds, migratory shorebirds, and rare beach and dune plants. Four specific segments of beach are described here in more detail.

Sore Thumb/Overlook Beach: This sandy beach area extending into Fire Island Inlet was historically an important nesting ground for least tern and piping plover, but the area has been eroded in recent years. This area remains, however, an important feeding and resting area for migratory shorebirds.

Cedar Beach: One of the largest common tern nesting colonies in the world (over 6,500 pairs in 1987) was found behind the primary dunes at Cedar Beach in the late 1980s, and a smaller colony (500 pairs in 1995) has occurred there in recent years. As many as 100 pairs of roseate tern (the fourth largest colony in the Northeast) have nested at this site as well, but only 19 pairs nested in 1995. This area has been one of only a few sizable roseate tern colonies in the northeastern United States and is important to the recovery of this species. The colony also supports several pairs of piping plover and averages over 200 pairs of black skimmer (Rynchops niger), making it one of the largest skimmer colonies in the New York Bight study area. Predation of the Cedar Beach tern/skimmer colony in 1995, possibly

by American crows (Corvus brachyrhynchos), resulted in complete destruction of eggs and loss of chicks, leading to abandonment of this large colony. A pair of northern harriers nests adjacent to the nearby salt marsh, and both harriers and short-eared owls use these marshes and dunes as foraging areas during winter. Cedar Beach is an area used by large numbers of nesting northern diamondback terrapins that also feed and winter in the tidal areas north of the tern colony. Cedar Beach is considered one of the best examples of maritime beach and maritime interdunal swales on Long Island. Rare, beach-dependent plants occurring at Cedar Beach and Gilgo Beach include seabeach amaranth and seabeach knotweed (Polygonum glaucum) on the beach, and rusty flatsedge (Cyperus odoratus), golden dock, red pigweed (Chenopodium rubrum), salt-meadow grass (Diplachne maritima), and seaside bulrush (Scirpus maritimus) in the interdunal swales at Overlook Beach.

Gilgo Beach: Gilgo Beach is the site of one of the largest least tern nesting colonies on Long Island. This area also supports breeding piping plover, seaside sparrow, and northern harrier, as well as high concentrations of nesting northern diamondback terrapin and rare plants.

Democrat Point: Democrat Point is the westernmost point of Fire Island, a dynamic sand spit adjacent to Fire Island Inlet. The Point is a nesting area for least tern and piping plover that also supports several rare plant species, including seabeach amaranth and seabeach knotweed on the beach and grassleaf ladies'-tresses and purple everlasting (Gnaphalium purpureum) in the interdunal swales.

Fire Island: This area includes the barrier island (Fire Island) and its associated tidal wetlands and intertidal mudflats, focusing on the area between Watch Hill/Davis Park and the Smith Point Park Bridge. The sandy beaches and dunelands of the barrier island in the eastern reach of the Great South Bay support a few nesting sites for least tern and piping plover. Nesting success by piping plover in this long stretch of undisturbed beach may be limited by a lack of available feeding areas such as open vegetation, ephemeral pools, inlets, and access to bayside foraging areas, and possibly by predation. Human and off-road vehicle disturbance may also be a cause for low nesting success. In recent years, plover breeding activity of territory establishment and courtship has increased on Fire Island; about ten pairs have nested, primarily along the beach in the Wilderness Area and south of Old Inlet. The area is also important for migrating and wintering northern harrier, which are possible breeders, short-eared owl, and snowy owl (Nyctea scandiaca), all of which forage over swales and the extensive salt marshes fringing the barrier island on its northern edge. These tidal marshes and associated mudflats provide resting and feeding habitat for thousands of migratory shorebirds, especially sandpipers, sanderling, plovers, and dowitcher during both spring and fall passages.

This portion of the barrier island supports a major breeding population of eastern mud turtle and is one of the few Long Island locations where black rail have been sighted. Clapper rail and seaside sparrow are common nesters in the salt marshes. The productive bay waters of the Fire Island National Seashore Wilderness Area are known for high concentrations of wintering waterfowl, especially scaup, pied-billed grebe (Podilymbus podiceps), American black duck, and red-breasted merganser, which gather to feed and rest there. Adult striped bass and bluefish congregate in the deeper waters of the eastern bay around the Smith Point Bridge where forage species such as menhaden are plentiful.

The Sunken Forest on Fire Island is a 16-hectare (40-acre) maritime oak-holly forest occurring behind the secondary dune, one of only a few mature maritime forests in the New York Bight Study area (see Raritan Bay - Sandy Hook Bay habitat complex and Island Beach in Barnegat Bay habitat complex),

and the northernmost holly-dominated maritime forest on the Atlantic barrier island chain. This community type is considered globally imperiled (G2) by The Nature Conservancy. Rare plants found along the beach on Fire Island include seabeach amaranth and seabeach knotweed; swamp sunflower (Helianthus angustifolius) and slender marsh-pink occur in interdunal swales at the eastern end. A hawk watch and count at the lighthouse on Fire Island averages over 9,000 raptors during the autumn migration. The most abundant raptors counted, in declining order of abundance, are American kestrel (Falco sparvarius), merlin, sharp-shinned hawk (Accipiter striatus), northern harrier, osprey, peregrine falcon, and Cooper's hawk (Accipiter cooperii).

Connetquot River Estuary/Connetquot River State Park: The Connetquot River is part of a 1,823-hectare (4,500-acre) undeveloped coastal watershed system, unique in this urbanized location, and is one of only four major rivers on Long Island. The river is fed by several natural cold water streams originating from groundwater sources. The estuarine portion of the watershed, from the mouth of the river at its outlet in Great South Bay to the limit of tidal influence, is approximately 3 kilometers (2 miles) in length, and includes adjacent state-owned tidal wetlands. Waterfowl in great numbers use the Connetquot River estuary as a major wintering area and as a stopover point during migration. The most abundant waterfowl include American black duck, mallard, scaup, canvasback (Aythya valisineria), redhead (Aythya americana), bufflehead (Bucephala albeola), and Canada goose. The large open and shallow Connetquot River estuary provides essential habitat for a diversity of fish and wildlife species. Of particular significance is the estuary's importance as a nursery ground for yearling striped bass and bluefish that concentrate to feed in the tidewater areas before commencing coastal migration. Unusual for Long Island, anadromous species such as alewife and white perch (Morone americana) are possible spawners here. The estuary supports a sea-run brown trout (Salmo trutta) fishery and a native brook trout (Salvelinus fontinalis) fishery in Connetquot Brook. Weakfish congregate to spawn in the sandy shallow of nearby Heckscher Flats. One of the northeasternmost known occurrences of pirate perch (Aphredoderus s. sayanus) is in the Connetqout River.

The majority of the Connetquot River watershed has been protected by the Connetquot River State Park and contains a variety of upland and wetland habitats that support an unusual diversity of regionally rare plants as well as a diversity of bird species. Over 100 species of birds have been reported as possibly breeding here. Rare plants include Long's bittercress (Cardamine longii) in a tidal freshwater marsh along the Connetquot River, weak rush in a sedge meadow near the river, and Collin's sedge and southern twayblade in red maple swamps in the watershed. Wet pine barrens interspersed with bridle paths and fire breaks support several rare plants, including Barratt's sedge, button sedge, hay sedge (Carex argyrantha), bent sedge (Carex styloflexa), yellow milkwort, slender nutrush, whip nutrush, pinweed, slender pinweed, crested yellow orchid, stargrass (Aletris farinosa), swamp oats (Sphenopholis pensylvanica), Nuttall's lobelia, and coastal violet (Viola brittoniana), while a disturbed site along the railroad right-of-way contains rusty flatsedge.

The headwaters of the Connetquot River, which flows south into Great South Bay, and of the Nissequogue River, which flows north into Long Island Sound, are separated by a only a short distance (about 3 kilometers [1.9 miles]) in the village of Hauppague in central Long Island. The riparian corridors of these two rivers thus form a nearly continuous belt of upland and aquatic habitat across the island. Although much of the land between the headwaters has been developed, there is a somewhat fragmented corridor of open space between the northern end of the Connetquot and the southern end of the two branches of the Nissequogue. This is one of the few places in central Long Island where there is a cross-island open space corridor for birds, insects, and amphibians. The land between the headwaters

contains a few coastal plain ponds supporting the eastern tiger salamander (Ambystoma t. tigrinum). Bow Drive Marsh at the headwaters of the Nissequougue River is a high-quality, coastal plain, poor fen supporting tiger salamander and several rare plant species, including Nuttall's lobelia, comb-leaved mermaid weed, long-tubercled spikerush, and stargrass (Aletris farinosa).

Champlin Creek and Orowoc Creek: Champlin Creek is a relatively undisturbed, clean, freshwater coastal stream. The upper portions of Champlin Creek provide habitat conditions suitable for natural reproduction by one of only six known wild populations of brook trout on Long Island. At its southern terminus near Great South Bay, the stream enters Seatuck National Wildlife Refuge and, ultimately, a system of freshwater, brackish, and tidal marshes and ditches. As in other coastal streams along the shoreline, the interface of fresh and salt water provides rich spawning and nursery habitats for commercially valuable marine species, including white perch and yearling striped bass and bluefish. Osprey nest in the National Wildlife Refuge and across the creek at Heckscher State Park, and least tern have nested on dredged material deposited along the park shoreline. The wetlands and nearby uplands of Heckscher State Park support several rare plant species, including slender marsh-pink, Nuttall's lobelia, angled spikerush, and pinweed, and a nearby pond has small floating bladderwort. Rare plants along Champlin Creek include Nuttall's lobelia and whip nutrush. Orowoc Creek is a freshwater coastal stream harboring a locally rare population of naturally reproducing brook trout. The upper watershed of Orowoc Creek, which is approximately 2 kilometers (1.5 miles) north of the bay, remains relatively undisturbed and is under consideration for public ownership through town and/or county purchase. Many species of birds, reptiles, and amphibians unusual for an urbanized area inhabit the wetlands and riparian woodlands. These include wood duck (Aix sponsa), DeKay's brown snake (Storeria dekayi), box turtles (Terrapene spp.), and numerous songbirds. A pine barren seep area along a tributary of the Orowoc has several rare plants, including Elliot's goldenrod (Solidago elliotttii), pixies, yellow milkwort, and whip nutrush. A peat (Sphagnum spp.) bog harboring sundews (Drosera spp.), cranberry (Vaccinium spp.), several species of orchid, and other plants of special botanical interest also occurs along the Orowoc. A nearby shallow pond contains comb-leaved mermaid-weed, an uncommon species in the region. Redfin pickerel (Esox americanus) are also found in this part of the Orowoc.

Lower Carmans River Watershed: This area includes the Swan River and Beaverdam Creek, Carmans River estuary, and Yaphank Creek.

Swan River and Beaverdam Creek: Beaverdam Creek empties into Bellport Bay without a blockage structure and, thus, supports a significant concentration of sea-run brown trout. The Swan River that flows east of Patchogue is an example of a free-flowing, spring-fed, stream habitat that supports both a native brook trout population and a sea-run population of brown trout in the tidal section below the Montauk Highway (Swan Lake Dam); it also contains a population of the regionally rare pirate perch.

Carmans River Estuary: The Carmans River estuary is one of only four major riverine ecosystems on Long Island. The river drains approximately 184 square kilometers (71 square miles), and has an average annual discharge of about 0.7 cubic meters per second (25 cubic feet per second). The tidal river begins approximately 3 kilometers (2 miles) north of Bellport Bay (part of Great South Bay) just below the Southaven Dam, and is primarily within the 972-hectare (2,400-acre) Wertheim National Wildlife Refuge. Extensive and undeveloped tidal wetlands on both sides of the river provide outstanding habitat for a great diversity of fish and wildlife species. The freshwater and tidal portions support over 40 species of fish. The Carmans River estuary is one of the most significant nursery areas for yearling striped bass in Great South Bay. Juvenile bluefish are also found in abundance. Both species may

spend a year or more in tidal portions of the river before commencing coastal migration. Alewife, sea-run brown trout, and white perch spawn in the estuary, which also provides important nursery habitat for these species. Freshwater fish species that occur in the river and ponds include a naturally reproducing population of brook trout, yellow perch (Perca flavescens), white perch, and common carp (Cyprinus carpio). The commercially and recreationally valuable blue crab spawns around the nutrient-rich salt marshes fringing the estuary. Forage fish such as killifish and Atlantic silverside also use the shallow waters of tidal wetland areas as spawning and nursery grounds. The estuary provides regionally important wintering habitat for high concentrations of waterfowl including canvasback, hooded merganser (Lophodytes cucullatus), redhead, northern shoveler (Anas clypeata), northern pintail (Anas acuta), gadwall (Anas strepera), American wigeon (Anas americana), American black duck, mallard, red-breasted merganser, scaup, and bufflehead. Other species of birds inhabiting the wetlands bordering the river are breeding osprey, sharp-tailed sparrow, seaside sparrow, and clapper rail, and migrating and wintering northern harriers, peregrine falcons, and other raptors that hunt over the tidal marshes during migration. Wetlands and uplands in the Carmans River watershed support nesting by nearly 100 species of migratory birds, including many Neotropical migrant songbirds.

The Carmans River is one of two rivers draining the Long Island Pine Barrens; the other is the eastward-flowing Peconic River. The network of wetland and upland habitat in the pine barrens supports regionally significant concentrations of rare plant and animal species. The four-toed salamander (Hemidactylium scutatum) breeds in the upper reaches of the Carmans River and Eastern tiger salamander breed in a network of ponds in the watershed. Rare plants occurring in the Carmans River watershed include pygmyweed and purple milkweed along the river and Collin's sedge in a red maple swamp. A coastal plain pond in the upper watershed (Week's pond) has several rare plant species, including an exemplary occurrence of fibrous bladderwort, few-flowered nutrush, whip nutrush, and button sedge. The headwaters of the Carmans River are within the central Long Island Pine Barrens. (See Long Island Pine Barrens - Peconic River habitat complex for additional details on this area.)

Yaphank Creek: Yaphank Creek is a completely undisturbed tributary of the Carmans River. At the creek's headwaters is an extensive emergent freshwater marsh; this regionally rare natural community is in excellent condition. Bordering the marsh is acidic bog vegetation, including Sphagnum moss, round-leaved sundew (Drosera rotundifolia), bladderwort (Utricularia spp.) and gerardia (Agalinis spp.), specifically adapted to live in the low-nutrient waters characteristic of sandy coastal plain soils. The fast-moving headwaters of upper Yaphank Creek are a spawning ground for one of Long Island's naturally reproducing populations of native brook trout, as well as for redfin pickerel. Upper Yaphank Creek provides nesting and foraging habitat for diverse avian species, including osprey, wood duck, American black duck, mallard, gadwall, and eastern bluebird. Northern harriers forage over the wetlands and associated sphagnum bog. Yaphank Creek is one of only four known New York State locales where the eastern mud turtle breeds in the brackish marshes and is one of the few Long Island habitats suitable for declining northern water snake (Nerodia sipedon). Lower Yaphank Creek also supports yearling striped bass and is a spawning area for white perch and several forage fish species.

D.5 Threats and Special Problems

Although many of the remaining undeveloped lands around Great South Bay are already publicly owned, recreational pressure from a growing human population is strong. This is especially problematic on the western barrier island, where town-owned lands of wildlife significance have repeatedly been opened to increased public access and more intensive use. Predation by small mammals, gulls, and crows of beach-nesting birds, including piping plover, least tern, common tern, roseate tern, and black skimmer is an increasing problem. Pressure on the ocean beaches from recreational use and associated beach management is extreme. Beach management threats include beach grooming, patrols by off-road vehicles, and garbage collection; in addition, placement of garbage cans on beaches attracts predators. Though fencing is erected around nesting areas, beach goers are not always respectful of fencing, especially when popular beach access points are closed. Some activities such as beach parties, volleyball games, and kite-flying occur outside the fencing, and disrupt incubating birds within fenced areas. Human activity within the intertidal zone disrupts plover chicks that forage along the water's edge, outside of fenced areas. Organized events, such as fireworks displays and annual festivals, draw large crowds to the beach. Beach stabilization, beach nourishment, dune alterations, and groin or jetty repairs and maintenance are all threats.

Elimination or alteration of tidal marsh, intertidal areas, and dune habitat, degradation of water quality, and increased human presence near breeding grounds can create negative and irreparable impacts to the natural communities of terrestrial and marine wildlife species, especially those already in decline such as federally listed threatened or endangered species. Overexploitation of marine resources has already resulted in population declines for economically valuable finfish, such as weakfish, and hard clams in Long Island waters. Degradation of water quality, especially by nonpoint source runoff, is of mounting concern. The Great South Bay is the receptacle for water from the more than a million people that live within the bay's drainage basin. Nonpoint sources dominate the releases into the bay, producing nutrient loading that is followed by eutrophication and increased levels of fecal bacteria, which in turn lead to closure of large segments of the bay to shellfishing and other water-related activities. These pollution effects are further exacerbated by intensive and competing human use factors that include commercial fishing, aquaculture, recreational boating, swimming, and commercial transportation and shipping. The current distribution of primary production in the bay reflects excessive nutrient loading, resulting in higher levels of phytoplankton growth, high turbidity, and increased macroalgal growth. These eutrophic (high nutrient) conditions tend to shift primary production from eelgrass-dominated to phytoplankton and seaweed-dominated systems. Other factors causing declines in eelgrass include eelgrass wasting disease, dredging and filling operations, and disturbance by power boats. Loss of eelgrass beds may eliminate other species by no longer providing them with specific benthic habitat requirements. Periodic noxious phytoplankton blooms (brown tides) occurring in the bay have major impacts on scallops and other invertebrates, fish, and wildlife. The cause of these blooms has not yet been established. Continuing discharges to ground and surface water of pesticides and fertilizers, as well as increased runoff and nitrogen loading from roads and septic systems, are adversely impacting water quality and vegetation in the area, altering spawning and nursery habitats to the detriment of the many marine species dependent on these systems. Special attention should be given to protection of the few existing wild brook trout fisheries in this complex. This can be achieved by protecting these important freshwater flows from nonpoint stormwater inputs, maintaining the adjacent wetland buffers, and providing adequate flow regimes.

Other wildlife species of concern, including piping plover, least, common, and roseate terns, and northern harrier are undergoing loss or disturbance to critical nesting habitats. Development of remaining private lands in sensitive areas such as the Carmans River estuary would eliminate or disturb wetland and forest habitat, with potentially devastating consequences to the ecology of the river, Great South Bay, and the rare or uncommon fauna and flora occurring in these habitats. Development of land in the watershed of the Carmans River would have an irreversible, negative impact on the Wertheim National Wildlife Refuge by fragmenting wildlife habitat that is now contiguous with refuge holdings, eliminating species sensitive to human disturbance, increasing predation on refuge wildlife by domestic cats and dogs, and increasing vandalism within refuge confines. Contaminant surveys at Wertheim National Wildlife Refuge showed levels of cadmium, chromium, and manganese exceeding at least one of the levels of concern reviewed. Biannual dredging and dredged material deposition of Fire Island Inlet may eliminate natural coastal features such as interdunal swales.

The U.S. Army Corps of Engineers is considering a range of options for the reformulation of the Fire Island segment of the south shore of Long Island, including developing an unbroken 15-foot-high dune ridge along the entire length of the island. These actions will result in degradation or loss of beach habitat for rare plants and animals, especially species such as piping plover or terns, which are dependent on overwash and inlet areas. A steel bulkhead proposed by the New York State Department of Transportation along the south side of Ocean Parkway at Gilgo Beach would destroy valuable beach habitat.

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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