

TRANSPORTATION STUDY

GULF ISLANDS

NATIONAL SEASHORE



PARK GENERAL, MISSISSIPPI

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CHAPTER I

INTRODUCTION

Gulf Islands National Seashore, Mississippi and Florida was established by Public Law 91-660, January 8, 1971, to insure the preservation of certain natural and recreational resources and to provide a variety of public uses. The Seashore is located in the northeastern portion of the Gulf of Mexico and includes a chain of offshore islands that extend nearly 150 miles from Ship Island, Mississippi to Santa Rosa Island, Florida. The Mississippi units are located between Ship Island and Petit Bois Island (See Figure 1). Also included is one mainland tract, Davis Bayou, located in Ocean Springs, Mississippi.

Gulf Islands National Seashore (Florida and Mississippi) is managed by the U.S. National Park Service with headquarters at Fort Pickens, Florida and Ocean Springs, Mississippi. Swimming, fishing, wilderness areas, and camping facilities as well as national historic sites are included in the Seashore.

Study Area

The study area shown in Figure 1 consists of the following five Mississippi units of the National Seashore:

- (1) Davis Bayou,
- (2) West Ship Island,
- (3) East Ship Island,
- (4) Horn Island, and
- (5) Petit Bois Island.

As shown in Figure 1, the distance by water between the units of the Seashore varies. The distances between Gulfport and the docking area at West Ship Island and Biloxi and the docking area at West Ship Island are about 11 and 12-1/2 nautical

miles, respectively. The distance from Davis Bayou to the center of Horn Island is approximately 16-1/2 nautical miles, while the distance between Davis Bayou and a suggested landing area on East Ship Island is approximately 17 nautical miles. In addition, the center points of Petit Bois Island and Horn Island are about 13-1/4 nautical miles apart; the center of Horn Island and the suggested East Ship Island docking area are about 14-1/2 miles apart and the suggested East Ship Island landing area and the West Ship Island docking area are approximately 5-1/2 nautical miles apart.

The only unit of the National Seashore accessible by land is Davis Bayou, which is served by U.S. 90. U.S. 90 also connects the cities of Biloxi and Gulfport, Mississippi (where ferry service to West Ship Island is provided). The island units of the National Seashore are only accessible by water.

Existing Use of the Seashore

The Mississippi units of the Seashore primarily serve recreational activities such as swimming, hiking, picnicking, camping, fishing, pleasure boating, and sun-bathing; however, the Seashore also has specific areas which are either listed on or in the process of nomination to the National Register of Historic Places. In addition, the undeveloped offshore islands provide habitats and ecosystems which are isolated and which could become natural laboratories for observing the impact of relatively rapid natural genetic and behavioral changes on populations of animals and plants. The following is a general overview of the existing facilities at the Seashore. A more detailed description of the existing use is included in the Final Environmental Statement (1) and the draft General Management Plan (2).

Davis Bayou - Davis Bayou, which includes the former Magnolia State Park, is the headquarters for the Mississippi district of the Seashore. Four renovated concrete buildings are used for offices and storage, while five cabins have been renovated and are used for Seashore housing. The following facilities are presently available:

- (1) Fifty camp sites with electrical and water connections,
- (2) A small boat dock for four to six boats and two boat launching ramps,

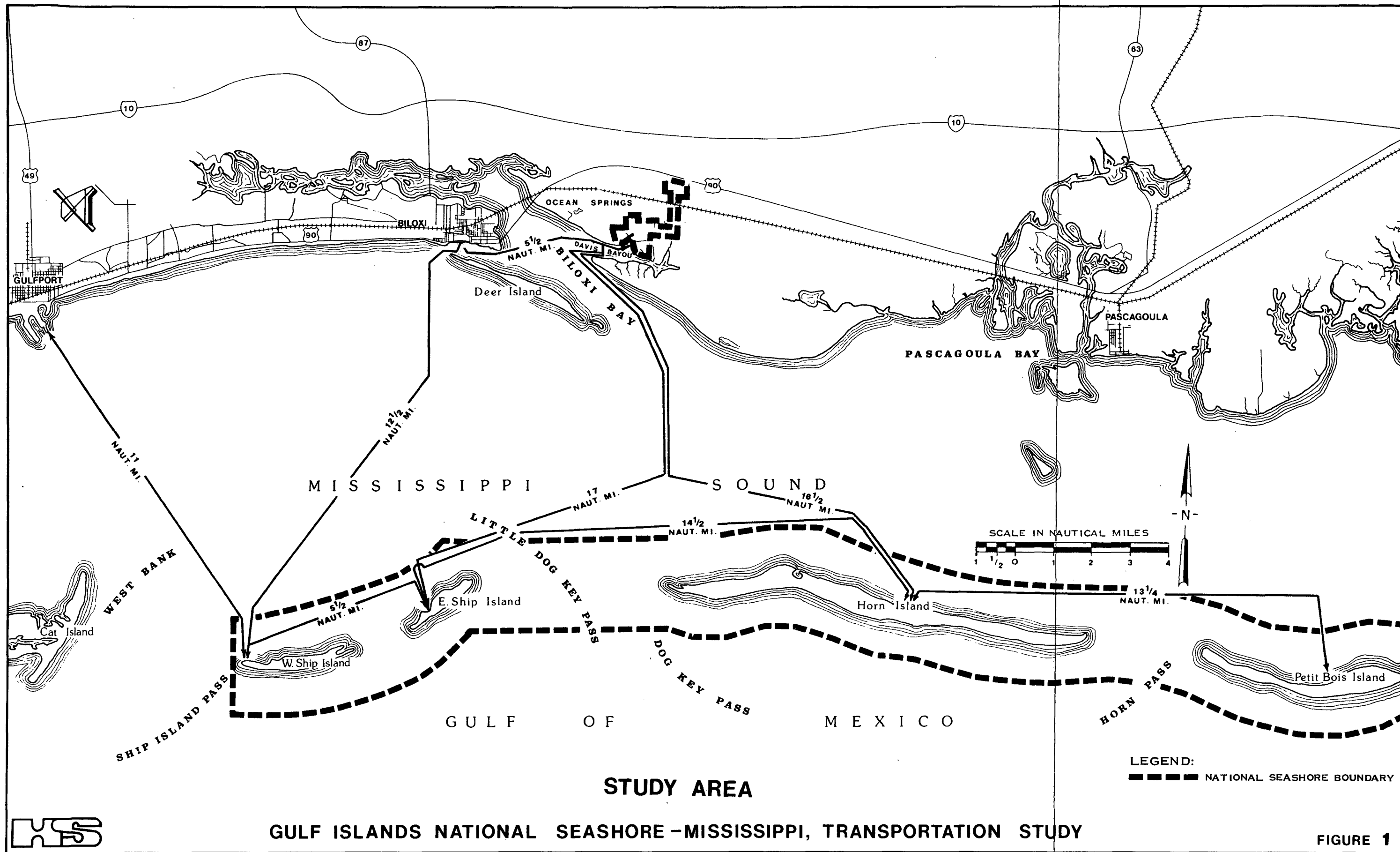


FIGURE 1

(3) Picnic facilities, including pavilions for groups of 40 to 60 people, and

(4) A softball field.

The Park Service also provides for a variety of activities at Davis Bayou, including marsh tours, natural history programs, local and state history programs and a variety of other special activities which are regularly scheduled.

West Ship Island - West Ship Island, approximately 3.70 miles long and 0.16 to 0.34 mile in width, provides for a variety of day-use activities, primarily swimming and historic tours at Fort Massachusetts. A ferry boat system which has been in operation for at least 40 years transports the non-boating public from both Biloxi and Gulfport to the island. Other existing public uses of the island include surfing, bay-fishing, shellfishing, surfcasting, beachcombing, hiking, picnicking, historical interpretation and a docking facility for 10 to 15 private boats. In addition, Park Service personnel live on the island, and lifeguards are provided to supervise beach activities.

East Ship Island - East Ship Island is about 2.6 miles long and varies in width from 0.09 to 0.53 mile and is only accessible by private or chartered boat. The island provides for a variety of beach use activities such as surfing, bay-fishing, shellfishing, surfcasting, and beachcombing; however, there is no supervision of beach use activities. In addition, artesian wells exist, and a walk-in campground area will be provided.

Horn and Petit Bois Islands - Both Horn and Petit Bois Islands are undeveloped. Horn Island is about 14.3 miles long and varies from 0.37 to 0.75 mile in width. An administrative dock, a ranger residence and several small storage buildings, located in the approximate center of Horn Island, comprise the only development. Access to the island is by private or chartered boat only, and usage is primarily limited to beach recreation and primitive camping. Persons arriving on the island by boat either anchor offshore and use a dinghy or beach their boats. A park ranger lives on the island to assist campers, day-use visitors and provide resource protection.

Petit Bois Island is the eastern most of the offshore islands and is approximately 7.5 miles long and varies in width from 0.19 to 0.75 mile. The only developments on the island are two navigational aids. Access to the island is restricted to private or chartered boat operators. Primitive camping

is permitted on the island, and day-use activities include fishing and various beach recreational activities similar to that at the other islands.

Proposed Use of the Seashore

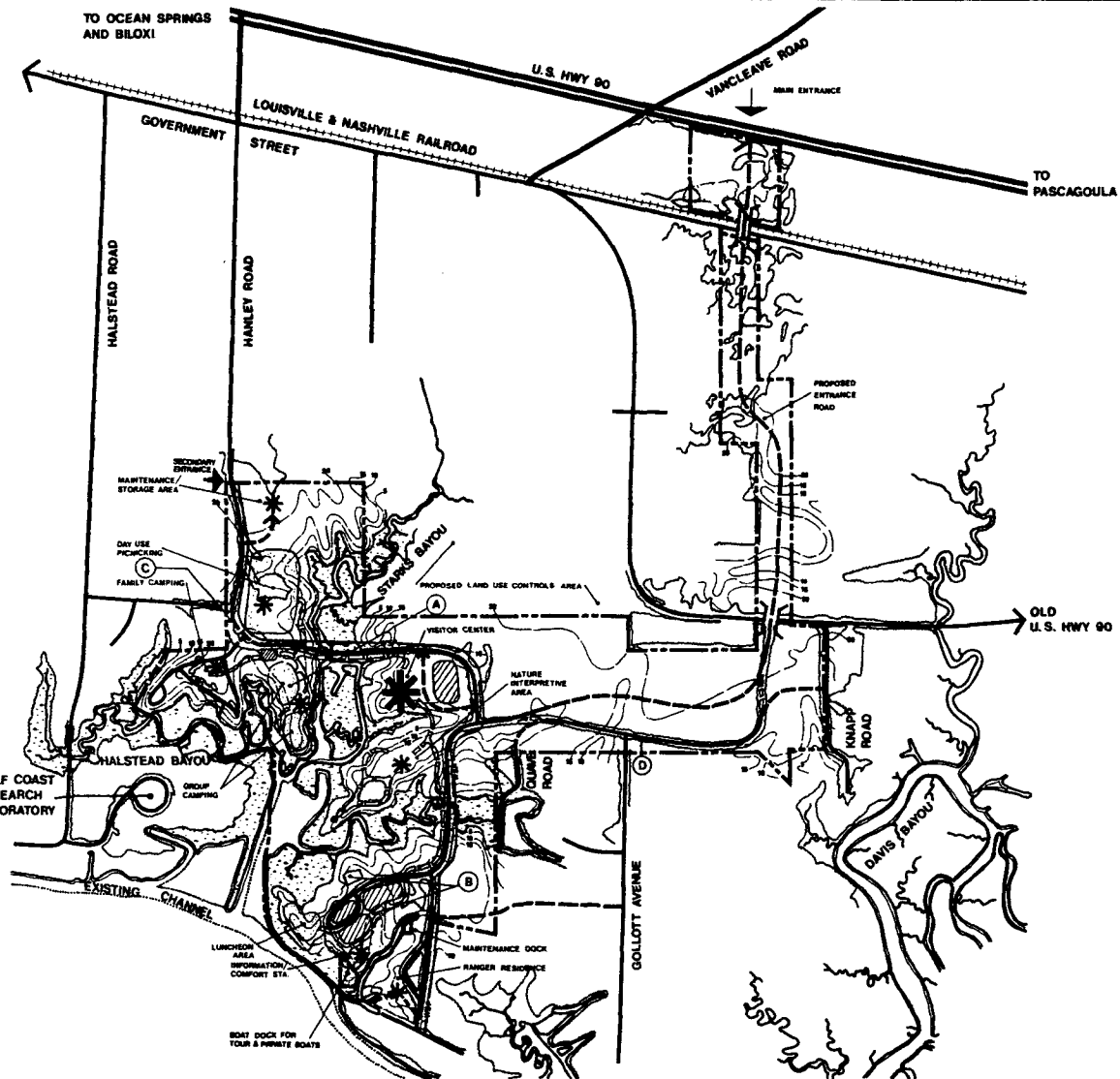
A proposed use and development plan has been prepared for Davis Bayou and West Ship Island. Development concept plans for East Ship Island, Horn Island and Petit Bois Island will not be prepared. A detailed description of the proposed usage of these islands, Davis Bayou and West Ship Island is included in the Final Environmental Statement (1) and the draft General Management Plan (2).

Davis Bayou - Proposed facilities at Davis Bayou include an operational headquarters, a maintenance compound, group and family camping areas, boat launching facilities and day-use recreational facilities (See Figure 2). A new entrance road will be constructed. This 1.7 mile long road located east of the present entrance will extend southward from U.S. 90 to a point near the intersection of Starks Boulevard and Magnolia Drive.

In addition, a boat basin, 160 feet in diameter, will be constructed and will have a depth of 6 feet below mean low water. This basin will be designed to accommodate all National Seashore maintenance and protection craft as well as the small tour boats. In addition, a double wide launching ramp, a small dock for short-term loading/unloading, and a 100 foot long dock for tour boat docking will be constructed parallel to the Davis Bayou Channel. A turning basin approximately 150 feet in diameter will be constructed within the Davis Bayou Channel adjacent to the dock.

Included in the development plan are a 20 site luncheon area and a 400 square foot comfort station to serve visitors utilizing the luncheon area and the tour boat docking facilities. All of the existing buildings will be removed from the central peninsula, and a new operational headquarters will be constructed in the vicinity of the existing swimming pool. Two parking lots will be constructed near the visitor center to accommodate 130 cars and 3 buses. Other planned parking includes a 10 car parking area near the northern end of the peninsula, a 10 car parking area adjacent to the boat maintenance facility located in the southeast portion of Davis Bayou and a parking area for about 30 cars and trailers located near the boat launching area.

West Ship Island - West Ship Island will continue to serve as the primary day-use beach recreational area. The ferry service



FINAL ENVIRONMENTAL STATEMENT
GENERAL MANAGEMENT PLAN
DEVELOPMENT CONCEPT PLAN
by: NATIONAL PARK SERVICE

DAVIS BAYOU UNIT PROPOSED USE AND DEVELOPMENT

GULF ISLANDS NATIONAL SEASHORE MISSISSIPPI, TRANSPORTATION STUDY

FIGURE 2



from Gulfport and Biloxi will continue with no expansion of service until the projected increases in usage of the islands warrants increased service. The existing boat dock will be relocated from the present site to a site in the vicinity of the old Lighthouse Complex (See Figure 3). The new dock will be approximately 500 feet long and 15 feet wide and will accommodate 2 tour boats and 10 to 15 private boats. A safe boat refuge will be constructed adjacent to the dock, dredged to a depth of 6 feet below mean low water and have a capacity to accommodate 30 to 40 private boats. All existing buildings in the immediate vicinity of Fort Massachusetts will be removed and replaced by a 3,000 square foot day-use facility. In addition, a new 3,500 square foot facility for Park Service personnel and a system of 6 foot wide boardwalk trails linking the docking area with the day-use facility, Fort Massachusetts and the beach will be constructed. Four boardwalk trails will provide access to the Gulf of Mexico beaches. In addition, a 30-site walk-in campground with a comfort station/shower building will be developed. Each site will have a shelter, a fire pit and a picnic table.

East Ship Island - A 50 site, walk-in campground will be developed on 2.5 acres located 1,000 feet northeast of the quarantine station ruins. Sites will not be designated and facilities will be limited to vault toilets. Existing wells will be capped and utilized to provide fresh water for campers. A boat dock is not presently planned, thus all boats must either beach or anchor offshore.

Horn and Petit Bois Islands - The Final Environmental Statement (1) states that an administrative dock will be maintained on the Mississippi Sound side of Horn Island in the vicinity of the existing ranger station with usage limited to tour boats and private boats during emergency situations and to Park Service boats. The small boat docking ramp and boat hoist will be retained for usage by Park Service personnel. A small package sewage treatment plant will be maintained at the ranger station. Any other development which might occur will be delayed until congressional action on the wilderness recommendation is completed. Primitive camping activities, beach use activities and hiking will continue on the island. No development at Petit Bois Island is planned.

Existing Transportation Service

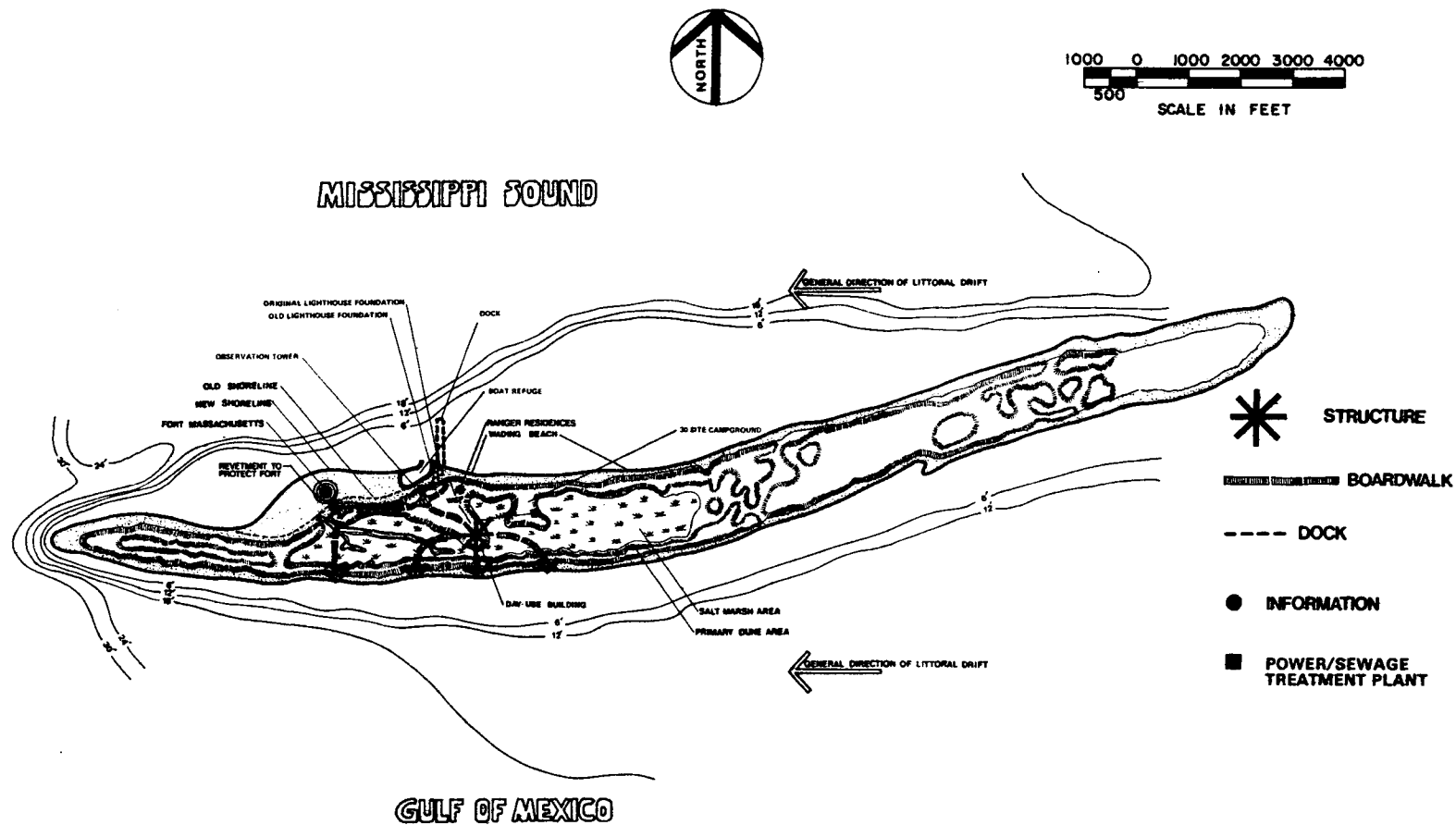
Public transportation service is presently provided from Gulfport and Biloxi to West Ship Island by two private concessionaire-operated ferry boat systems. The operator in Biloxi uses a boat that has a seating capacity of 250 and has a 150 passenger boat that can be used as needed. The operator in

Gulfport has a 224 passenger boat to transport passengers to West Ship Island. The ferry systems operate primarily between the 1st of April and Labor Day weekend, making one trip on weekends between the 1st of April and May 15th and two trips daily between May 15th and Labor Day weekend. Occasionally, as demand warrants, other special trips are made. When two trips are made the boats in both cities leave at 9:00 A.M. and arrive at West Ship Island about 10:15 A.M. The boats depart from the island around 12:15 P.M. and arrive back at Gulfport and Biloxi at 1:30 P.M. The boats then make a second trip leaving at 2:30 P.M. and arriving at West Ship Island about 3:45 P.M. The boats depart from Ship Island at 5:15 P.M. returning to Gulfport and Biloxi at 6:30 P.M. The cost per passenger in 1978 was \$5.00 for adults and \$2.50 for children.

Operation of the ferry boat system is managed by the National Park Service applying Coast Guard regulations. The National Park Service requires the private concessionaire to sign a concession permit which presently is valid through December 31, 1982. This permit specifies basic operational procedures that must be followed by the concessionaire. The permit includes a franchise fee which specifies that the concessionaires shall pay 2-1/2 percent of the gross receipts to the United States Government. In previous years, the franchise fee was specified at \$3,000.00. In addition, all rates and prices charged to the public by the concessionaire are subject to regulation and approval by the Park Service. The private concessionaire in Biloxi operates the snack bar service on West Ship Island. Regulations concerning the operation of this service are specified in the concession permit, and all prices must be approved by the Park Service. The concessionaires must also abide by Coast Guard regulation. For example, the Coast Guard requires that each boat have a crew of four, a captain and three mates. Park service personnel ride each boat to orient visitors.

Each of the concessionaires is required to submit an annual financial report to the Park Service. This financial report will be used to determine the cost of operating the present ferry system which will be used in the cost comparison of various transportation alternatives.

The concessionaires advertise by placing flyers in local hotels and by advertising in the local paper, "The Entertainer". Reservations may be made; however, they are not required. Both of the concessionaires have parking areas designated for persons riding the ferry system.



FINAL ENVIRONMENTAL STATEMENT
GENERAL MANAGEMENT PLAN
DEVELOPMENT CONCEPT PLAN
by: NATIONAL PARK SERVICE

WEST SHIP ISLAND PROPOSED USE AND DEVELOPMENT

GULF ISLANDS NATIONAL SEASHORE—MISSISSIPPI, TRANSPORTATION STUDY

FIGURE 3



Environmental Review

The principle features of the study area are the barrier islands, West and East Ship Islands, Horn Island and Petit Bois Island. These islands are composed of sand shoals which have accreted through the years to points above sea level. Sea oats, dune grasses, and other vegetative forms have stabilized the sand and permitted the growth and development of dunes and dune ridges. The Gulf shores of the elongated islands consist of wide beaches of very fine-grained sand, while the Mississippi Sound shores are characterized by coarser sands, narrow beaches and prolific growth of grass beds in the shallows near the shore. Wave energies on the northern shores are much less extensive or destructive than on the Gulf side.

The Sound is broad and shallow, with an average depth of 2 to 3 feet within yards of the shore and an average depth of only 10 to 15 feet in open water. Coarse sands comprise the bottom along the shores, but the sediments phase into finer sands as distance from the mainland coast increases. The center of the sound is primarily composed of silt and mud beds.

Tidal ranges in the sound are relatively small, varying from 1 foot at neap tide to 2-1/2 feet at spring tide. The range at any particular time of the year may also be influenced by the current climatologic conditions as northerly winds reduce the tidal change and southerly winds tend to increase it.

Waters within the study area are relatively clear (visibility extends 10 to 15 feet), and the concentrations of pollutants are small. The temperature of the Sound varies from minimum values of 12°C and 8°C (surface and bottom temperatures, respectively) in the winter to highs of 34°C and 32°C in the summer. Salinity is the greatest fluctuating physical parameter in the Sound as surface water varies from 2 parts per thousand (ppt) near the mainland to 36 ppt at Horn Island.

The pH values are nearly uniform throughout the study area, with only a small annual oscillation from 7.3 to 8.3. Greater fluctuations are apparent in the dissolved oxygen (DO) content of the waters. The DO content may vary in surface waters from a low near 6.5 in August to a high near 14.0 in December. The DO content is also sensitive to biological oxygen demand (BOD) loading of the waters, but such effluent loadings are rare and uncharacteristic events.

Flora - The Mississippi Sound hosts a large variety of marine flora in its protected and enriched waters. The basic forms of marine vegetation are beds of spermatophytes, algal epiphytes, encrusters and marshes. Typical grasses in the area

are shoal grass, turtle grass and manatee grass (See Table 1 for listing of generic names). Shoal grass and turtle grass beds form extended belts in clear water from one to four feet in depth on the north side of the barrier islands. Manatee grass is found in the same areas, but in slightly deeper waters (four to six feet). The grasses grow on firm bottoms of medium to very-fine grained sand in low energy waters and are paramount in stabilizing bottom sediments and absorbing small amounts of wave energies. Most importantly, the grass beds provide habitats for many other species of algae, crustaceans, invertebrates and small vertebrates. Interspersed within the grass beds are the algal epiphytes and encrusters which attach to stable substrates such as large pieces of broken shells, debris and rock or rip-rap intrusions.

Extensive marsh beds may be found along the mainland coast, in the bays and bayous and on the islands, especially Horn Island. The marshes support a tremendous amount of productivity and are a critical link in the fecundity of the Sound as a whole. Of the 40 species present in the region, Juncus roemerianus is by far the most abundant as it exceeds the sum of all the other species present.

Fauna - Approximately 130 species of epifauna and infauna exist in the waters of the Mississippi Sound. The variety of species range in rank from coelenterates to vertebrates and in size from zooplankton to spotted gars. Distribution of the species is a function of bottom geology, salinity, temperature and food supply. Thus, there is a difference between species compositions of the open sound and the shallow-water northern shores of the barrier islands.

Benthic fauna includes species of gastropods, polychaetes, and brittle stars (See Table 1). The most abundant species is a small, very prolific clam, Mulinia lateralis (Little Surf-clam). Others are found sparsely distributed in the open waters. Chordates, amphipods and urchins are found along the northern shores of the barrier islands. The chordate Branchiostoma caribaeum is the most abundant species along the islands.

Other species in the Mississippi Sound belonging to the families of clams, oysters, shrimp, crab and fish are widely distributed and will be considered in this study as a general case.

Study Purpose

The purpose of this study is to determine the feasibility of providing a public ferry service from Davis Bayou to Petit Bois and Horn Islands, to evaluate the ferry service from

TABLE 1

MACRO-FLORA AND BENTHIC FAUNA OF THE MISSISSIPPI SOUND
GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI TRANSPORTATION STUDY

MACRO-FLORAGrasses

Shoal Grass
Turtle Grass
Manatee grass

Generic Name

Diplanthera wrightii
Thalassia testudinum
Cymodecea manatorium

Marshes

*Juncus roemerianus
Spartina alterniflora
S. cynosuroides
S. patens
Scirpus alneyi
Sagittaria lancefolia

BENTHIC FAUNATypeGeneric NameBarrier Island

Chordate
Shrimp
Amphipod
Keyhole Urchin
Polychaete - sand worm
Gold crown worm

*Branchiostoma caribaeum
Gastrosaccus dissimiles
Haustorius arinarius
Mellea quinquesperforata
Nephtys bucera
Cisthanides gouldii

Open Bay

Polychaete
Bottle star
Little surf-clam
Clam
Polychaete
Clam

Brachioasychis americana
Hemipholas elongatus
*Mulinia lateralis
Nuculana acuta
Polydora lupina
Cuna calli

*Most abundant

Gulfport and Biloxi to West Ship Island, to determine the feasibility of providing a shuttle service to East Ship Island and to evaluate the feasibility of operating a full range of transportation services from Davis Bayou. Comparative analyses of alternative modes, routings, schedules and capacities were performed and evaluated relative to service costs and environmental impacts.

The study was guided by the recommended use and developments contained within the Final Environmental Statement (1) and the draft General Management Plan (2). A sequence for establishing the various elements of the transportation system was determined consistent with National Park Service time table for development of the Seashore.

Order of Presentation

This report is organized to document elements of the feasibility analysis in the sequence actually performed. The major events occurred as follows:

- (1) A review of the Final Environmental Statement and the draft General Management Plan to determine existing and proposed use of the Seashore,
- (2) A review of the existing transportation service,
- (3) An analysis of existing and future visitor use, including projections of future visitation, development of a demand estimating procedure and projections of transportation systems patronage,
- (4) A mode inventory,
- (5) Development of alternative transportation systems with one year operating and capital costs,
- (6) Development of final transportation system alternatives including support facilities, routes, schedules and annual costs for the planning period,
- (7) A description of management options and preparation of a Pro Forma profit and loss statement for each alternative, and
- (8) A description of the recommended alternative transportation system.

CHAPTER II

EXISTING AND FUTURE VISITOR USE

Visitation data is compiled monthly and maintained by the National Park Service. The procedure used to record visitation data and prepare monthly use reports for the time period between January, 1973 and October, 1978 was obtained and analyzed to determine monthly and daily variations. Based upon these monthly and daily trends and conversations with park rangers, a systematic estimating procedure was developed to project the number of persons that would visit the Seashore and those that would use a transportation system for each year to 1980 and for 1985, 1990 and 1995. The complete Technical Memorandum on "Existing and Future Visitor Use" is contained in Appendix A.

Visitation Data Recording Procedure

The National Park Service has established a written procedure that is used to record monthly visitation to the Seashore. A traffic counter is used to record visitation to Davis Bayou while personal observations are used to record visitation to East Ship Island, Petit Bois Island and Horn Island. A combination of personal observations and data recorded by the ferry service is used to record visitation to West Ship Island. A detailed description of the recording procedure is contained in Appendix A.

Existing Visitation Data

The Park Service had monthly visitation data for the National Seashore for each month between January, 1973 and October, 1978. A record of visitation to Horn Island was not initiated until March, 1974, and no estimates of visitation to Petit Bois Island were recorded until January, 1978. In addition, visitation to East Ship Island and West Ship Island were combined under the heading of Ship Island.

The total number of annual person visits to the National Seashore increased from 299,400 in 1973 to about 456,745 in 1976 (See Table 2). In 1977, the total visitation decreased to

TABLE 2

PERSON VISITS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY1973 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Total</u>
January	100	3,526	3,626
February	450	11,251	11,701
March	500	28,905	29,405
April	4,000	41,599	45,599
May	6,472	29,727	36,199
June	14,101	28,805	42,906
July	17,000	19,396	36,396
August	14,562	26,894	41,456
September	3,144	13,850	16,994
October	650	14,500	15,150
November	450	10,135	10,585
December	940	8,443	9,383
TOTAL	62,369	237,031	299,400

1974 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	300	10,733	0	11,033
February	290	11,344	0	11,634
March	700	24,392	739	25,831
April	4,030	37,834	2,336	44,200
May	6,651	35,615	3,673	45,939
June	16,094	22,923	5,314	44,331
July	14,610	25,996	1,812	42,418
August	13,609	12,370	4,236	30,215
September	3,846	20,707	2,138	26,691
October	2,161	12,753	1,500	16,414
November	1,175	3,957	697	5,829
December	550	7,026	557	8,133
TOTAL	64,016	225,650	23,002	312,668

1975 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	604	8,753	468	9,825
February	955	12,619	418	13,992
March	2,565	19,235	600	22,400
April	3,374	29,933	1,548	34,855
May	7,572	33,702	3,000	44,274
June	7,271	35,466	3,219	45,956
July	10,872	33,060	4,388	48,320
August	10,856	29,954	2,236	43,046
September	3,568	21,449	1,712	26,729
October	2,136	19,994	2,112	24,242
November	1,401	18,375	728	20,504
December	672	15,769	440	16,881
TOTAL	51,846	278,309	20,869	351,024

¹ Includes East Ship and
West Ship Islands

TABLE 2 CONT'D

PERSON VISITS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY1976 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	742	11,077	516	12,335
February	773	31,860	556	33,189
March	875	35,888	832	37,595
April	6,820	38,394	3,364	48,578
May	10,873	39,666	4,407	54,946
June	14,217	39,033	4,953	58,203
July	21,263	34,549	6,963	62,775
August	16,950	30,975	6,468	54,393
September	7,233	24,187	4,220	35,640
October	3,283	21,949	2,188	27,420
November	1,036	17,308	741	19,085
December	580	11,658	348	12,586
TOTAL	84,645	336,544	35,556	456,745

1977 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	540	11,388	104	12,032
February	560	14,130	284	14,974
March	1,508	17,491	1,264	20,263
April	6,939	23,075	2,716	32,730
May	12,577	22,693	2,780	38,050
June	13,436	22,522	1,972	37,930
July	20,461	45,740	2,616	68,817
August	11,521	43,779	982	56,282
September	1,711	33,840	712	36,263
October	1,890	33,411	388	35,689
November	926	27,990	160	29,076
December	772	22,473	140	23,385
TOTAL	72,841	318,532	14,118	405,491

1978 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Petit Bois</u>	<u>Total</u>
January	136	20,220	68	272	20,696
February	180	25,725	312	392	26,609
March	2,905	24,490	317	73	27,785
April	7,692	43,722	3,636	1,272	56,322
May	12,980	47,280	4,220	3,249	67,729
June	18,588	46,088	3,848	2,886	71,410
July	29,053	53,731	4,432	2,038	89,254
August	15,642	43,305	2,584	2,424	63,955
September	7,703	37,513	2,884	808	48,908
October	2,111	39,364	1,136	329	42,940
TOTAL	96,990	381,438	23,437	13,743	515,608

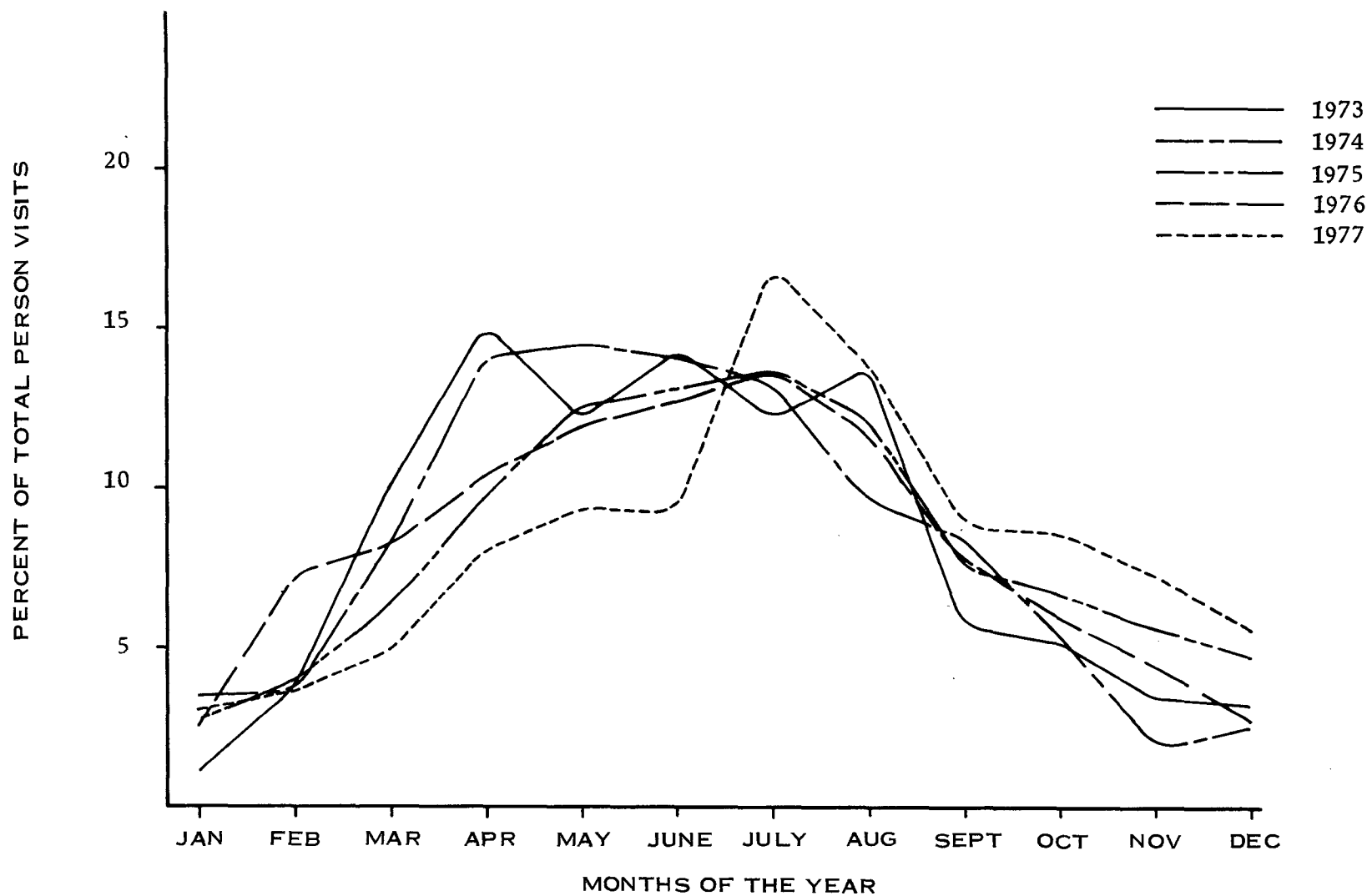
¹ Includes East Ship and West Ship Islands

405,491 due primarily to the inclement weather during the months of April, May and June. The increase in annual person visits between 1973 and 1974 was slightly more than 13,000, while the increase between 1974 and 1975 exceeded 38,000. The small increase between 1973 and 1974 can be attributed to the change in occupancy factor for private boats from five persons per vessel in 1973 to four persons per vessel in 1974. The larger increase between 1974 and 1975 can be accounted for by the recording of visitation to Horn Island which was included in the total annual visitation beginning in March, 1974. This increase would have been larger if the concessionaires had made two trips per day in 1975 to West Ship Island (which was the case prior to and since 1975) rather than one trip per day.

Annual visitation to Davis Bayou increased from approximately 237,031 in 1973 to 336,544 in 1976, as shown in Table 2. Annual visitation to Ship Island (East and West Ship Islands combined) increased from 62,639 person visits in 1973 to 84,645 in 1976. In both of these cases visitation decreased in 1977 due to inclement weather; however, through the first ten months, the 1978 visitation exceeded the 1976 visitation.

As previously stated, records of visitation to Horn Island were not maintained until 1974. As shown in Table 2, the total annual visitation to Horn Island increased from 23,002 in 1974 to 35,556 in 1976. The fluctuation in the annual visitation can be attributed to inclement weather and variability resulting from the visitation data recording procedure.

Monthly distribution curves were developed from the data in Table 2 for the entire National Seashore. As shown in Figure 4, visitation to the National Seashore peaked during the summer months (May-August) in 1975 and 1976, with July being the peak month. However, the monthly visitor distribution curves varied significantly in 1973, 1974 and 1977. The difference in the 1973 and 1974 curves can be accounted for by problems encountered with the traffic counter that was used to record visitation data to Davis Bayou and by the fact that visitation to Horn Island was first recorded in March, 1974. The Park Service experienced re-occurring malfunctions with the traffic counter in 1973 and 1974 and frequently estimated monthly visitation to Davis Bayou. In 1977, the inclement weather in April, May and June reduced visitation to the Seashore. Thus, the 1975 and 1976 variations appear reasonable and should be used to determine the monthly distribution of visitors to the Seashore.



MONTHLY DISTRIBUTION OF VISITORS-MISSISSIPPI UNITS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE 4



The monthly distribution of the ferry service patronage for both the service from Biloxi and Gulfport is illustrated in Figure 5. Usually, the ferry service operates between the 1st of April and Labor Day weekend; however, occasionally some service is provided in March, October and November. Most of the patronage occurs in June, July and August, with July being the peak month. The monthly distributions for both ferry systems and the distributions for each year between 1973 and 1978 are similar. Thus, all of the distribution curves for both systems were averaged to determine one variation.

The daily distribution of ferry service patronage is fairly constant during the weekdays, averaging around 10 percent of the weekly patronage riding the system on each weekday, while about 50 percent use the system on weekends (See Appendix A). Saturday is the peak day, with about 26 to 28 percent of weekly patronage riding the system on any given Saturday.

Since the ferry systems presently make one trip during the morning and a second trip during the afternoon, an hourly distribution of patronage is not available; however, an AM-PM distribution of patronage for each day of the week was prepared (See Appendix A). On the average, about 60 to 65 percent of the daily patronage rode the ferry service to West Ship Island during the morning trip. It should be noted that the concessionaire must hold open seats on the P.M. trip to accommodate those A.M. passengers who remain on West Ship Island all day and return on the evening trip.

The monthly visitation pattern to Horn Island was somewhat erratic as no two years are similar (See Appendix A). This variance in the monthly distribution can be attributed to the visitation recording procedure (See Appendix A) and due to the changeover in Park Service personnel used to record visitation. The 1974 curve, the first year for which visitation data was maintained, resulted in a low percentage of visitors during the month of July and a peak in June. Visitation in both 1975 and 1976 peaked in July, reflecting the combined impact of day-use visitors and campers. The 1977 monthly distribution varied from the previous three years as April and May were the peak months. This variability can be attributed to the inclement weather conditions in 1977. Due to these variations in the monthly distribution, an average of the 1975 and 1976 variation was used.

Visitation Projections

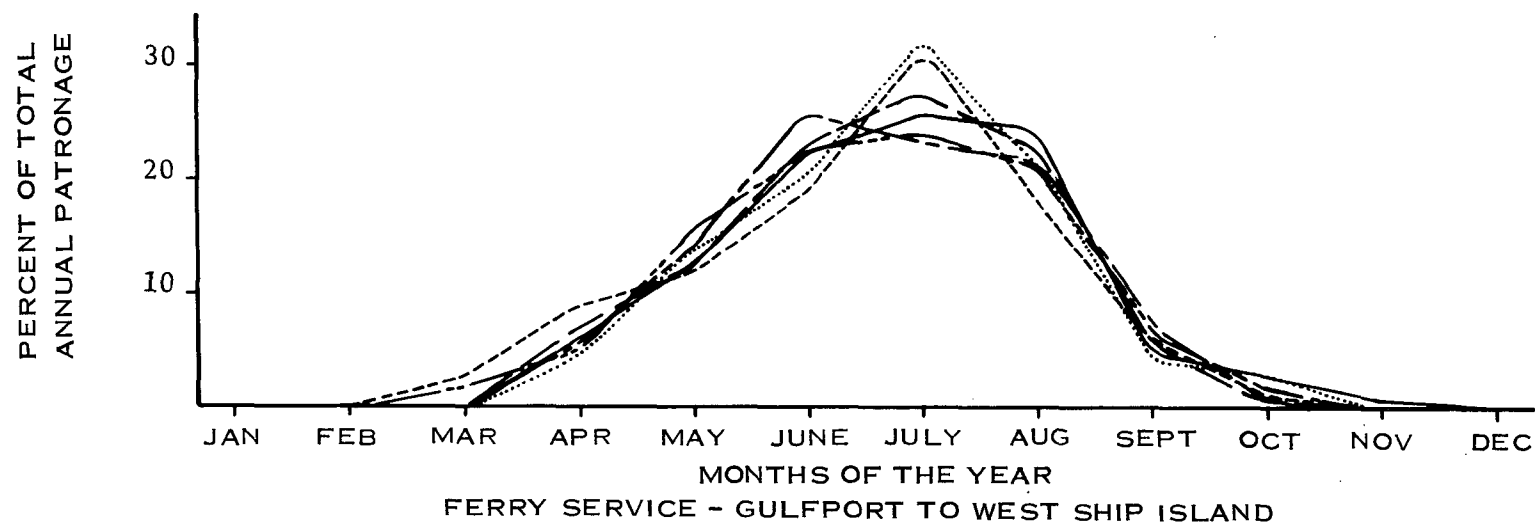
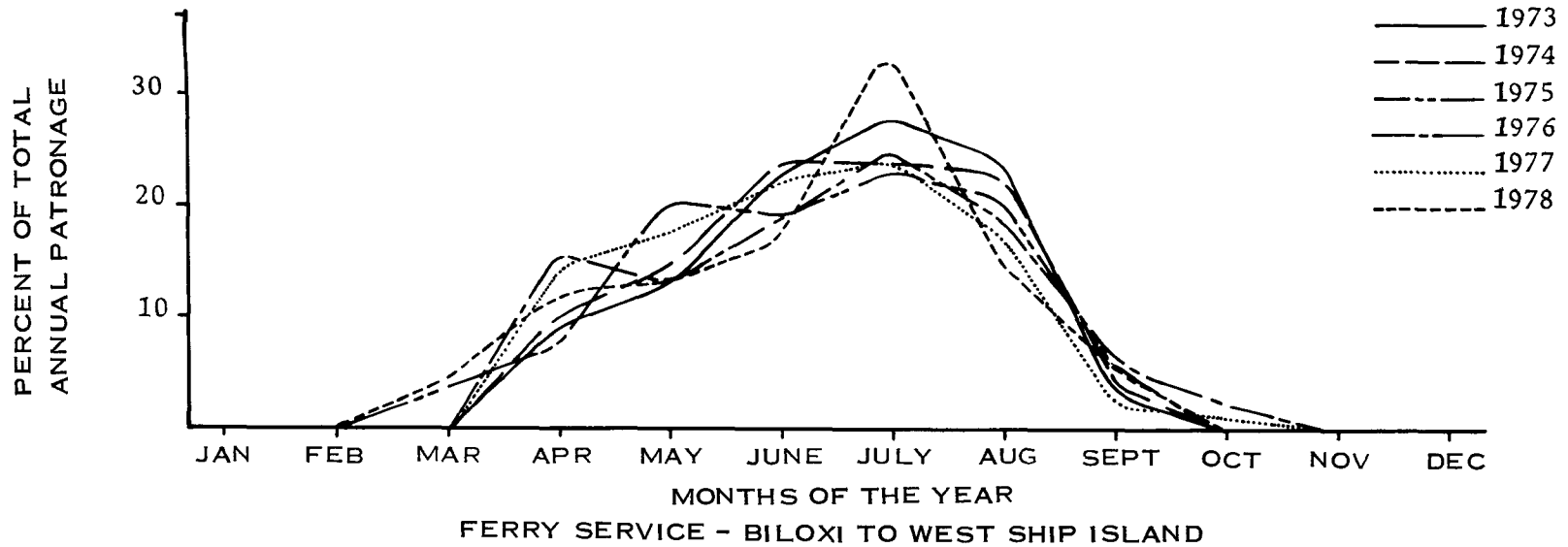
Total visitation to the Seashore was estimated for each year to 1980 and in five year increments from 1980 to 1995. Prior

to estimating this visitation, annual growth factors were developed. Details pertaining to how these projections were made are discussed in Appendix A. Based upon the projected increase in tourism and local population, visitation should increase by about five percent annually. Based on the annual growth rate in boat registrations for the State of Mississippi between 1975 and 1978, visitation by the boating public should also increase by approximately five percent annually. Due to the proposed development at West Ship Island, it is assumed that the patronage of the ferry system would increase by about eight percent annually to 1985 when the island development would be completed. It is assumed that visitation resulting from the improvement in facilities on West Ship Island would level off after 1985 and increase at an annual rate of five percent.

Offshore Island Camping - The development of a transportation system, which will provide access to the offshore islands for the non-boating public, will attract new visitors to the Seashore. Thus, this increase in visitation should be added to the annual growth rate. It is assumed that the system's first year of operation would be 1980. The Park Service estimates that about 33 percent of the campers during a given week would desire to camp on Friday with about 90 percent of these camping also on Saturday night and that about 50 percent would desire to leave the mainland to camp on the offshore islands on Saturday night. As a result, about 80 percent of any given week's campers must be transported from the offshore islands to the mainland on Sunday.

The 1978 distribution of island camping, developed from available Park Service data, was used to determine the monthly distribution of island camping. This distribution was selected since the National Park Service stated that the 1978 curve generally represents actual camping patterns. The Park Service also estimated that a maximum of five percent of the persons riding the ferry service system on Fridays and Saturdays would be interested in camping. Thus, based upon the monthly and weekly distributions and the percentage of persons that would camp two nights, it was projected that about 950 individual campers would camp in 1980 (See Appendix A).

Since camping on the offshore islands by the non-boating public will be a new attraction at the Seashore, the growth in this activity will be greater than that of the sum of the projected population and tourist growth. Since no surveys were permitted by the National Park Service, the growth rate for a similar type attraction was applied. The Cumberland Island, Georgia National Seashore is similar to the offshore islands at Mississippi Gulf Islands National Seashore in that the island is only accessible via a boat service provided by



MONTHLY DISTRIBUTION OF PATRONAGE-FERRY SERVICE TO WEST SHIP ISLAND

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

the National Park Service. Based upon visitation data at Cumberland Island, camping increased by 340 percent from 1976, the first year in which the public transportation service was available, to 1977 and increased by 170 percent between 1977 and 1978. Thus, this type of growth rate can be expected at the Mississippi Gulf Islands National Seashore. Based upon the visitation data at Cumberland Island, it is projected that the increase in the number of campers would probably stabilize after two years. It was estimated that the number of campers would then increase at an annual rate of five percent, the projected annual increase of population and tourism. As shown in Table 3, it is projected that the initial 950 campers in 1980 will increase to about 3,230 in 1981 and to slightly more than 5,490 in 1982. This total will increase to more than 6,355 in 1985 and increase to approximately 10,350 in 1995.

The National Park Service has estimated that about 20 percent of the total campers would use the new facilities at West Ship Island. Based upon the visitation data, 24 percent of the remaining 80 percent of the offshore island campers are projected to camp at East Ship Island and 56 percent are expected to camp at Horn Island. As shown in Table 3, the number of campers at West Ship Island is expected to increase from about 190 in 1980 to approximately 1,270 in 1985 and to nearly 2,070 in 1995. The projected number of campers at East Ship Island is expected to total about 230 in 1980, increasing to slightly less than 2,500 in 1995, while the projected number of campers at Horn Island in 1980 would be about 530, increasing to about 5,800 in 1985. All of the projections in Table 3 assume that the capacity on any island is not exceeded.

Ferry Service - It is projected that the ferry service patronage will increase by eight percent annually between 1978 and 1985. After 1985, it is estimated that the patronage will increase by five percent. Since the transportation system serving offshore island camping (East Ship Island and Horn Island) would attract about 760 persons, the 1980 ferry system patronage was adjusted to about 63,040 by subtracting 760 passengers from 63,800 (the 1980 estimated patronage) as shown in Table 4. It is projected that the ferry system patronage will increase to about 92,600 in 1985 and to about 150,900 in 1995.

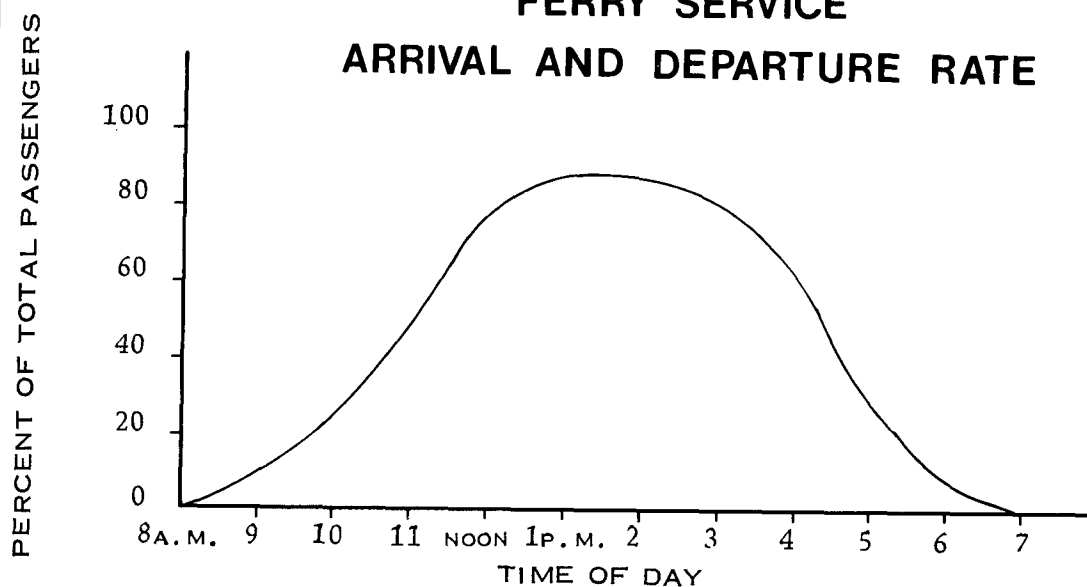
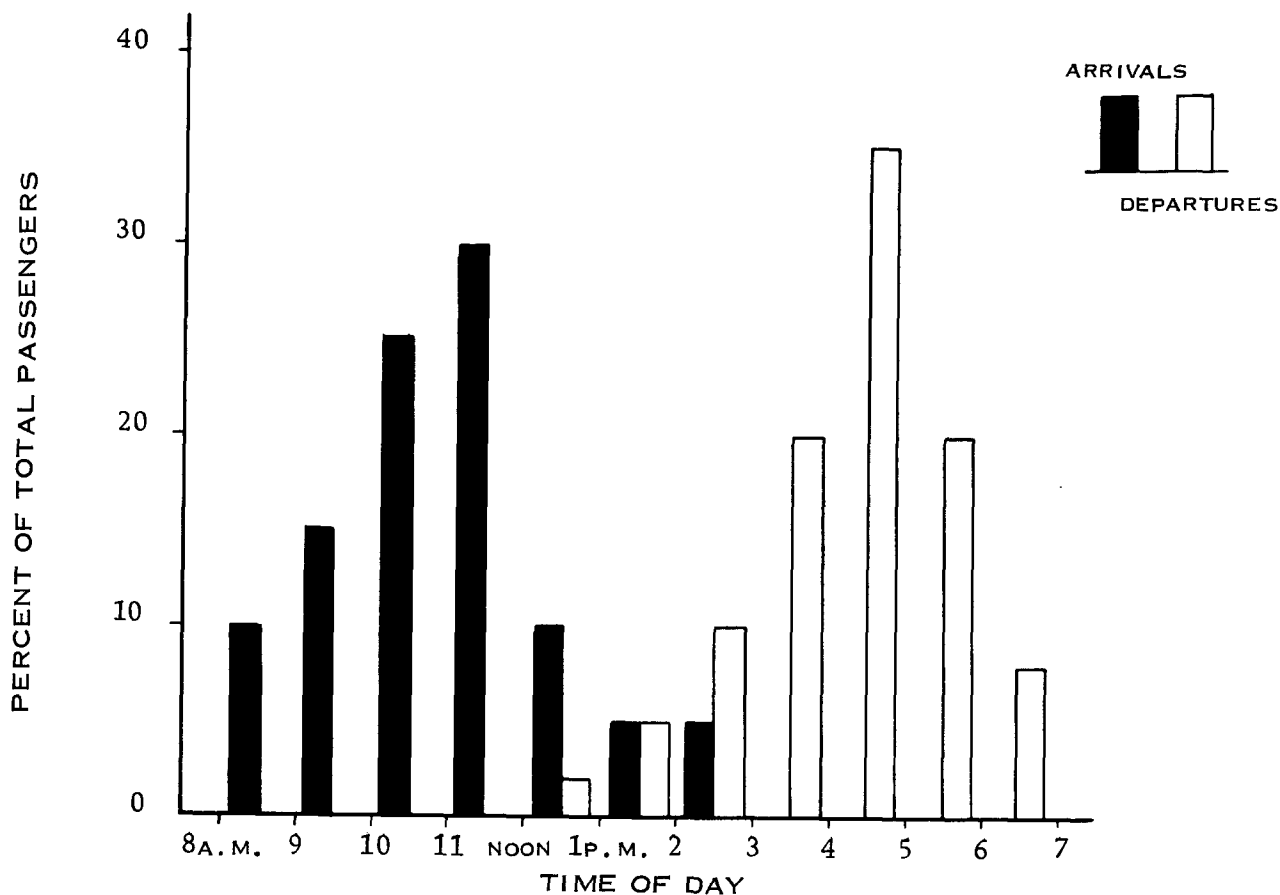
Since the present ferry system makes one trip during the morning and a second trip during the afternoon, an hourly distribution of patronage is not presently available. As previously discussed, about 60 percent of the daily passengers depart on the morning trip. Since surveys of visitors to the National Seashore were not permitted, an hourly arrival and departure rate of passengers at the Seashore is unavailable.

TABLE 3

PROJECTED CAMPERS THAT WOULD USE A TRANSPORTATION SYSTEM¹GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

	<u>Total Campers</u>	<u>West Ship Island</u>	<u>East Ship Island</u>	<u>Horn Island</u>
1980	950	190	230	530
1981	3230	645	775	1810
1982	5490	1100	1320	3070
1985	6355	1270	1525	3560
1990	8110	1620	1945	4545
1995	10,350	2070	2480	5800

¹Assumes that the capacity on any island is not exceeded.



GULF ISLANDS NATIONAL SEASHORE MISSISSIPPI
TRANSPORTATION STUDY

FIGURE 6

TABLE 4

PROJECTED FERRY SYSTEM PATRONAGE TO WEST SHIP ISLAND
GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Year</u>	<u>Projected Patronage</u>
1978	54,757
1979	59,100
1980	63,000
1985	92,600
1990	118,200
1995	150,900

However, the ferry service at Fire Island National Seashore in New York provides access to beach activities on offshore islands for the non-boating public. Thus, the hourly arrival and departure rates and resulting accumulation curve contained in the Fire Island National Seashore Transportation Study (3) and in the report "Transportation - Half the Fun" (4) are shown in Figure 6. The arrival and departure rates and peak accumulation illustrate the peak demand that would occur if a demand responsive service was operated. Since the cost of operating such a service to the offshore islands is very expensive, as much as two or three times the cost per person of a conventional system, the cost of a demand responsive service would be prohibitive. However, should the National Park Service consider using a demand responsive system to the offshore islands, the data from Fire Island National Seashore could be used. The data from the existing system at Mississippi Gulf Islands, as well as general trends from Fire Island will be used to establish schedules when the capacity of the existing ferry service would be exceeded by a projected patronage.

Total Projected Seashore Visitation - The total visitation was projected by summing the projections for Davis Bayou, offshore island boating visitors, offshore island campers and projected ferry system patronage. This results in the projected annual visitation shown in Table 5. The 1978 projected visitation of 566,480 is estimated to increase to nearly 628,150 in 1980 and to more than 1,334,300 in 1995.

Capacity Limitations

The National Park Service has established a maximum capacity on West Ship Island of 2,000 visitors per day. In addition, since the camping areas on East Ship Island and West Ship Island will have a specified total number of camping sites, the annual capacity of these camping sites can be estimated, assuming that the daily and monthly trends remain constant.

The development plan for West Ship Island includes 30 camp sites. Assuming four people per site (the average number of campers per camp site estimated by the National Park Service), the camping area can accommodate a maximum of 120 people on the peak day. It is projected that about 650 campers can camp at West Ship Island in the peak month and that the estimated annual number of campers would be nearly 2,300 (See Appendix A). The National Park Service estimates that one-half of these campers or about 1,150 campers would use the transportation system. By comparing this total with the projected number of campers at West Ship Island in Table 3,

TABLE 5

PROJECTED ANNUAL VISITATION

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Year</u>	<u>Visitation at Davis Bayou</u>	<u>Boating Public Visitation</u>	<u>Non-Boating Public Offshore Island Camper Visitation</u>	<u>Ferry System Patronage</u>	<u>Total Projected Visitation</u>
1978	431,710	80,013	0	54,757	566,480
1979	453,300	84,000	0	59,100	596,400
1980	476,000	88,200	950	63,000	628,150
1985	607,500	112,600	6400	92,600	819,100
1990	775,400	143,700	8100	118,200	1,045,400
1995	989,600	183,400	10,400	150,900	1,334,300

it can be expected that the capacity of the West Ship Island camping area will be reached after 1982. It is assumed that once the capacity of the camping area at West Ship Island is exceeded, the campers desiring to camp on West Ship Island will camp on East Ship Island until the capacity of East Ship Island camping is exceeded. As a result, the projected campers that would use a transportation system was modified as shown in Table 6.

The Final Environmental Statement (1) states that a 50 site walk-in campground will be developed on East Ship Island. Thus, a maximum of 200 people could be accommodated on a single day and about 250 people could camp in a week. This weekly total converts to a monthly total of 1,080 campers during peak month (See Appendix A) with the estimated annual number of campers approximating 3,800. The National Park Service estimates that about 30 percent of these campers would be persons arriving in private boats. Thus, the total number of annual campers that would use the transportation system is about 2,660. By assuming that campers who desire to camp on West Ship Island but cannot due to capacity limitations would camp on East Ship Island, the capacity of East Ship Island would be exceeded between 1990 and 1995. It is assumed that those persons who wish to camp on East Ship Island but cannot due to capacity limitations will camp on Horn Island. As a result, the modified projected campers desiring to camp on East Ship Island is shown in Table 6.

A capacity limitation at Horn Island has not been established at this time. It should be noted that, based upon the modified projected number of campers at Horn Island, 6,540 in 1995, that the peak day number of campers would approximate 340. If the National Park Service determines that Horn Island cannot accommodate 340 campers on a peak day, then these campers would either have to be refused camping permits or forced to camp on Petit Bois Island.

To determine the maximum number of persons who may arrive via the ferry boat service without exceeding the capacity of West Ship Island, 2,000 persons per day, the number of persons in private boats must be subtracted from the daily capacity. According to the Final Environmental Statement (1), the boat refuge will have a capacity of 30 to 40 private boats and an additional 10 to 15 private boats could either dock along the new dock, moor offshore or be beached. Assuming four persons per boat, between 160 and 220 persons, or an average of 190, would arrive at West Ship Island on private boats. Thus, a total of 1,810 persons could arrive at West Ship Island on the ferry system. Assuming that the daily and monthly distributions of patronage shown earlier remain constant, the capacity on

TABLE 6

MODIFIED PROJECTED CAMPERS THAT WOULD USE
A TRANSPORTATION SYSTEM

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

	<u>Total Campers</u>	<u>West Ship Island¹</u>		<u>East Ship Island³</u>		<u>Horn Island</u>
	<u>Projected Campers</u>	<u>Projected Campers</u>	<u>Overflow²</u>	<u>Projected Campers⁴</u>	<u>Overflow²</u>	<u>Projected Campers⁵</u>
1980	950	190	0	230	0	530
1981	3230	645	0	775	0	1810
1982	5490	1100	0	1320	0	3070
1985	6355	1270	120	1645	0	3560
1990	8110	1620	470	2415	0	4545
1995	10,350	2070	920	3400	740	6540

¹Capacity of the West Ship Island camping area is 2300 annual campers with one-half or 1150 campers riding the transportation system.

²Overflow equals projected campers minus capacity.

³Capacity of the East Ship Island camping area is 3800 annual campers with 70 percent or 2660 campers riding the transportation system.

⁴Includes overflow from West Ship Island.

⁵Includes overflow from East Ship Island.

West Ship Island will be reached when the ferry system patronage reaches 111,000. As shown in Table 5, the 1990 patronage was estimated at 118,200. Thus, either the number of persons riding the ferry system must be restricted or the capacity of West Ship Island should be increased before 1990. To accommodate the original projected ferry system patronage of 150,900 the capacity of West Ship Island should be increased to about 2,650 persons per day (190 arriving on private boats and about 2,460 arriving on the ferry system).

CHAPTER III

DEVELOPMENT OF TRANSPORTATION ALTERNATIVES

By quantifying the number of day-use visitors and campers desiring to utilize the offshore islands, the costs associated with each of the transportation alternatives can be developed and compared. This chapter evaluates nine different transportation alternatives designed to satisfy projected visitor demand. In addition, the 1990 annual operating and capital costs were determined in order to develop a basis on which to compare the relative cost of one alternative versus another. This chapter also contains an evaluation of the parking and access problems of each of the existing ferry service operations and evaluates the impact of relocating these operations.

Potential Vessels

Previous studies (5) have shown that a transportation system consisting of helicopters, seaplanes, hydrofoils or hovercrafts would be cost prohibitive. As a result, the National Park Service limited the study to propeller driven boats of various sizes. The Final Environmental Statement (1) and the draft General Management Plan (2) both specify that a small scale, shallow draft tour boat with a maximum capacity of 25 persons be considered to serve the demand to Horn and Petit Bois Islands, while access to the day-use activities on West Ship Island should be provided by boats similar in size to the existing ferry service boats (200 to 225 passenger boats).

Various shipyards were contacted to ascertain if there were existing boats which could satisfy the needs of this study. As a result, the following three basic types of vessels were considered for inclusion in the study:

- (1) 150-passenger boats,
- (2) 10 to 25-passenger landing craft, and
- (3) 10 to 25-passenger boats.

Various conventional boats which could transport about 150 passengers were inventoried. Pictures and specifications of these boats are shown in Appendix B. The 150-passenger boat was favored over larger boats since 150-passenger crafts are more readily available for purchase. These boats were also favored over 50 and 100-passenger boats since the 150-passenger boat is more cost effective as shown in the Transportation

Study for Gulf Islands National Seashore, Park General, Florida (5). That is, it would require 3 50-passenger crafts or 2 100-passenger crafts to transport the same number of persons as 1 150-passenger boat. As a result, the initial capital investment, using either 50-passenger or 100-passenger boats, would be about twice that of 1 150-passenger vessel (5). In addition, while the operating cost per hour for the 150-passenger boat is about 10 percent higher than a 100-passenger boat and about 60 percent higher than a 50-passenger boat, the smaller boats would be required to make more trips per day than the 150-passenger boat to transport the same number of passengers (assuming more than 100 people were transported per day). Thus, the annual operating cost for a system consisting of smaller boats would be greater than that of a transportation system consisting of 150-passenger boats (5).

The average 150-passenger conventional boat would operate at a sustained sea speed of about 10 knots and consume nearly 32 gallons per hour as shown in Table 7. While the cost of 150-passenger boats could vary between \$250,000 and \$350,000, an average cost (in 1978 dollars) of \$275,000 was selected. The range in cost varies directly with the number of amenities provided on the boat. These boats would also require four crew members at a cost of about \$31.00 per hour of operation.

The National Park Service requested that a large boat capable of transporting about 250 passengers also be considered. Such a vessel would cost about \$350,000 and consume about 50 gallons per hour while operating at a sustained sea speed of about 10 to 12 knots. Specifications of these boats are included in Appendix B. A 250-passenger boat would require a crew consisting of two operators and five deck hands based upon U.S. Coast Guard, Office of Marine Safety Regulations. The crew cost would be about \$55.00 per hour of operation (includes docking and waiting time).

Since the Final Environmental Statement and the draft General Management Plan suggested that a small boat with a maximum passenger capacity of 25 persons be considered, two types of vessels were selected. As shown in Appendix B, both landing craft and conventional boats were considered. The landing crafts inventoried were capable of being beached and would not require docking facilities. Persons riding this boat would be required to wade through about 12 to 18 inches of water. As shown in Table 7, the average landing craft would consume about 15 gallons per hour while operating at a sustained sea speed of about 10 knots. The initial cost (in 1978 dollars) of the average craft was approximately \$80,000. The vessel would require two crew members at a cost of about \$17.00 per hour.

TABLE 7

COMPARISON OF BOATS
AVERAGE CHARACTERISTICS ¹

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

	<u>10-25 Passenger Landing Craft</u>	<u>10-25 Passenger Conventional Boat</u>	<u>150-Passenger Conventional Boat</u>	<u>250-Passenger Conventional Boat</u>
Fuel Consumption:	15 gal/hr	15 gal/hr	32 gal/hr	50 gal/hr
Sustained Sea Speed:	10 knots	15 knots	10 knots	10-12 knots
Initial Cost:	\$80,000	\$100,000	\$275,000	\$350,000
Annual Capital Cost:	\$ 8,500 ²	\$ 10,600 ²	\$ 29,100 ²	\$ 37,100 ²
Annual Insurance Cost:	\$ 3,200	\$ 4,000	\$ 5,500	\$ 7,000
Annual Maintenance Cost	\$ 4,800	\$ 6,000	\$ 8,200	\$ 10,500
Number of Crew Required:	2	2	4	7
Crew Cost:	\$17.00/hr	\$17.00/hr	\$31.00/hr	\$55.00/hr
Service Life:	20 years	20 years	20 years	20 years
Seaworthiness:	Fair	Fair	Good	Good

¹ 1978 dollars.² 20 year life, 10% salvage value and 10% interest rate. Interest rate assumes NPS buys all boats.

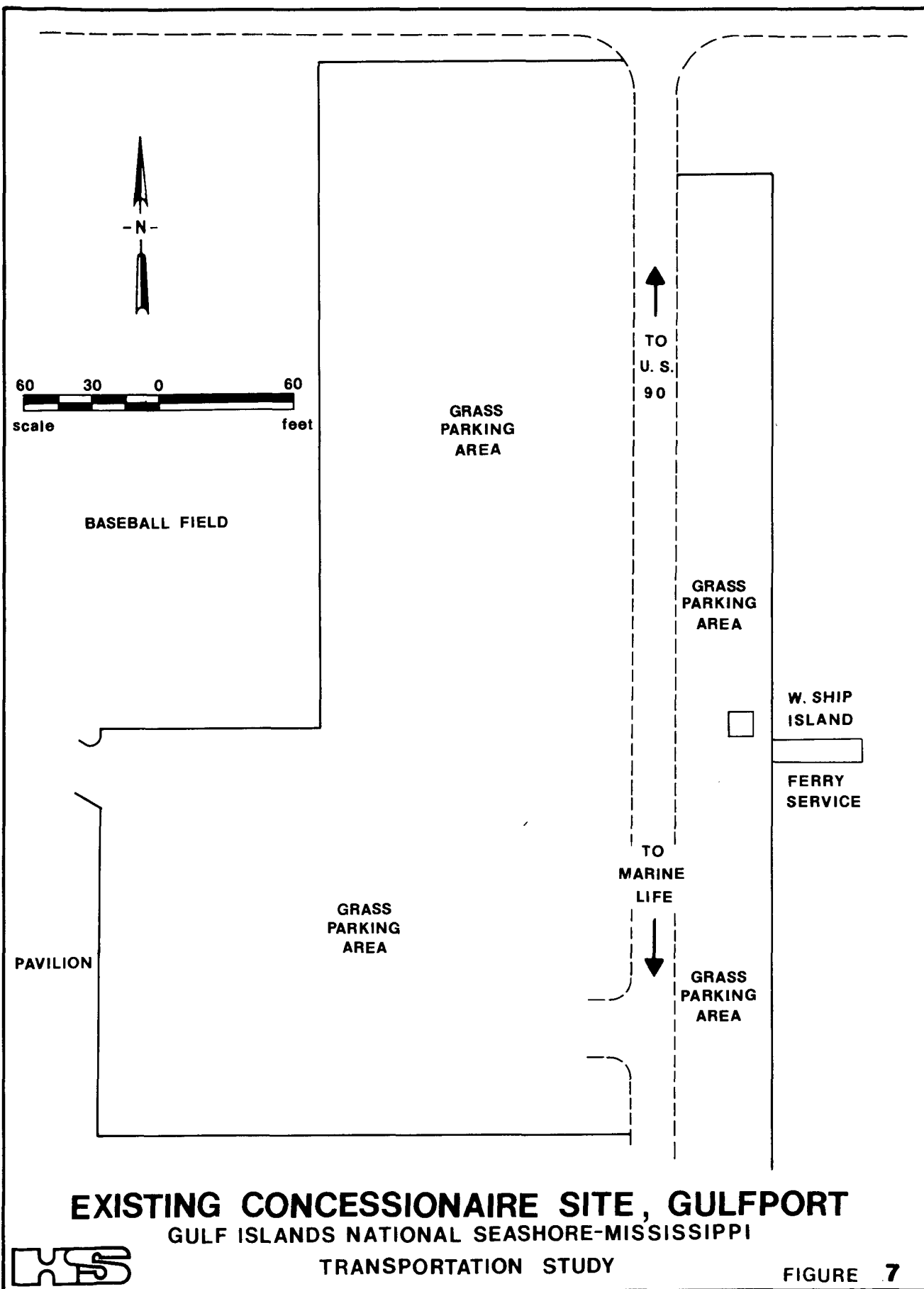
The conventional boat would either require docking facilities or would be anchored offshore, in which case campers would wade through three to four feet of water to gain access to the islands. While the fuel consumption of conventional boats is the same as that of the landing craft, the conventional boat can travel at a sustained sea speed of about 15 knots (See Table 7). The initial cost of the conventional boat, about \$100,000 in 1978 dollars, is slightly higher than that of the landing craft. The conventional boat would also require two crew members at a cost of about \$17.00 per hour.

Analysis of Existing Service

Both the Gulfport and Biloxi ferry service operations were analyzed to determine if modifications in the existing service were necessary. In addition, available parking was inventoried to determine if additional parking would be necessary and if there was land area available for additional parking.

Modification of Existing Service - Presently, both the Gulfport and Biloxi ferry systems operate primarily between April 1st and Labor Day weekend, making one or two trips on weekends between April 1st and May 15th and two trips daily between May 15th and Labor Day weekend. Since the Park Service did not permit personal interviews or surveys, trip desires of potential day-use visitors who might ride the ferry system between Labor Day weekend and April 1st can only be estimated from the ferry service operator's past experience. As previously discussed in Chapter II, some limited service has been provided in March, September, October and November. Based upon the patronage during these months and the projected patronage, the ferry system service should be expanded to include daily service in April after Easter and September and weekend service in March, April before Easter and October. The cost analyses for the alternatives assume that a trip is made on each day of the suggested expanded service regardless of the patronage. The detailed cost analyses for the final alternatives assume that a trip is made only on those days of the suggested expanded service when the projected patronage exceeds 20.

Analysis of Parking - The Gulfport ferry service presently has two areas for parking as shown in Figure 7. The area along the water can accommodate about 50 cars, while the grass and sand area across the street from the boat dock can park about 150 cars. Additional parking could be accommodated if the present unorganized parking area was paved and striped for parking. If this improvement was implemented, about 80 additional cars or a total of nearly 280 automobiles could be parked.



Assuming 3.0 persons per vehicle (the vehicle occupancy rate estimated by the private concessionaires), the existing 205 parking spaces could park about 615 people at any one time on a peak day. Based upon an average of 1.85 to 1.90 turn-overs per parking space per day, about 1,140 to 1,170 people could be accommodated in the parking area on the peak day. Thus, additional parking would be required around 1989 or 1990. If the parking area was paved to park 280 automobiles, then about 1,550 to 1,600 people could be accommodated on the peak day. Thus, the parking would satisfy the 1995 demand.

The ferry service operation in Biloxi had about 200 parking spaces available for passengers. However, due to construction on the adjacent land area immediately west of the marina, available parking has been reduced to about 150 spaces in 1979 (See Figure 8). Some of this parking area is also utilized by persons patronizing the adjacent restaurant, fishing from the piers or utilizing the small craft harbor. Thus, not all of the 150 parking spaces are always available for persons riding the ferry service. Assuming that all 150 parking spaces would be available, the parking area could accommodate about 830 to 855 people on the peak day. Based upon the projected patronage, this parking demand will be exceeded in 1989. In order to park the projected 1995 patronage, about 80 additional parking spaces would be required, and the ferry service would have to be guaranteed that the 150 parking spaces would always be available. Based upon conversations with the City of Biloxi, there is no potential for parking expansion in the immediate area of the docking facility. In order to satisfy the projected demand, a shuttle service from the nearby hotels would be required.

Relocation of the Ferry Service - The City of Gulfport is strongly opposed to relocating the ferry service operation in Gulfport, as the City is presently preparing to extensively develop the land area contiguous to the Gulfport Small Craft Harbor. The present location is the only area in Gulfport where docking facilities and an eight foot channel are available. Relocating to another area would require major construction and dredging.

Both the Gulf Regional Planning Commission and the City of Biloxi expressed concern about the present location of the Biloxi ferry service operation. The primary concern was the number of available parking spaces. Two other potential areas were identified; (1) one located in the vicinity of Southern Avenue and (2) the other in the Myrtle Street area. The Southern Avenue location would be centrally located as most of the major hotels would be within one-half mile of the ferry service operation. However, major improvements

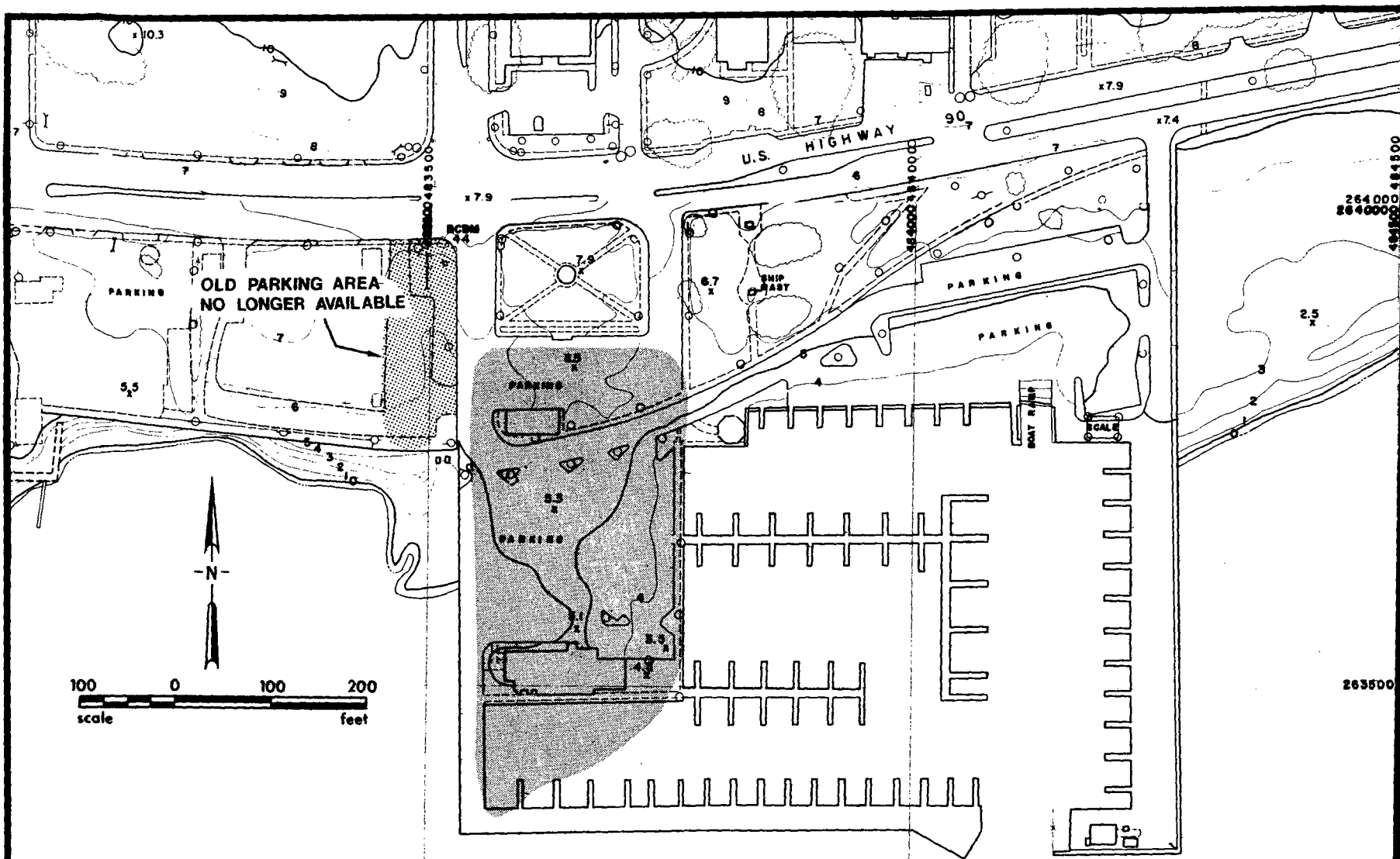
in the existing docking area would be required. In addition, there would be no land area available for parking. Thus, all ferry service passengers would have to either walk to the facility or ride from some remote parking area on a shuttle service. Development of this area was not favored by either the City of Biloxi or the Gulf Regional Planning Commission.

The Myrtle Street location (See Figure 9) was favored by both the City of Biloxi and the Gulf Regional Planning Commission as a potential site. There are existing docking facilities which would require improvement, and some dredging would be required. In addition, two major tracts of land costing about \$400,000¹ would have to be purchased. This area is adjacent to the Gulf Marine State Park, and the land area satisfies the projected 1995 parking demand. Based upon conversations with the City of Biloxi and the Gulf Regional Planning Commission, the National Park Service would have to provide the money to develop the Myrtle Street location or monies would have to be provided by private enterprise. Since the development cost would be excessive for private enterprise due to the small return on the money invested, the National Park Service would most likely have to develop the site.

The Cities of Gulfport and Biloxi and the Gulf Regional Planning Commission all objected to any proposal which included the relocation of all ferry service operations to the Davis Bayou area. All of these agencies stated that relocating the ferry service to Davis Bayou would reduce tourism and have a negative impact upon the economy in both cities, and would cause a decline in hotels' receipts along the Gulf Coast.

Concession Contract Vs. Special Use Permit - Both the Gulfport and Biloxi ferry services presently operate under a "Concession Permit" that is administered by the National Park Service. The Permit is in effect for five years (through 1982). This contractual agreement is satisfactory to the ferry service operators as long as the ferry service remains "status quo". The capital investment required to expand the service would necessitate a long-term (20 to 30 year) agreement. For example, as of the fall of 1978, the only loans available for purchase of a new boat were for 10 years with a 13-1/2 percent interest rate. Thus, the annual capital cost (principle plus interest) over a ten year period of one new boat costing \$350,000 would be about \$66,000. If interest rates increased to 20 percent, the annual cost would be increased to about \$84,000. This compares to a present annual capital cost of about \$3,000 to \$5,000. Thus, the present fare would need to be quadrupled. This increase does not consider the rise in costs for fuel, maintenance and personnel. The procedure would be cost prohibitive.

¹Rough cost estimate made by the City of Biloxi

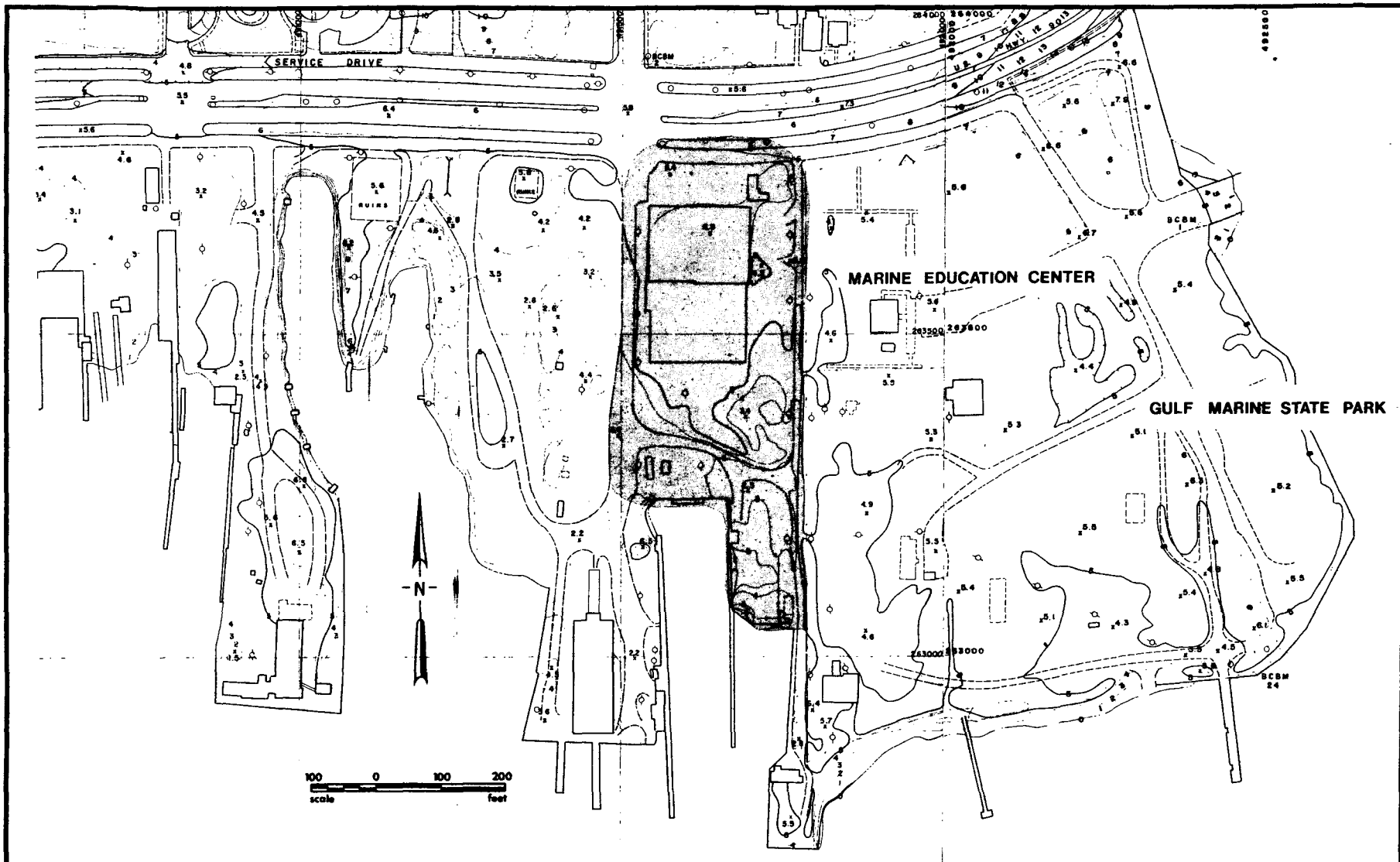


EXISTING CONCESSIONAIRE SITE, BILOXI

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI, TRANSPORTATION STUDY

FIGURE 8





POTENTIAL CONCESSIONAIRE SITE-MYRTLE STREET AREA, BILOXI



GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE 9



Therefore, it would be most beneficial to the National Park Service to purchase all new boats and add a surcharge to the concession contract or special use permit that would be paid directly to the Park Service to finance the purchase of the boats. This surcharge could either be a fixed amount applied to the fare or a percentage of the gross operating income. It is suggested that a percentage of the gross operating income be used to pay for the new boats as this procedure would be easier to administer. The surcharge should be paid monthly during the time period that the ferry service operates. Thus, the ferry service operators would be required to file monthly statements of income and expenses which would improve the accounting procedures presently used.

A detailed analysis of the Concessioner Annual Financial Report showed that the recording of expenses is incomplete and confusing. Neither of the ferry service operations provided a complete listing of the following:

1. Salaries for all personnel including the captain, captain's mates, ticket sales personnel and clerical aid.
2. Depreciation of boats and other capital investments such as the ticket sales facility. All depreciation is lumped together, and it is difficult to determine if the depreciation claimed for each item is "fair".
3. Operating expenses broken down for maintenance, insurance, fuel and other operating expenses such as supplies for the boat.

The items on the financial report listed as "net profit from operations" and "net income" do not include all salaries, and thus, does not present a true indication of the profitability (or loss) of the operation. For example, the Pan Isles Inc. 1977 financial report listed a net income of \$24,525.15 which included only \$12,000.00 in salaries. If appropriate salaries for all personnel were included, the operation might have shown a "break-even" operation or even a loss.

It is suggested that the ferry service operators be required to provide on an annual basis a detailed description of all salaries, depreciation costs, fuel costs, maintenance costs, insurance costs and other operating costs. This would provide sufficient information for the Park Service to make a proper evaluation of a requested fare increase. It is also suggested that the "special use permit" concept of operation be retained and that the Park Service purchase all

new boats. A concessions contract is not suggested since the Park Service would be required to negotiate a long term contract (20 to 30 years) which would eliminate the potential for the Park Service to change operators should either inadequate service be provided or the operation change owners.

System Alternatives

Nine different transportation systems were reviewed. All of the systems provided for two different services: a ferry service consisting of the existing ferry service boats and new 150-passenger boats transporting visitors to West Ship Island and 10 to 25-passenger boats (either landing craft which can be beached or conventional boats which would require docking facilities) transporting campers to the various offshore islands. New 250-passenger boats were not included in this analysis as only the relative cost of one alternative versus another was of concern. Costs for the larger boats will be included in the detailing of alternatives. In order to compare the alternatives, projected annual visitation and annual operating and capital costs for 1990 were used. The analysis assumes that all of the projected patronage will be accommodated. The following patronage projections were utilized:

- (1) A total of 118,200 day-use visitors would ride the transportation system to West Ship Island, of which about 65,000 would depart from Gulfport and the remaining 53,200 from Biloxi.
- (2) For transportation alternatives in which the only access to the West Ship Island camping area was via the ferry service from Gulfport and Biloxi, an additional 1,620 campers would ride the ferry service. About 890 of these would depart from Gulfport, while 730 would leave from Biloxi.
- (3) For those transportation alternatives in which the only access to the camping area on West Ship and East Ship Islands is via the ferry service from Gulfport and Biloxi, the patronage estimates in (1) and (2) above should include an additional 1,945 campers (destined for East Ship Island) for a total of 3,565 campers with destinations on East and West Ship Islands. About 1,070 of these additional campers would leave from Gulfport and go to East Ship Island while 875 would depart from Biloxi and go to East Ship Island.

- (4) For those transportation alternatives in which only campers to Horn Island would depart from Davis Bayou, approximately 4,545 campers would depart from Davis Bayou.
- (5) For those transportation alternatives in which service to East Ship Island and Horn Island would be provided from Davis Bayou only, about 6,490 campers would depart from Davis Bayou.
- (6) For those transportation alternatives in which all persons camping on the offshore islands would be required to depart from Davis Bayou, a total of 8,110 campers would be transported from Davis Bayou.

Table 8 illustrates the annual 1990 operating and capital costs in 1990 dollars for each alternative broken down into the following categories:

- (1) The transportation service from Biloxi,
- (2) The transportation service from Gulfport,
- (3) The transportation service from Davis Bayou, and
- (4) The total transportation system.

The annual capital cost of the boats was determined by inflating the initial cost, shown in Table 7, by seven percent annually to approximate 1990 costs. The 1990 value was then amortized over a 20 year period at a 10 percent interest rate assuming a 10 percent salvage value. This interest rate and amortization period would only be valid for analyses in which the National Park Service buys the boats. If a private operator purchased the boats, the vessels would be amortized over a 10 year period at a 13-1/2 percent interest rate assuming 10 percent salvage value. The annual capital cost shown in Table 8 is the annualized capital cost of the boats only. Cost for support facilities such as waiting areas, maintenance facilities or docking areas are not included.

The annual operating cost includes insurance, maintenance costs, personnel cost for captains and captain's mates and running costs (fuel, oil, etc.). The annual insurance cost, which is primarily a function of vessel value and the number of months in which the boat is used, includes marine liability, hull insurance, breach of warranty and crew liability. Based upon estimates from Inland Overseas Marine Associates, Atlanta, Georgia, who are specialists in marine insurance, the annual premium would be about four percent of the capital

TABLE 8

ALTERNATIVE ANNUAL OPERATING AND
CAPITAL COSTS FOR 1990 in 1990 DOLLARS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

Alternative	Biloxi Transportation System			Gulfport Transportation System			Davis Bayou Transportation System			Total System		
	Annual Operating Cost	Annual Capital Cost	Total Annual Cost	Annual Operating Cost	Annual Capital Cost	Total Annual Cost	Annual Operating Cost	Annual Capital Cost	Total Annual Cost	Annual Operating Cost	Annual Capital Cost	Total Annual Cost
1	287,800	\$95,400	\$383,200	\$370,600	\$139,000	\$509,600	\$ 316,300	\$102,000	\$ 418,300	\$1,066,900	\$451,300	\$1,311,100
2	—	—	—	—	—	—	1,071,800	469,100	1,540,900	1,071,800	469,100	1,540,900
3	289,200	91,600	380,800	376,800	189,000	515,800	295,500	105,200	400,700	961,500	335,800	1,297,300
4	—	—	—	—	—	—	1,152,700	483,600	1,636,800	1,152,700	483,600	1,636,300
5	—	—	—	—	—	—	1,004,000	427,200	1,431,200	1,004,000	427,200	1,431,200
6	289,200	91,600	380,800	376,800	139,000	515,800	462,600	181,100	643,700	1,128,600	411,700	1,540,300
7	289,200	91,600	380,800	376,800	139,000	515,800	489,200	171,500	660,700	1,155,200	402,100	1,557,300
8	289,200	91,600	380,800	376,800	139,000	515,800	542,300	190,000	732,300	1,208,300	420,600	1,628,900
9	287,800	95,400	383,200	370,600	139,000	509,600	622,400	207,700	830,100	1,280,800	442,100	1,722,900

cost of the vessel. This would assume that the vessel is operated 12 months a year which would be the case for the 10 to 25-passenger boats. However, the day-use ferry service only operates about six months a year (190 days); thus, the insurance premium would be about one-half of four percent or about two percent of the capital cost of the boat. These rates were used to determine the 1978 insurance rates shown on Table 7. These insurance costs were then inflated at an annual rate of seven percent to approximate 1990 dollars.

The annual maintenance cost of a vessel is primarily a function of the vessel value. Based upon estimates from James S. Kroger, Inc., Naval Architects, Miami, Florida, the annual maintenance cost would be about six percent of the vessel value. This rate would be applied to the small boats which would be operated 12 months of the year; however, the annual maintenance cost for the large boats which would operate during only about 6 months of the year (190 days) would be 3 percent of the vessel cost. The annual maintenance cost in 1978 dollars is shown in Table 7. These rates were inflated at an annual rate of seven percent to obtain 1990 annual maintenance costs.

The crew cost shown on Table 7 is based on the use of a captain at \$10.00 per hour and captain's mates at \$7.00 per hour (1978 dollars). Thus, the crew cost for the 10 to 25-passenger boats would be about \$17.00 per hour of operation while the crew costs for the 150 passenger vessel would be about \$31.00 per hour. These values were then inflated at an annual rate of seven percent to determine 1990 crew costs.

The running cost was based upon the fuel consumption rate for each vessel shown in Table 7. The running cost for each alternative was determined by multiplying the number of hours of operation for each alternative by the fuel consumption rate and multiplying this product by \$0.50 per gallon to determine 1978 running costs. This value was then inflated at an annual rate of seven percent to determine the 1990 running costs. The operating cost does not include cost for a manager, clerk or mechanic, maintenance cost of support facilities, operating fees or general and administrative costs.

Based upon an analysis of the concessionaire's annual financial report, the annual cost of operating the day-use service from both Gulfport and Biloxi was about \$100.00 per trip in 1978. These values were inflated at an annual rate of seven percent to approximate 1990 dollars.

Table 9 shows the total number of 1990 annual users, annual cost and the cost per user in 1990 dollars for the day-use service to West Ship Island, the camper service to the other islands and the total system. The table also shows the ranking of each alternative based upon the lowest cost per user for the total system.

Alternative 1 - Alternative 1 provides transportation services between Gulfport/Biloxi and West Ship Island, between Davis Bayou and Horn Island and between East and West Ship Islands (See Figure 10). In 1990, this alternative would require three boats (existing ferry service boat plus two new 150-passenger boats) operating from Biloxi, four boats (one existing and three new 150-passenger boats) operating from Gulfport and seven landing craft operating from Davis Bayou. In addition, one landing craft would be required to transport campers between East and West Ship Islands. The total annual operating and capital costs of the transportation services operating from Biloxi and Gulfport would be about \$383,200 and \$509,600, respectively. The annual cost of the service from Davis Bayou which includes the cost of the boat operation between East and West Ship Islands would be approximately \$418,000 (See Table 8). Thus, the total annual cost of the system would be approximately \$1,311,100 with a cost per user of \$10.38 as shown in Table 9.

Alternative 2 - As shown in Figure 11, all of the transportation service for this alternative departs from Davis Bayou. In 1990, the day-use ferry service to West Ship Island will require a total of ten boats (the two existing boats plus eight new vessels), the service from Davis Bayou to Horn Island would require a total of seven landing craft and the shuttle from East Ship Island to West Ship Island would require one additional landing craft. The total annual cost of this system would be about \$1,540,900 (See Table 8). The annual cost of the day-use service would approximate \$1,121,700, while the cost to provide camper service would be about \$419,200. The resulting total cost per passenger would be nearly \$12.20 (See Table 9).

Alternative 3 - This alternative system provides the same day-use service from Biloxi and Gulfport as Alternative 1 (See Figure 12). However, the service to Horn and East Ship Islands is provided by a 25-passenger conventional boat. This system would either necessitate the construction of docking facilities at both Horn Island and East Ship Island or require campers to wade ashore in three to four feet of water. In 1990, this system would require five new 150-passenger boats in addition to the two existing boats to provide the ferry service and seven 25-passenger boats to

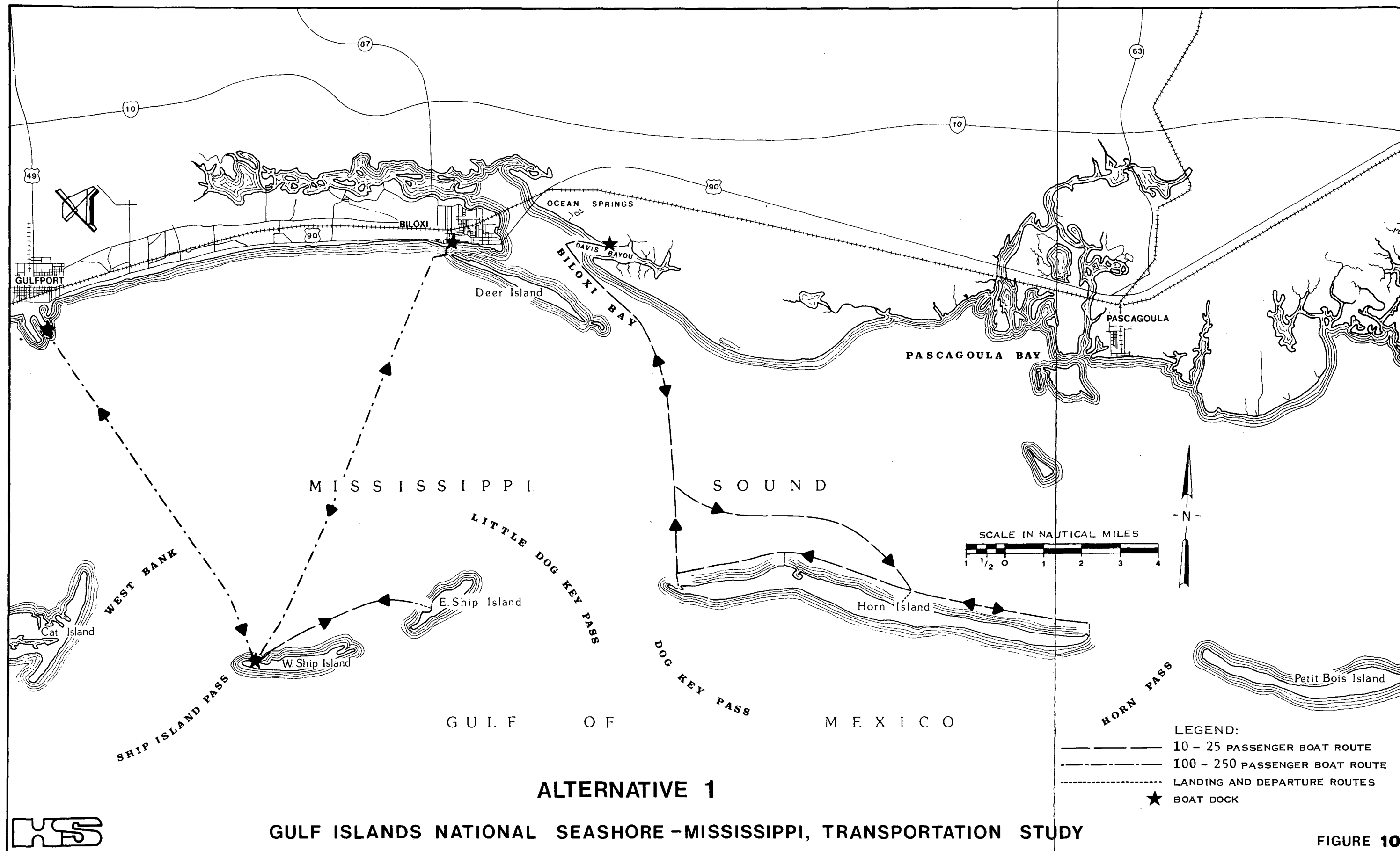


FIGURE 10

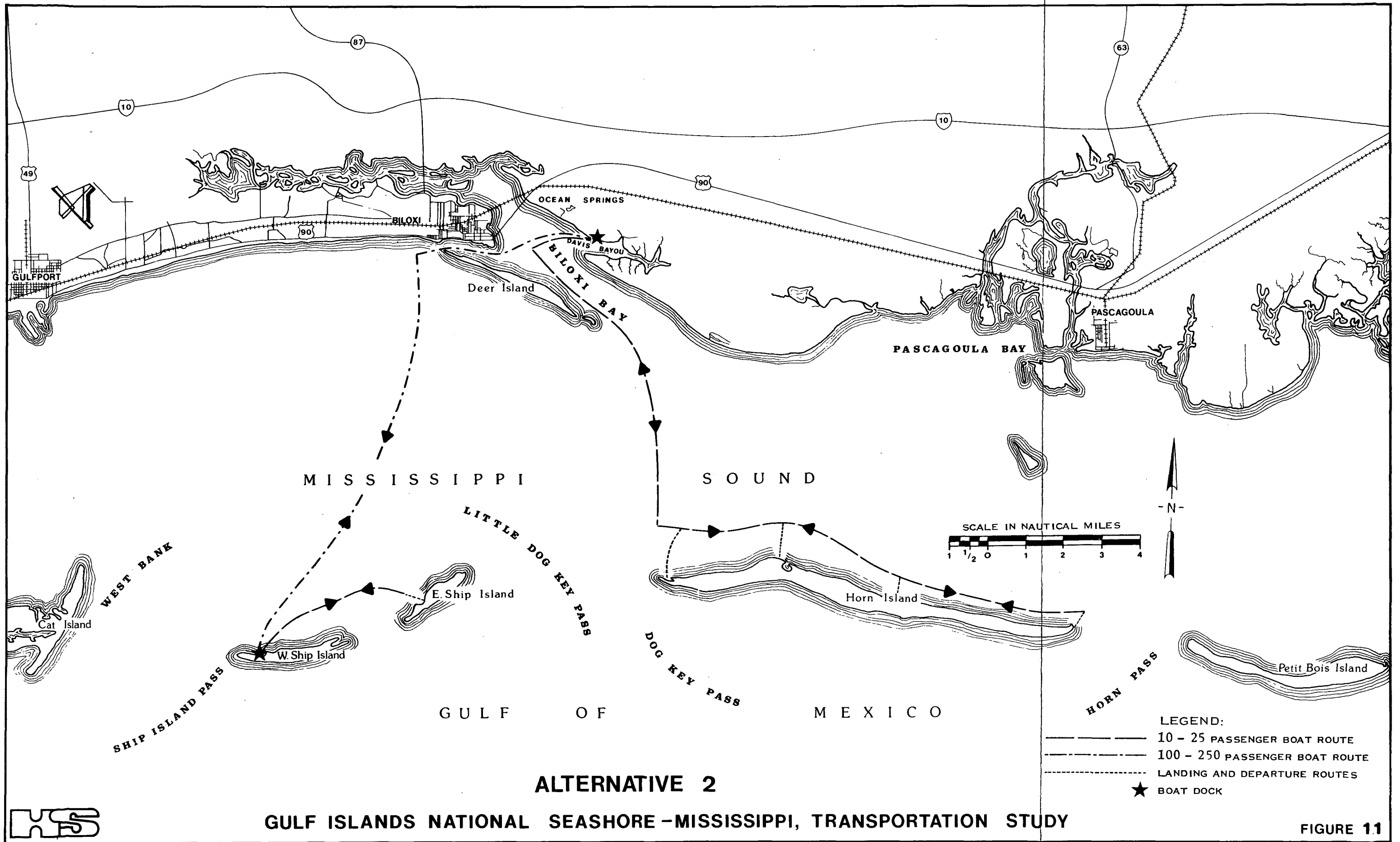
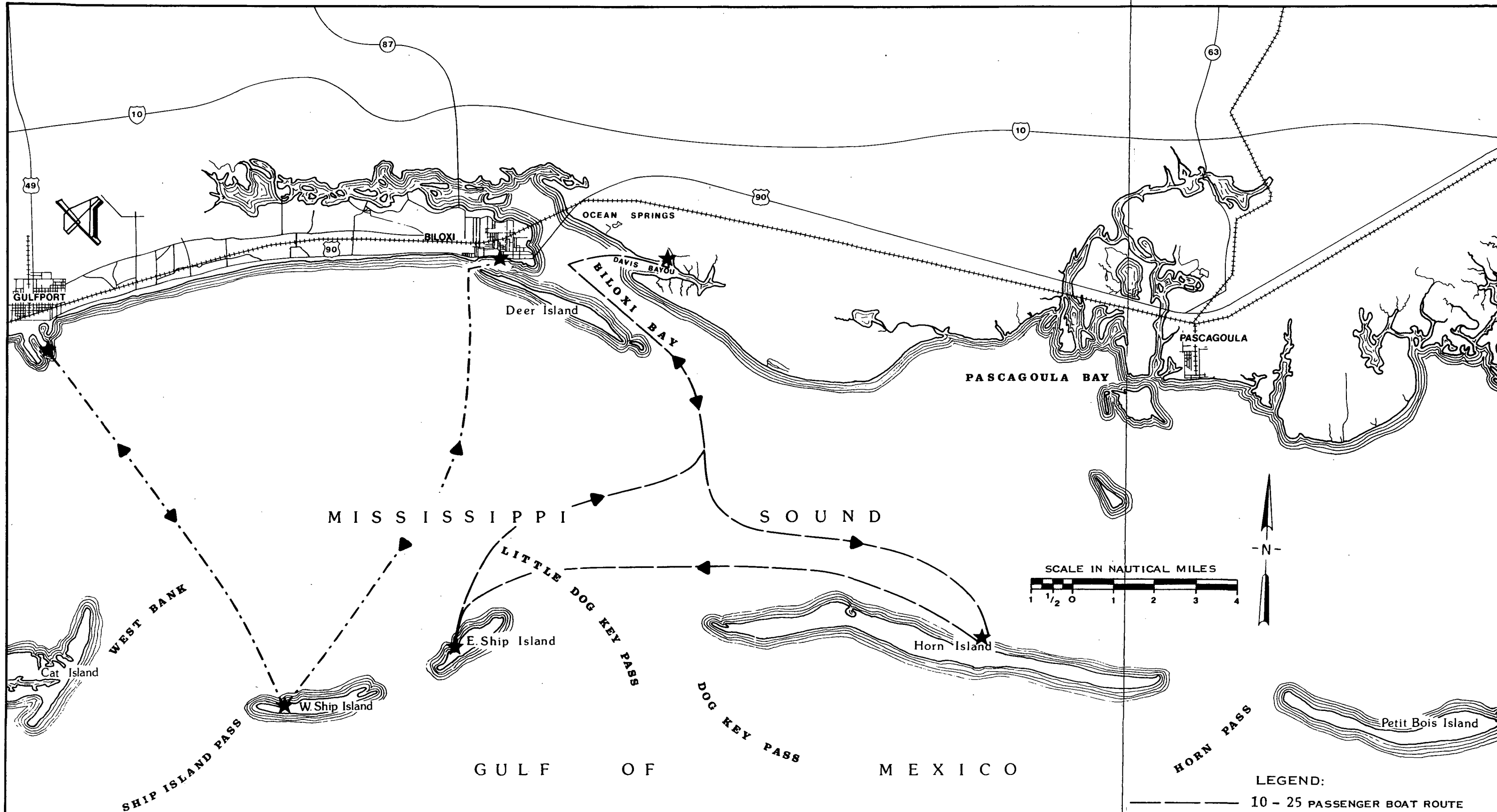


FIGURE 11



LEGEND:

—— 10 - 25 PASSENGER BOAT ROUTE

- - - 100 - 250 PASSENGER BOAT ROUTE

★ BOAT DOCK

ALTERNATIVE 3

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE 12

TABLE 9

ALTERNATIVE COMPARISON FOR 1990 IN 1990 DOLLARS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

Alternative	Day Use Service (Gulfport and Biloxi)			Camper Service (Davis Bayou)			Total System			Ranking of Lowest Cost Per User
	Annual Users	Total Annual Cost	Cost Per User	Annual Users	Total Annual Cost	Cost Per User	Annual Users	Total Annual Cost	Cost Per User	
1	121,765 ¹	\$ 892,800	\$7.34	4,545 ²	\$418,300 ³	\$92.04	126,310	\$1,311,100	\$10.38	2
2	121,765 ¹	\$1,121,700 ⁴	9.21	4,545 ²	\$419,200 ³	92.23	126,310	1,540,900	12.20	5
3	119,820 ¹	896,600	7.48	6,490 ²	400,700	61.74	126,310	1,297,300	10.27	1
4	119,820 ¹	1,030,500 ⁴	8.60	6,490 ²	605,800	93.34	126,310	1,636,300	12.95	8
5	119,820 ¹	1,030,500 ⁴	8.60	6,490 ²	400,700	61.74	126,310	1,431,200	11.33	3
6	119,820 ¹	896,600	7.48	6,490 ²	643,700	99.18	126,310	1,540,300	12.19	4
7	119,820 ¹	896,600	7.48	6,490 ²	660,700	101.80	126,310	1,557,300	12.33	6
8	119,820 ¹	896,600	7.48	6,490 ²	732,300	112.84	126,310	1,628,900	12.90	7
9	118,200	892,800	7.55	8,110	830,100	102.36	126,310	1,722,900	13.64	9

¹ Includes campers desiring to camp at West Ship Island

² Does not include campers at West Ship Island

³ Includes cost of shuttle service between East and West Ship Islands

⁴ Cost of West Ship Island day-use service departing from Davis Bayou

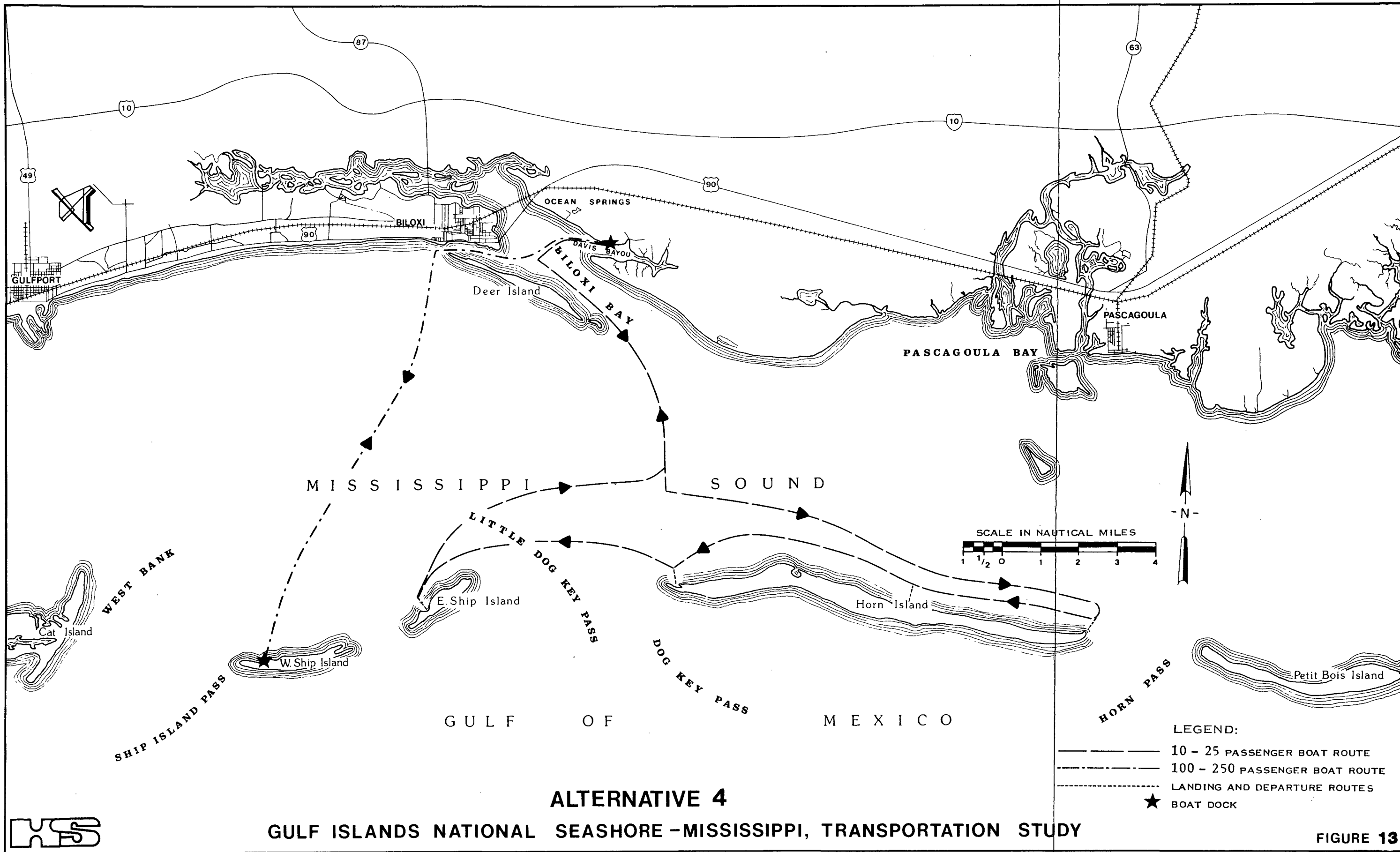
serve campers. As shown in Table 8, the 1990 annual cost of the camping service would be approximately \$400,700. Combining this with the cost of the day-use service to West Ship Island, as discussed in Alternative 1, the total annual cost for Alternative 3 would be nearly \$1,297,300 (See Table 9). The total cost per passenger for the system would approximate \$10.27.

Alternative 4 - All of the Alternative 4 transportation services originate at Davis Bayou (See Figure 13). The day-use service is the same as Alternative 2; however, the camping service goes directly to Horn Island and East Ship Island. This system would require a total of 13 landing craft and 7 new 150-passenger boats. The total cost of the system would be about \$1,636,300 resulting in a 1990 cost per user of \$12.95 as shown in Table 9.

Alternative 5 - As in the case of Alternatives 2 and 4, all transportation services would leave from Davis Bayou (See Figure 14). The system which combines the day-use service of Alternative 2 with the camping shuttle service from Alternative 3 would require docking facilities at Horn Island and East Ship Island. A total of nine boats (seven new boats) would be needed for the day-use service and seven 25-passenger conventional boats would be required for the camper service in 1990. The annual cost of the system would approximate \$1,431,200 (See Table 8) with an average cost per passenger of \$11.33 (See Table 9).

Alternative 6 - The Alternative 6 transportation system consists of a day-use service from Gulfport and Biloxi as in Alternative 1 and a camper service that utilizes landing craft which would travel from Davis Bayou to Horn Island, to East Ship Island and back to Davis Bayou (See Figure 15). In 1990, this service will require 7 boats to transport day-use visitors to West Ship Island and 14 landing craft for the camper service. The annual cost of the camping service would be about \$643,700 (See Table 8). Combining this cost with the cost to operate the ferry service the total annual cost of the system would be about \$1,540,300 (See Table 8). As shown in Table 9, the resulting cost per user would be approximately \$12.19.

Alternative 7 - This alternative provides the same day-use service from Gulfport and Biloxi as Alternative 1. The camping service originates at Davis Bayou and travels to Horn Island, to East Ship Island, back to Horn Island and then to Davis Bayou (See Figure 16). In 1990, this system would require 14 landing craft for the camper service and 7 boats for the day-use service. The annual cost for the camper service would be about \$660,700 (See Table 8).



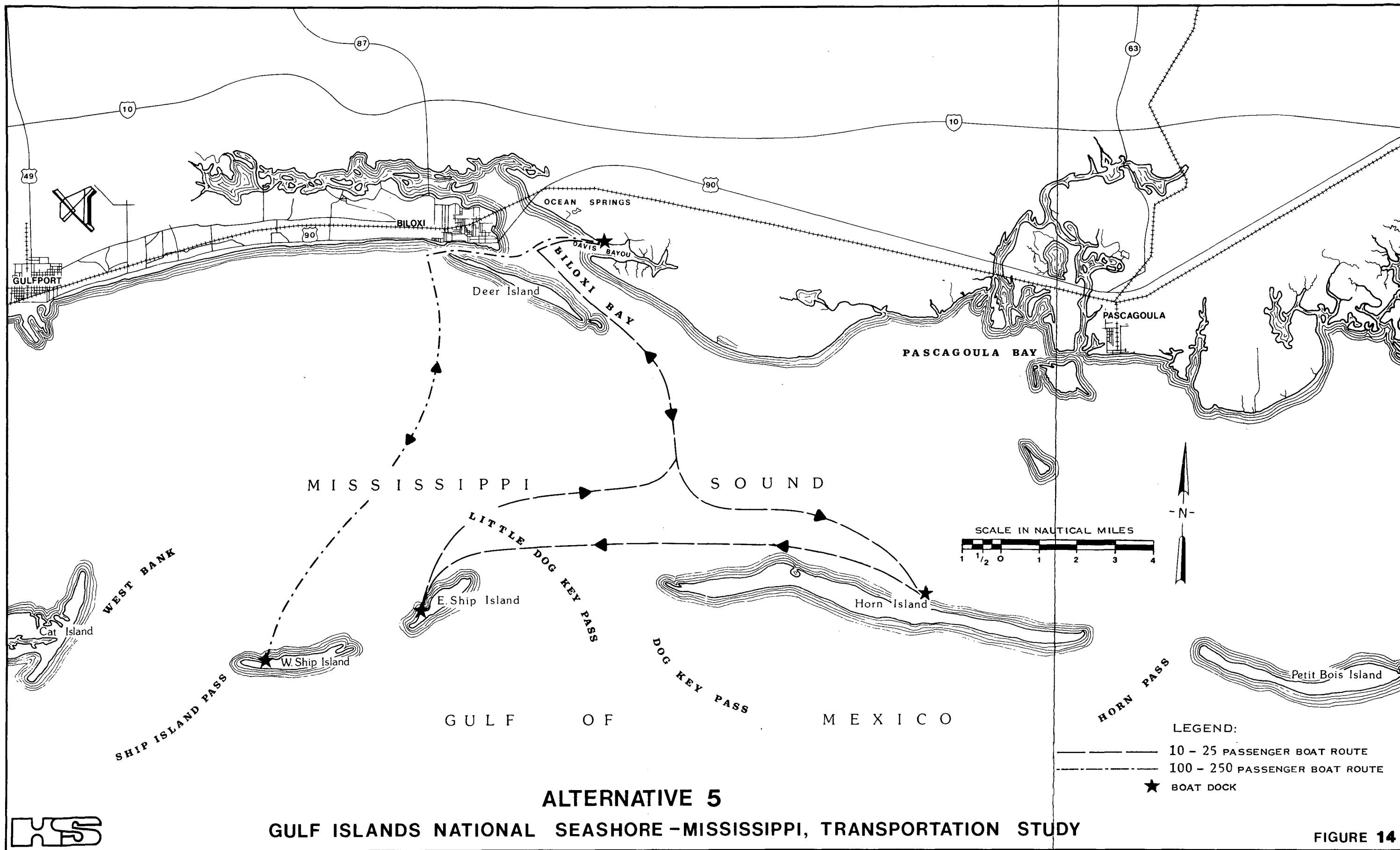


FIGURE 14

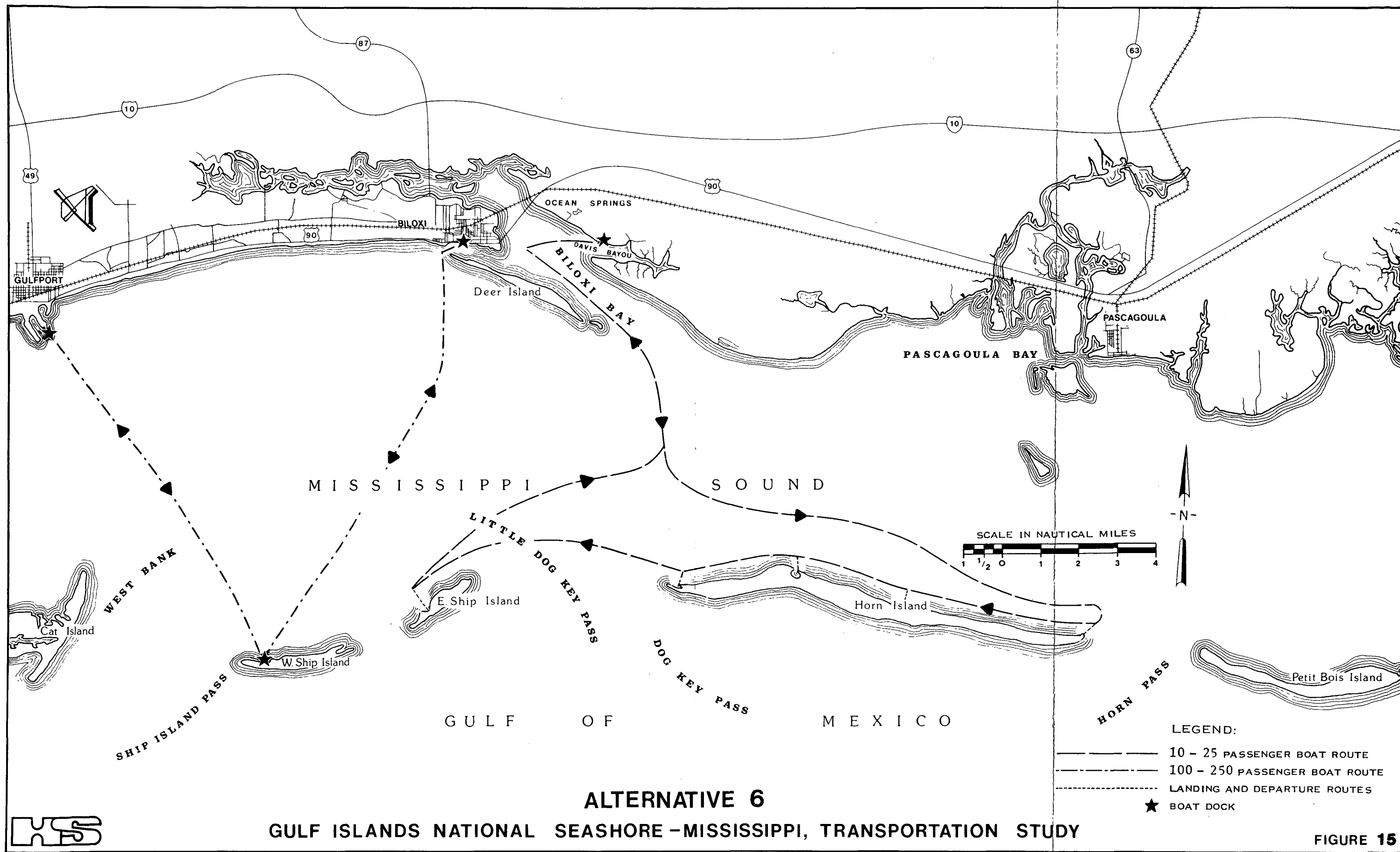


FIGURE 15

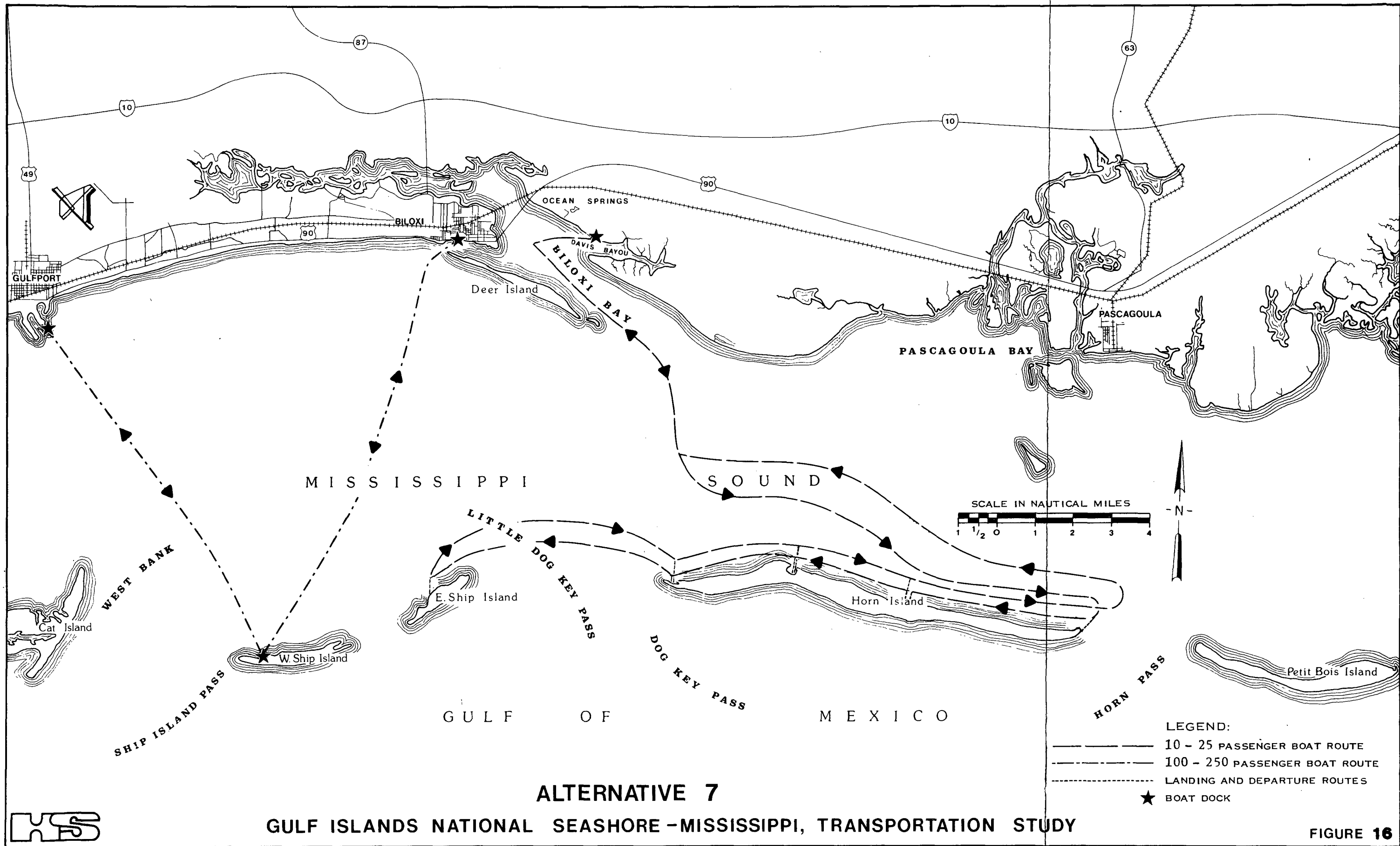


FIGURE 16

Adding this cost to the cost of the day-use service (See Alternative 1), the total annual cost would be approximately \$1,557,300. The resulting 1990 cost per passenger would be about \$12.33 (See Table 9).

Alternative 8 - Alternative 8 provides the same day-use service from Biloxi and Gulfport to West Ship Island as Alternative 1. As shown in Figure 17, the camping service would consist of landing craft and would originate at Davis Bayou, travel to Petit Bois Island, Horn Island and East Ship Island and then return to Davis Bayou. The camping service would require 15 landing craft in 1990, while 7 boats would be needed to service day-use visitors traveling to West Ship Island. The 1990 annual cost of the camping service would be about \$732,000 as shown in Table 8. The total 1990 annual cost of the system would be approximately \$1,628,900 which would result in a total cost per passenger of \$12.90 (See Table 9).

Alternative 9 - As shown in Figure 18, camper service would originate at Davis Bayou and day-use visitors would travel to West Ship Island from Gulfport and Biloxi. A total of 17 landing craft would be required in 1990 to provide the camping service which would travel from Davis Bayou to Horn Island, East Ship Island and West Ship Island, while 7 boats would be required to provide day-use service to West Ship Island. The camping service would have a total 1990 annual cost of nearly \$830,100 (See Table 8). The total system cost would be approximately \$1,722,900. As a result, the cost per passenger for this system would be about \$13.64 as shown in Table 9.

Environmental Impacts

The environmental impacts of the nine transportation alternatives will be defined as having either a positive or negative effect on the environment, and as being either small (slight effect) or large (sizeable effect). The impacts of the type of landing used at the offshore islands and the dredging of a channel at Davis Bayou will also be considered.

All of the nine alternatives will have negative effects on grass beds at Davis Bayou, mud flat areas and the stability of the beaches. These effects will be a result of principally physical forces, due to disturbance from the propellers and wakes of large boats. The grass beds and mud flats may be disturbed and possibly destroyed from the stirring actions of large propellers, while the shorelines and shallow water shore vegetation will suffer from the highly erosive action of multiple boat wakes. The degree of effect is a function of the frequency and the size of the disturbances.

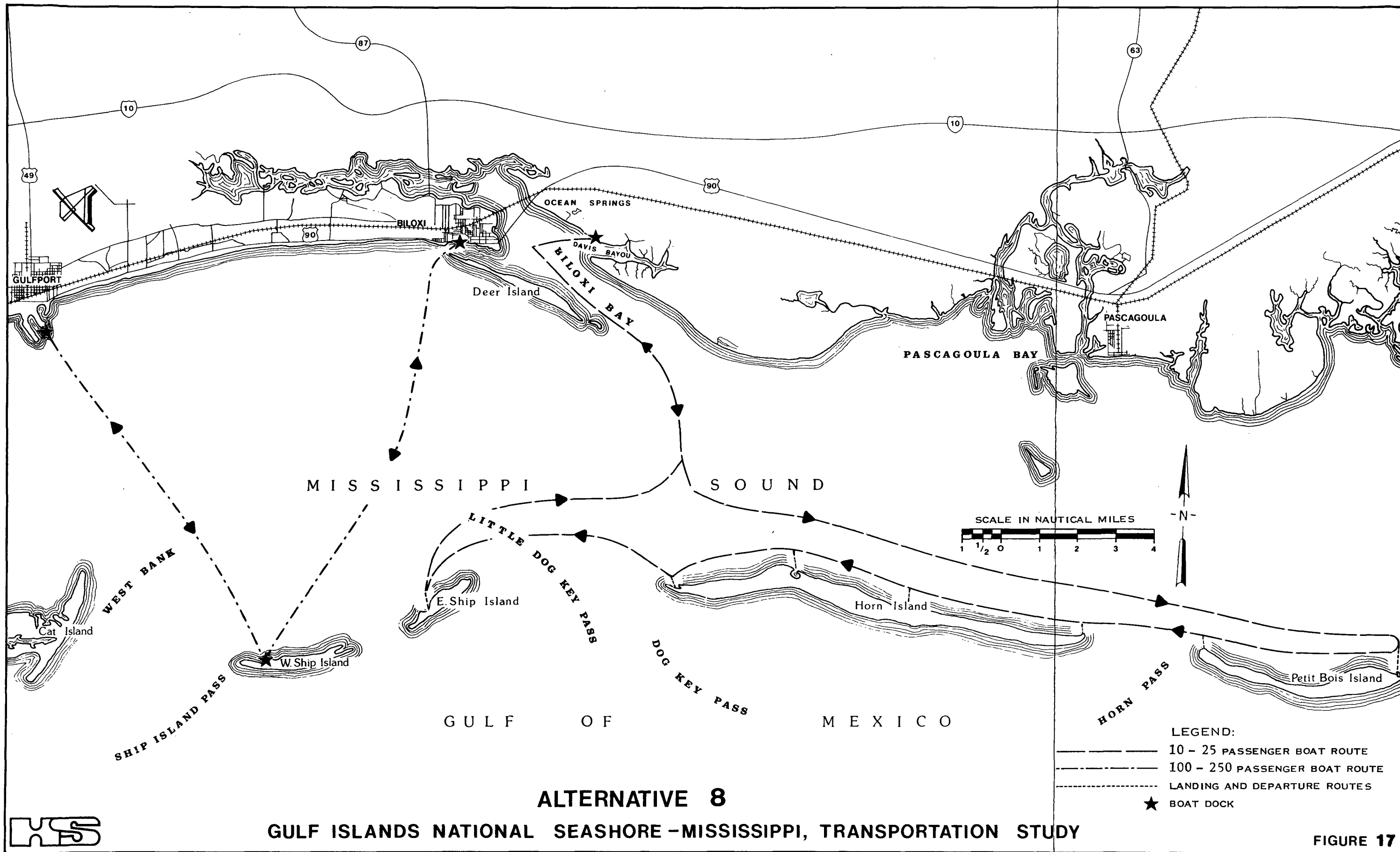
Physical effects from mixing of the waters may become apparent from changes in temperature and/or salinity of the waters. These effects are difficult to predict and may be only speculated at this time. If large boats are employed frequently and operate for long durations, temperature and salinity changes from mixing may be significant in shallow water areas. Minor changes in either or both parameters will affect species distribution and may result in detrimental changes.

In a similar manner, oil and gas leakage, from all of the nine alternatives will introduce a moderate negative impact chemically on the waters and the biology of the Mississippi Sound and the offshore islands. Discharged or spilled petroleum products may be present in amounts up to or exceeding one percent of the total petroleum consumed by the various craft. Petroleum products are lethal to marine organisms if deposition exceeds trace amounts.

Litter, in addition to being unsightly to humans, may be disturbing and/or lethal to fauna and flora. Litter supplies unneeded sources for disturbance and/or destruction by physical forces (e.g. wave action and debris battering the shore, etc.). Litter may also disintegrate, releasing unnecessary chemical compounds into the water.

The beaches of the offshore islands (and the islands themselves) are replenished by the long-shore transport of sand by the prevailing currents. The principle sources of this sand, historically, in the Mississippi Sound have been the Apalachicola, Alabama and Tombigbee Rivers. The westward currents have carried sand from the mouths of these rivers laterally to supply sand to replace that which is eroded. Recently, dams have been constructed on all of these rivers which has minimized the source of sand to replenish the barrier islands. The effects of these modifications have yet to be significantly felt. Extreme caution should be employed in the development of support facilities for each of the alternatives to minimize any further erosion or disturbance of the beaches and the islands. The consequences of such disruptions may be farreaching, both temporally and spatially.

Benthic flora and fauna along the barrier island shores are the most sensitive of the biota to intrusion impacts. The habitats there reflect both stability of the substrate by absorbing and dissipating small amounts of energy and



ALTERNATIVE 8

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

- LEGEND:
- 10 - 25 PASSENGER BOAT ROUTE
 - - - 100 - 250 PASSENGER BOAT ROUTE
 - - - LANDING AND DEPARTURE ROUTES
 - ★ BOAT DOCK

FIGURE 17

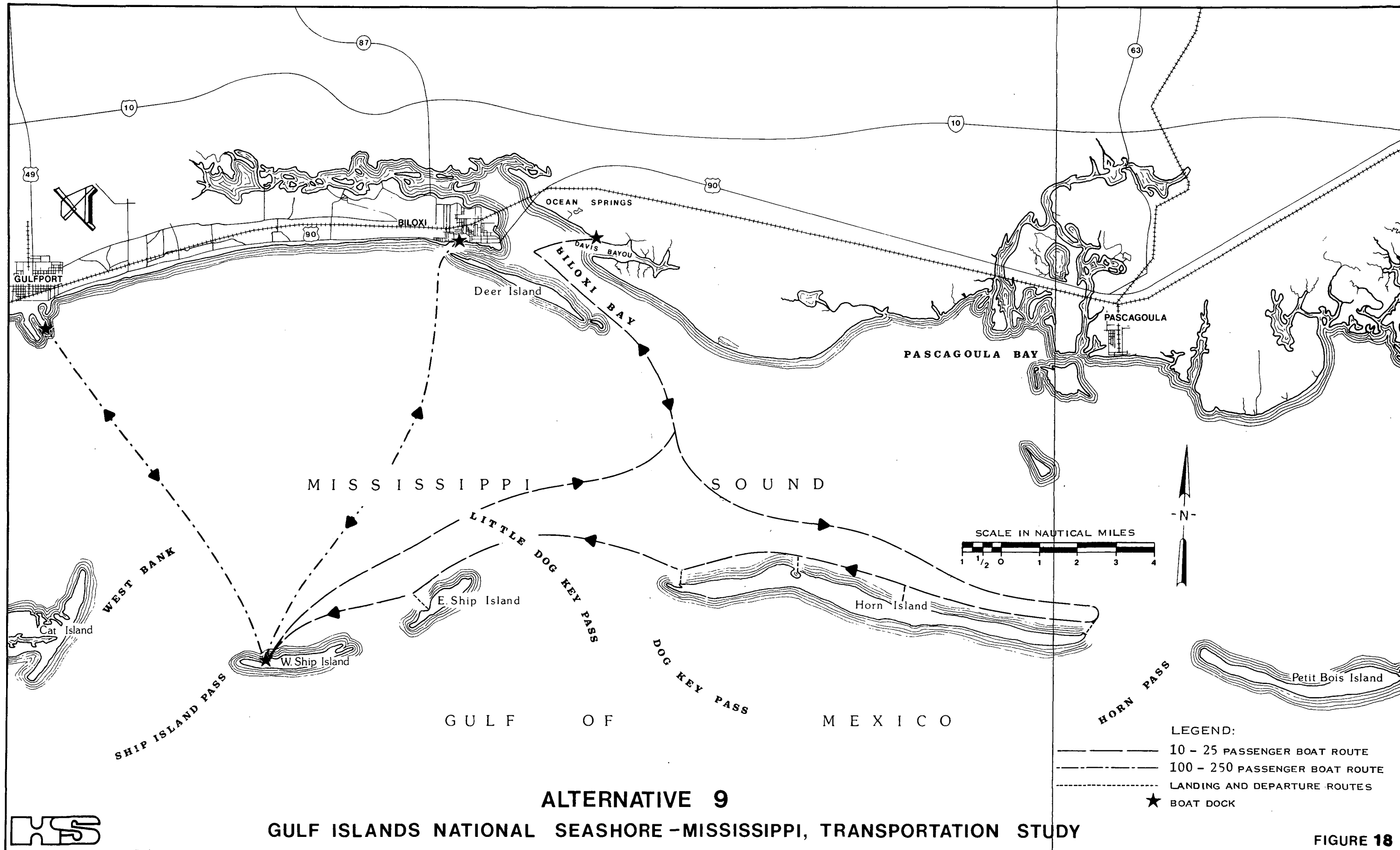


FIGURE 18

sensitivity by being susceptible to and intolerant of changes in physical and/or chemical conditions. The grass beds in this area secure the sands and provide stable habitats for numerous faunal species. The grass beds are extremely sensitive to temperature or salinity changes and increases in erosive factors and effluent concentrations. Some changes may or may not be adverse to a particular faunal species itself, but negative effects on its habitat, e.g. the grass bed, are equally as destructive. Therefore, impacts such as minimizing construction activities, reducing dredging and selecting boats with small wakes are most desirable since they minimize the effects on both the floral and faunal species.

In evaluating the effects of the alternative transportation systems, a balancing compromise between conflicting factors must be achieved. For example, smaller boats may be desirable for a particular route to minimize physical disturbances, yet more frequent trips of these boats would be required to transport the identical number of visitors. In general, those alternatives (Alternatives 1, 3, 6, 7, 8 and 9) which utilize smaller boats, have less frequent trips, slower operating speeds (yielding smaller wakes) and shorter trip routes are favored. Additionally, the encouragement of anti-litter and anti-waste attitudes and values will significantly lessen the impacts of all alternatives.

The impact from boat landings on the offshore islands is considered from two perspectives: with a dock and without a dock (i.e. beach landings). Beach landings impact the islands in several ways. Large negative effects occur to the grass beds and benthic species, due to the scraping of boats, feet, etc. on the bottom during landings. This action, in turn, affects a large negative impact on the fauna associated with the bed by destroying the fauna's habitat, and on the beach itself by destroying the stabilizing factor in the beach's existence.

The impact of a dock on a beach affects a different scenario. A temporary, medium negative impact would occur on the grass beds and associated fauna during the period of construction. A moderate positive impact might result as new habitats would be provided for species which holdfast to substrates. New growth would occur on the pilings of the dock, beginning a new ecosystem based on the holdfast biota. This positively impacts many levels of species from barnacles and oysters to crustaceans, algae and fish. The disturbance caused by propellers and wakes of large boats would result in a negative impact on grass beds, mud flat areas and the stability of the beaches. Trash receptacles may be promoted along the dock supporting a minimal litter campaign and thus minimizing the impact from human throwaways. Finally, from a

sociological standpoint, a dock might be a positive impact. A dock allows access to island to those people who might otherwise be denied due to physical disabilities or attitudinal unwillingness to "wade ashore" from a beach landing.

Dredging a deep water channel (10 to 14 feet) at Davis Bayou to accommodate large vessels could have a large and negative effect. This type of cut would severely alter the flow characteristics of the bayou, allowing a much larger intrusion of sound water into the estuary than previously existed. The immediate effect of dredging would be the introduction of significantly higher salinity concentrations since a deep water channel will provide uninhibited, direct access of deeper bay water into the shallow bayou. Species which are estuarine (low salinity) adapted will be driven from the region. Temperatures in the bayou would most likely change as they would more closely approximate those in the open sound (narrower temperature extremes) than the estuary. Erosion in the bayou would most likely be increased with periodic dredging due to the change in depths. The sources of erosion would be from the overall change in bottom currents and circulation patterns and the suction and disruption from the propellers of the large boats such a channel would accommodate. Erosion from these factors would also affect the banks and marsh areas. These effects would be large and negative.

Further consideration should be given to the effects of periodic dredging. Turbidity would be increased, and pollutants would be spilled. These effects would be large and negative. In addition, dredging is a perpetually recurring problem. Natural and artificial currents would continually attempt to re-fill the channel with sediments, and dredging would be continually required to maintain the channel. Periodic dredging would keep the area in a constant state of flux.

CHAPTER IV

DEVELOPMENT OF MOST VIABLE ALTERNATIVES

Chapter III presented nine different transportation alternatives which were evaluated by the National Park Service. This chapter will present the most viable transportation alternatives as selected by the National Park Service and detail their cost and schedules. In addition, a pro forma profit and loss statement and user-fee analysis for the day-use services only will be included, alternative management options will be discussed and an analysis of the impact of shifting all ferry services to Davis Bayou will be presented.

Selection Of Alternatives

The preliminary alternatives included nine transportation alternatives utilizing new 150-passenger boats in addition to the existing boats for the day-use service and either boats which could be beached (landing craft) or conventional boats for camper service. The Park Service decided to eliminate any alternative in which all of the transportation service originated at Davis Bayou (Alternatives 2, 4 and 5). The Park Service also eliminated Alternatives 7 and 9 and selected Alternatives 1, 3, 6 and 8 as viable transportation alternatives.

The Park Service requested that new 250-passenger boats be considered in the development of the day-use service. As a result, Option 1 was added to each of the four viable alternatives. Therefore, Alternative 1, Option 1; Alternative 3, Option 1; Alternative 6, Option 1 and Alternative 8, Option 1 included new 250-passenger boats for day-use service to West Ship Island.

Since the Park Service desired to analyze a shuttle service between East and West Ship Islands and since the addition of this shuttle service would provide for the concentration of offshore island camping departures from Davis Bayou, a shuttle service between East and West Ship Islands was added to Alternatives 3, 6 and 8. Alternative 1 already included a shuttle service between the two islands. To adequately serve this additional transportation link, the 25-passenger boat route was changed to travel from Davis Bayou to East Ship Island initially rather than traveling from Davis Bayou to Horn Island and then to East Ship Island. The addition of the shuttle service between East and West Ship Islands combined with the purchase of new 150-passenger boats for day-use service will be identified as Option 2. Thus, Alternatives 3, 6 and 8 will have an Option 2. The combination of the shuttle service between East and West Ship Islands

with the purchase of new 250-passenger boats will be identified as Option 3. This option will be added to Alternatives 3, 6 and 8.

Therefore, the following transportation alternatives were detailed:

1. Alternative 1 (includes new 150-passenger boats for day-use service),
2. Alternative 1, Option 1 (includes new 250-passenger vessels for day-use service),
3. Alternative 3 (includes new 150-passenger boats for day-use service),
4. Alternative 3, Option 1 (includes new 250-passenger craft for day-use service),
5. Alternative 3, Option 2 (includes new 150-passenger vessels for day-use service and the shuttle service between East and West Ship Islands),
6. Alternative 3, Option 3 (includes new 250-passenger boats for day-use service and the shuttle service between East and West Ship Islands),
7. Alternative 6 (includes new 150-passenger boats for day-use service),
8. Alternative 6, Option 1 (includes new 250-passenger craft for day-use service),
9. Alternative 6, Option 2 (includes new 150-passenger boats for day-use service and the shuttle service between East and West Ship Islands),
10. Alternative 6, Option 3 (includes new 250-passenger boats for day-use service and the shuttle service between East and West Ship Islands),
11. Alternative 8 (includes new 150-passenger boats for day-use service),
12. Alternative 8, Option 1 (includes new 250-passenger boats for day-use service),
13. Alternative 8, Option 2 (includes new 150-passenger boats for day-use service and shuttle service between East and West Ship Islands),

14. Alternative 8, Option 3 (includes new 250-passenger boats for day-use service and shuttle service between East and West Ship Islands).

The Park Service requested that Alternative 3 be modified to eliminate the docks at the offshore islands and include landing craft which would transport passengers to one location on Horn Island.

Final Transportation Alternatives

In order to minimize the cost of the transportation alternatives, it was assumed that day-use service would not be provided unless there were at least 20 persons desiring to travel on the day-use service to West Ship Island. In addition, it was decided that a new boat would not be purchased just to serve the projected demand on a few of the peak days during a year. Therefore, on the average, the projected peak day patronage would not be accommodated on about ten days during the year. The purchase of a boat just to serve the patronage on these few days was not economically justified.

In addition, the transportation service for campers to the offshore islands would not operate unless there were four persons per day desiring to depart from Davis Bayou. The system would operate on any day on which there were campers already on the offshore islands desiring to return to the mainland.

For those alternatives in which the day-use service transported campers to the offshore islands, it was assumed that the campers, with their camping gear, would occupy the space of two day-use visitors. This would apply to both existing and new boats. Any area designed to store camping gear would reduce the area designated for seating. The capacity of the day-use service vessels were restricted accordingly. For those alternatives which included camper service to East Ship and Horn Islands and a shuttle service between East and West Ship Islands, it was assumed that no campers would be permitted on the day-use service boats. In this case, all campers would depart from and return to Davis Bayou. This concentration of offshore island campers would provide the National Park Service with the opportunity to properly educate those persons desiring to camp on the offshore islands as to the primitive conditions and facilities available on the various islands. This process would provide some quality control of the island usage and would permit the Park Service to encourage those persons whom they felt were not experienced enough to camp on the islands to stay on the mainland. This concentration of campers would also provide

the mechanism by which the collection of camping and transportation fees would be concentrated at one location and handled uniformly. The transport of campers on the day-use service boats would result in some problems with the proper identification of campers, the assessment of the proper camping fee to these persons and the collection of this fee from the day-use service operators.

The day-use boat schedules are designed for 1985 peak day conditions. The peak day schedule is the same for all alternatives. The non-peak day schedule for 150-passenger and 250-passenger boats would not be the same. The 250-passenger boats would not be at capacity on peak days in 1985, and there would be some non-peak days when two 150-passenger boats would be needed to provide the same service that one 250-passenger boat could provide. As a result the operating cost for the system using 250-passenger boats would be less. All of the alternatives will require the purchase of one new boat by 1985 at both of the Biloxi and Gulfport operations. The schedule of the camper service varies from alternative to alternative and, as a result, will be discussed individually.

For all alternatives, the first day-use service boats depart from Gulfport and Biloxi at 8:00 A.M., travel to West Ship Island, remain at West Ship Island for two hours and then return to Gulfport and Biloxi. A second boat leaves around 9:00 A.M. and remains at West Ship Island for about 2 hours. The first boats then leave Gulfport and Biloxi around 1:00 P.M., while the second boats depart around 2:30 P.M. The final boats return to Gulfport and Biloxi around 6:30 in the evening.

It should be noted that Figure 6 shows that the peak passenger arrival times are 10:00 A.M. and 11:00 A.M. However, if boats departed from Gulfport and Biloxi during this time then each boat could only make one trip per day. Thus, four boats rather than two boats would be needed, and as a result, the capital cost of operating the system would double. In addition, there would be a significant increase in operating cost as three crews would be required. In order to minimize these costs, boat schedules were selected to permit two round trips per day by boat. The system is similar to the existing transportation system and results in a reasonable cost per user, while a demand responsive system would approximately double the cost per user.

For each alternative, the operating and capital costs for 1985, 1990 and 1995 were determined. For the purpose of comparing day-use service alternatives, it was assumed that the National Park Service would purchase any new vessels and

that the system would be operated by a private concessionaire. For camper service alternatives, it was assumed that the National Park Service would purchase all vessels and operate the camper service. The operating cost includes:

1. Personnel salaries and benefits - includes manager/supervisor, clerk, mechanic, boat captains and captain's mates,
2. Maintenance cost - includes maintenance cost of the transportation vehicles for the day-use service and the cost of maintaining the support facilities and the transportation vehicles for the camper service. Since the day-use services would utilize private docking facilities, the cost of maintaining the support facilities would be included in the docking fee which is considered a part of the capital cost,
3. Running cost - includes cost of fuel, oil, grease, etc. and
4. Insurance cost.

The day-use service operating cost also includes a general and administrative cost which is ten percent of the above operating cost and an operating fee which is ten percent of the sum of the operating cost and the general and administrative cost. To account for inflation, the operating cost was increased at an annual rate of seven percent.

The capital costs include the amortized annual cost of the transportation vehicles and the required docking fee for the day-use service. The capital costs of the camper service include the cost of the boats and the required support facilities. It was assumed that those support facilities included in the Final Environmental Statement (1) and the draft General Management Plan (2) would be provided by the National Park Service and therefore were not included in the capital cost of the transportation system.

Each of the detailed alternatives includes the estimated patronage. It should be noted that this patronage would vary from alternative to alternative since the service would not operate unless a minimum number of people desired to ride the system. In addition, the system would not accommodate all persons on a few of the peak days during each year. For each of the alternatives, the cost per user for both the day-use and camper service was determined. It should be noted that the average cost per user for the day-use service includes a profit for the operator, but does not include any

fee assessed by the Park Service. Since the present day-use patronage consists of 68 percent adults and 32 percent children, the cost per user must be adjusted to compare with current passenger fees. Assuming that the present split between adults and children remains constant, the average cost per user should be increased by \$0.80 to determine the adult fare and reduced by \$1.70 to determine the children fare. This fare rate schedule would provide for a \$2.50 difference between the adult and children remains constant, the average cost per user should be increased by \$0.80 to determine the adult fare and reduced by \$1.70 to determine the children fare. This fare rate schedule would provide for a \$2.50 difference between the adult and children fares. The cost per user of the camper service indicates what the fare would have to be to provide for a break-even operation assuming that all equipment was owned and operated by the National Park Service.

Alternative 1 - This alternative consists of using the existing ferry service boats with new 150-passenger boats to provide additional day-use service, 25-passenger landing craft to provide access to Horn Island and a 25-passenger shuttle craft (landing craft) operating between East and West Ship Islands (See Figure 19). As shown in Table 10, the operating cost of the day-use service would increase from about \$327,000 in 1980 to more than \$1,693,000 in 1995, while the capital cost would increase from approximately \$39,000 in 1980 to \$308,000 in 1995. As a result, the cost per user would increase from about \$5.94 in 1980 to nearly \$13.49 in 1995.

The cost of transporting campers from Davis Bayou to Horn Island and between East and West Ship Islands would increase from about \$123,000 in 1980 to nearly \$733,000 in 1995. As a result, the cost of operating the system would cost about \$351.43 per passenger in 1980. This cost would reduce as patronage increased as shown in Table 10. The 1985 cost per passenger would be slightly more than \$95.00.

As shown in the 1985 peak day schedules (See Figure 20), three boats would be required to transport passengers from Davis Bayou to Horn Island. One boat should probably be purchased in each of the following years: 1980, 1981, and 1982. Another boat would be required in 1980 to provide the shuttle service between East and West Ship Islands. A round trip from Davis Bayou to two points on Horn Island and back to Davis Bayou would consume about four hours. Thus, each of the three boats could make two round trips per day with the first boat leaving at 8:00 A.M. and the last boat returning to Davis Bayou around 7:30 in the evening. By 1991, a fourth boat would be required to provide the camper service to Horn Island. The day-use service would require the

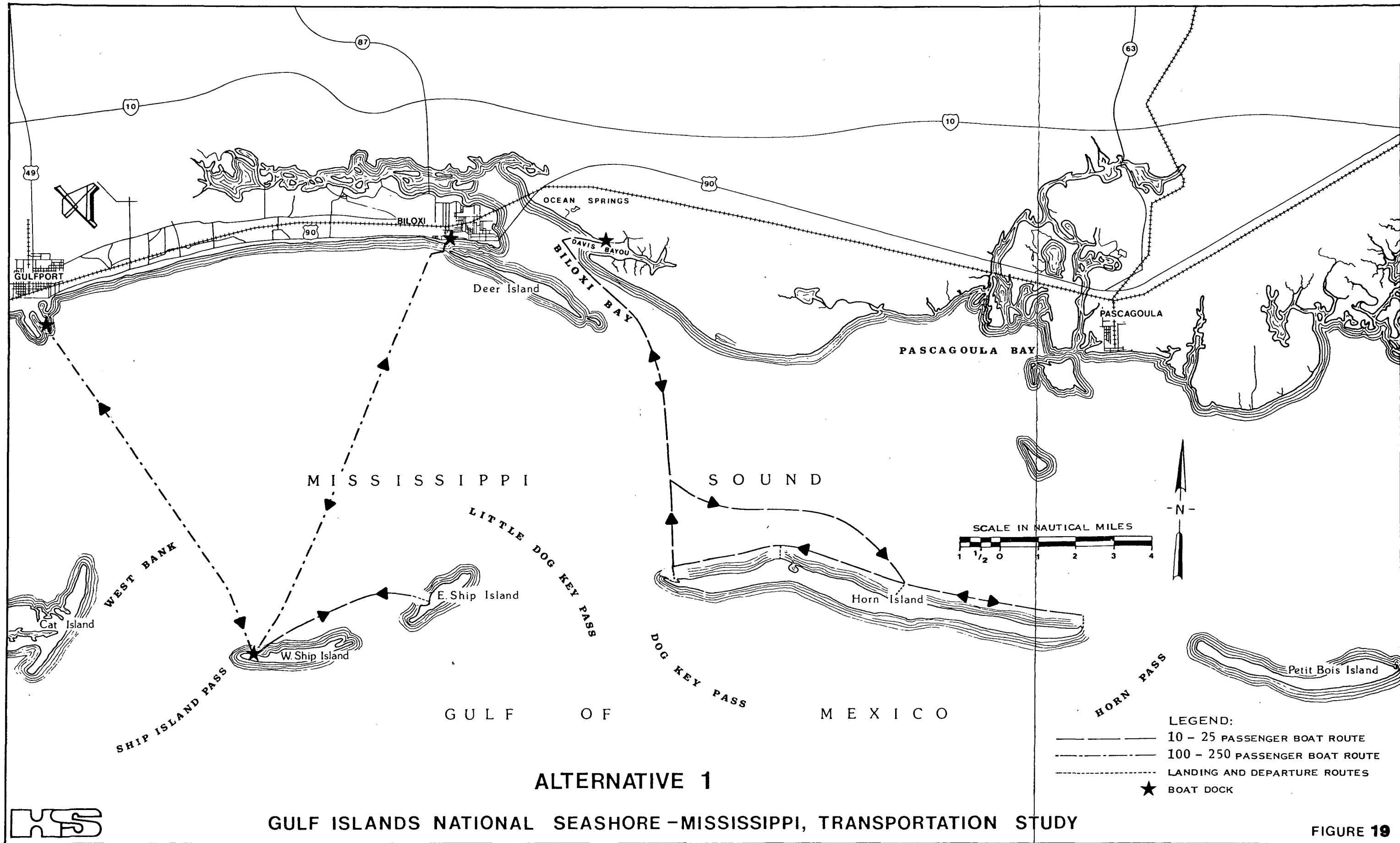


FIGURE 19

TABLE 10

ALTERNATIVE 1 - ALTERNATIVE 1, OPTION 1 COST SUMMARY
 GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
Camper Service ¹					
1980	\$103,000	\$20,000	\$123,000	350	\$351.43
1985	247,000	60,000	307,000	3220	95.34
1990	373,000	60,000	433,000	3960	109.34
1995	652,000	81,000	733,000	5750	127.48
Day-Use Service ²					
1980	\$327,000	\$39,000	\$366,000	61,600	\$5.94
1985	565,000	81,000	646,000	90,100	7.17
1990	947,000	138,000	1,085,000	115,100	9.43
1995	1,693,000	308,000	2,001,000	148,300	13.49
<u>Alternative 1, Option 1</u>					
Camper Service ¹					
1980	\$103,000	\$20,000	\$123,000	350	\$351.43
1985	247,000	60,000	307,000	3220	95.34
1990	373,000	60,000	433,000	3960	109.34
1995	652,000	81,000	733,000	5750	127.48
Day-Use Service ²					
1980	\$327,000	\$50,000	\$377,000	61,600	\$6.12
1985	591,000	102,000	693,000	91,200	7.60
1990	914,000	106,000	1,020,000	115,500	8.83
1995	1,687,000	190,000	1,877,000	149,000	12.60

¹ Assumes Park Service Owns and Operates Equipment.

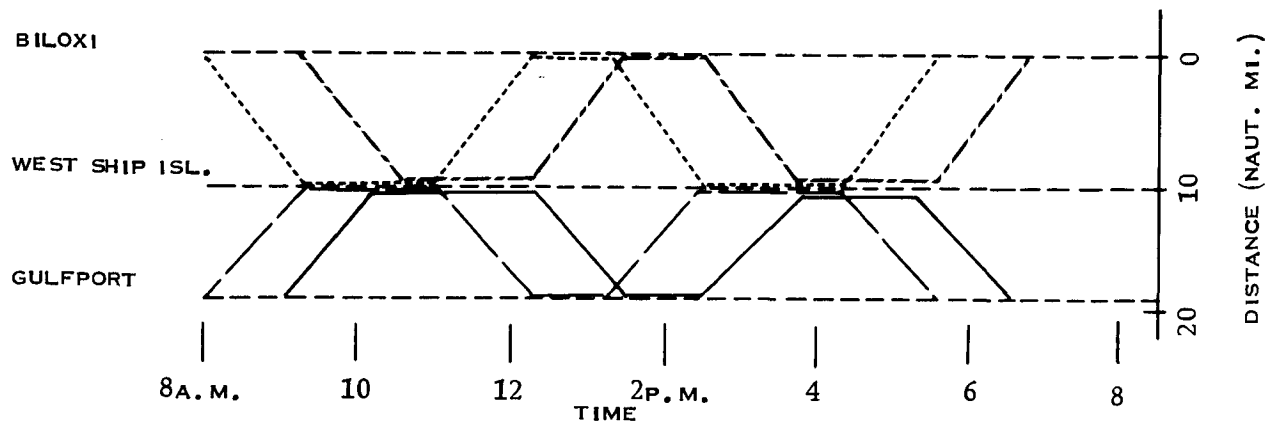
² Assumes Park Service Owns Equipment, Operated by Private Concessionaire.

purchase of one new 150-passenger boat at both Biloxi and Gulfport prior to 1985. The Biloxi boat should be needed around 1981, and the Gulfport boat should be needed in 1980. By 1993, a second new boat would be needed at Biloxi, while new boats should be needed at Gulfport in 1986 and 1991.

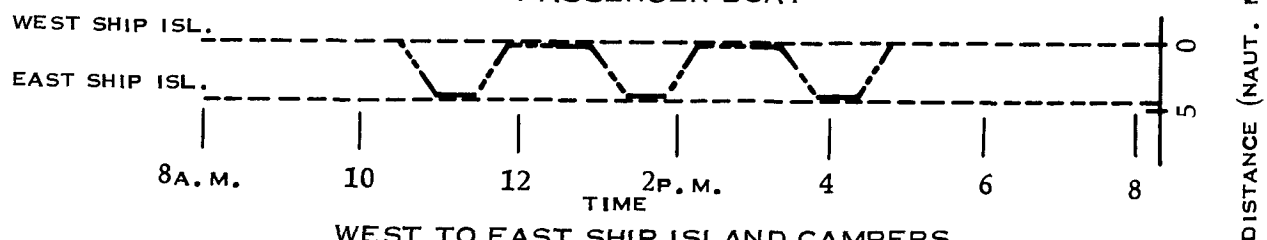
Alternative 1, Option 1 - This alternative consists of using the same vessels as in Alternative 1 except that the day-use service would consist of the existing ferry service boats and new 250-passenger boats. The camper service operation and costs would be the same as Alternative 1. As shown in Table 10, the operating cost of the 250-passenger boats would not differ significantly from the cost of operating the 150-passenger boats; however, the capital cost would be significantly reduced in 1990 and 1995 with Alternative 1, Option 1 as only one new 250-passenger boat would be needed at Biloxi (purchased around 1981) and two new 250-passenger boats would be needed at Gulfport (one purchased around 1980 and one in 1991). As a result, the cost per passenger would increase from slightly more than \$6.12 in 1980 to nearly \$12.60 in 1995. The 1985 peak day boat service to West Ship Island using 250-passenger boats would not vary from the schedule for 150-passenger vessels as shown in Figure 21. However, the peak day schedule would vary in years thereafter.

Alternative 3 - This alternative consist of the same day-use service as Alternative 1; however, the camper service consists of a boat traveling from Davis Bayou to East Ship Island to one location on Horn Island and back to Davis Bayou (See Figure 22). The camper service would begin at 8:00 A.M. with the last boat returning to Davis Bayou around 7:30 P.M. As shown in Figure 23, this alternative's 1985 peak day camper schedule would require three vessels, one purchased in 1980, one in 1981 and one in 1984. Each boat would make two round trips per day, and each round trip would take about 4-1/2 hours. This system would require that additional landing craft be purchased in 1987 and 1991.

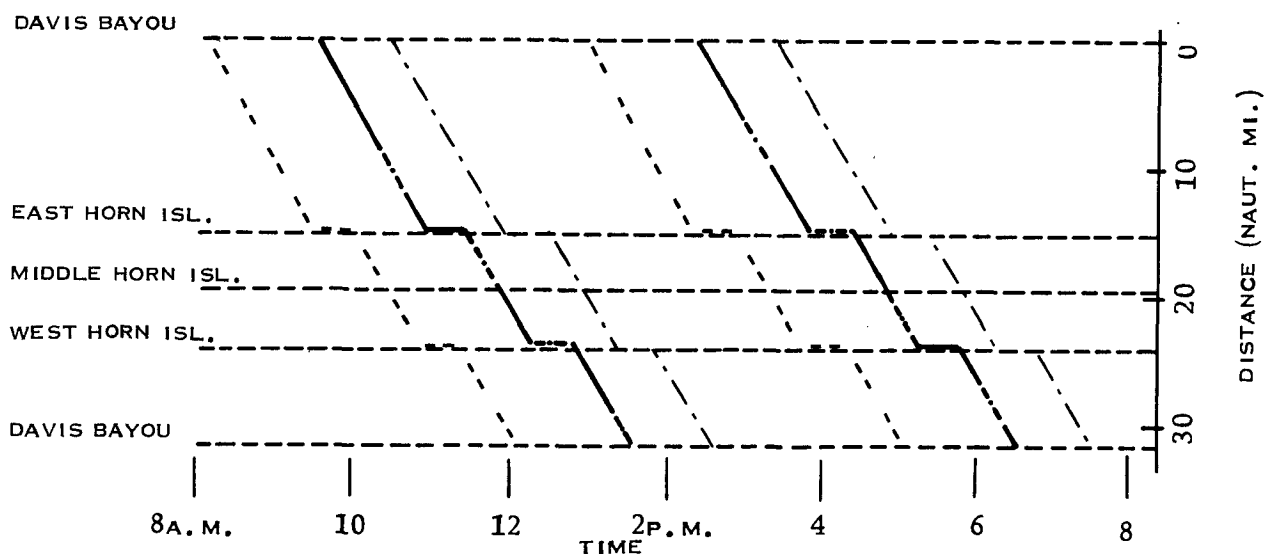
The cost of the day-use service for Alternative 3 should be slightly less than that in Alternative 1 since campers desiring to travel to East Ship Island would not travel on the day-use system. A new boat should be needed in Biloxi in 1981, while a second new boat should probably not be needed until 1994. One new boat should be purchased for Gulfport in 1987 and another in 1992. The cost per passenger would increase from nearly \$5.91 in 1980 to about \$13.35 in 1995 as shown on Table 11. Since this alternative does not include a shuttle service between East and West Ship Islands,



DAY - USE VISITORS, EAST AND WEST SHIP ISLAND CAMPERS
150 PASSENGER BOAT



WEST TO EAST SHIP ISLAND CAMPERS
25 PASSENGER LANDING CRAFT



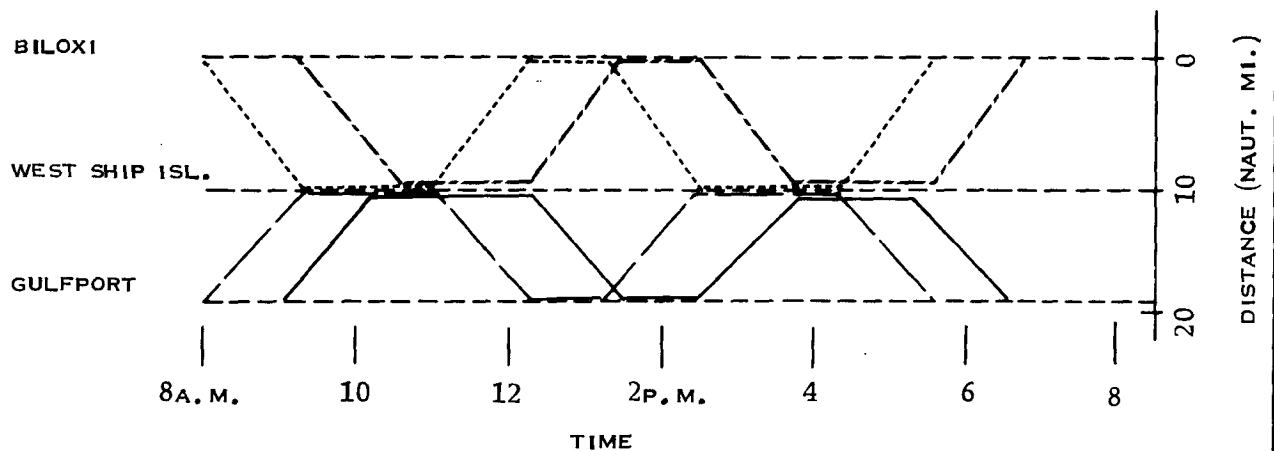
DAVIS BAYOU TO HORN ISLAND CAMPERS
25 PASSENGER LANDING CRAFT

NOTE: BOAT SCHEDULES ASSUME TWO STOPS MADE AT HORN ISLAND, LOCATION OF STOPS CAN VARY. 250 PASSENGER BOAT SCHEDULE MAY BE USED IN PLACE OF 150 PASSENGER BOAT SCHEDULE.

ALTERNATIVE 1 1985 PEAK DAY SCHEDULES

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY



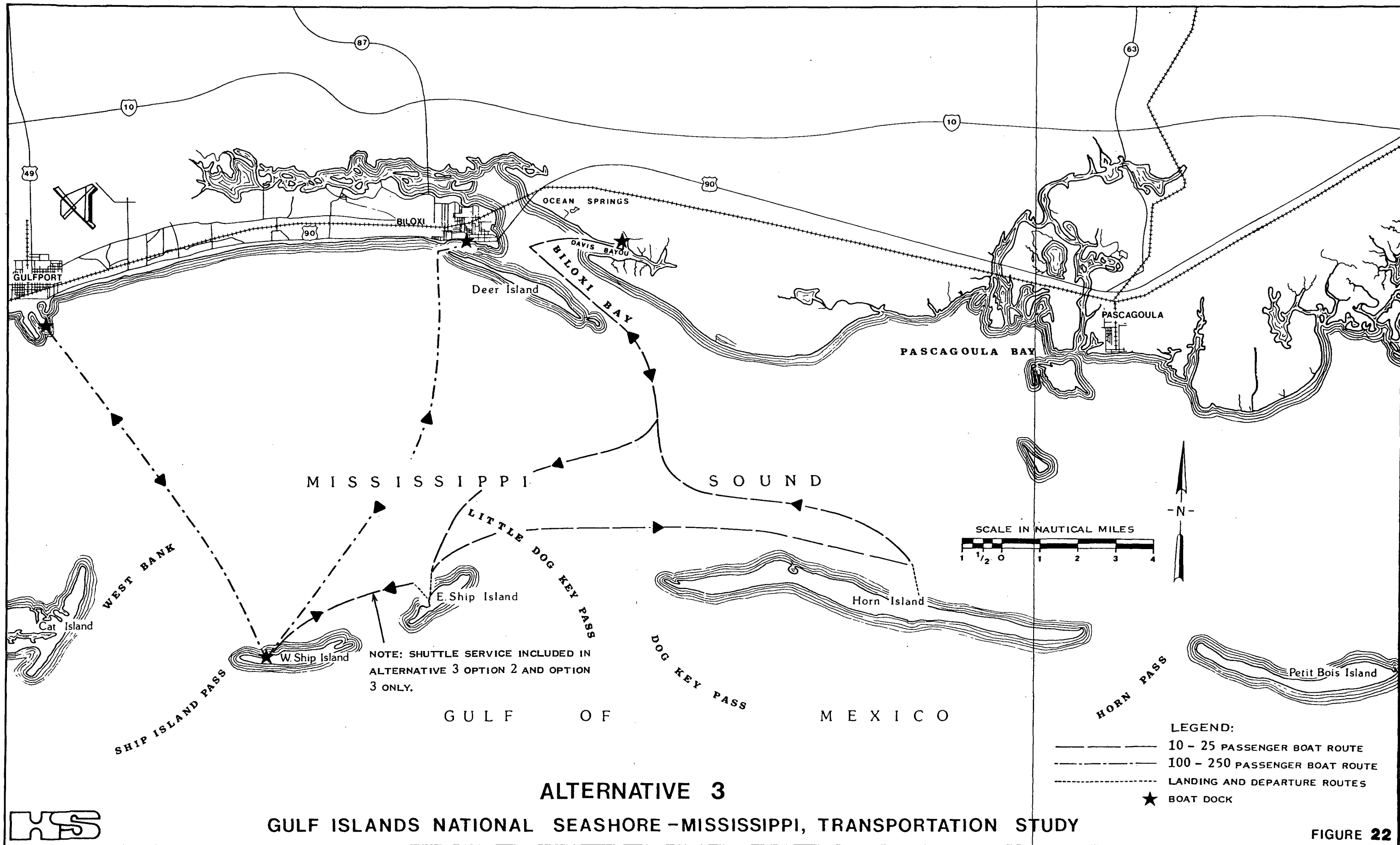


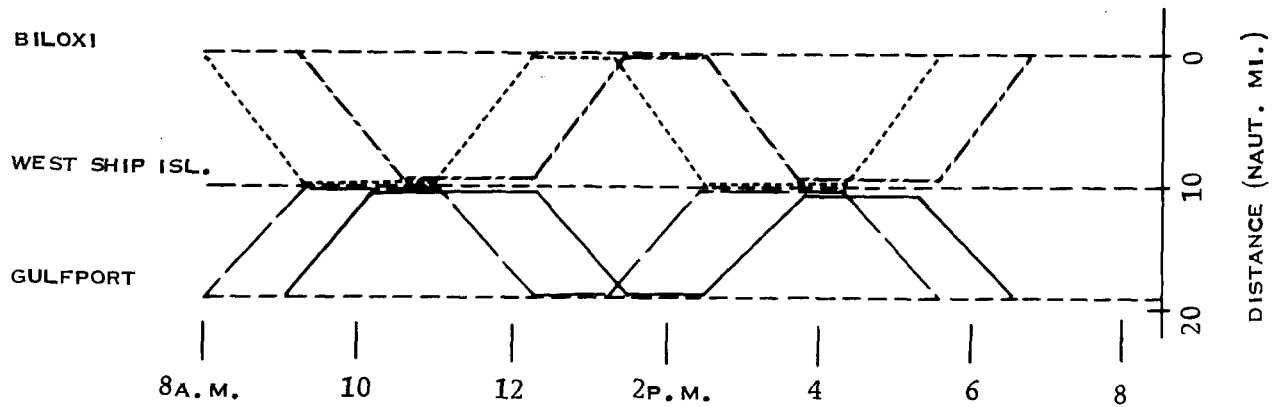
SERVICE FROM BILOXI AND GULFPORT TO WEST SHIP ISLAND

250 PASSENGER PEAK DAY BOAT SERVICE TO WEST SHIP ISLAND

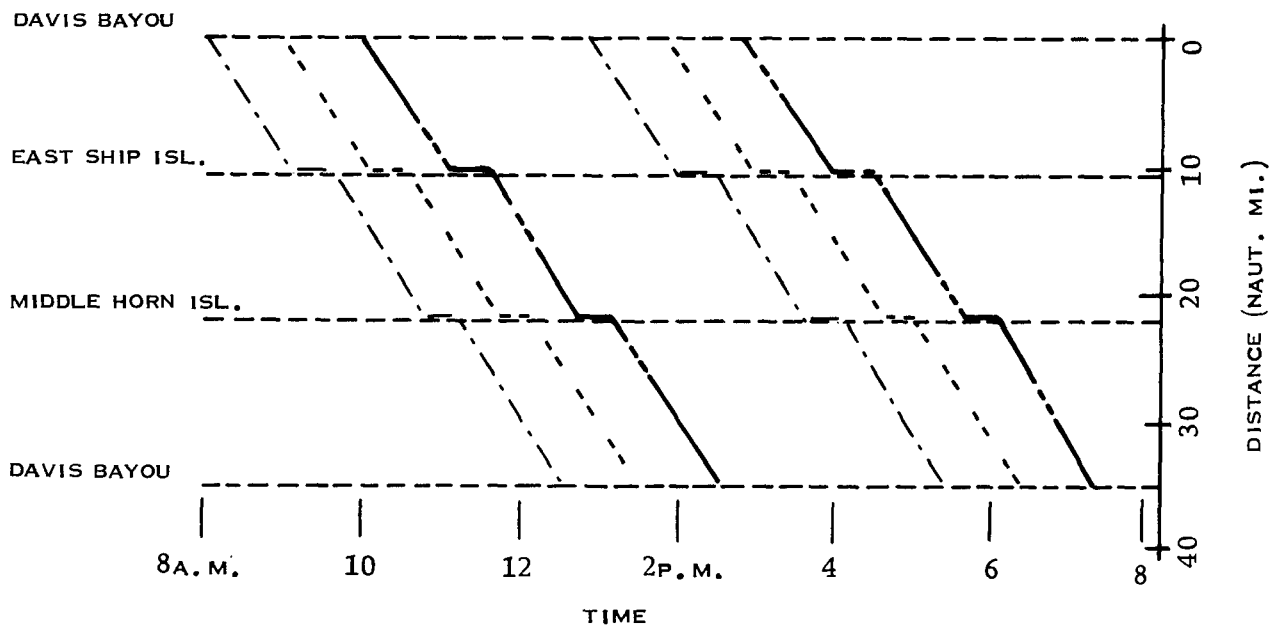
GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY







DAY - USE VISITORS AND WEST SHIP ISLAND CAMPERS
150 PASSENGER BOAT



DAVIS BAYOU TO HORN AND EAST SHIP ISLAND CAMPERS
25 PASSENGER LANDING CRAFT

NOTE : 250 PASSENGER BOAT SCHEDULE MAY BE USED IN PLACE OF 150 PASSENGER BOAT SCHEDULE.

ALTERNATIVE 3 1985 PEAK DAY SCHEDULES

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI

TRANSPORTATION STUDY

FIGURE 23



TABLE 11

ALTERNATIVE 3 - ALTERNATIVE 3, OPTION 1 - ALTERNATIVE 3, OPTION 2
ALTERNATIVE 3, OPTION 3 COST SUMMARY

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
Camper Service ¹					
1980	\$94,000	\$10,000	\$104,000	660	\$157.58
1985	227,000	69,000	296,000	4390	67.43
1990	375,000	85,000	460,000	6030	76.29
1995	598,000	106,000	704,000	8040	87.56
Day-Use Service ²					
1980	\$327,000	\$39,000	\$366,000	61,900	\$5.91
1985	554,000	81,000	635,000	90,700	7.00
1990	941,000	138,000	1,079,000	115,800	9.32
1995	1,674,000	308,000	1,982,000	148,500	13.35
<u>Option 1</u>					
Camper Service ¹					
1980	\$94,000	\$10,000	\$104,000	660	\$157.58
1985	227,000	69,000	296,000	4390	67.43
1990	375,000	85,000	460,000	6030	76.29
1995	598,000	106,000	704,000	8040	87.56
Day-Use Service ²					
1980	\$327,000	\$50,000	\$377,000	61,900	\$6.09
1985	577,000	102,000	679,000	91,400	7.43
1990	908,000	106,000	1,014,000	116,000	8.74
1995	1,650,000	190,000	1,840,000	149,300	12.32

¹ Assumes Park Service Owns and Operates Equipment.

² Assumes Park Service Owns Equipment, Operated by Private Concessionaire.

TABLE 11 (Cont'd)

<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
<u>Option 2</u>					
Camper Service ¹					
1980	\$109,000	\$20,000	\$129,000	750	\$172.00
1985	314,000	92,000	406,000	5560	73.02
1990	478,000	110,000	588,000	6870	85.59
1995	730,000	110,000	840,000	8630	97.33
Day-Use Service ²					
1980	\$327,000	\$39,000	\$366,000	62,000	\$5.90
1985	550,000	81,000	631,000	90,900	6.94
1990	931,000	138,000	1,069,000	116,000	9.22
1995	1,629,000	308,000	1,937,000	149,000	13.00
<u>Option 3</u>					
Camper Service ¹					
1980	\$109,000	\$20,000	\$129,000	750	\$172.00
1985	314,000	92,000	406,000	5560	73.02
1990	478,000	110,000	588,000	6870	85.59
1995	730,000	110,000	840,000	8630	97.33
Day-Use Service ²					
1980	\$327,000	\$50,000	\$377,000	61,900	\$6.09
1985	571,000	102,000	673,000	91,400	7.36
1990	901,000	106,000	1,007,000	116,100	8.67
1995	1,625,000	190,000	1,815,000	149,500	12.14

¹ Assumes Park Service Owns and Operates Equipment.

² Assumes Park Service Owns Equipment, Operated by Private Concessionaire.

the cost per passenger of the camper service would be somewhat less than that of Alternative 1. The cost per user would decrease from about \$157.58 in 1980 to nearly \$67.43 in 1985, increasing to more than \$87.00 in 1995.

Alternative 3, Option 1 - The routes, the 1985 peak day schedules and the cost of the camper service for this alternative are the same as Alternative 3 (See Figures 22 and 23). The cost of the day-use service with new 250-passenger vessels would increase from approximately \$6.09 per passenger in 1980 to about \$12.32 in 1995 (See Table 11). This cost is slightly less than that of Alternative 1, Option 1. The day-use service should require a new boat in Biloxi in 1981 and a new boat in Gulfport in 1980 and another in 1992. The camper service should require that a landing craft be purchased in each of the following years: 1980, 1981, 1984, 1987 and 1991.

Alternative 3, Option 2 - This alternative consists of the same routes as Alternative 3 with the addition of a shuttle service between East and West Ship Islands (See Figure 22). This additional shuttle service would enable the Park Service to have all camping activities originate at Davis Bayou. The day-use service would be the same as that previously described in Alternative 3. Additional boats for Biloxi should be needed in 1984 and 1994, while additional boats for Gulfport would be needed in 1980, 1988 and 1992. The camper service would probably require that one boat be purchased in each of the following years: 1981, 1982, 1984 and 1989 to provide service from Davis Bayou to the offshore islands. Another craft should be purchased in 1980 to provide the shuttle service. As shown in Figure 24, each of the four boats used in 1985 to provide camper service would make two round trips per day during the peak days. Each round trip would take about 4-1/2 hours to complete.

As a result of the additional boats, the cost of the camper service would be slightly higher than the cost of the Alternative 3 service. As shown in Table 11, the cost per user would be about \$172.00 in 1980. This cost would decrease to slightly more than \$73.00 per passenger in 1985 and increase to about \$97.33 in 1995. The cost of the day-use service would be slightly less than the cost of the same service in Alternative 3. This reduction in cost is due to the fact that additional space would be available on the ferry service for day-use passengers since all campers and their camping gear would utilize the camper service. As shown in Table 11, the cost per user would increase from about \$5.90 in 1980 to approximately \$13.00 in 1985.

Alternative 3, Option 3 - This system consists of the same service as Alternative 3, Option 2 with the exception that any new vessels purchased to provide day-use service would be 250-passenger boats. A new 250-passenger boat should be needed in Biloxi in 1984, while a new boat should be needed in Gulfport in 1980 and another in 1993. The cost of the day-use service would increase from about \$6.09 per passenger in 1985 to approximately \$12.14 per passenger in 1995. This alternative would use the same 1985 peak day schedules as Alternative 3, Option 2 as shown in Figure 24.

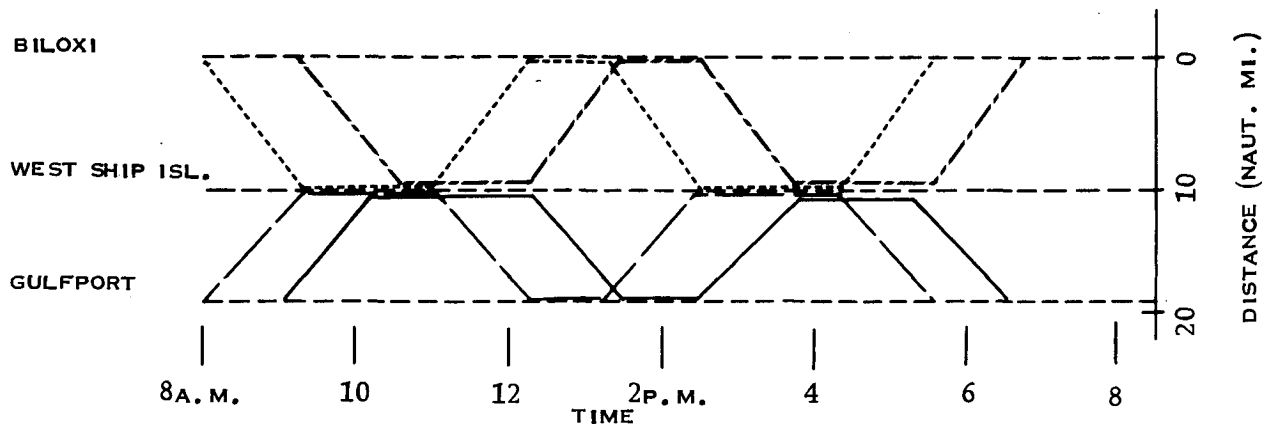
Alternative 6 - This alternative consists of the ferry service transporting day-use visitors and West Ship Island campers on 150-passenger boats and landing craft transporting campers to Horn and East Ship Islands (See Figure 25). The camper service would travel from Davis Bayou to East Ship Island, to two locations on Horn Island and then return to Davis Bayou. The two locations would vary from four areas on the island, the two ends of the island, the area near the ranger station and in the vicinity of the chimney.

As shown in Figure 26, four boats would be required to serve the 1985 peak day-use demands. Two of the boats would make two round trips per day with each round trip requiring about 5-1/2 hours to complete. By 1985, six landing craft would be required to transport the offshore island campers. The schedule and cost of the ferry system transporting day-use visitors and West Ship Island campers would be the same as Alternative 3. The purchase date of all boats would also be the same as Alternative 3.

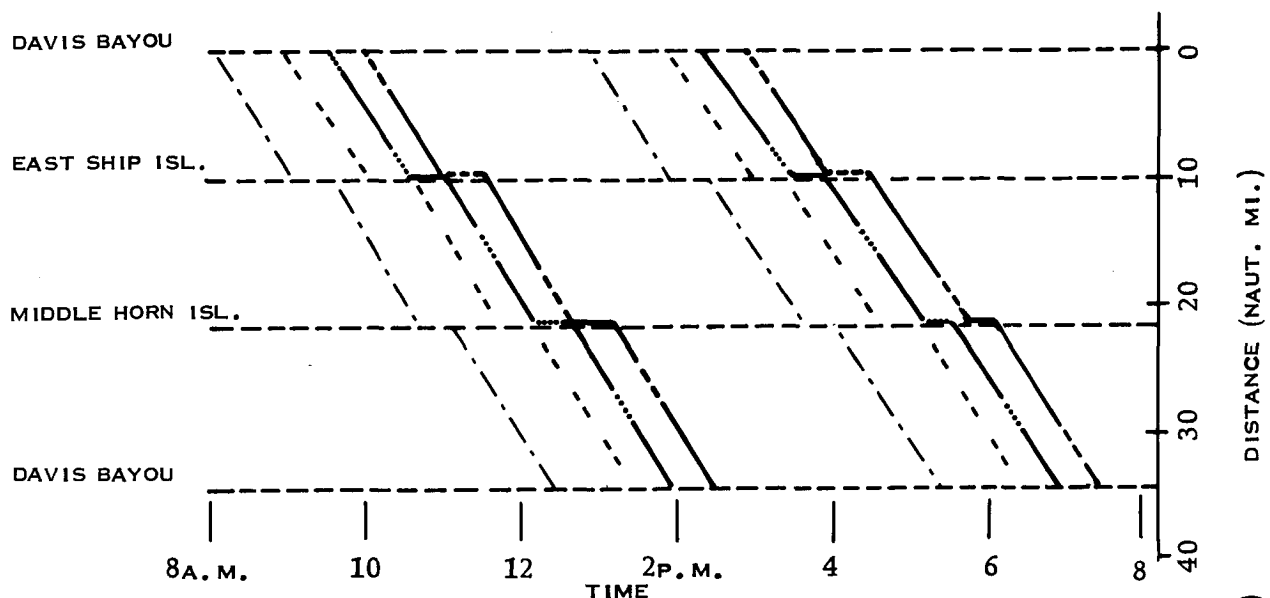
As shown in Table 12, the cost of the camper service would be less than Alternative 1 but greater than Alternative 3. The cost of the system during 1980, the initial year of operation, would be about \$162.12 per passenger. This cost would reduce to approximately \$77.22 in 1985 and increase to more than \$97.00 in 1995.

Alternative 6, Option 1 - This alternative consists of the same operation as Alternative 6 with the exception of new 250-passenger boats being purchased to provide day-use service. The cost of this day-use service is the same as that previously discussed for Alternative 3, Option 1. The cost of the camper service would be the same as that of Alternative 6. The purchase date of all vessels would be the same as Alternative 3, Option 1.

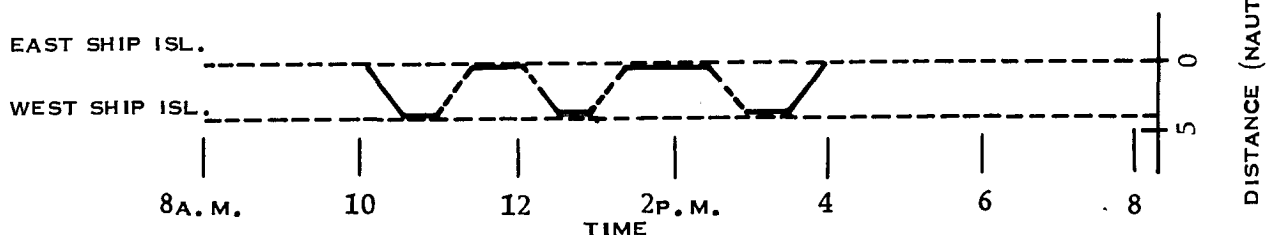
Alternative 6, Option 2 - This alternative consists of the same service as Alternative 6 with the addition of the shuttle service between East and West Ship Islands (See



DAY - USE VISITORS
150 PASSENGER BOAT



ALL CAMPERS
25 PASSENGER LANDING CRAFT



EAST TO WEST SHIP ISLAND CAMPERS

25 PASSENGER LANDING CRAFT

NOTE: 250 PASSENGER BOAT SCHEDULE MAY BE USED IN PLACE OF 150 PASSENGER BOAT SCHEDULE.

ALTERNATIVE 3 OPTION 2&3 1985 PEAK DAY SCHEDULES **GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI**



TRANSPORTATION STUDY

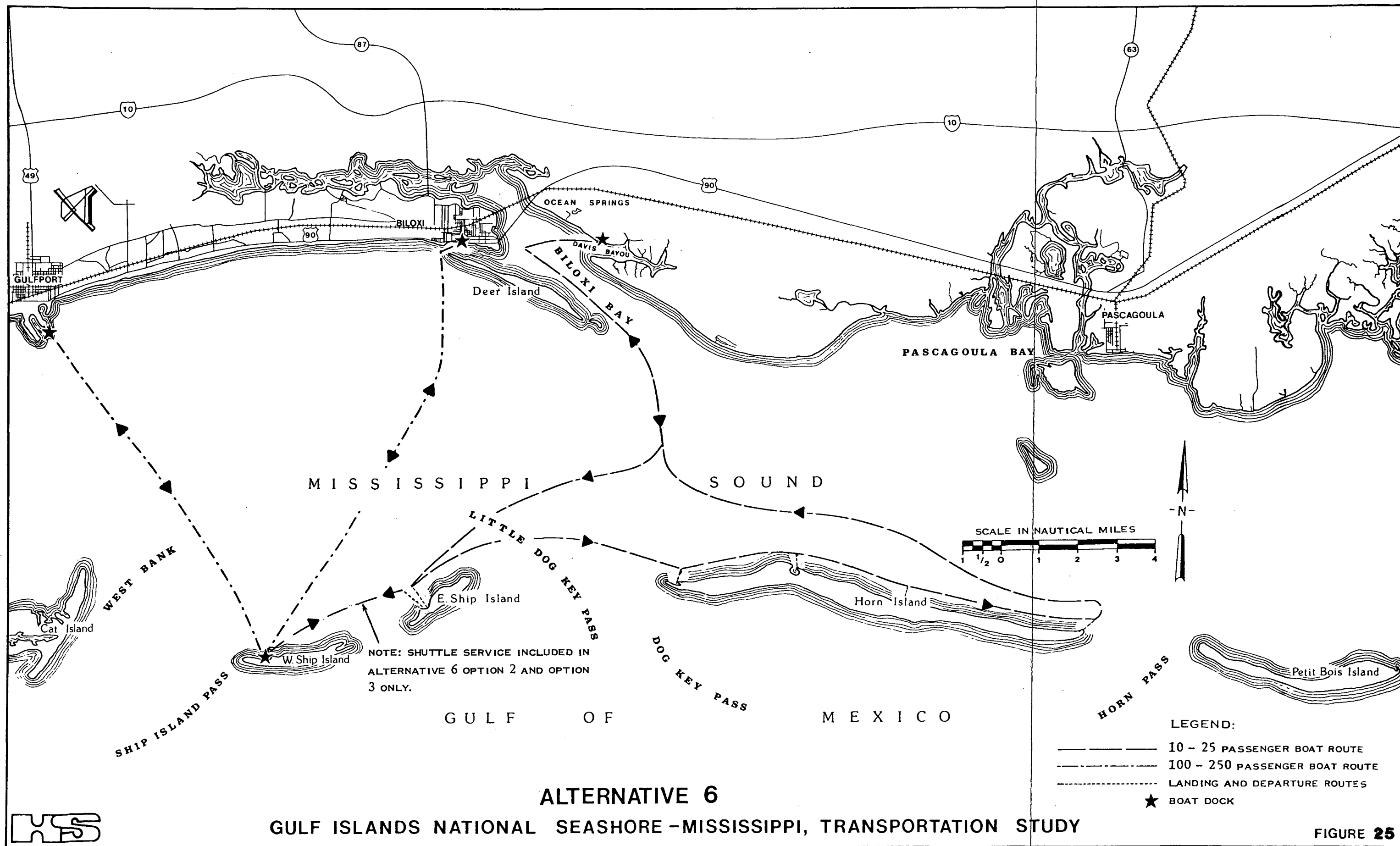
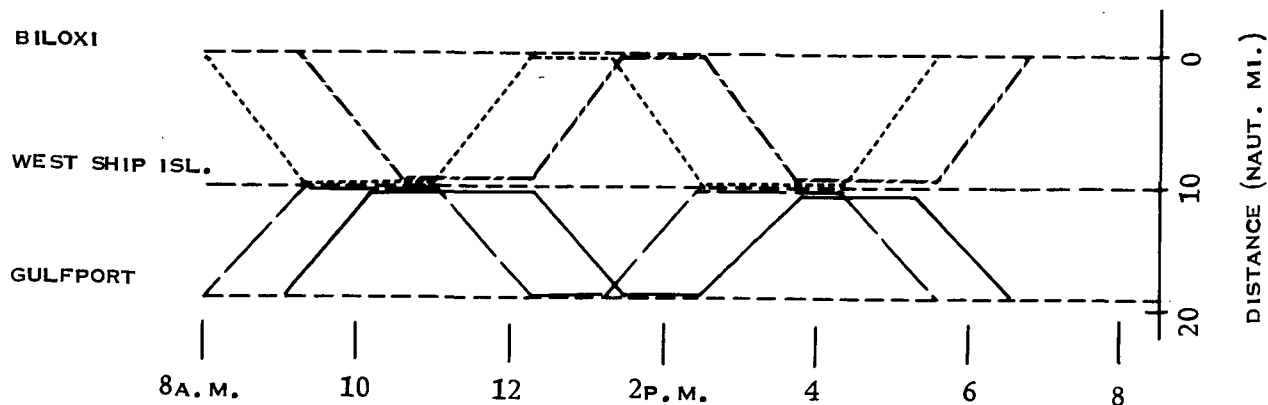
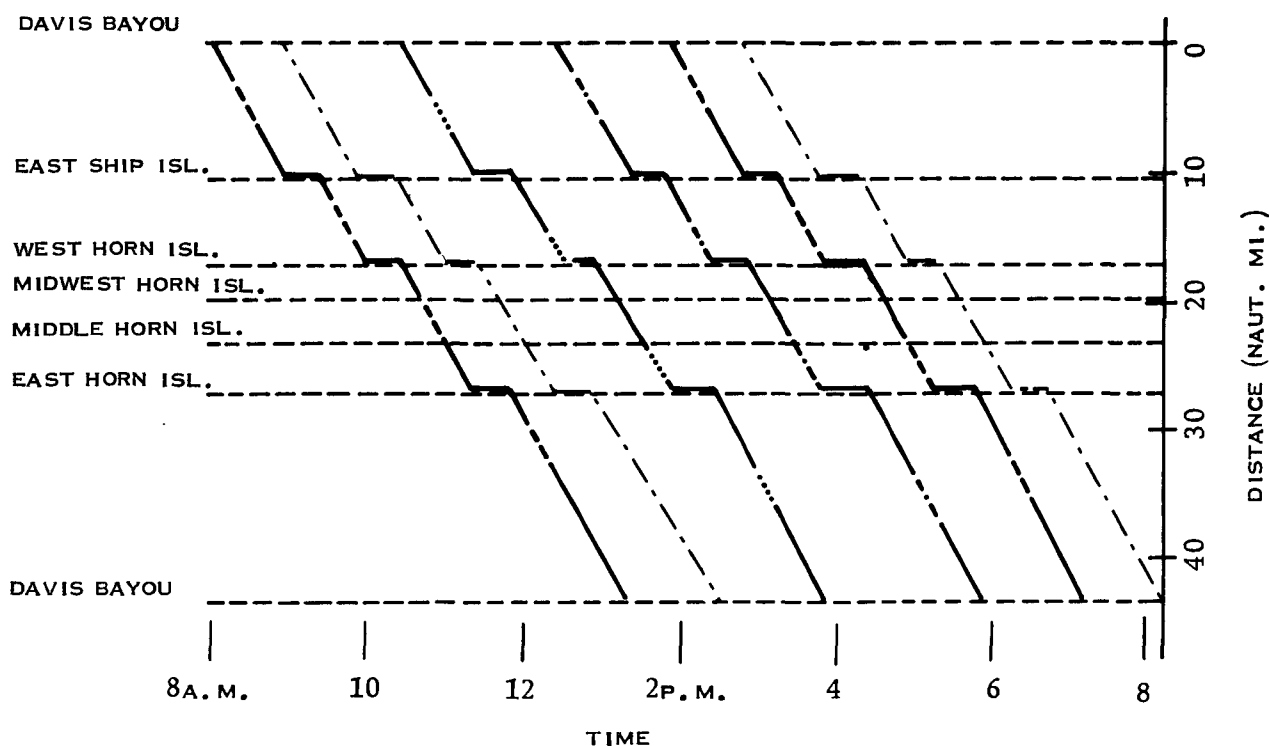


FIGURE 25



DAY - USE VISITORS AND WEST SHIP ISLAND CAMPERS
150 PASSENGER BOAT



DAVIS BAYOU TO HORN AND EAST SHIP ISLAND CAMPERS
25 PASSENGER LANDING CRAFT

NOTE: BOAT SCHEDULES ASSUME TWO STOPS MADE AT HORN ISLAND,
LOCATION OF STOPS CAN VARY. 250 PASSENGER BOAT SCHEDULE MAY
BE USED IN PLACE OF 150 PASSENGER BOAT SCHEDULE

ALTERNATIVE 6 1985 PEAK DAY SCHEDULES

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY



TABLE 12

ALTERNATIVE 6 - ALTERNATIVE 6, OPTION 1 - ALTERNATIVE 6, OPTION 2
ALTERNATIVE 6, OPTION 3 COST SUMMARY

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
Camper Service ¹					
1980	\$97,000	\$10,000	\$107,000	660	\$162.12
1985	258,000	81,000	339,000	4390	77.22
1990	472,000	97,000	569,000	6030	94.36
1995	664,000	118,000	782,000	8040	97.26
Day-Use Service ²					
1980	\$327,000	\$39,000	\$366,000	61,900	\$5.91
1985	554,000	81,000	635,000	90,700	7.00
1990	941,000	138,000	1,079,000	115,800	9.32
1995	1,674,000	308,000	1,982,000	148,500	13.35
<u>Option 1</u>					
Camper Service ¹					
1980	\$97,000	\$10,000	\$107,000	660	\$162.12
1985	258,000	81,000	339,000	4390	77.22
1990	472,000	97,000	569,000	6030	94.36
1995	664,000	118,000	782,000	8040	97.26
Day-Use Service ²					
1980	\$327,000	\$50,000	\$377,000	61,900	\$6.09
1985	577,000	102,000	679,000	91,400	7.43
1990	908,000	106,000	1,014,000	116,000	8.74
1995	1,650,000	190,000	1,840,000	149,300	12.32

¹ Assumes Park Service Owns and Operates Equipment.

² Assumes Park Service Owns Equipment, Operated by Private Concessionaire.

TABLE 12 (Cont'd)

<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
<u>Option 2</u>					
Camper Service ¹					
1980	\$112,000	\$20,000	\$132,000	750	\$176.00
1985	403,000	104,000	507,000	5560	91.19
1990	528,000	120,000	648,000	6870	94.32
1995	931,000	141,000	1,072,000	8630	124.22
Day-Use Service ²					
1980	\$327,000	\$39,000	\$366,000	62,000	\$5.90
1985	550,000	81,000	631,000	90,900	6.94
1990	931,000	138,000	1,069,000	116,000	9.22
1995	1,629,000	308,000	1,937,000	149,000	13.00
<u>Option 3</u>					
Camper Service ¹					
1980	\$112,000	\$20,000	\$132,000	750	\$176.00
1985	403,000	104,000	507,000	5560	91.19
1990	528,000	120,000	648,000	6870	94.32
1995	931,000	141,000	1,072,000	8630	124.22
Day-Use Service ²					
1980	\$327,000	\$50,000	\$377,000	61,900	\$6.09
1985	571,000	102,000	673,000	91,400	7.36
1990	901,000	106,000	1,007,000	116,100	8.67
1995	1,625,000	190,000	1,815,000	149,500	12.14

¹ Assumes Park Service Owns and Operates Equipment.

² Assumes Park Service Owns Equipment, Operated by Private Concessionaire.

Figure 25). As shown in Figure 27, five landing craft will be required to transport campers from Davis Bayou to East Ship Island and Horn Island on peak days in 1985. One craft should be purchased in each year from 1980 through 1984. A sixth boat would be required to transport passengers between East and West Ship Islands. This boat should be purchased in 1980. By 1995, seven landing craft will be required to transport passengers to East and West Ship Islands, and one boat would be required to provide the shuttle service. The two additional boats should be purchased in 1987 and 1991 (one in each year).

The cost of the camper service for this alternative would be higher than the Alternative 3, Option 2 service. The cost per user in 1980 would be about \$176.00 as shown in Table 12. This cost would decrease to approximately \$91.19 in 1985 and then escalate to approximately \$124.22 in 1995. The cost of the day-use service for this alternative is the same as that perviously described for Alternative 3, Option 2.

Alternative 6, Option 3 - This system consists of the same service as Alternative 6, Option 2; however, all new boats purchased to transport day-use visitors would be 250-passenger craft. The cost of the day-use service and the purchase date of new boats would be the same as Alternative 3, Option 3, while the cost of the camper service and the purchase date of the landing craft would be the same as Alternative 6, Option 2.

Alternative 8 - This alternative consists of the same ferry service as Alternatives 3 and 6. The camper service transports campers from Davis Bayou to East Ship Island, to two points on Horn Island, to a point on Petit Bois Island and then returns to Davis Bayou (See Figure 28). This alternative requires six boats on peak days in 1985 to transport campers. One boat should be purchased in each year between 1980 and 1985. Each round trip would take about 7-1/2 hours to complete as shown in Figure 29. Ten landing craft would be required by 1995 to provide the camper service. The additional craft should be needed in the following years: 1987, 1989, 1991 and 1993 (one in each year).

As shown on Table 13, the cost of the camping service would be greater than any of the previous alternatives. The only exception to this would be the cost during the first year of operation (1980) when the system would cost about \$168.18 per passenger to operate. This cost is less than one-half of the cost for the first year of service for Alternative 1. In 1985, the system would cost about \$97.50 per passenger, slighly greater than Alternative 1 and significantly higher

TABLE 13

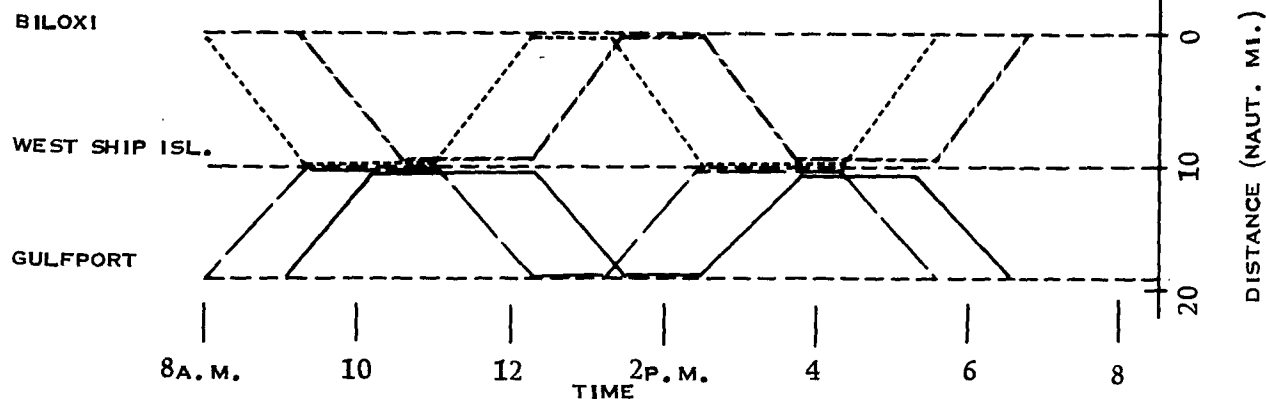
ALTERNATIVE 8 - ALTERNATIVE 8, OPTION 1 - ALTERNATIVE 8, OPTION 2
ALTERNATIVE 8, OPTION 3 COST SUMMARY

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

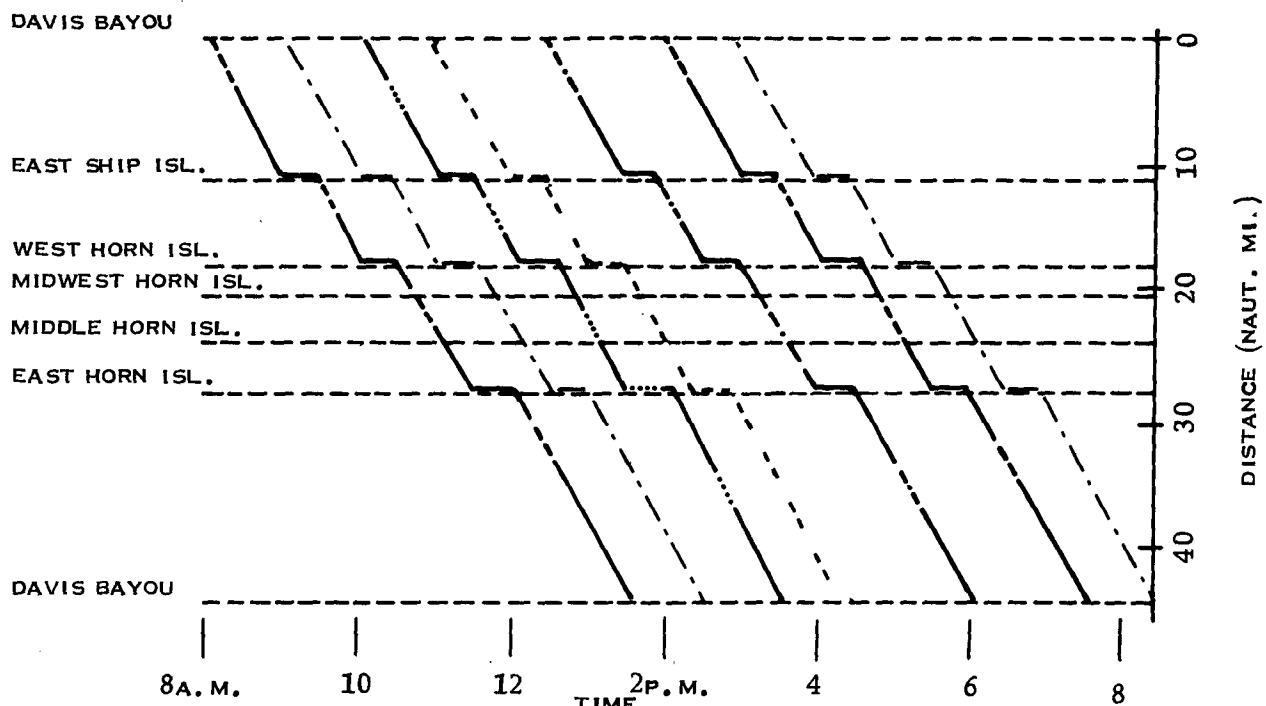
<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
Camper Service ¹					
1980	\$101,000	\$10,000	\$111,000	660	\$168.18
1985	322,000	106,000	428,000	4390	97.50
1990	533,000	142,000	675,000	6030	111.94
1995	898,000	186,000	1,084,000	8040	134.83
Day-Use Service ²					
1980	\$327,000	\$39,000	\$366,000	61,900	\$5.91
1985	554,000	81,000	635,000	90,700	7.00
1990	941,000	138,000	1,079,000	115,800	9.32
1995	1,674,000	308,000	1,982,000	148,500	13.35
<u>Option 1</u>					
Camper Service ¹					
1980	\$101,000	\$10,000	\$111,000	660	\$168.18
1985	322,000	106,000	428,000	4390	97.50
1990	533,000	142,000	675,000	6030	111.94
1995	898,000	186,000	1,084,000	8040	134.83
Day-Use Service ²					
1980	\$327,000	\$50,000	\$377,000	61,900	\$6.09
1985	577,000	102,000	679,000	91,400	7.43
1990	908,000	106,000	1,014,000	116,000	8.74
1995	1,650,000	190,000	1,840,000	149,300	12.32

¹ Assumes Park Service Owns and Operates Equipment.

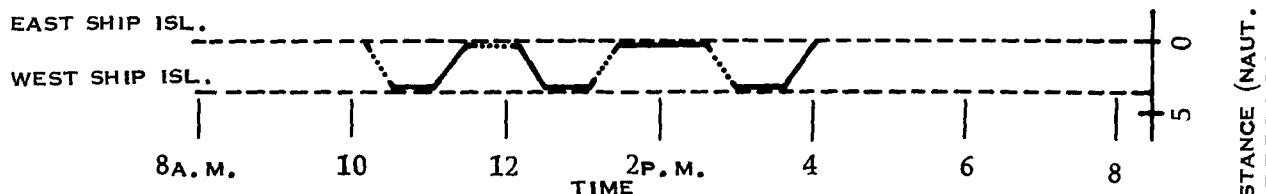
² Assumes Park Service Owns Equipment, Operated by Private Concessionaires.



DAY - USE VISITORS
150 PASSENGER BOAT



ALL CAMPERS
25 PASSENGER LANDING CRAFT



EAST TO WEST SHIP ISLAND CAMPERS
25 PASSENGER LANDING CRAFT

NOTE : BOAT SCHEDULES ASSUME TWO STOPS MADE AT HORN ISLAND, LOCATION OF STOPS CAN VARY. 250 PASSENGER BOAT SCHEDULE MAY BE USED IN PLACE OF 150 PASSENGER BOAT SCHEDULE.

ALTERNATIVE 6 OPTION 2&3 1985 PEAK DAY SCHEDULES

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI

TRANSPORTATION STUDY



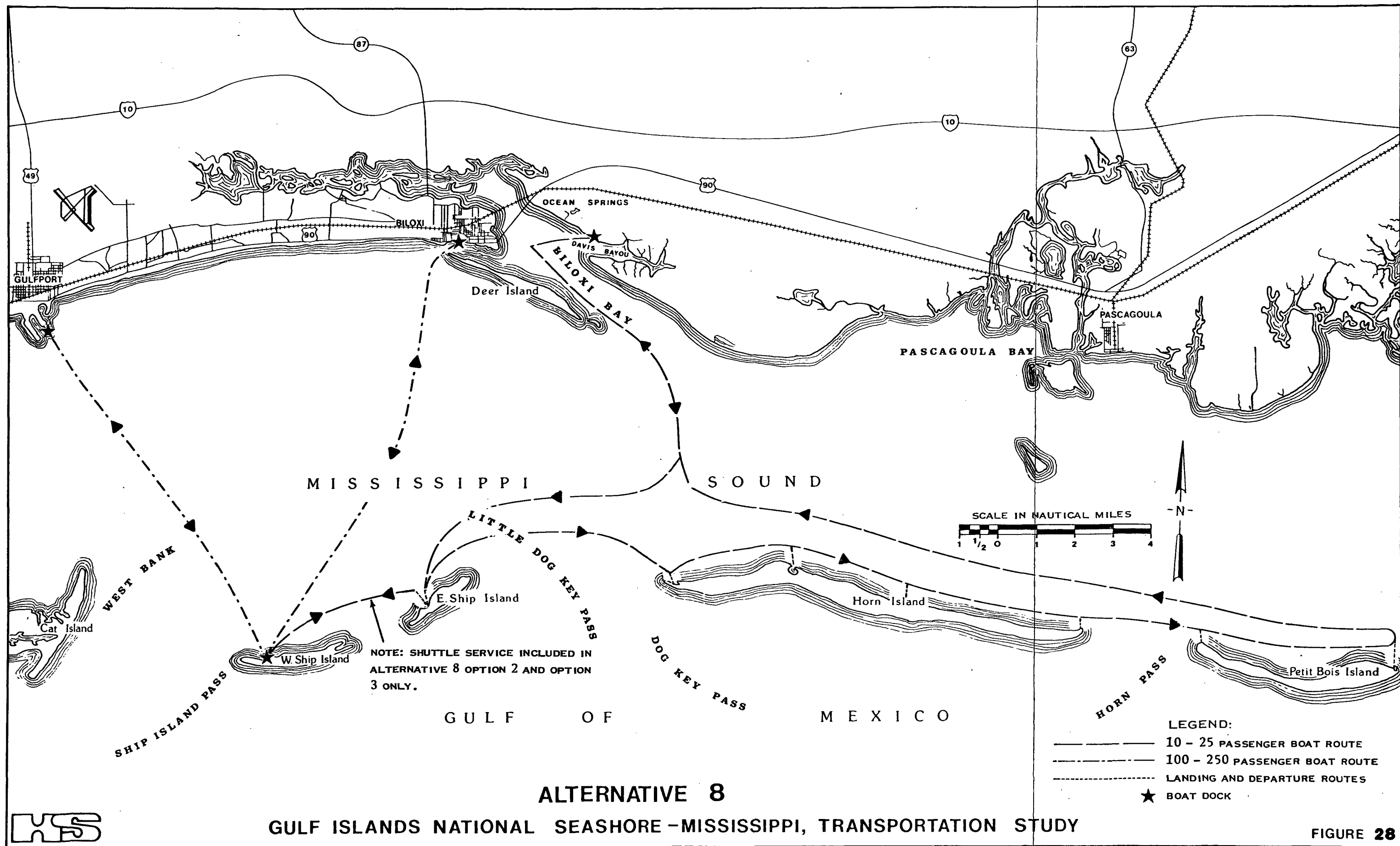
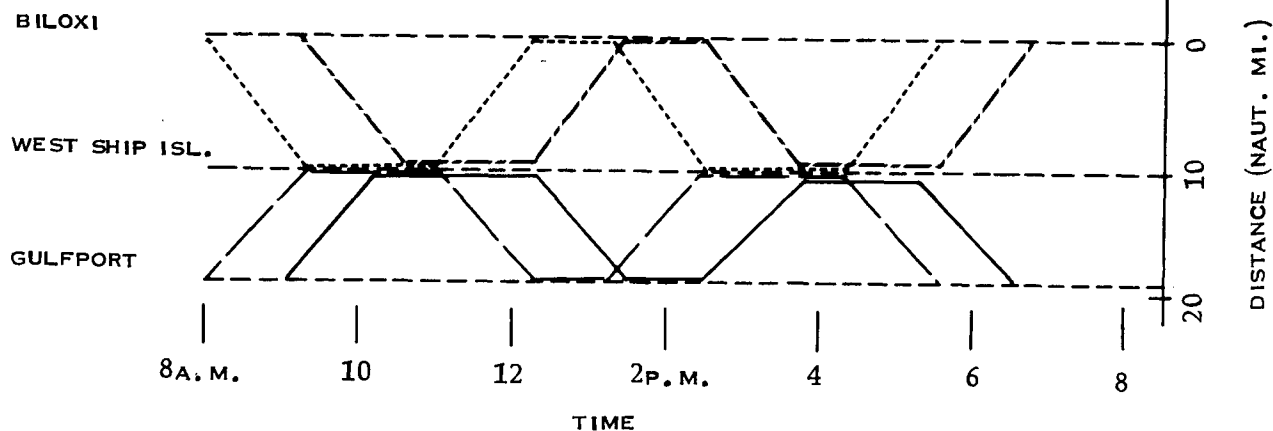
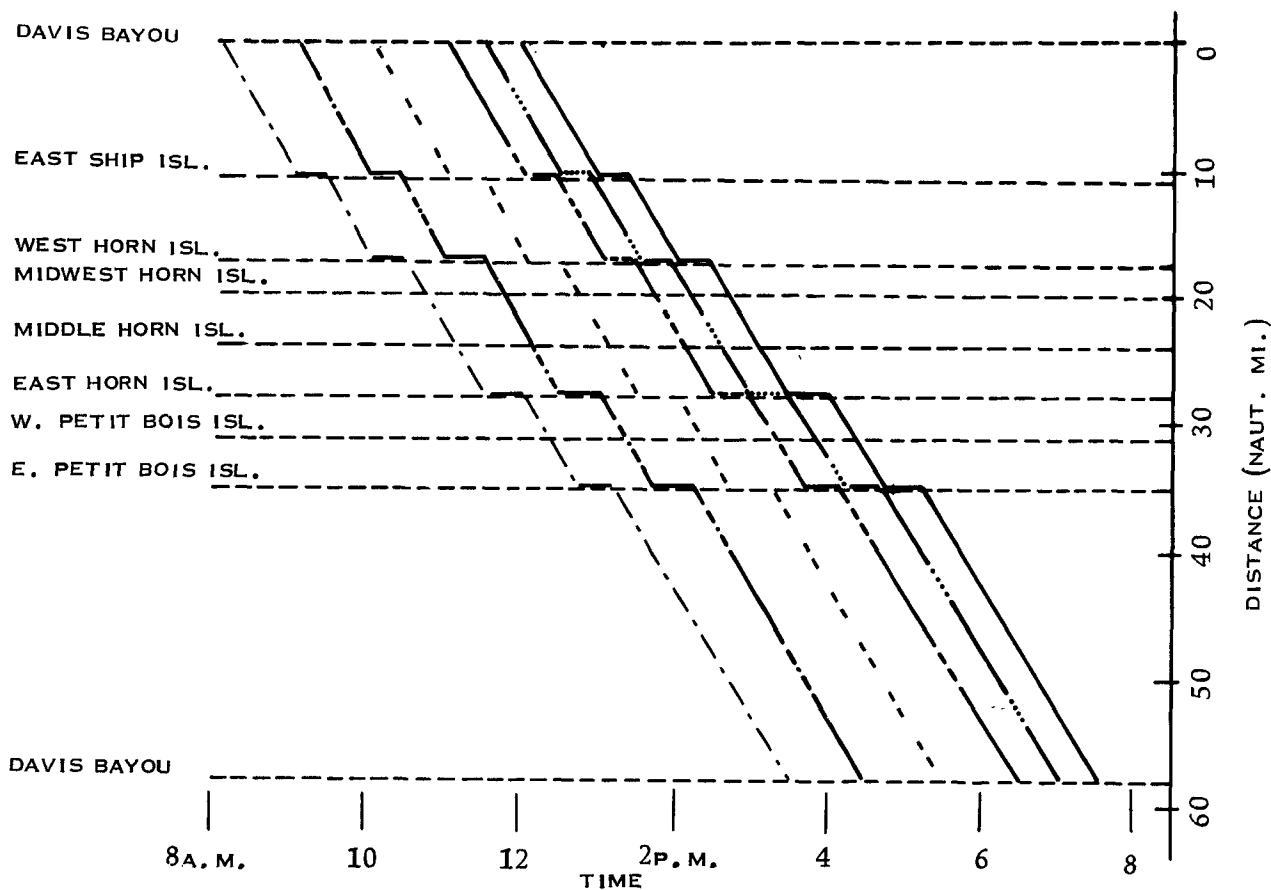


FIGURE 28



DAY USE VISITORS AND WEST SHIP ISL. CAMPERS
150 PASSENGER BOAT



DAVIS BAYOU TO HORN, EAST SHIP AND PETIT BOIS ISL. CAMPERS
25 PASSENGER LANDING CRAFT

NOTE: BOAT SCHEDULES ASSUME TWO STOPS MADE AT HORN ISLAND AND ONE STOP ON PETIT BOIS ISLAND, LOCATION OF STOPS CAN VARY. 250 PASSENGER BOAT SCHEDULE MAY BE USED IN PLACE OF 150 PASSENGER BOAT SCHEDULE.

ALTERNATIVE 8 1985 PEAK DAY SCHEDULES

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY



TABLE 13 (Cont'd)

<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
<u>Option 2</u>					
Camper Service ¹					
1980	\$118,000	\$30,000	\$148,000	750	\$197.33
1985	430,000	141,000	571,000	5560	102.70
1990	693,000	176,000	869,000	6870	126.49
1995	1,201,000	199,000	1,400,000	8630	162.22
Day-Use Service ²					
1980	\$327,000	\$39,000	\$366,000	62,100	\$5.90
1985	550,000	81,000	631,000	90,900	6.94
1990	931,000	138,000	1,069,000	116,000	9.22
1995	1,629,000	308,000	1,937,000	149,000	13.00
<u>Option 3</u>					
Camper Service ¹					
1980	\$118,000	\$30,000	\$148,000	750	\$197.33
1985	430,000	141,000	571,000	5560	102.70
1990	693,000	176,000	869,000	6870	126.49
1995	1,201,000	199,000	1,400,000	8630	162.22
Day-Use Service ²					
1980	\$327,000	\$50,000	\$377,000	61,900	\$6.09
1985	571,000	102,000	673,000	91,400	7.36
1990	901,000	106,000	1,007,000	116,100	8.67
1995	1,625,000	190,000	1,815,000	149,500	12.14

¹ Assumes Park Service Owns and Operates Equipment.

² Assumes Park Service Owns Equipment, Operated by Private Concessionaires.

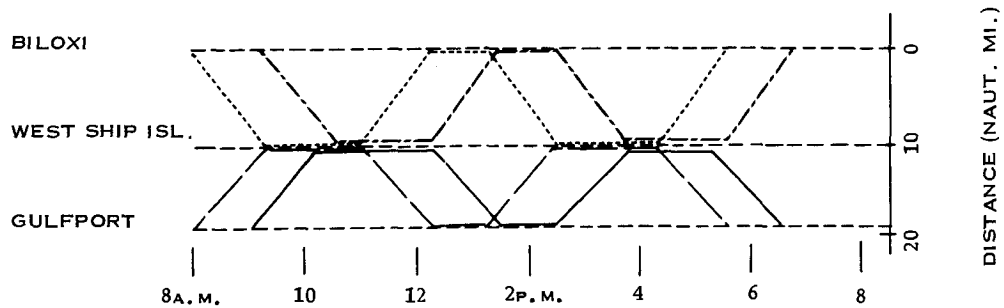
than either Alternative 3 or Alternative 6. This cost per passenger would escalate to nearly \$135.00 per passenger in 1995. The cost of the day-use service and the purchase date of new boats would be the same as Alternatives 3 and 6.

Alternative 8, Option 1 - This system would consist of the same transportation service as Alternative 8 with the exception of utilizing new 250-passenger boats rather than new 150-passenger boats for the day-use service. The number of boats required, purchase date and the cost of the day-use service would be the same as Alternative 3, Option 1, while the number of boats, purchase date and cost of operating the camper service would be the same as Alternative 8 (See Table 13).

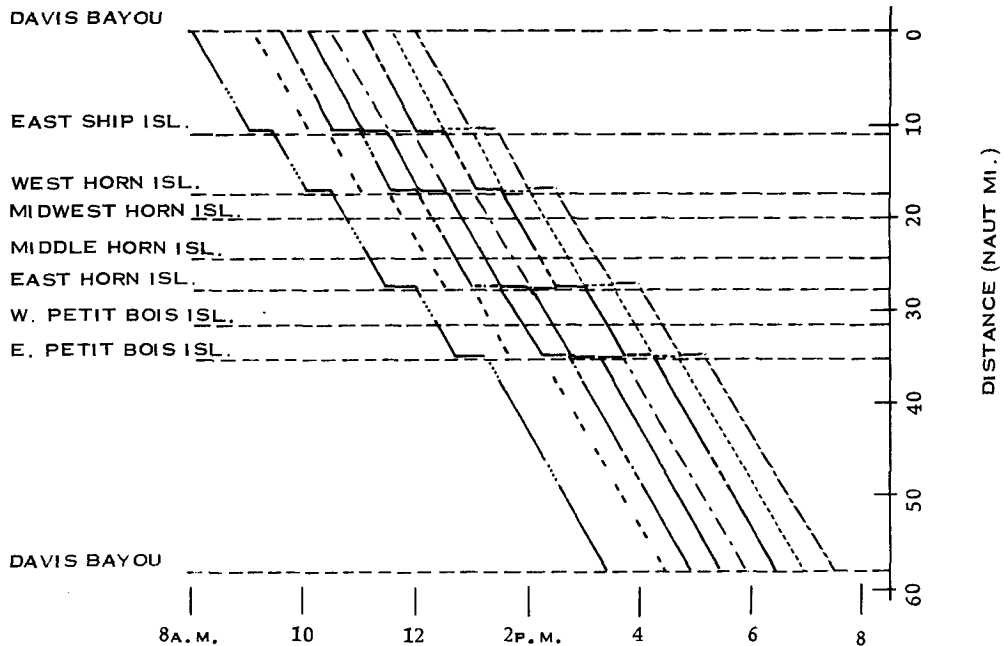
Alternative 8, Option 2 - This system consists of the same service as Alternative 8 except that all campers would depart from Davis Bayou, and West Ship Island campers would ride a shuttle service from East Ship Island to West Ship Island. The number of boats, purchase dates and 1985 peak day schedule for the day-use service would be the same as Alternative 3, Option 2. As shown in Figure 30, eight boats would be required to provide the camper service from Davis Bayou to the offshore islands. Two craft should probably be purchased in 1980 and in 1982, while one craft should be purchased in each of the following years: 1981, 1983, 1984 and 1985. A ninth landing craft, purchased in 1980, would be required to provide the shuttle service between East and West Ship Islands on peak days in 1985. In 1995, 12 boats would be required to transport campers to the offshore islands with an additional boat used for the shuttle service. One boat should probably be purchased in 1987, 1989, 1991 and 1993.

As shown in Table 13, the cost of the day-use service is the same as Alternative 3, Option 2. The cost of the camper service would be greater than any other alternative. The cost per passenger would be about \$197.33 in 1980, the first year of operation. As passenger volume increased, this cost would reduce to nearly \$102.70 per passenger in 1985 and then continually increase to approximately \$162.22 in 1995.

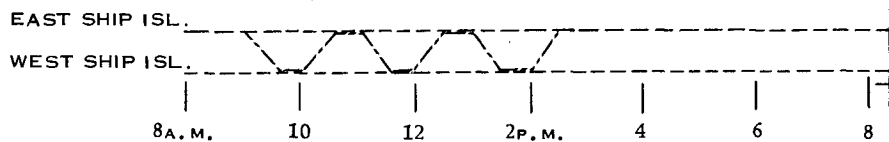
Alternative 8, Option 3 - This alternative is the same as Alternative 8, Option 2 except for the day-use service. New 250-passenger vessels rather than 150-passenger boats would be used to provide the expanded day-use service. The purchase date and the number of boats required to provide the day-use service would be the same as Alternative 3, Option 3, and the number of boats needed to provide the camper service would be the same as Alternative 8, Option 2. Thus,



TIME
DAY USE VISITORS
150 PASSENGER BOAT



TIME
ALL CAMPERS
25 PASSENGER LANDING CRAFT



TIME
EAST TO WEST SHIP ISLAND CAMPERS
25 PASSENGER LANDING CRAFT

NOTE: BOAT SCHEDULES ASSUME TWO STOPS MADE AT HORN ISLAND AND ONE STOP ON PETIT BOIS ISLAND. LOCATION OF STOPS CAN VARY. 250 PASSENGER BOAT SCHEDULE MAY BE USED IN PLACE OF 150 PASSENGER BOAT SCHEDULE.

ALTERNATIVE 8 OPTION 2&3 1985 PEAK DAY SCHEDULES

GULF ISLANDS NATIONAL SEASHORE MISSISSIPPI
TRANSPORTATION STUDY



the cost of operating the day-use transportation system would be the same as Alternative 3, Option 3, while the cost of providing the camper service would be the same as Alternative 8, Option 2.

Support Facilities - The support facilities required for the day-use service would be basically the same for all alternatives. There would be some difference in the amount of docking area required due to the difference in the length of the two boats. The 150-passenger boat would require about 65 feet of dock space per boat, while the 250-passenger boat would require 90 feet of dock space per boat. Additional docking space would be required in both Gulfport and Biloxi for the ferry service boats. Based upon the current docking fees at both the Biloxi and Gulfport harbors, it was estimated that the 1980 docking fee for the 150-passenger boat would be about \$1,400 per year while the fee for the 250-passenger boat would be about \$2,000 per year. These fees were inflated at an annual rate of seven percent to project 1985, 1990 and 1995 costs. Additional docking space would be required in Gulfport by 1980, while a second docking area would be needed by 1981 at Biloxi. A third docking area would be needed in Gulfport by 1987 and a fourth area by 1992 if 150-passenger boats are purchased. With 150-passenger boats, a third docking area would be needed in Biloxi by 1994. If 250-passenger boats are bought, then a third docking area would not be required at Gulfport until 1992 and only two docking areas would be needed at Biloxi through 1995. The proposed docking facilities at West Ship Island will adequately accommodate the day-use service.

Based upon the Final Environmental Statement (1) and the draft General Management Plan (2), the development of the Davis Bayou area includes about six slips for the camper boats. Based upon this assumption, the maintenance and docking facilities required by the camper service can be accommodated for Alternatives 1, 3 and 6, all options associated with these alternatives and Alternative 8. However, Alternative 8, Option 1 would require two additional slips in 1990 and two more in 1995. Alternative 8, Option 2 and Alternative 8, Option 3 would require two additional slips in 1985 and two more slips in 1990. The capital cost of these additional slips and the cost of maintaining these support facilities were included in the cost summaries.

Required Parking Facilities

As previously discussed in Chapter III, the available number of parking spaces at the Gulfport day-use facility could adequately serve the 1995 parking demand provided that the existing unpaved parking area was surfaced and striped for parking. This parking improvement should be made by 1990.

A parking deficiency will occur at the Biloxi facility by 1990. This analysis assumes that all of the present 150 parking spaces would be available for the ferry service system. However, the multi-use of these parking spaces will restrict the availability of parking for persons desiring to ride the day-use transportation system. Thus, about 50 of these 150 parking spaces should be designated for use by others at the Biloxi small craft harbor. Therefore, the parking spaces presently available would accommodate the projected peak day parking demand until about 1985. Since the availability of additional parking is severely restricted, some type of shuttle service from the nearby hotels should be implemented by 1985. Based upon conversations with the City of Biloxi, the City may operate a tram service circulating from the hotel area eastward to the Marine Education Center and Gulf Marine State Park. If this system were in operation by 1985, then persons desiring to ride the day-use transportation system could ride the City operated tram service. However, should the City of Biloxi decide to not operate such a service, then a shuttle service from the nearby hotels to the Biloxi facility should be implemented. One bus would be needed in 1985 with a second vehicle needed by 1987. A third and fourth vehicle would be required between 1990 and 1995. The additional cost of providing this shuttle service was not included in the cost summaries.

Based upon conversations with the National Park Service and an analysis of the Final Environmental Statement (1) and the draft General Management Plan (2), about 30 long term parking spaces have been designated at Davis Bayou for persons camping on the offshore islands. These parking spaces would accommodate the Alternative 1 and Alternative 1, Option 1 projected demand until about 1985 when about 20 to 25 additional spaces would be needed. It was assumed that when additional parking was constructed that sufficient parking would be provided to satisfy the projected 1995 demand. Thus, about 55 to 60 parking spaces should be built in 1985 to accommodate the Alternative 1 and Alternative 1, Option 1 demand.

Additional parking will be required in 1982 for Alternatives 3, 6 and 8 and all options. About 35 additional spaces would be needed in 1982 and about 118 additional spaces would be required by 1995 for Alternatives 3, 6 and 8 and Option 1 of these three alternatives. It was assumed that the additional 118 spaces would be constructed in 1985 to minimize construction costs rather than constructing additional parking spaces every three or four years. Alternatives 3, 6 and 8, Options 2 and 3 would require basically the same number of parking spaces; however, about ten additional spaces would be needed in 1995. It was assumed that the 1980 construction cost would be about \$1,800 per parking space. This projected construction cost was inflated at an annual rate of seven percent to

approximately 1985 costs. As a result, it was estimated that the additional parking required by Alternative 1 and Alternative 1, Option 1 would cost about \$142,000 to construct. This cost was amortized over a 20 year period at a 10 percent inflation rate assuming that the parking area would be adequately maintained. The initial cost of the parking facility for Alternatives 3, 6 and 8 and Option 1 would be about \$300,000, while the cost of the parking facility for Alternatives 3, 6 and 8 Options 2 and 3 would cost about \$312,000. The amortized annual capital cost for these support facilities was included in the cost summaries.

Management Alternatives

The search for a practical method of managing and operating the transportation services of the proposed alternatives resulted in identification of three options. The three considered the ramification of equipment, ownership and management/operations. These three management alternatives were:

Management Option 1 - Equipment owned and operated by the National Park Service,

Management Option 2 - Equipment owned by the Park Service and operated by a private concessionaire, and

Management Option 3 - Equipment owned and operated by a private concessionaire.

Management Option No. 1 - Equipment Owned and Operated by the National Park Service - The primary advantage of this management option involves the purchase of the new boats. The present economic market forces a private individual who desires to purchase a boat to have a substantial amount of cash available to make the monthly payments. The National Park Service would be capable of obtaining a 30-year loan at a lower interest rate than would a private concessionaire. One disadvantage of this option would be that the Park Service would not have a profit motive incentive to serve the public. The only incentive the Park Service would have would be to maintain a "good public image" and provide for adequate public use and enjoyment of the Seashore. However, this option is capable of rapid implementation and avoids the involvement of second or third parties.

Management Option No. 2 - Equipment Owned by the Park Service and Operated by a Private Concessionaire - This option has the same advantage as Option No. 1 in regard to the purchase of new boats. In addition, since the ferry service is presently operated by a private concessionaire, the expertise

to operate the day-use service is readily available. However, the camper service would not be attractive as a business investment for private operators. This alternative has one distinct disadvantage in that the total cost of operating and maintaining the transportation system would be more costly than Management Option No. 1.

Management Option No. 3 - Equipment Owned and Operated by a Private Concessionaire - A major advantage of this option is that it is easily implemented with the National Park Service selecting a private operator by bid on the basis that the selected operator provide equipment and perform within standards set by the Park Service. This option would also eliminate the necessity of the Park Service to enter the public transportation management and operation business. The most significant impediment to this option is high capital cost of equipment with low financial returns anticipated at the outset of the operation. Most likely, some subsidy for the day-use service and a significant subsidy for the camper service would be required.

Day-Use Service Pro Forma Statement

The National Park Service requested that a pro forma statement be prepared for the day-use service only, detailing 1985 costs for each of the transportation alternatives and management options. The cost comparison tables include both annual operating and capital cost. The following 1978 hourly rates were used for personnel:

Manager/Supervisor	\$9.00 per hour
Clerk/Ticket Sales	\$5.00 per hour
Mechanic	\$7.50 per hour
Captain	\$7.00 per hour
Captain's Mate	\$5.00 per hour

These rates were increased by 40 percent to account for benefits and were inflated at an annual rate of 7 percent. For those options under which a private concessionaire would employ the personnel, an additional 20 percent was included to account for additional overhead and the higher pay scale a private concessionaire would be expected to pay.

Under Management Option No. 1, Alternatives 3, 6 and 8 and Alternatives 3, 6 and 8 - Option 2 would be the least expensive to operate (See Table 14). However, the total annual cost of all of the alternatives are relatively the same as the least expensive costs about \$487,000 and the most expensive (Alternative 1 Option 1) costs about \$536,000 in 1985. It should be noted that while the options which include the

purchase of 250-passenger vessels are more expensive in 1985, they would be less expensive to operate after 1985 when additional 150-passenger boats would be required.

With Management Option No. 2, Alternatives 3, 6 and 8 - Option 2, the least expensive systems, would cost about \$631,000 to operate in 1985 as shown in Table 15. Alternatives 3, 6 and 8 would cost about \$635,000 to operate, and Alternative 1 would cost approximately \$646,000 to operate. As in the case of the previous management option, those alternatives which include the purchase of new 250-passenger boats are more expensive to operate in 1985; however, these options would be less expensive to operate by 1990.

Under Management Option No. 3, the 1985 cost of operating the systems would vary between \$715,000 and \$799,000. As in the case of the other management options, Alternatives 3, 6 and 8 - Option 2, would be the least expensive to operate, costing nearly \$715,000, and Alternative 1 - Option 1 would be the most expensive, costing about \$799,000 (See Table 16).

Day-Use Service - 1985 User-Fee Analysis

In order to determine what type of subsidy, if any, would be required to operate a system, a 1985 user-fee analysis was performed. This analysis was conducted for the day-use service only as requested by the National Park Service. Two user-fees were selected. As previously discussed, it was assumed that the present distribution between children and adults would remain stable and that children would be charged about \$2.50 less per person than adults. Based upon the current distribution between children and adults, the adult fare should be about \$0.80 higher than the average fare.

The first user-fee assumes that the present fare would increase at an annual rate of about 4 percent, resulting in a 1985 adult fare of \$6.50 and a \$4.00 charge for children. The average fare would then be \$5.70. As shown in Table 17, under Management Option No. 1 (equipment owned and operated by the National Park Service), Alternative 3, 6 and 8 - Option 3 would be break-even operations in 1985. Alternatives 1, 3, 6 and 8 would operate at a profit. All of the alternatives under Management Option No. 2 and No. 3 would require a National Park Service subsidy, varying from a low of \$113,000 per year for Management Option No. 2 Alternatives 3, 6 and 8 - Option 2 to a high of \$279,000 for Management Option No. 3 - Alternative 1, Option 1.

TABLE 14

1985 PRO FORMA STATEMENT - DAY-USE SERVICE
MANAGEMENT OPTION 1 - EQUIPMENT OWNED AND OPERATED BY PARK SERVICE

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

	<u>Alt. 1</u>	<u>Alt.3,6,8</u>	<u>Alt. 1 Option 1</u>	<u>Alt.3,6,8 Option 1</u>	<u>Alt.3,6,8 Option 2</u>	<u>Alt.3,6,8 Option 3</u>
<u>Capital Costs (Annualized)</u>						
Support Facilities	\$10,000	\$10,000	\$12,000	\$12,000	\$10,000	\$12,000
Boats	<u>71,000</u>	<u>71,000</u>	<u>90,000</u>	<u>90,000</u>	<u>71,000</u>	<u>90,000</u>
TOTAL ANNUAL CAPITAL COST	\$81,000	\$81,000	\$102,000	\$102,000	\$81,000	\$102,000
<u>Operating Costs (Annualized)</u>						
Salaries and Benefits						
Manager/Supervisor	\$39,000	\$39,000	\$39,000	\$39,000	\$39,000	\$39,000
Clerk/Ticket Sales	22,000	22,000	22,000	22,000	22,000	22,000
Mechanic	33,000	33,000	33,000	33,000	33,000	33,000
Captains	72,000	69,000	80,000	74,000	69,000	73,000
Captains' Mates	124,000	121,000	118,000	115,000	121,000	114,000
Maintenance Costs - Boats	52,000	52,000	60,000	60,000	52,000	60,000
Running Costs	43,000	41,000	48,000	46,000	41,000	45,000
Fixed Costs - Insurance	<u>29,000</u>	<u>29,000</u>	<u>34,000</u>	<u>34,000</u>	<u>29,000</u>	<u>34,000</u>
TOTAL ANNUAL OPERATING COSTS	<u>\$414,000</u>	<u>\$406,000</u>	<u>\$434,000</u>	<u>\$423,000</u>	<u>\$406,000</u>	<u>\$420,000</u>
TOTAL ANNUAL COST	\$495,000	\$487,000	\$536,000	\$525,000	\$487,000	\$522,000

TABLE 15

1985 PRO FORMA STATEMENT - DAY-USE SERVICE
 MANAGEMENT OPTION 2 - EQUIPMENT OWNED BY PARK SERVICE, OPERATED BY PRIVATE CONCESSIONAIRE

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

	<u>Alt. 1</u>	<u>Alt.3,6,8</u>	<u>Alt. 1</u> <u>Option 1</u>	<u>Alt.3,6,8</u> <u>Option 1</u>	<u>Alt.3,6,8</u> <u>Option 2</u>	<u>Alt.3,6,8</u> <u>Option 3</u>
<u>Capital Costs (Annualized)</u>						
Support Facilities	\$10,000	\$10,000	\$12,000	\$12,000	\$10,000	\$12,000
Boats	<u>71,000</u>	<u>71,000</u>	<u>90,000</u>	<u>90,000</u>	<u>71,000</u>	<u>90,000</u>
TOTAL ANNUAL CAPITAL COST	\$81,000	\$81,000	\$102,000	\$102,000	\$81,000	\$102,000
<u>Operating Costs (Annualized)</u>						
Salaries and Benefits						
Manager/Supervisor	\$47,000	\$47,000	\$47,000	\$47,000	\$47,000	\$47,000
Clerk/Ticket Sales	26,000	26,000	26,000	26,000	26,000	26,000
Mechanic	40,000	40,000	40,000	40,000	40,000	40,000
Captains	86,000	83,000	96,000	89,000	82,000	87,000
Captains' Mates	149,000	145,000	141,000	138,000	144,000	136,000
Maintenance Costs - Boats	52,000	52,000	60,000	60,000	52,000	60,000
Running Costs	43,000	41,000	48,000	46,000	40,000	45,000
Fixed Costs - Insurance	29,000	29,000	34,000	34,000	29,000	34,000
General and Administrative Costs	44,000	43,000	47,000	46,000	43,000	46,000
Operating Fee	<u>49,000</u>	<u>48,000</u>	<u>52,000</u>	<u>51,000</u>	<u>47,000</u>	<u>50,000</u>
TOTAL ANNUAL OPERATING COST	<u>\$565,000</u>	<u>\$554,000</u>	<u>\$591,000</u>	<u>\$577,000</u>	<u>\$550,000</u>	<u>\$571,000</u>
TOTAL ANNUAL COST	\$646,000	\$635,000	\$693,000	\$679,000	\$631,000	\$673,000

TABLE 16

1985 PRO FORMA STATEMENT - DAY-USE SERVICE
MANAGEMENT OPTION 3 - EQUIPMENT OWNED AND OPERATED BY PRIVATE CONCESSIONAIRE

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

	<u>Alt. 1</u>	<u>Alt.3,6,8</u>	<u>Alt. 1 Option 1</u>	<u>Alt.3,6,8 Option 1</u>	<u>Alt.3,6,8 Option 2</u>	<u>Alt.3,6,8 Option 3</u>
<u>Capital Costs (Annualized)</u>						
Support Facilities	\$10,000	\$10,000	\$12,000	\$12,000	\$10,000	\$12,000
Boats	<u>126,000</u>	<u>126,000</u>	<u>160,000</u>	<u>160,000</u>	<u>126,000</u>	<u>160,000</u>
TOTAL ANNUALIZED CAPITAL COST	\$136,000	\$136,000	\$172,000	\$172,000	\$136,000	\$172,000
<u>Operating Costs (Annualized)</u>						
Salaries and Benefits						
Manager/Supervisor	\$47,000	\$47,000	\$47,000	\$47,000	\$47,000	\$47,000
Clerk/Ticket Sales	26,000	26,000	26,000	26,000	26,000	26,000
Mechanic	40,000	40,000	40,000	40,000	40,000	40,000
Captains	86,000	83,000	96,000	89,000	82,000	87,000
Captains' Mates	149,000	145,000	141,000	136,000	144,000	136,000
Maintenance Costs - Boats	52,000	52,000	60,000	60,000	52,000	60,000
Running Costs	43,000	41,000	48,000	46,000	40,000	45,000
Fixed Costs - Insurance	29,000	29,000	34,000	34,000	29,000	34,000
General and Administrative Costs	58,000	57,000	64,000	63,000	57,000	63,000
Operating Fee	<u>64,000</u>	<u>63,000</u>	<u>71,000</u>	<u>70,000</u>	<u>62,000</u>	<u>69,000</u>
TOTAL ANNUAL OPERATING COST	<u>\$594,000</u>	<u>\$583,000</u>	<u>\$627,000</u>	<u>\$613,000</u>	<u>\$579,000</u>	<u>\$607,000</u>
TOTAL ANNUAL COST	\$730,000	\$719,000	\$799,000	\$785,000	\$715,000	\$782,000

TABLE 17

1985 USER-FEE ANALYSIS - DAY-USE SERVICE
GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI TRANSPORTATION STUDY

	User-Fee #1 Average \$5.70			User-Fee #2 Average \$7.20		
	Adults \$6.50	Children \$4.00		Adults \$8.00	Children \$5.50	
	<u>Annual Cost</u>	<u>Est. Revenue</u>	<u>Profit (Subsidy)</u>	<u>Annual Cost</u>	<u>Est. Revenue</u>	<u>Profit (Subsidy)</u>
<u>Management Option #1</u>						
Alternative 1	\$495,000	\$514,000	\$19,000	\$495,000	\$649,000	\$154,000
Alternatives 3,6,8	487,000	517,000	30,000	487,000	653,000	166,000
Alternative 1, Option 1	536,000	520,000	(16,000)	536,000	657,000	121,000
Alternatives 3,6,8 - Option 1	525,000	521,000	(4,000)	525,000	658,000	133,000
Alternatives 3,6,8 - Option 2	487,000	518,000	31,000	487,000	654,000	167,000
Alternatives 3,6,8 - Option 3	522,000	521,000	(1,000)	522,000	658,000	136,000
<u>Management Option #2</u>						
Alternative 1	\$646,000	\$514,000	(\$132,000)	\$646,000	\$649,000	\$ 3,000
Alternatives 3,6,8	635,000	517,000	(\$118,000)	635,000	653,000	18,000
Alternative 1, Option 1	693,000	520,000	(173,000)	693,000	657,000	(36,000)
Alternative 3,6,8 - Option 1	679,000	521,000	(158,000)	679,000	658,000	(21,000)
Alternative 3,6,8 - Option 2	631,000	518,000	(113,000)	631,000	654,000	23,000
Alternative 3,6,8 - Option 3	673,000	521,000	(152,000)	673,000	658,000	(15,000)
<u>Management Option #3</u>						
Alternative 1	\$730,000	\$514,000	(\$216,000)	\$730,000	\$649,000	(\$81,000)
Alternatives 3,6,8	719,000	517,000	(202,000)	719,000	653,000	(66,000)
Alternative 1, Option 1	799,000	520,000	(279,000)	799,000	657,000	(142,000)
Alternatives 3,6,8 - Option 1	785,000	521,000	(264,000)	785,000	658,000	(127,000)
Alternatives 3,6,8 - Option 2	715,000	518,000	(197,000)	715,000	654,000	(61,000)
Alternatives 3,6,8 - Option 3	782,000	521,000	(261,000)	782,000	658,000	(124,000)

The second user-fee selected assumed that the present fares would inflate at the average annual inflation rate of seven percent. As a result, the 1985 fare would be \$8.00 for adults and \$5.50 for children with an average user fee of \$7.20. Based upon this-user fee, all of the alternatives under Management Option No. 1 would operate at a substantial profit, varying between \$121,000 for Alternative 1 - Option 1 to about \$167,000 for Alternatives 3, 6 and 8 - Option 2. Some of the alternatives under Management Option No. 2 would operate at either a near break-even operation or profit except for Alternative 1 Option 1, which would require a \$36,000 subsidy in 1985. Alternative 3, 6, 8 - Option 1 would require about a \$21,000 subsidy and Alternatives 3, 6 and 8 - Option 3 would require about a \$15,000 subsidy. All of the alternatives under Management Option No. 3 would require a subsidy as shown in Table 17. This subsidy would vary from \$61,000 in 1985 for Alternatives 3, 6 and 8 - Option 2 to \$142,000 for Alternative 1 - Option 1.

Recommended Transportation System

Based upon the detailed analysis of the various management options, type of service, and capital and operating costs, it is recommended that Alternative 6, Option 3 be implemented, that the new day-use service equipment be purchased by the National Park Service and operated by a private concessionaire and that the National Park Service own and operate the equipment for the camper service. Alternatives 1, 3, 6 and 8, Alternative 1, Option 1 and Alternatives 3, 6 and 8 - Option 2 mix day-use activities and campers on the ferry system boats. This mix of various uses would not provide for quality control of the offshore island camping activities and would result in a problem in charging those persons desiring to camp on the offshore islands a different fee from those desiring to use the day-use facilities.

The Alternative 3 camper service, while the least expensive, would not be the most desirable as only one point on Horn Island would serve as the drop-off/pick-up point for campers. This system does not provide all campers with the opportunity to camp on various parts of Horn Island unless they hike with all their camping gear to the various areas on the island. If the system were modified slightly so that each boat stopped at a different location on the island, this problem would not be remedied as it would be difficult to coordinate the departure time of the boats with those persons desiring to camp on each part of the island. Alternative 8 camper service does not provide the primitive camper with a different type of experience than does Alternative 6. Since Alternative 8 camper service is the more expensive than

Alternative 6, and requires more docking facilities at Davis Bayou than are presently planned, it was eliminated from consideration.

While the cost of operating the transportation systems in 1985, using new 250-passenger boats would be more expensive than purchasing new 150-passenger boats, the long term investment favors the purchase of the larger boats. Thus, Alternatives 1, 3, 6 and 8 and Alternatives 3, 6 and 8 - Option 2 were eliminated as desirable alternatives.

As a result, Alternative 6, Option 3, camper and day-use service would provide the best transportation service to meet the projected demands. The day-use visitors and the primitive campers would be segregated on different boats. By requiring all primitive campers to depart from Davis Bayou, the National Park Service would have the opportunity to properly orientate the campers as to the type of facilities available on the various offshore islands. This type of operation would provide some type of "quality control" of the campers to insure that all persons are fully informed of the primitive facilities. Each boat which departs from Davis Bayou would go directly to East Ship Island and then stop at different locations on Horn Island. The inclusion of a shuttle service between East and West Ship Islands would be required with the centralization of all primitive camping activities at Davis Bayou. In addition, this shuttle service might possibly be used during rough weather conditions to transport campers from Horn and East Ship Islands to West Ship Island where they could return to the mainland via the large ferry service boats. This type of operation would only occur during emergency conditions when the weather conditions would be too rough for the landing craft to travel to Horn and East Ship Islands.

It is recommended that the day-use service be operated by a private concessionaire with the National Park Service purchasing the new boats. Since the current economic market would make the purchase of boats by a private concessionaire cost prohibitive and since private operators are presently available, this management option would be the most economically feasible.

Since the camper service would cost about \$100.00 per camper to operate and since the maximum reasonable user fee that could be charged in 1980 would be about \$10.00 per camper, the resulting \$80.00 to \$90.00 per camper operating deficit would not be conducive to a private operator. The high cost per camper are primarily due to the limitations on the size and type of craft used. The reduction of service would

lower the annual cost but would not significantly lower the cost per user since lowering the service would lower the number of users. By only providing service on those days on which 10 or more persons desired to leave the mainland and camp offshore, the cost per user would be almost 30 percent less. Thus, in 1985 the cost per camper for the recommended alternative would be about \$70.00. Therefore, it is suggested that the Park Service own and operate the camper service with the possibility of increasing the day-use user fee by about \$1.00 per person to help offset the operating deficit of the camper service. This would still result in an operating deficit in 1985 of about \$45.00 to \$50.00 per camper.

All Ferry Services from Davis Bayou

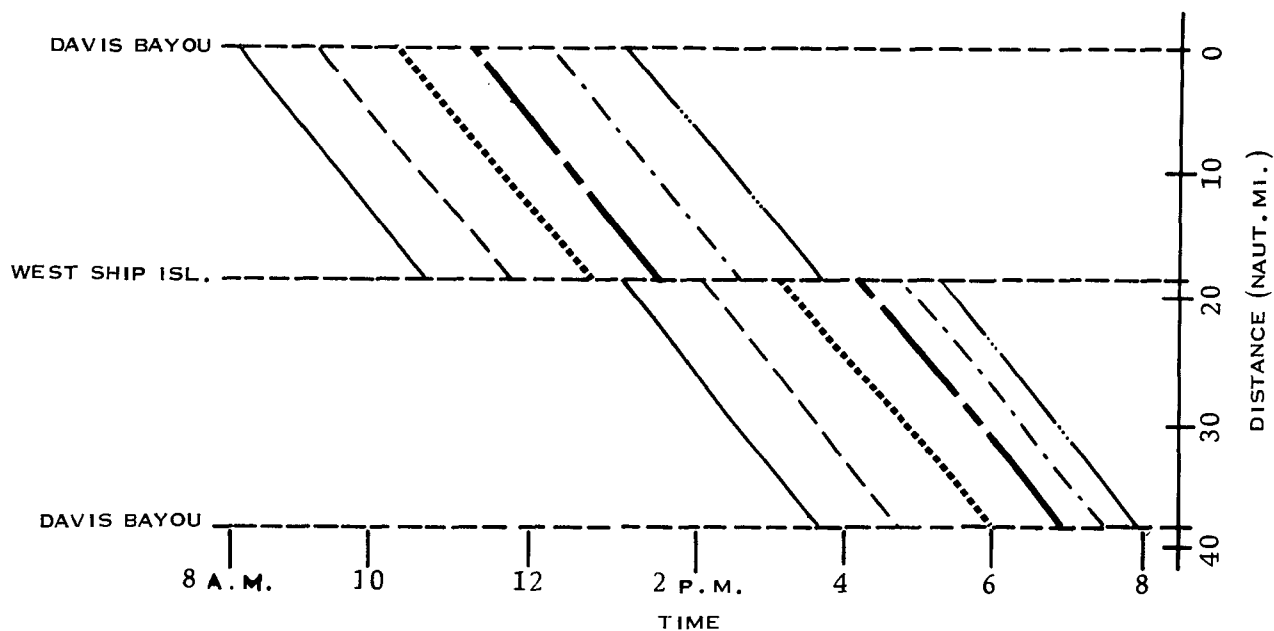
In addition to analyzing the present ferry service to West Ship Island, a shuttle service between East and West Ship Islands and a camper service originating at Davis Bayou and traveling to the offshore islands, the National Park Service desired an evaluation of two considerations: shifting all ferry service operations to Davis Bayou or continuing the ferry service at Gulfport and Biloxi in addition to new proposed docks at Davis Bayou.

The transfer of the day-use service to Davis Bayou would require substantial construction to accommodate the large boats. About 170 feet of new dock would be needed for the 2 existing boats and about 65 feet of dock would be required for each new 150-passenger boat. Approximately 90 feet of dock would be needed for each new 250-passenger vessel. Expanded maintenance facilities would also be needed.

Additional parking spaces at Davis Bayou would be required for the ferry service. About 355 parking spaces encompassing about 3.5 acres of land area would be needed in 1980. Another 125 spaces should be constructed in 1985, requiring about 1.25 acres of land.

The existing channel at Davis Bayou would require widening and deepening. A channel about 10 feet deep and approximately 50 feet wide would be needed to accommodate the large boats and to permit a large ferry service boat and a smaller camper service boat to pass in the channel.

A suggested 1985 peak day schedule for a ferry service consisting of both new 150-passenger boats and new 250-passenger boats is shown in Figures 31 and 32, and the suggested route is illustrated in Figure 33. It is suggested that the boats depart Davis Bayou and travel to West Ship Island via the channel adjacent to Biloxi. The boats would return via the channel east of Deer Island. This route would provide the

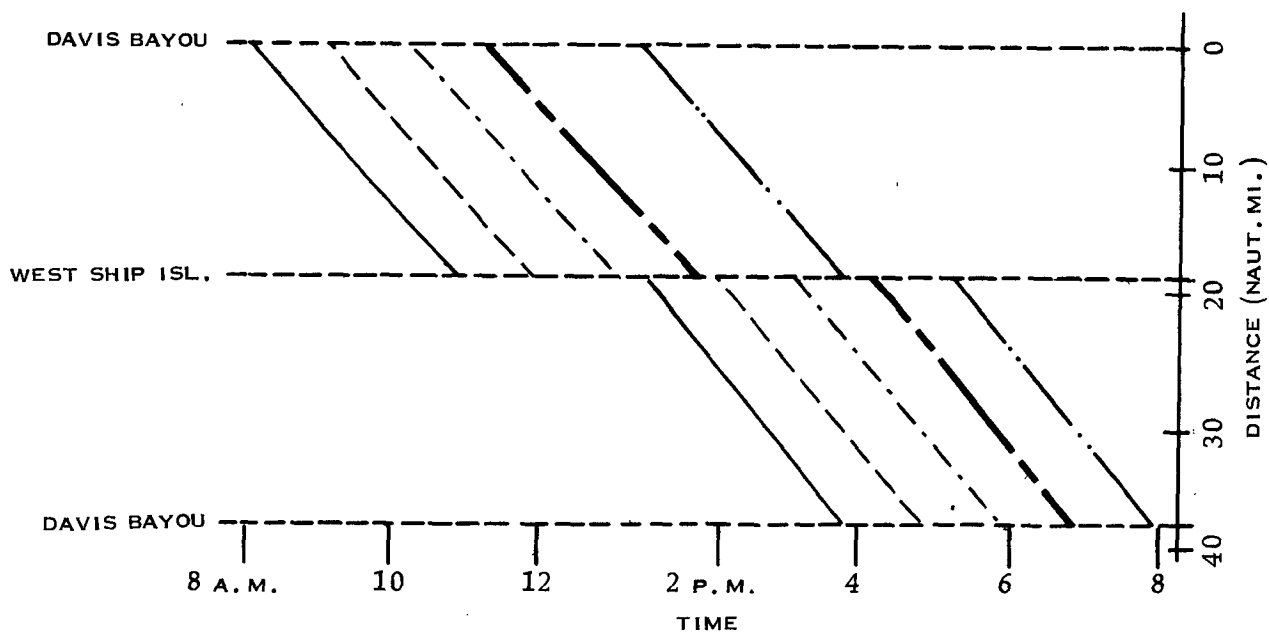


DAY-USE VISITORS
DAVIS BAYOU TO WEST SHIP ISLAND

**DAVIS BAYOU DAY-USE SERVICE
1985 PEAK DAY SCHEDULE
150 PASSENGER BOAT**

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY





DAY-USE VISITORS
DAVIS BAYOU TO WEST SHIP ISLAND

**DAVIS BAYOU DAY-USE SERVICE
1985 PEAK DAY SCHEDULE
250 PASSENGER BOAT**

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY



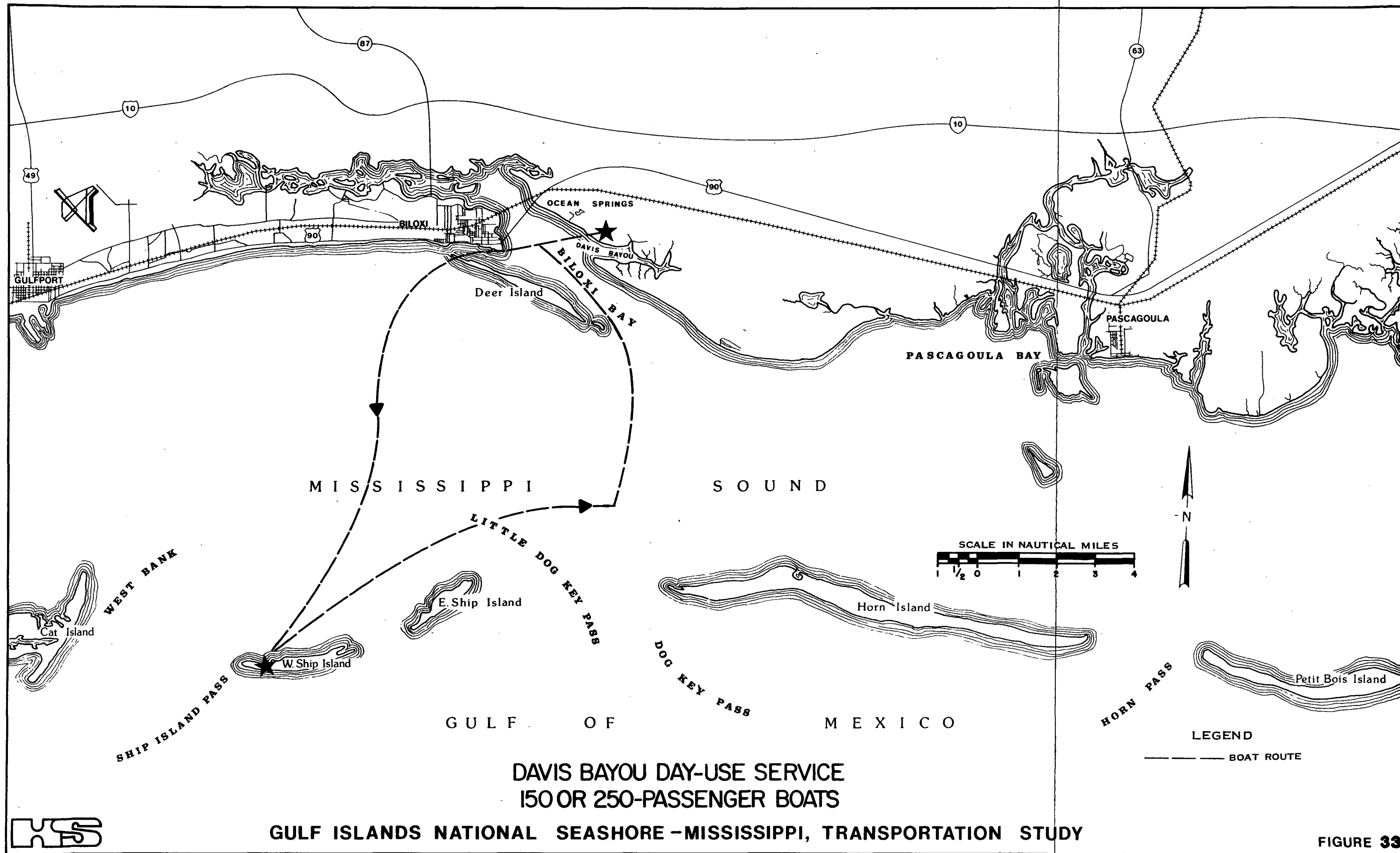


FIGURE 33

service the opportunity to inform visitors about Biloxi and the fishing activities there. It also provides the visitors the opportunity to travel two different routes. The travel time via each route is about the same even though the route using the channel at Biloxi is shorter. This is due to the slower travel speeds required in this channel.

As shown in Figure 31, a system using new 150-passenger craft would need four new 150-passenger boats and the two existing boats to provide service on peak days in 1985. Two of the boats should be purchased in 1980 and a third and fourth boat in 1982 and 1984. Additional craft would be needed in 1986, 1989, 1991 and 1994 (one per year). Due to the travel time from Davis Bayou to West Ship Island (about five hours for a round trip), a boat can only make one round trip per day.

The cost of operating the ferry service with new 150-passenger boats is shown in Table 18. The cost assumes that the National Park Service purchases the new boats and the system is operated by a concessionaire. The total cost of operating the system increases from about \$364,000 in 1980 to \$2,527,000 in 1995. About 75 percent of the total cost is the operating cost. The cost per user varies from \$6.07 in 1980 to nearly \$17.57 in 1995.

Figure 32 illustrates the suggested 1985 peak day schedule for a ferry system consisting of the existing ferry boats and new 250-passenger craft. In 1985, five boats (two existing and three new vessels) would be needed. One new boat should be purchased in each of the following years: 1980, 1982 and 1985. By 1995, two more new boats would be needed, one purchased in 1988 and a second in 1992.

The cost of operating the ferry service with new 250-passenger boats is shown in Table 18. The total cost increases from approximately \$549,000 in 1980 to nearly \$2,440,000 in 1995. The cost per user would vary from about \$9.27 in 1980 to \$16.86 in 1995.

The relocation of the ferry service to Davis Bayou would not be energy efficient, as each boat would use about 70 more gallons per trip than the existing route and visitors desiring to ride the system would be required to drive farther. Those who used to ride the system in Gulfport would be required to drive an additional 40 miles (round trip), while those in Biloxi would have to drive an additional 18 to 20 miles.

The relocation of the ferry service would not meet with satisfaction by either the cities of Gulfport and Biloxi or the hotels/motels in each city. Both cities, especially Gulfport,

TABLE 18

DAVIS BAYOU FERRY SERVICE COST SUMMARY

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI TRANSPORTATION STUDY

<u>Year</u>	<u>Operating Cost</u>	<u>Capital Cost</u>	<u>Total Cost</u>	<u>Est. Patron.</u>	<u>Cost/ User</u>
<u>150-Passenger Boats</u>					
1980	\$197,000	\$167,000	\$364,000	60,000	\$6.07
1985	664,000	284,000	948,000	90,000	10.52
1990	1,258,000	425,000	1,683,000	114,300	14.72
1995	1,942,000	585,000	2,527,000	143,800	17.57
<u>250-Passenger Boats</u>					
1980	\$409,000	\$140,000	\$549,000	59,100	\$9.27
1985	731,000	283,000	1,014,000	88,300	11.48
1990	1,260,000	376,000	1,636,000	116,000	19.10
1995	1,966,000	474,000	2,440,000	144,700	16.86

would seek all avenues available to prevent the Park Service from relocating the service. In addition, tourism in the area might decline, thus reducing patronage of the local hotels/motels.

A ferry service consisting of the existing service with new service at Davis Bayou would not be economically justified. It is estimated, based upon the location of hotels/motels and the major travel corridors, that about ten percent of the projected visitors using the Biloxi service would travel to Davis Bayou to ride a boat to West Ship Island. No visitors would travel from Gulfport to Davis Bayou. Thus, about 3,000 people would ride the Davis Bayou boat in 1980. This patronage would increase to about 7,000 in 1995. The 1980 peak day patronage would approximate 50 persons, while the 1995 peak day patronage would be 115. The annual cost of operating the system in 1980 would be about \$45,000, which results in a cost per passenger of about \$150. The cost per passenger would not vary significantly between 1980 and 1995.

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APPENDIX A

TECHNICAL MEMORANDUM

EXISTING AND FUTURE USE

FOR

GULF ISLANDS NATIONAL SEASHORE
PARK GENERAL, MISSISSIPPI

Prepared for

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DENVER SERVICE CENTER

Prepared by

HENSLEY-SCHMIDT, INC.
ATLANTA, GEORGIA

DECEMBER, 1978

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EXISTING AND FUTURE VISITOR USE

Visitation data is compiled monthly and maintained by the National Park Service. The procedure used to record visitation data and prepare monthly public use reports for the time period between January, 1973, and October, 1978, was obtained and analyzed to determine monthly and daily variations. Based upon these monthly and daily trends and conversations with park rangers, a systematic estimating procedure was developed to project the number of persons that would visit the Seashore and those that would use a transportation system for each year to 1980 and for 1985, 1990 and 1995.

Visitation Data Recording Procedure

The National Park Service has established a written procedure that is used to record monthly visitation to the Seashore. A traffic counter is used to record visitation to Davis Bayou while personal observations are used to record visitation to East Ship Island, Petit Bois Island and Horn Island, and a combination of personal observations and data recorded by the ferry service are used to record visitation to West Ship Island.

Davis Bayou - A traffic counter located at the main entrance to Davis Bayou records all vehicles which enter and exit. Prior to July 31, 1976, a battery-operated traffic counter was used. Due to the problems encountered with battery failure, the power source was converted to a 110 volt power supply. The following recording procedure is used to estimate persons visiting Davis Bayou in a single month:

- (1) Record the total vehicle count from the traffic counter reading and subtract this from the previous month's reading,
- (2) Divide this total by four since the counter registers each axle of all vehicles entering and leaving the park,
- (3) Subtract trailer axles, the total number of recreational camping units obtained from the camp ground receipts, from the figure in (2) above,
- (4) Multiply the resulting figure by 3.5 (the estimated number of persons per vehicle) to determine person visits,
- (5) Multiply the number of tenting units and recreational vehicle units by 3.5 to convert these units into camping visitors, and
- (6) Add the total number of camping visitors in (5) above to the total in (4) above to determine the total number of visitors to Davis Bayou in a single month.

Travel by National Park Service personnel is not deducted from the total visitation figures. It is assumed that this travel balances with the total number of visitors which enter and leave the park by Stark Boulevard, a primary access road for residents east of the National Park. Vehicles entering and leaving the park via Stark Boulevard are not recorded.

Ship Island - Visitation to West Ship Island is recorded by the park ranger and the private concessionaire. The following procedure is used to determine monthly visitation:

- (1) At West Ship Island, the ranger records the number of boats that either dock or use the waters in the vicinity of West Ship Island,
- (2) These boats are categorized as either pleasure boats, commercial boats (shrimpers), ferry service tours or overnight boats. In some instances, shrimp boats anchor off of the island and sleep, in which case some rangers include these vessels in both the commercial boat and overnight boat categories; thus, there is some duplication in recording the total number of boats.
- (3) The total number of pleasure boats, commercial boats and overnight boats is summed and multiplied by four, the estimated number of persons per boat,
- (4) This total number of visitors is added to the number of persons using the ferry service tours as recorded by the private concessionaire to determine the total number of visitors to West Ship Island,
- (5) The number of camping units on East Ship Island is recorded by the patrol ranger's daily contacts. In cases where weather conditions would not permit a complete control, the previous day's figures would be used, unless this day follows a holiday or weekend. In this case, a visitation figure from a corresponding day of a previous week would be used.
- (6) Day-use of East Ship Island is also recorded by the patrol ranger's daily contact.
- (7) The total number of visitors at East Ship and West Ship Islands are summed to arrive at the total number of visitors to Ship Island, which is recorded on the monthly public use reports.

It should be noted that the daily recordings of visitors to Ship Island is not retained on file. Thus, daily distributions of visitors to East Ship and West Ship Islands are unavailable. However, the ferry service does maintain accurate data as to the number of adults and children which use the ferry service on each boat trip. Based upon conversations with the local rangers, it is estimated that the number of persons visiting East Ship and West Ship Islands is under-reported since only one complete patrol of the island land and water area is made each day.

Horn and Petit Bois Islands - Prior to March, 1974, visitation to Horn Island was not maintained. Since March, 1974, visitation to Horn Island is recorded by the local ranger's daily patrol. Each day the ranger makes one complete patrol of the island land and water area to determine the number of daily visitors. From this patrol, the daily number of campers and day-use visitors is recorded. In cases where weather conditions are not conducive to a complete patrol, the previous day's figures would be used, unless this day follows a holiday or weekend. In this case, a visitation figure from a corresponding day of a previous week would be used.

The ranger also records the total number of boats anchored off Horn Island or using the water area adjacent to the island if he does not make personal contact with the boaters. In this case, the total number of boats is multiplied by four, the estimated number of persons per vessel, to determine person visits. (Prior to April, 1974, a factor of five persons per vessel was utilized to convert the number of boats visiting the Seashore to person visits. Beginning in April, 1974, an occupancy factor of four persons per boat was used.) The estimated number of visitors in these boats (those with which personal contact is not made) is added to the total number of visitors with which personal contact was made to determine the daily visitation to Horn Island. It should be noted that since only one complete patrol of the island land and water area is made per day the total number of visitors using the island is under-reported. Daily recordings of visitors to Horn Island are not maintained in the Park Service files. Thus, daily variations of visitors to Horn Island are not available.

Prior to 1978, visitation figures for Petit Bois Island were not recorded. From sporadic patrols of the island, the Park Service estimated that the visitation would be approximately 50 percent of that at Horn Island. Beginning in 1978, a new procedure to record visitation to Petit Bois Island was developed. At various times during each month, an aerial flight of Horn and Petit Bois Islands is made. During this aerial flight, the number of boats observed at Horn Island and Petit Bois Island is recorded. Based upon this observation, a percentage factor is developed and applied to the

recorded Horn Island visitation for that month to determine visitation at Petit Bois Island. For example, if 10 boats were observed at Horn Island and 7 boats at Petit Bois Island, the factor would be 70 percent (7 divided by 10 multiplied by 100 percent). Thus, the total monthly visitation to Horn Island would be multiplied by 70 percent to approximate the total visitation to Petit Bois Island. Daily recordings of visitors to Petit Bois Island are not maintained in the Park Service files, therefore daily variations are unavailable.

Existing Visitation Data

The Park Service had monthly visitation data for the National Seashore for each month between January, 1973 and October, 1978. A record of visitation to Horn Island was not initiated until March, 1974, and no estimates of visitation to Petit Bois Island were recorded until January, 1978. In addition, visitation to East Ship Island and West Ship Island were combined under the heading of Ship Island.

The total number of annual person visits to the National Seashore increased from 299,400 in 1973 to about 456,745 in 1976 (See Table A-1). In 1977, the total visitation decreased to 405,491 due primarily to the inclement weather during the months of April, May and June. However, based upon a comparison of the total person visits during the first ten months of 1976 and 1978 (See Figure A-1), the projected 1978 total visitation will approximate 566,000 person visits (See Figure A-2). As shown in Figure A-2 and Table A-1 the increase in annual person visits between 1973 and 1974 was slightly more than 13,000, while the increase between 1974 and 1975 exceeded 38,000. The small increase between 1973 and 1974 can be attributed to the change in the occupancy factor for private boats from five persons per vessel in 1973 to four persons per vessel in 1974. The larger increase between 1974 and 1975 can be accounted for by the recording of visitation to Horn Island which was included in the total annual visitation beginning in March, 1974. This increase would have been larger if the concessionaires had made two trips per day in 1975 to West Ship Island (which was the case prior to and since 1975) rather than one trip per day.

Annual visitation to Davis Bayou increased from approximately 237,031 in 1973 to 336,544 in 1976, as shown in Table A-1. Visitation decreased in 1977 due to inclement weather; however, through the first 10 months of 1978, the total visitation to Davis Bayou approximated 381,438 person visits.

TABLE A-1
PERSON VISITS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

1973 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Total</u>
January	100	3,526	3,626
February	450	11,251	11,701
March	500	28,905	29,405
April	4,000	41,599	45,599
May	6,472	29,727	36,199
June	14,101	28,805	42,906
July	17,000	19,396	36,396
August	14,562	26,894	41,456
September	3,144	13,850	16,994
October	650	14,500	15,150
November	450	10,135	10,585
December	940	8,443	9,383
TOTAL	62,369	237,031	299,400

1974 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	300	10,733	0	11,033
February	290	11,344	0	11,634
March	700	24,392	739	25,831
April	4,030	37,834	2,336	44,200
May	6,651	35,615	3,673	45,939
June	16,094	22,923	5,314	44,331
July	14,610	25,996	1,812	42,418
August	13,609	12,370	4,236	30,215
September	3,846	20,707	2,138	26,691
October	2,161	12,753	1,500	16,414
November	1,175	3,957	697	5,829
December	550	7,026	557	8,133
TOTAL	64,016	225,650	23,002	312,668

1975 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	604	8,753	468	9,825
February	955	12,619	418	13,992
March	2,565	19,235	600	22,400
April	3,374	29,933	1,548	34,855
May	7,572	33,702	3,000	44,274
June	7,271	35,466	3,219	45,956
July	10,872	33,060	4,388	48,320
August	10,856	29,954	2,236	43,046
September	3,568	21,449	1,712	26,729
October	2,136	19,994	2,112	24,242
November	1,401	18,375	728	20,504
December	672	15,769	440	16,881
TOTAL	51,846	278,309	20,869	351,024

¹ Includes East Ship and West Ship Islands

PERSON VISITS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY1976 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	742	11,077	516	12,335
February	773	31,860	556	33,189
March	875	35,888	832	37,595
April	6,820	38,394	3,364	48,578
May	10,873	39,666	4,407	54,946
June	14,217	39,033	4,953	58,203
July	21,263	34,549	6,963	62,775
August	16,950	30,975	6,468	54,393
September	7,233	24,187	4,220	35,640
October	3,283	21,949	2,188	27,420
November	1,036	17,308	741	19,085
December	580	11,658	348	12,586
TOTAL	84,645	336,544	35,556	456,745

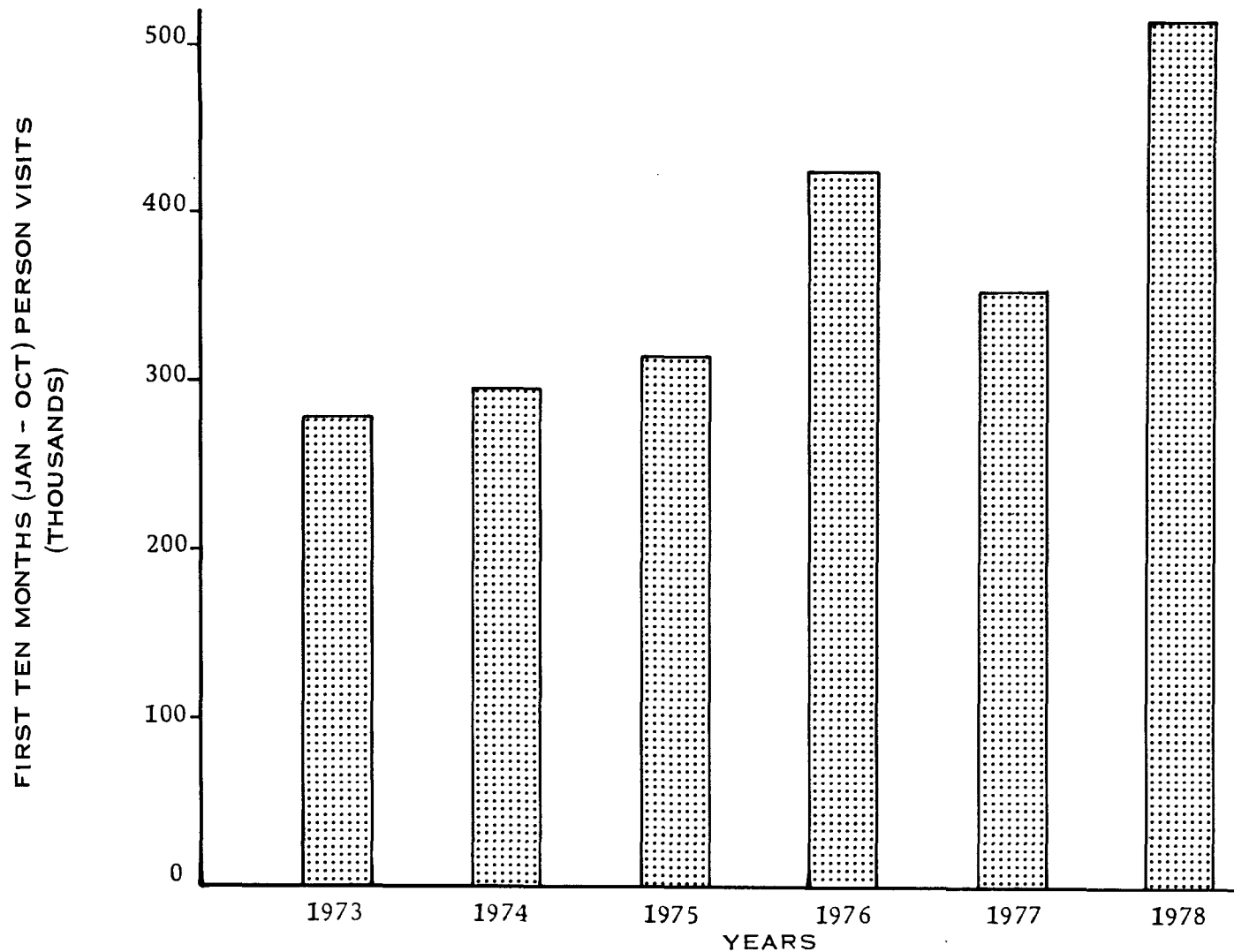
1977 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Total</u>
January	540	11,388	104	12,032
February	560	14,130	284	14,974
March	1,508	17,491	1,264	20,263
April	6,939	23,075	2,716	32,730
May	12,577	22,693	2,780	38,050
June	13,436	22,522	1,972	37,930
July	20,461	45,740	2,616	68,817
August	11,521	43,779	982	56,282
September	1,711	33,840	712	36,263
October	1,890	33,411	388	35,689
November	926	27,990	160	29,076
December	772	22,473	140	23,385
TOTAL	72,841	318,532	14,118	405,491

1978 Visitation

	<u>Ship¹ Island</u>	<u>Davis Bayou</u>	<u>Horn Island</u>	<u>Petit Bois</u>	<u>Total</u>
January	136	20,220	68	272	20,696
February	180	25,725	312	392	26,609
March	2,905	24,490	317	73	27,785
April	7,692	43,722	3,636	1,272	56,322
May	12,980	47,280	4,220	3,249	67,729
June	18,588	46,088	3,848	2,886	71,410
July	29,053	53,731	4,432	2,038	89,254
August	15,642	43,305	2,584	2,424	63,955
September	7,703	37,513	2,884	808	48,908
October	2,111	39,364	1,136	329	42,940
TOTAL	96,990	381,438	23,437	13,743	515,608

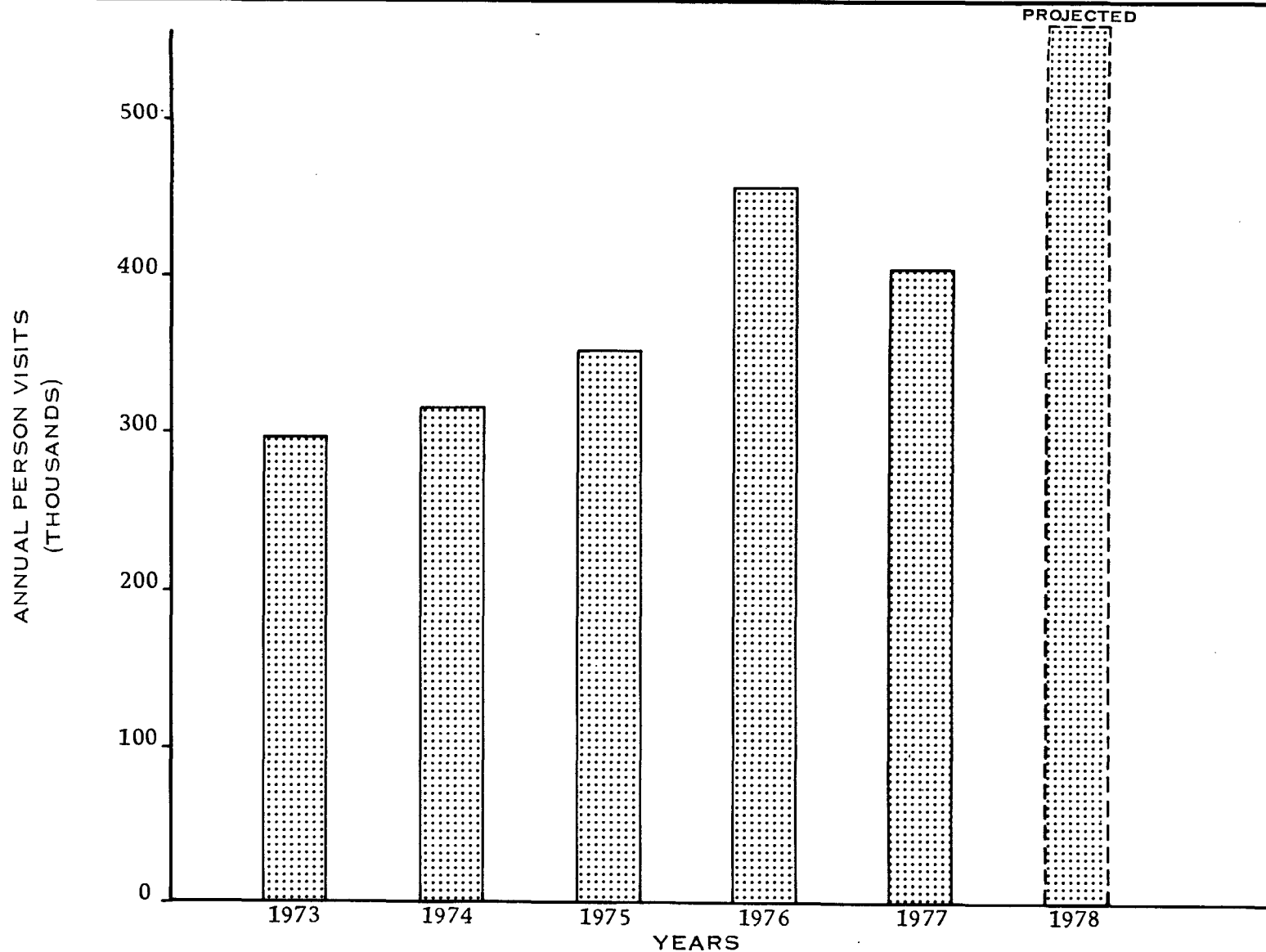
¹Includes East Ship and
West Ship Islands



FIRST TEN MONTHS PERSON VISITS - MISSISSIPPI UNITS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE A1



ANNUAL PERSON VISITS - MISSISSIPPI UNITS
GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE A2

Annual visitation to Ship Island (East and West Ship Islands combined) increased from 62,639 person visits in 1973 to 84,645 in 1976 and then decreased to 72,841 visitors in 1977 (See Table A-1). During the first 10 months of 1978, the annual visitation to East and West Ship Islands was slightly more than 96,990. As shown in Table A-2 and Figure A-3, the total number of persons utilizing the ferry service to West Ship Island increased from slightly more than 37,500 in 1973, the first year for which visitation data was available, to slightly more than 43,300 annual person visits in 1977. The drop in the 1975 patronage may be attributed to the concessionaire making one trip per day rather than the two trips per day prior to and since 1975. Since the ferry service to West Ship Island does not operate in November and December, the total usage figures for the first ten months of 1978 is the total 1978 patronage. As shown in Table A-2 and Figure A-3, approximately 54,760 persons rode the ferry service in 1978.

As previously stated, records of visitation to Horn Island were not maintained until 1974. As shown in Table A-1 and Figure A-4, the total annual visitation to Horn Island increased from 23,002 in 1974 to 35,556 in 1976. In 1977, the total annual person visits decreased to 14,118, and through the first 10 months of 1978 the visitation approximated 23,437 person visits. The decrease in 1977 can be attributed to the inclement weather during April, May and June and the variability resulting from the procedure used to record visitation data. The decrease from 1976 to 1978 can also be attributed to the variability resulting from the visitation data recording procedure.

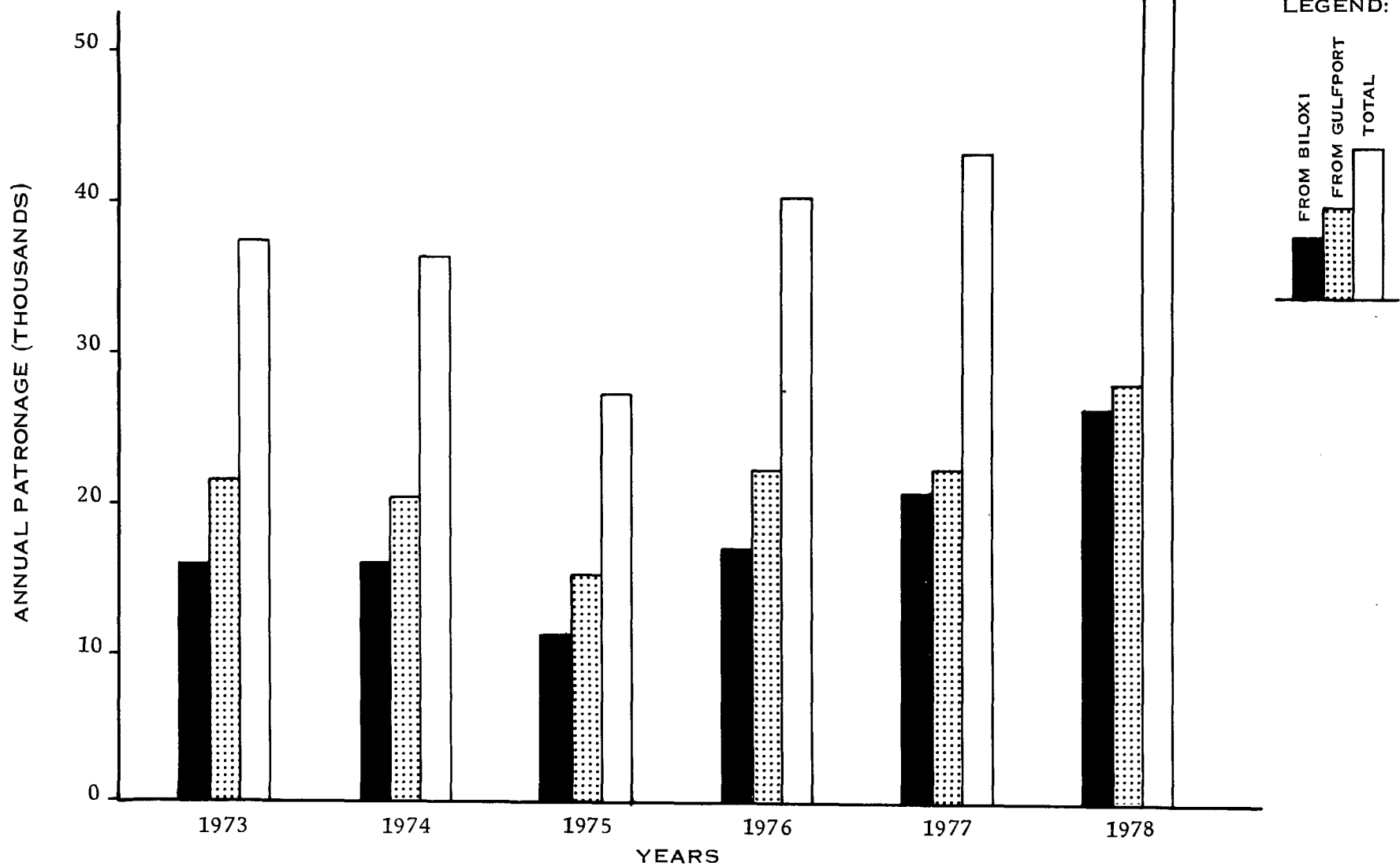
The annual visitation to the National Seashore is dependent upon the weather conditions along the Mississippi Gulf Coast. Thus, visitation could vary significantly (by as much as 10 to 15 percent) from year to year. In addition, it should be noted that about five percent of the increase from 1976 to 1978 is due to the fact that visitation to Petit Bois Island was not recorded in 1976, but was added to the projected total annual visitation for 1978. In addition, some variation in visitation can be attributed to the different park rangers (who vary from year to year and week to week) who are used to record the visitation data.

Monthly distribution curves were developed from the data in Table A-1 for the entire National Seashore and for Horn Island. Based upon annual patronage data obtained from the private concessionaires, monthly, daily and AM-PM distributions of the Biloxi and Gulfport ferry services to West Ship Island were prepared.

TABLE A-2

FERRY SERVICE PATRONAGE
GULF ISLAND NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Year</u>	<u>Annual Patronage</u>		<u>Total</u>
	<u>From Biloxi</u>	<u>From Gulfport</u>	
1973	15,868	21,644	37,512
1974	16,144	20,270	36,414
1975	11,647	15,576	27,223
1976	17,019	23,392	40,411
1977	21,028	22,312	43,340
1978	26,571	28,186	54,757

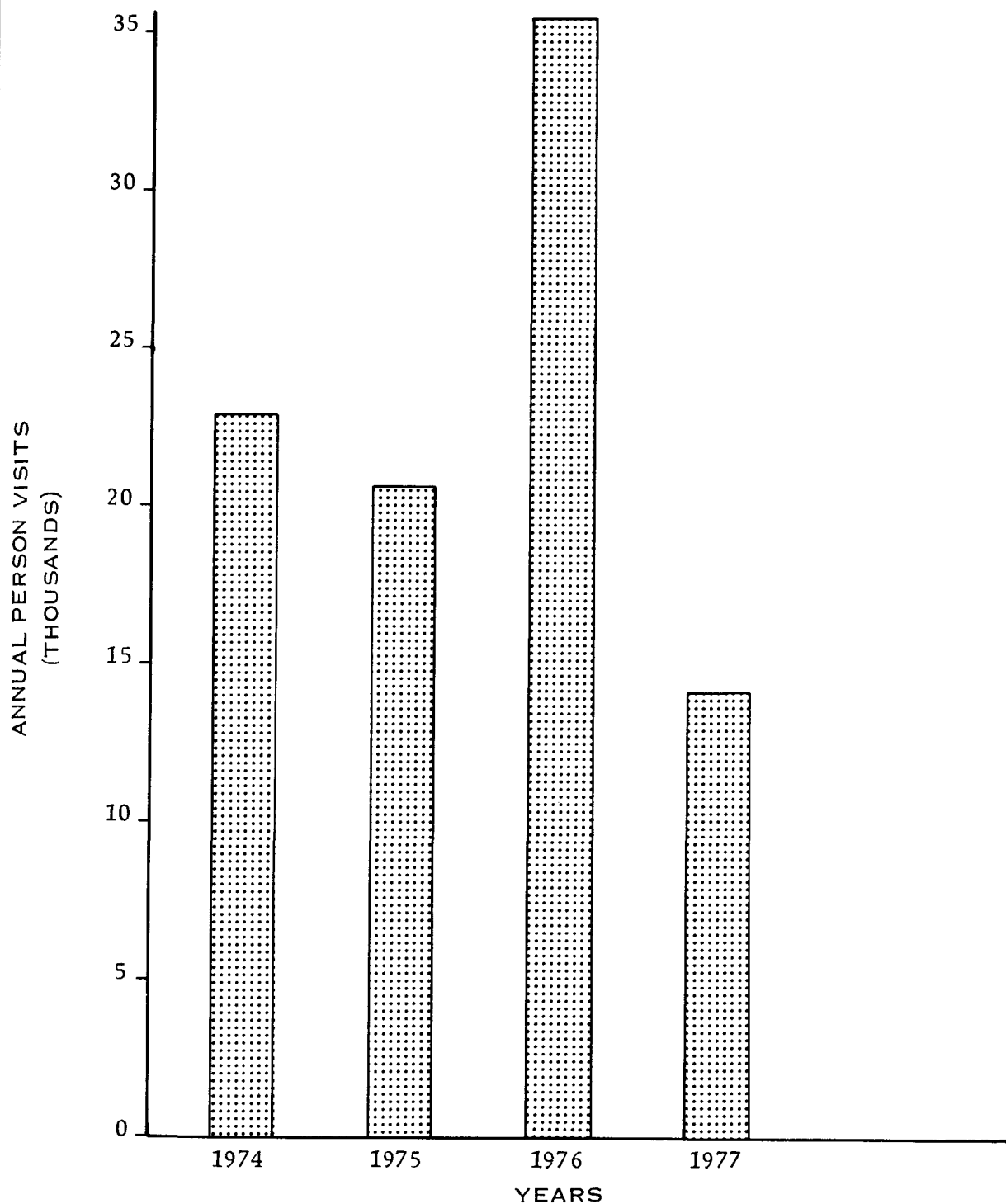


ANNUAL PATRONAGE - FERRY SERVICE TO WEST SHIP ISLAND



GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE A 3



ANNUAL PERSON VISITS - HORN ISLAND

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY



FIGURE A4

As shown in Figure A-5, visitation to the National Seashore peaked during the summer months (May - August) in 1975 and 1976, with July being the peak month. However, the monthly visitor distribution curves varied significantly in 1973, 1974 and 1977. The difference in the 1973 and 1974 curves can be accounted for by the problems encountered with the traffic counter that was used to record visitation data to Davis Bayou and by the fact that visitation to Horn Island was first recorded in March, 1974. The Park Service experienced recurring malfunctions with the traffic counter in 1973 and 1974 and frequently estimated monthly visitation to Davis Bayou. In 1977, the inclement weather in April, May and June reduced visitation to the Seashore. Thus, the 1975 and 1976 variations appear reasonable and should be used to determine the monthly distribution of visitors to the Seashore.

The monthly distribution of the ferry service patronage for both the service from Biloxi and Gulfport is illustrated in Figure A-6. Usually the ferry service operates between the 1st of April and Labor Day weekend; however, occasionally some service is provided in March, October and November. Most of the patronage occurs in June, July and August, with July being the peak month. The monthly distributions for both ferry systems and the distributions for each year between 1973 and 1978 are similar. Thus, all of the distribution curves for both systems should be averaged to determine one variation which should be used in subsequent analysis.

In addition, a daily distribution of patronage on the two ferry services is shown in Figure A-7. Patronage is fairly constant during the weekdays, averaging around 10 percent of the weekly patronage riding the system on each weekday, while about 50 percent uses the system on weekends. Saturday is the peak day, with about 26 to 28 percent of the weekly patronage riding the system on any given Saturday. The weekly distributions appear reasonable and since they are similar, they should be combined into one weekly distribution and used in subsequent analysis.

Since the ferry systems presently make one trip during the morning and a second trip during the afternoon, an hourly distribution of patronage is not available; however, an AM-PM distribution of patronage for each day of the week was prepared. On the average, about 65 percent of the daily patronage rode the ferry service from Biloxi to West Ship Island during the morning trip (See Figure A-8). The distribution for the ferry service from Gulfport to West Ship Island varied, as the morning patronage ranged between 50 and 60 percent of the daily ridership. It should be noted that the concessionaire must hold open seats on the PM trip to accommodate those AM passengers who remain on West Ship Island all day and return on the evening trip.

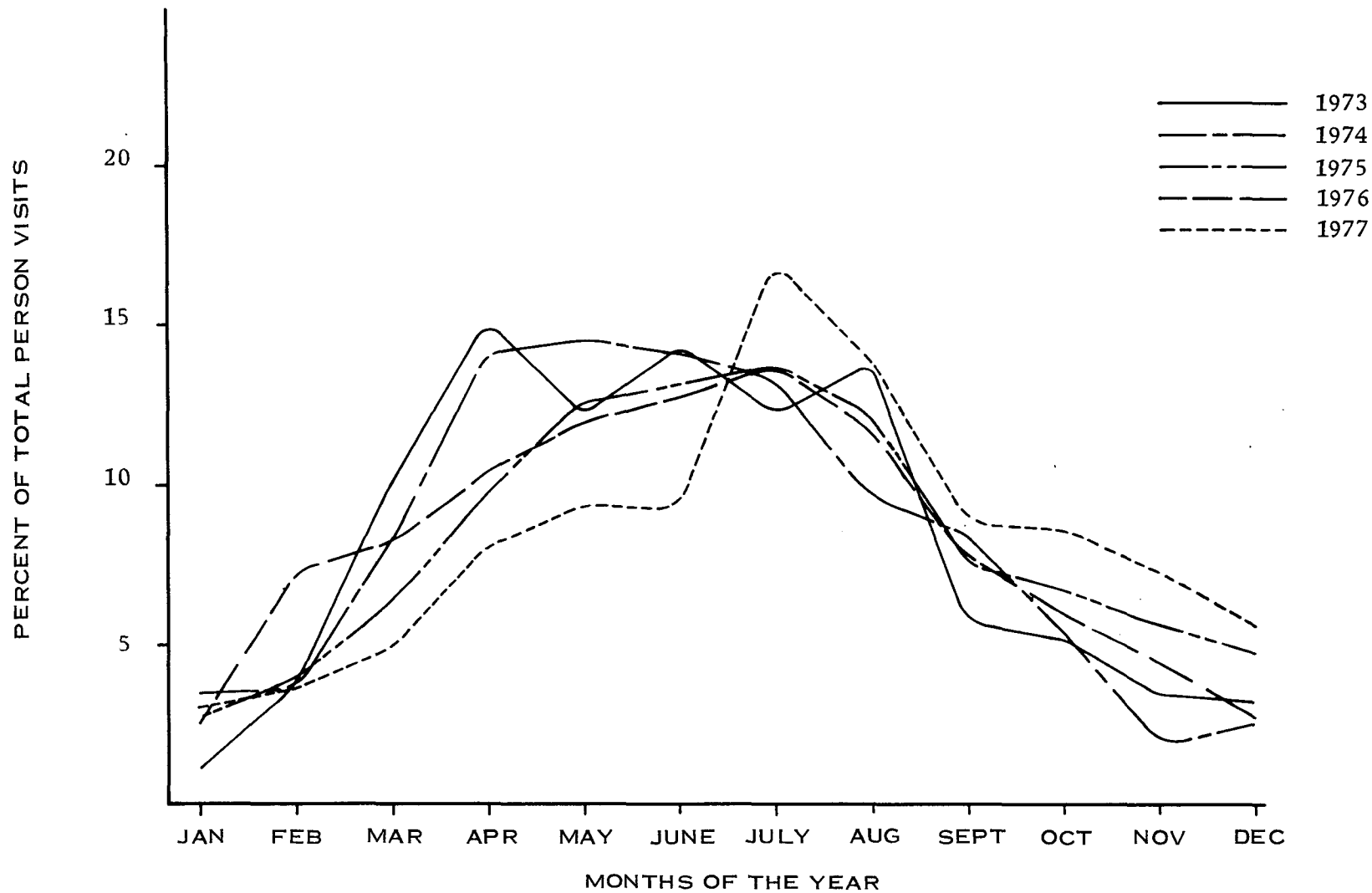
The monthly distribution of visitors to Horn Island for the years 1974 to 1977 was prepared. As shown in Figure A-9, the visitation pattern is somewhat erratic as no two years are similar. This variance in the monthly distribution can be attributed to the visitation recording procedure, previously discussed, and due to the changeover in Park Service personnel used to record visitation. The 1974 curve, the first year for which visitation data was maintained, shows a low percentage of visitors during the month of July and a peak in June. The 1975 and 1976 curves both peak in July reflecting the combined impact of day-use visitors and campers. The 1977 monthly distribution varies from the previous three years as April and May are the peak months. The variability of this curve can be attributed to the inclement weather conditions in 1977. Since the 1974 and 1977 curves are erratic, the visitation variations to Horn Island during these years should not be used in subsequent analysis. However, an average of the 1975 and 1976 variation appears reasonable.

Visitation Projections

Total visitation to the Seashore was to be estimated for each year to 1980 and in five year increments from 1980 to 1995. Prior to estimating this visitation, annual growth factors were developed. The Park Service currently uses seven percent to approximate the annual increase in visitation to the National Seashore.

Visitation to the National Seashore will be greatly dependent upon the projected increase in population in the area of Mississippi contiguous to the National Seashore and by the projected increase in tourism. The Southern Mississippi Planning and Development Commission has projected that the population will increase by approximately two percent annually between 1978 and 1995 (1). In addition, tourism in the Mississippi Gulf area is expected to increase by two to three percent annually between 1978 and 1995 (2). Thus, based upon the projected increase in tourism and local population, visitation should increase by about five percent annually.

The five percent annual growth in population and tourism would not be applicable to boating visitors. The increase in visitation by the boating public would be directly related to the increase in boat registration. According to the Mississippi Boat and Water Safety Commission, historical data on boat registration in the Mississippi Gulf Planning Region is unavailable; however, the annual growth rate in boat registrations for the State of Mississippi between 1975 and 1978 was about five percent. Thus, visitation by the boating public should be increased by five percent annually.

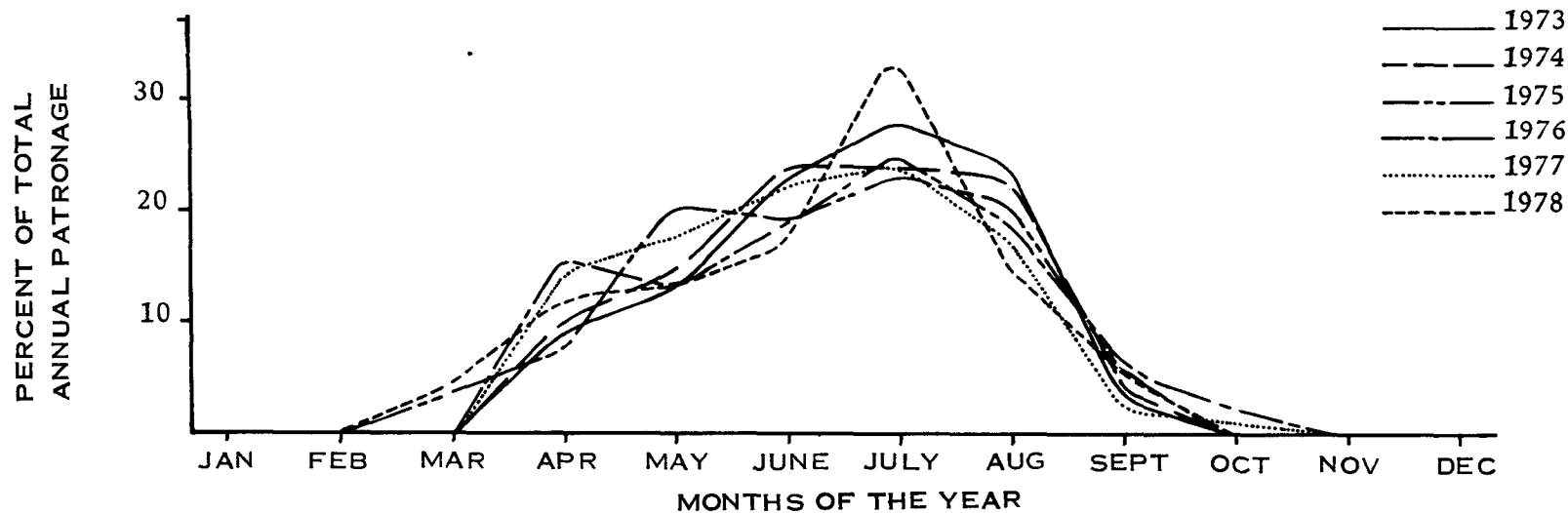


MONTHLY DISTRIBUTION OF VISITORS-MISSISSIPPI UNITS

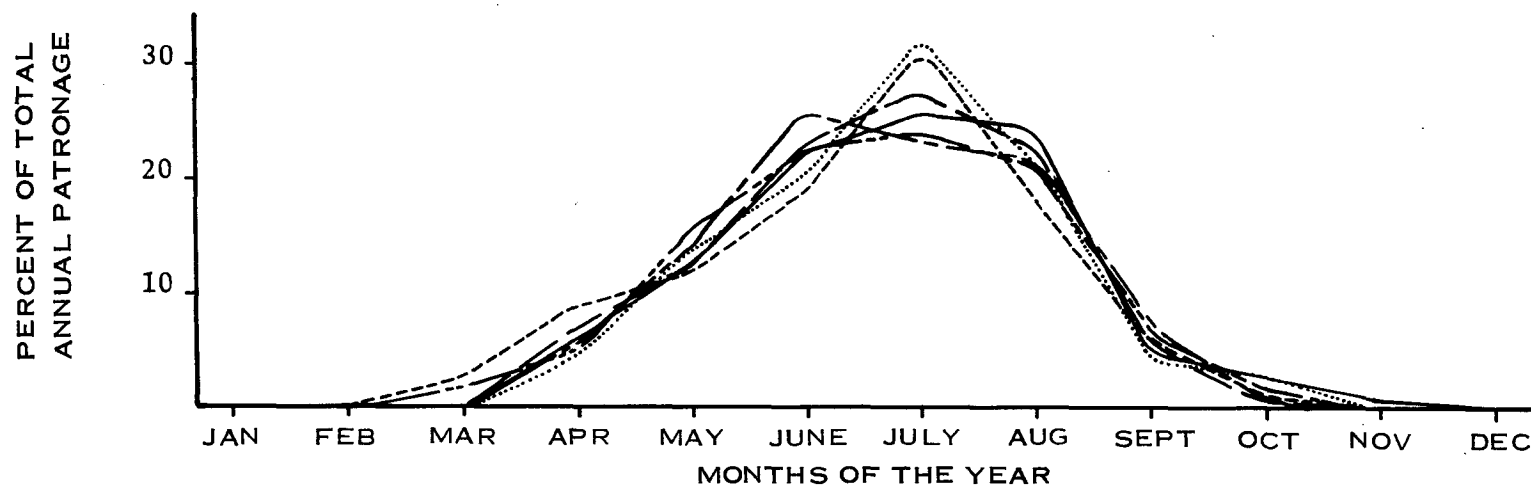
GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE A-5





FERRY SERVICE - BILOXI TO WEST SHIP ISLAND



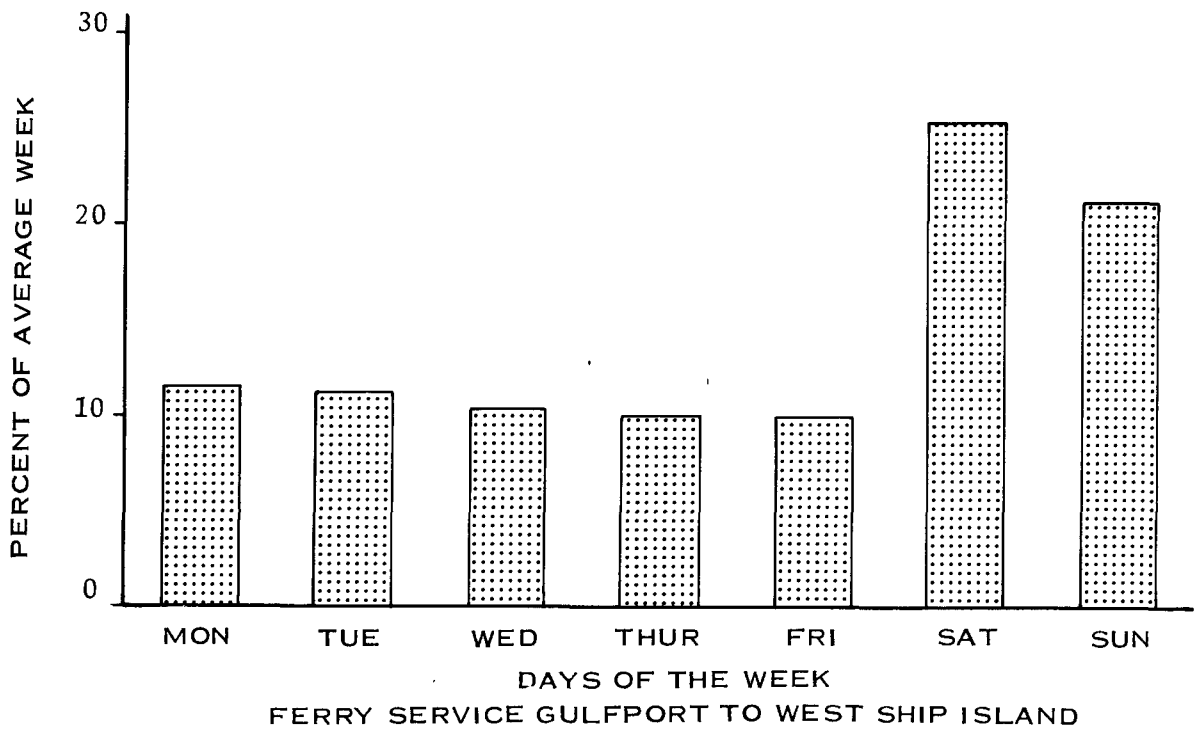
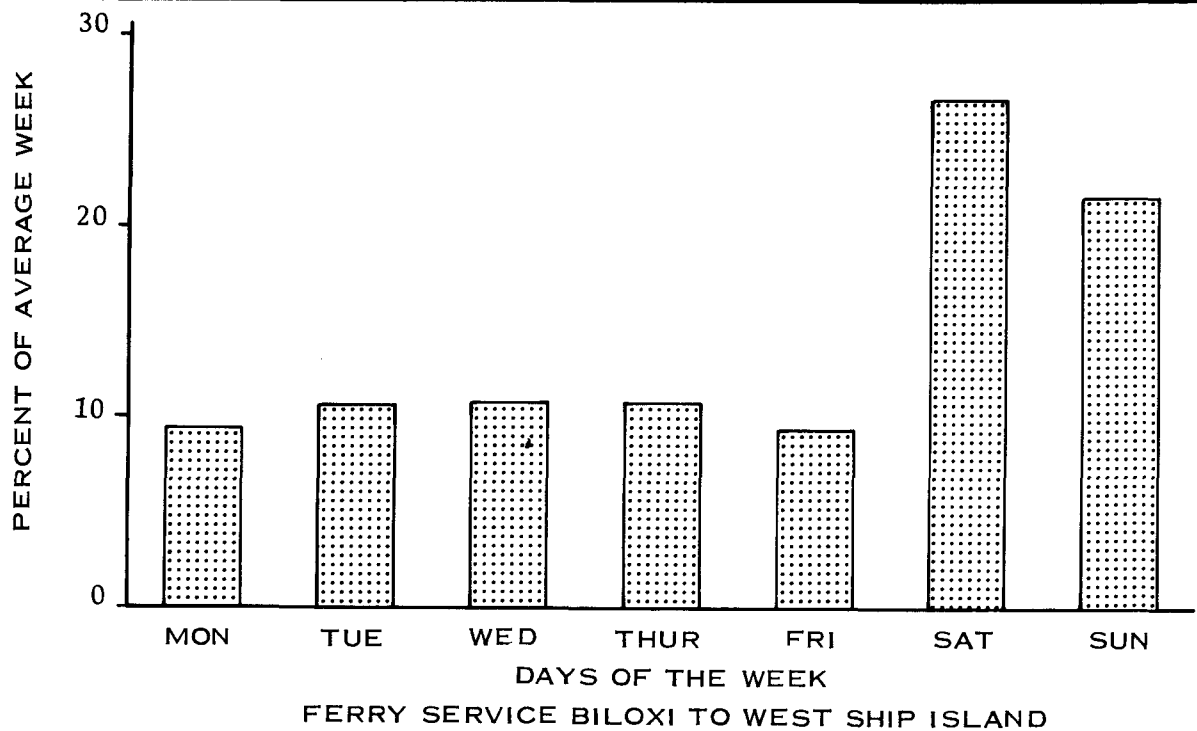
FERRY SERVICE - GULFPORT TO WEST SHIP ISLAND



MONTHLY DISTRIBUTION OF PATRONAGE-FERRY SERVICE TO WEST SHIP ISLAND

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE A-6



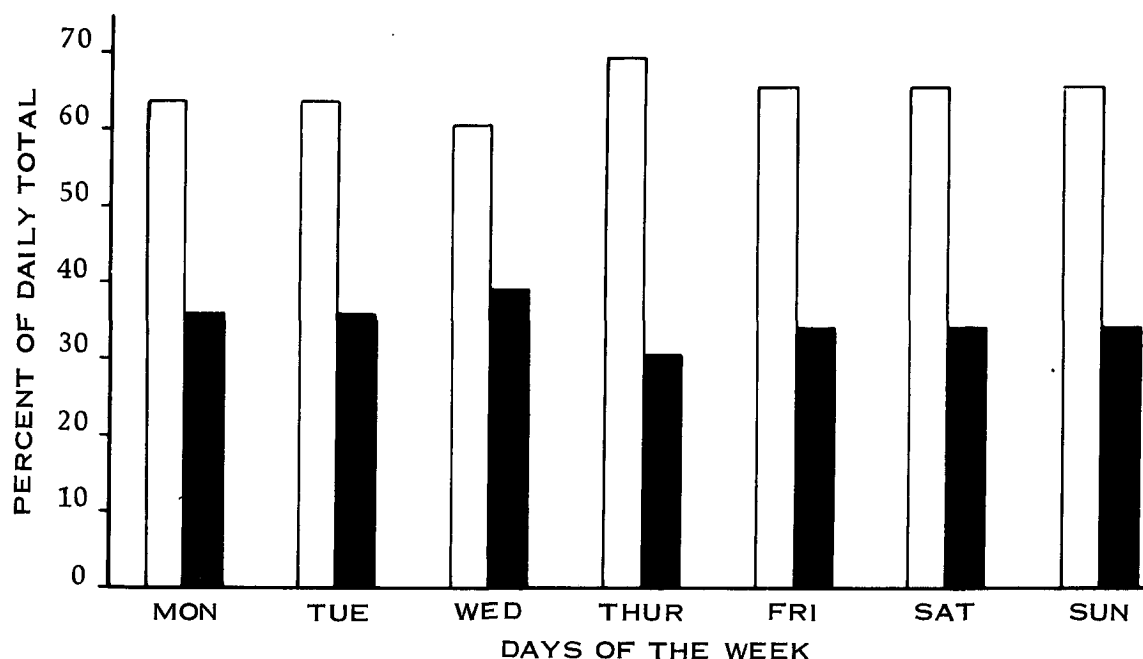
**DAILY DISTRIBUTION OF PASSENGERS
FERRY SERVICE TO WEST SHIP ISLAND**

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY

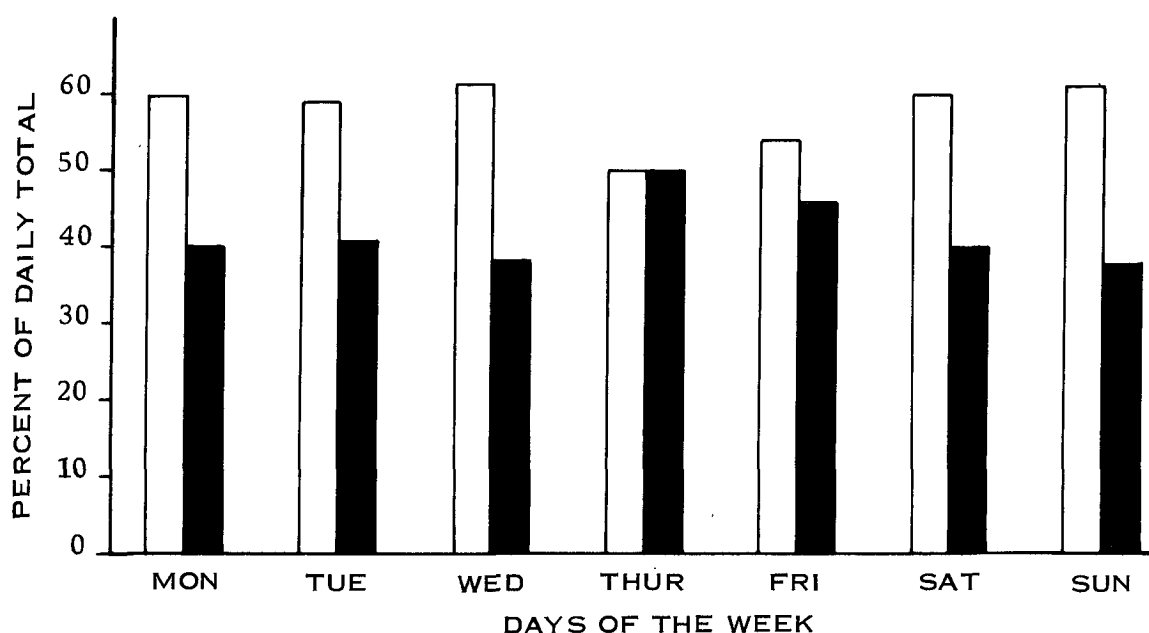


FIGURE A 7

LEGEND:



FERRY SERVICE BILOXI TO WEST SHIP ISLAND



FERRY SERVICE GULFPORT TO WEST SHIP ISLAND

A.M.-P.M. DISTRIBUTION OF PASSENGERS FERRY SERVICE TO WEST SHIP ISLAND

GULF ISLANDS NATIONAL SEASHORE-MISSISSIPPI
TRANSPORTATION STUDY

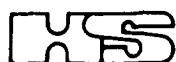
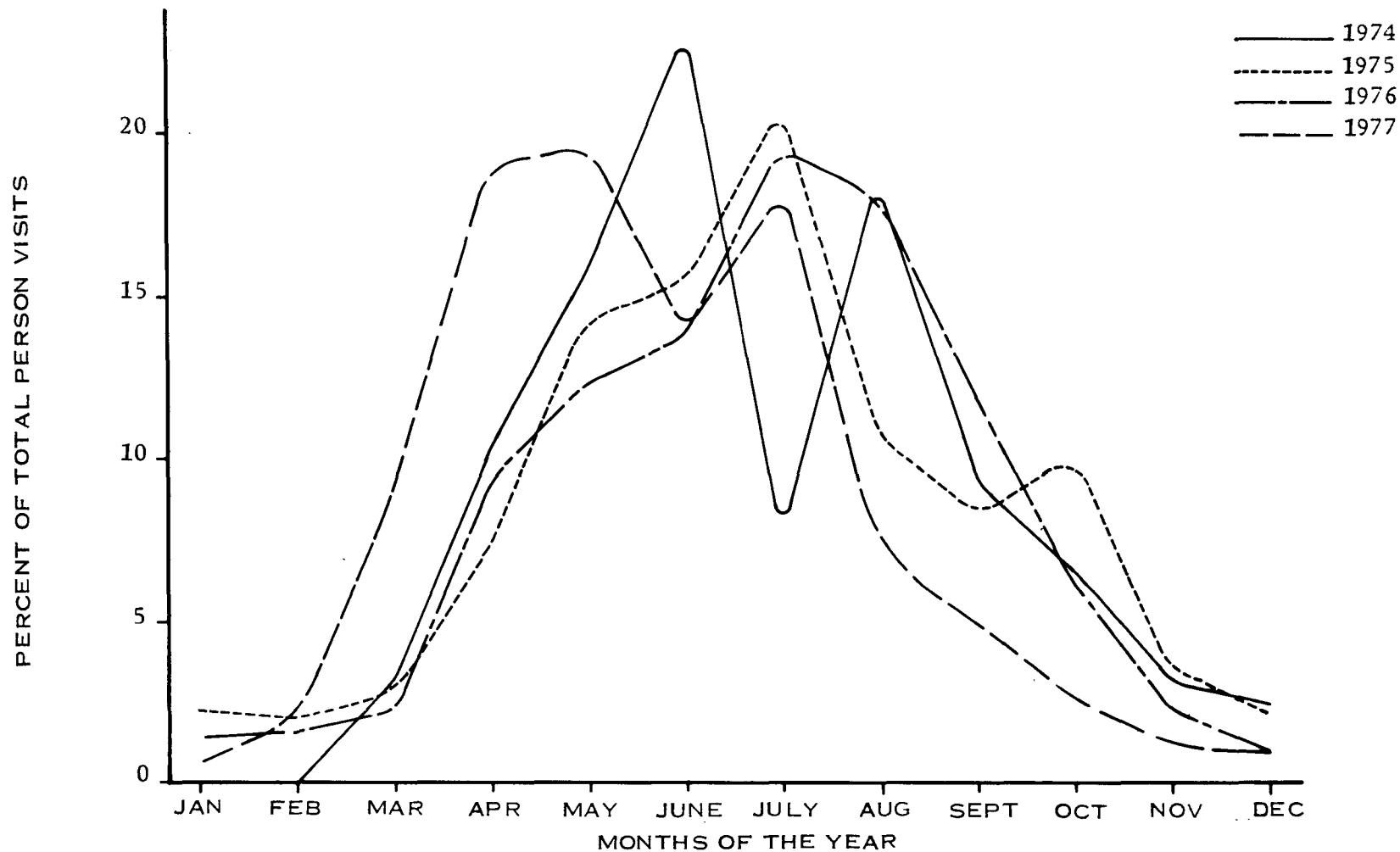


FIGURE A8



MONTHLY DISTRIBUTION OF VISITORS - HORN ISLAND

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE A 9



An analysis of visitation data maintained by the ferry system which provides service between Biloxi and Gulfport and West Ship Island shows that patronage between 1973 and 1978 increased at an annual rate of eight percent. However, the patronage increased at an annual rate of 4 percent between 1973 and 1977 and increased by 26 percent between 1977 and 1978. Based on proposed development at West Ship Island, it is assumed that the patronage of the ferry system would increase by about eight percent annually to 1985 when the island development would be completed. It is assumed that visitation resulting from the improvement in facilities on West Ship Island would level off after 1985 and increase at an annual rate of five percent.

Offshore Island Camping - The development of a transportation system, which will provide access to the offshore islands for the non-boating public, will attract new visitors to the Seashore. Thus, this increase in visitation should be added to the annual growth rates. It is assumed that the system's first year of operation would be 1980. The National Park Service has estimated that a maximum of five percent of the persons riding the ferry service system on Fridays and Saturdays would be interested in camping. By multiplying the 1978 Friday and Saturday patronage (about 19,500) by 5 percent, an estimated total of 975 campers results.

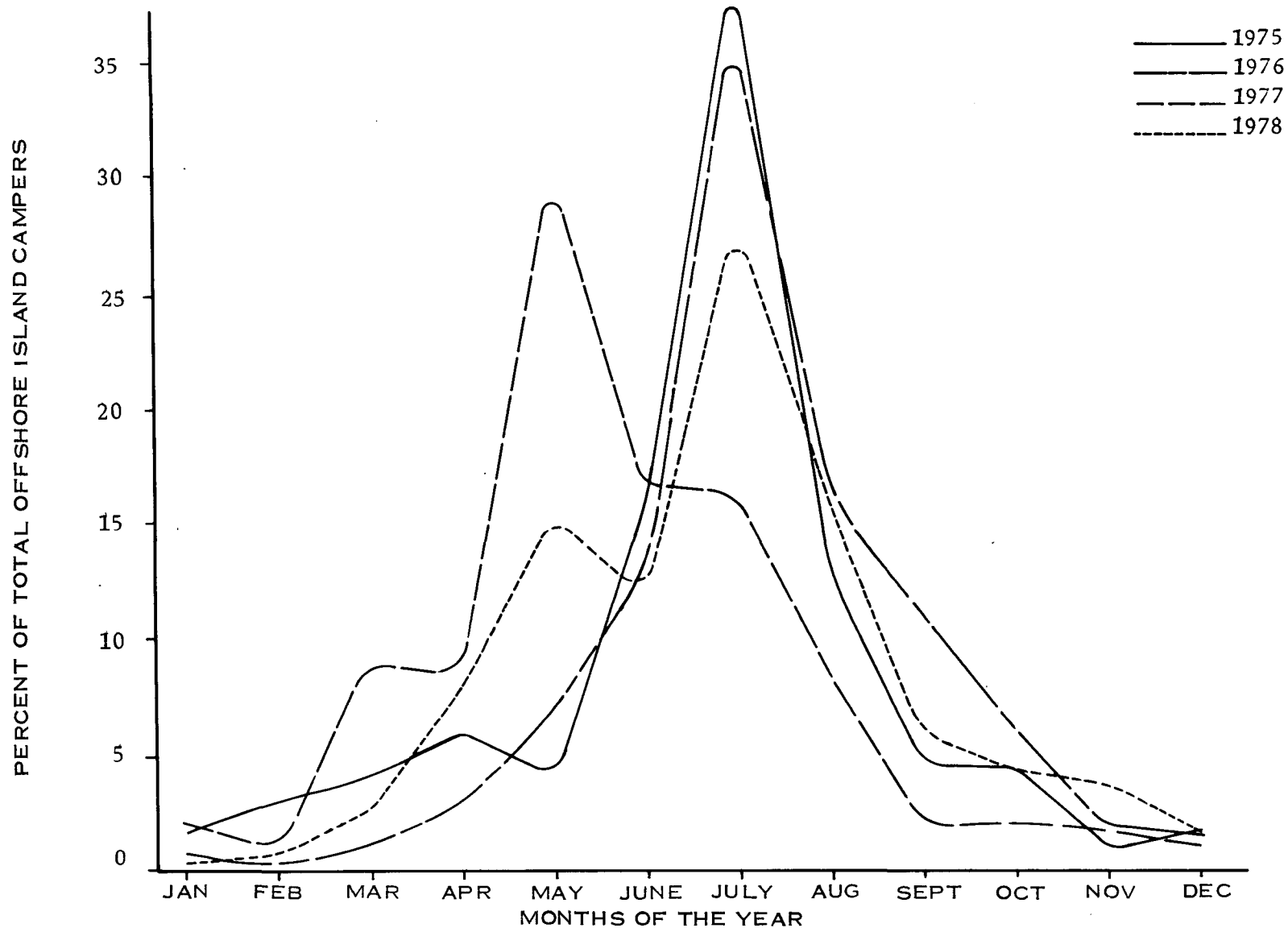
The Park Service stated that about 33 percent of the total campers would desire to camp on Friday night with about 90 percent of these, 30 percent (33 percent multiplied by 90 percent), also camping on Saturday nights. The Park Service also estimated that about 50 percent of a total week's campers would desire to camp on Saturday night only. Thus, about 80 percent (30 percent plus 50 percent) of an average week's camping nights would occur on Saturday. The Park Service indicated that some persons riding the ferry service system Sundays through Thursdays had expressed interest in camping; however, the percentage of total passengers would be minimal (less than one percent). The Park Service estimated that the number of persons desiring to camp on Sundays through Thursdays would comprise about 20 percent of the total number of campers. Thus, to the projected number of campers on Saturday night during the months of April through October (975) to the total number of camping nights which would be expected between April and October, the 975 campers were divided by 0.8 (80 percent). As a result, a total of 1,220 camping nights would occur between April and October.

Since camping will occur during all 12 months of the year, the projected 7 month total of 1,220 camping nights must be factored to a 12 month total. Island camping data maintained by the National Park Service was obtained and analyzed. As shown in Figure A-10, the monthly distribution of island

campers varies between 1975 and 1978. The 1975 and 1976 distributions peak during June, July and August with very little camping in any other month. According to the Park Service, neither year accurately recorded the camping in April and May. The 1977 curve differs significantly from the 1978 curve as shown in Figure A-10. This difference can be accounted for by the fact that the inclement weather in 1977 was not conducive to camping. The 1978 distribution peaks in July with a small peak occurring in May. Since there was no significant amount of inclement weather in 1978 and since the National Park Service stated that the 1978 curve generally represents actual camping patterns, the 1978 curve was selected to determine the monthly distribution of island camping.

Based upon the 1978 distribution, factors which can be applied to annual projections of offshore island camping to determine monthly offshore island camping were developed (See Table A-3). In addition, factors to be applied to the monthly projections to determine the daily number of offshore island campers that depart from the mainland and from the offshore islands are shown in Tables A-4 and A-5 respectively. Based upon the Park Service estimate that about 17 percent of the total campers desire to camp between Sunday and Thursday (an average of 3.4 percent per day), that about 33 percent would desire to camp on Friday with about 90 percent of these camping also on Saturday night, and that about 50 percent would desire to leave the mainland to camp on the offshore islands on Saturday night, the factors in Tables A-4 and A-5 were developed. These daily factors were determined by converting the percentage that each day of the week is of the average week to the percentage each day of the week is of the average month. This was accomplished by dividing by 52 (number of weeks in a year) and multiplying by 12 (number of months in a year).

As shown in Table A-3 and Figure A-10, the months of April through October constitute about 90 percent of the total annual camping nights. Therefore, the total number of camping nights between April and October was divided by 0.9 to estimate the annual total of camper nights, 1,355 (1,220 divided by 0.9 equals 1355). Since the Park Service estimated that about 90 percent of the Friday night campers would also camp on Saturday night, the total number of annual camper nights, (1,355), was factored to estimate the total number of individual campers. Since 33 percent of the total camper nights occurred on Friday and since about 90 percent of the Friday night campers would camp on Saturday night, it was estimated that about 30 percent (33 percent multiplied by 90 percent or 0.9) of the total camper nights would be persons individual campers, the total number of camper nights was



MONTHLY DISTRIBUTION OF OFFSHORE ISLAND CAMPERS
GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI, TRANSPORTATION STUDY

FIGURE A10

TABLE A-3

FACTORS TO BE APPLIED TO ANNUAL PROJECTIONS
OF OFFSHORE ISLAND CAMPING TO DETERMINE
MONTHLY CAMPERS ON OFFSHORE ISLANDS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Month</u>	<u>Factor</u>
January	0.003
February	0.009
March	0.029
April	0.083
May	0.153
June	0.118
July	0.283
August	0.162
September	0.062
October	0.042
November	0.039
December	0.019

TABLE A-4

FACTORS TO BE APPLIED TO MONTHLY PROJECTIONS TO DETERMINE THE DAILY
NUMBER OF OFFSHORE ISLAND CAMPERS THAT DEPART FROM THE MAINLAND

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Day of Week</u>	<u>Factor</u>
Monday	0.0078
Tuesday	0.0078
Wednesday	0.0078
Thursday	0.0078
Friday	0.0762
Saturday	0.1154
Sunday	0.0078

TABLE A-5

FACTORS TO BE APPLIED TO MONTHLY PROJECTIONS TO
DETERMINE THE DAILY NUMBER OF OFFSHORE ISLAND
CAMPER'S THAT DEPART FROM THE OFFSHORE ISLANDS

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Day of Week</u>	<u>Factor</u>
Monday	0.0078
Tuesday	0.0078
Wednesday	0.0078
Thursday	0.0078
Friday	0.0078
Saturday	0.0069
Sunday	0.1846

multiplied by 70 percent or 0.70 (100 percent minus 30 percent) to estimate the total number of individual campers, 950 (1,355 multiplied by 0.70 equals 950).

Since camping on the offshore islands by the non-boating public will be a new attraction at the Seashore, the growth in this activity will be greater than that of the sum of the projected population and tourist growth. Since no surveys were permitted by the National Park Service, the growth rate for a similar type attraction was applied. The Cumberland Island, Georgia National Seashore is similar to the offshore islands at the Mississippi Gulf Islands National Seashore in that the island is only accessible via a boat service provided by the National Park Service. One of the attractions at Cumberland Island is primitive camping. Primitive camping is denoted as backpackers on the Cumberland Island monthly public use reports. Based upon visitation data at Cumberland Island, the primitive camping increased by 340 percent from 1976, the first year in which the public transportation service was available, to 1977 and increased by 170 percent between 1977 and 1978. Thus, this type of growth rate can be expected at the Mississippi Gulf Islands National Seashore. Based upon the Cumberland Island visitation data, it is projected that the increase in the number of campers would probably stabilize after two years. It was estimated that the number of campers would then increase at an annual rate of about five percent, the projected annual increase of population and tourism. As shown in Table A-6, it is projected that the initial 950 campers in 1980 will increase to about 3,230 in 1981 and to slightly more than 5,490 in 1982. This total will increase to more than 6,355 in 1985 and increase to approximately 10,350 in 1995.

The National Park Service has estimated that about 20 percent of the total campers would use the new facilities at West Ship Island. Thus, the total number of campers was multiplied by 20 percent to project the number of campers that would camp at West Ship Island. Based upon the visitation data, about 30 percent of the present island campers camp on East Ship Island while the remaining 70 percent camp on Horn Island. Thus, 24 percent of the remaining 80 percent of the offshore island campers are projected to camp at East Ship Island and 56 percent are expected to camp at Horn Island.

As shown in Table A-6, the number of campers at West Ship Island is expected to increase from about 190 in 1980 to approximately 1,270 in 1985 and to nearly 2,070 campers in 1995. The projected number of campers at East Ship Island is expected to total about 230 in 1980, increasing to slightly less than 2,500 in 1995, while the projected number of campers at Horn Island in 1980 would be about 530, increasing to about 5,800 campers in 1995. All of the projections in Table A-6 assume that the capacity on any island is not exceeded.

TABLE A-6

PROJECTED CAMPERS THAT WOULD USE A TRANSPORTATION SYSTEM¹GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

	<u>Total Campers</u>	<u>West Ship Island</u>	<u>East Ship Island</u>	<u>Horn Island</u>
1980	950	190	230	530
1981	3230	645	775	1810
1982	5490	1100	1320	3070
1985	6355	1270	1525	3560
1990	8110	1620	1945	4545
1995	10,350	2070	2480	5800

¹Assumes that the capacity on any island is not exceeded.

Ferry Service - As stated previously, the patronage on the ferry system has increased at an annual rate of eight percent between 1973 and 1978; however, the annual rate of increase between 1973 and 1977 was four percent. Assuming that the proposed development on West Ship Island included in the Final Environmental Statement(3) and the draft General Management Plan(4) will be completed by 1985, it is projected that the patronage will increase by eight percent annually between 1978 and 1985. After 1985, it is estimated that the patronage will increase by the projected annual increase in the local population and tourism, five percent. Since the transportation system serving offshore island camping (East Ship Island and Horn Island) would attract about 760 persons, the 1980 ferry system patronage was adjusted to about 63,000 by subtracting 760 passengers from 63,800 (58,100 times 1.08) as shown in Table A-7. It is projected that the ferry system patronage will increase to about 92,600 in 1985 and to about 150,900 in 1995 (See Table A-7).

The monthly distribution of passengers on the ferry system was previously shown in Figure A-6. This figure was used to develop the factors that should be applied to the annual patronage projections to determine the monthly patronage on the ferry system (See Table A-8). In addition, the daily distribution of patronage shown previously on Figure A-7 was used to determine the factors which should be applied to monthly projections to determine the daily patronage on the ferry system (See Table A-9). These daily factors were determined by converting the percentage that each day of the week is of the average week to the percentage each day of the week is of the average month. This was accomplished by dividing by 52 (number of weeks in a year) and multiplying by 12 (number of months in a year).

Since the present ferry system makes one trip during the morning and a second trip during the afternoon, an hourly distribution of patronage is not presently available. As shown previously on Figure A-8, about 60 percent of the daily passengers depart on the morning trip. Since any surveys of visitors to the National Seashore was not permitted, an hourly arrival and departure rate of passengers at the Seashore is unavailable. However, since the ferry service to Fire Island National Seashore in New York provides access to beach activities on offshore islands for the non-boating public, the hourly arrival and departure rates and resulting accumulation curve contained in the Fire Island National Seashore Transportation Study (5) and in the report Transportation - Half the Fun (6) are shown (See Figure A-11). The arrival and departure rates and peak accumulation illustrate the peak demand that would occur if a demand responsive service was operated. Since the cost of operating

TABLE A-7

PROJECTED FERRY SYSTEM PATRONAGE TO WEST SHIP ISLAND
GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Year</u>	<u>Projected Patronage</u>
1978	54,757
1979	59,100
1980	63,000
1985	92,600
1990	118,200
1995	150,900

TABLE A-8

FACTORS TO BE APPLIED TO ANNUAL PATRONAGE TO DETERMINE THE
MONTHLY PATRONAGE ON THE FERRY SYSTEM TO WEST SHIP ISLAND

GULF ISLAND NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Month</u>	<u>Factor</u>
January	0
February	0
March	0.0115
April	0.0880
May	0.1435
June	0.2150
July	0.2710
August	0.2090
September	0.0500
October	0.0115
November	0.0005
December	0

TABLE A-9

FACTORS TO BE APPLIED TO MONTHLY PATRONAGE TO DETERMINE THE
DAILY PATRONAGE ON THE FERRY SYSTEM TO WEST SHIP ISLAND

GULF ISLAND NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Day</u>	<u>Factor</u>
Monday	0.0243
Tuesday	0.0255
Wednesday	0.0246
Thursday	0.0243
Friday	0.0225
Saturday	0.0602
Sunday	0.0492

such a service to the offshore island is very expensive, as much as two or three times the cost per person of a conventional system, a demand responsive service would be cost prohibitive. However, should the National Park Service consider using a demand responsive system to the offshore islands, the data from Fire Island National Seashore could be used. The data from the existing system at Mississippi Gulf Islands, as well as general trends from Fire Island will be used to establish schedules when the capacity of the existing ferry service would be exceeded by a projected patronage.

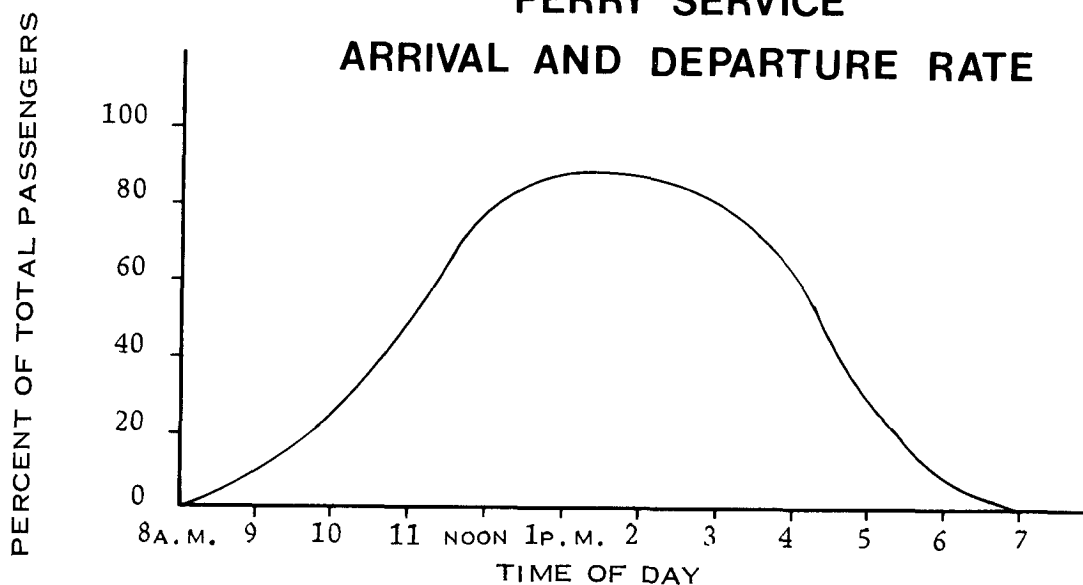
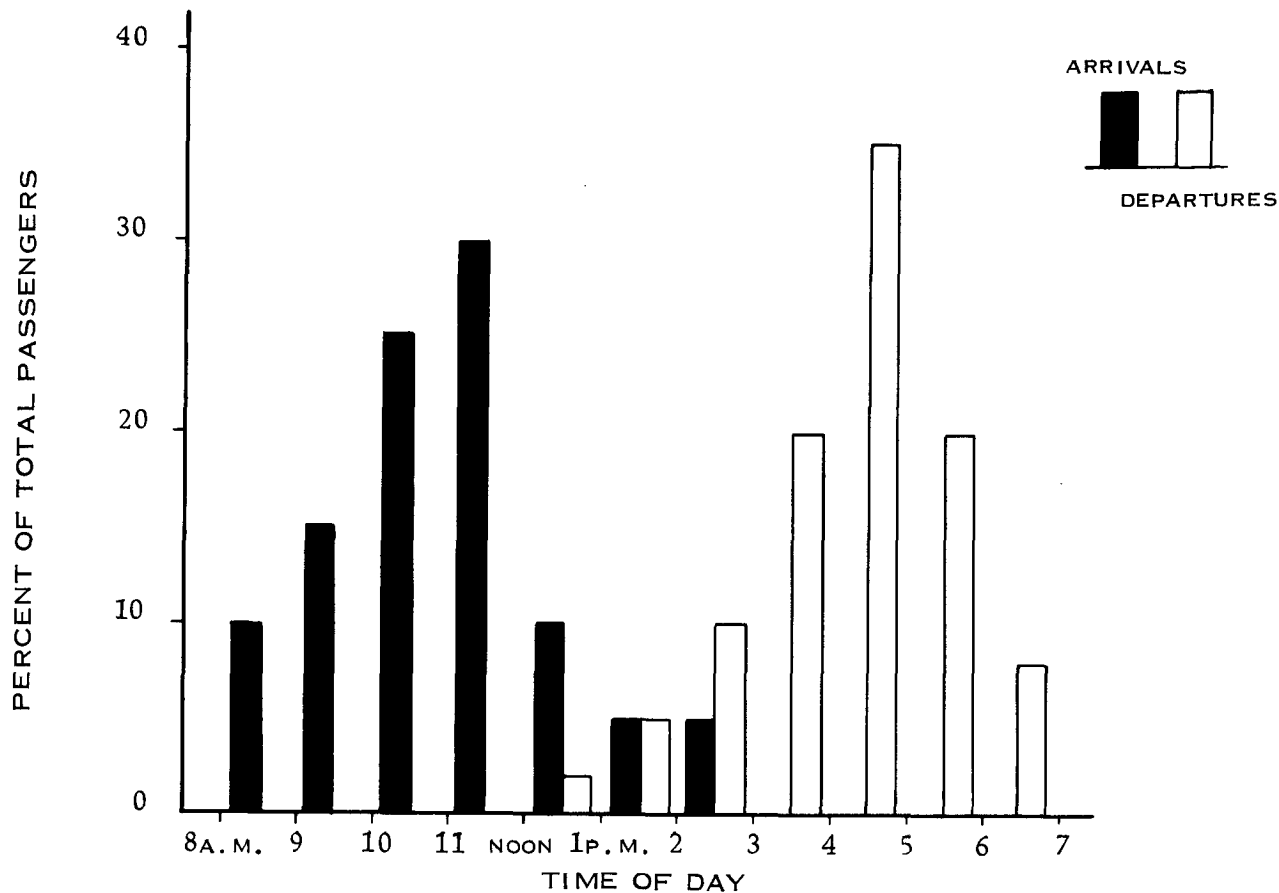
In order to predict the number of passengers on an annual, monthly, daily and hourly basis, it is necessary to begin with the annual total patronage. Multiplying the total annual patronage by the correct monthly factor for the appropriate year and month determines each calendar month's visitation. The daily factors are then applied for the appropriate day of the week to determine each day's patronage. To illustrate the use of the factors, assume that a prediction for a total day's patronage for a Sunday in June of 1985 is desired. Using Table A-7, the annual patronage projected for the year 1985 is 92,600. Looking at Table A-8, the monthly factor to be applied for June, 1985 is 0.215. Table A-9 shows the daily factor to be applied for Sunday is 0.0492.

Therefore,

$$\begin{array}{r} 92,600 \text{ (1985 annual patronage)} \\ \times 0.215 \\ \hline 19,909 \text{ (monthly patronage June, 1985)} \end{array}$$

$$\begin{array}{r} 19,909 \text{ (monthly patronage June, 1985)} \\ \times 0.0492 \\ \hline 980 \text{ (daily patronage for Sunday, June, 1985)} \end{array}$$

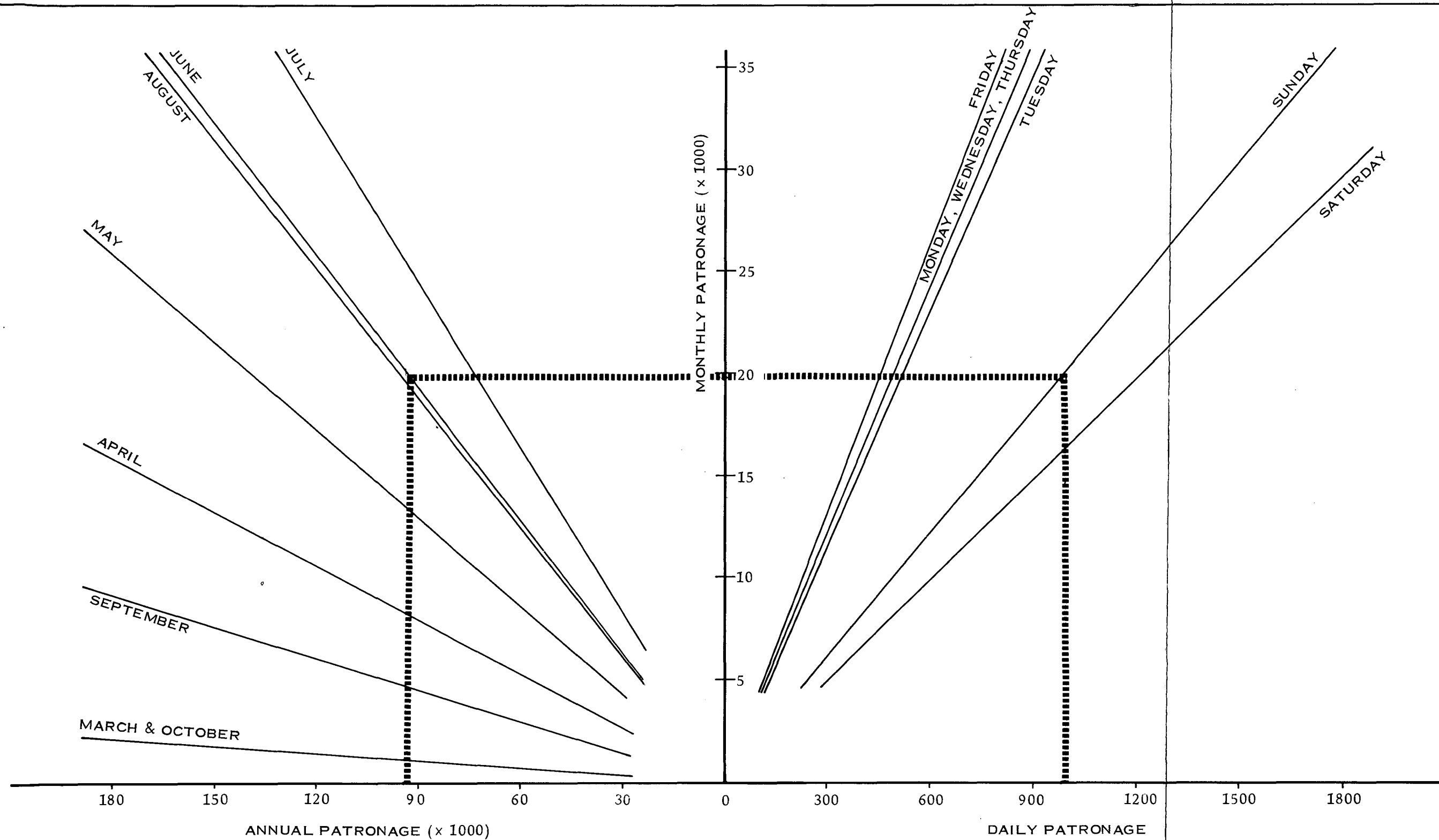
These results can also be determined by use of Figure A-12. The dashed line on Figure A-12 indicates the example stated above. Using the 1985 annual patronage projection of 92,600, find 92,600 passengers on the axis labeled "Annual Patronage." From this point, project a perpendicular line to the annual patronage axis that intersects with the line labeled for the month (June) for which the projection is desired. From the intersection of the desired month (June), project a line to the right which is perpendicular to the axis labeled "Monthly Patronage." The intersection of this projected line with the monthly projection axis indicates the total monthly patronage. For example, approximately 19,900 monthly passengers are shown. Continue to project to the right a line perpendicular to the axis labeled "Daily Patronage." The



GULF ISLANDS NATIONAL SEASHORE MISSISSIPPI
TRANSPORTATION STUDY



FIGURE A-11



ESTIMATION CURVES FOR MONTHLY AND DAILY PATRONAGE
FERRY SERCIVE TO WEST SHIP ISLAND
 GULF ISLANDS NATIONAL SEASHORE—MISSISSIPPI, TRANSPORTATION STUDY



FIGURE A12

intersection of this projected line with the daily patronage axis indicates the total daily patronage. For this example, approximately 980 daily passengers are shown.

In order to project the hourly arrival and departure rates, the percentage arriving each hour shown in Figure A-11 should be applied to the daily patronage. Prior to the time when the capacity of the existing ferry service is exceeded by the projected patronage, the number of passengers desiring to ride the ferry service in the morning can be determined by multiplying the daily patronage by 60 percent.

Total Projected Seashore Visitation - To determine the total projected visitation to the Seashore, the following was summed:

1. The existing visitation to Davis Bayou was estimated to increase at a five percent annual rate (See Table A-10).
2. The boating visitation to the offshore islands was estimated to increase at an annual rate of five percent (See Table A-10).
3. The projected offshore island campers that would use the transportation system as shown in Table A-6, and
4. The projected ferry system patronage to West Ship Island shown in Table A-7.

The projections for the four items above were summed to estimate the total visitation for each year to 1980 and in five year increments from 1980 to 1985. As shown in Table A-11, the projected 1978 visitation of 566,480 is estimated to increase to nearly 628,150 in 1980 and to more than 1,334,300 in 1995.

Capacity Limitations

The National Park Service has established a maximum capacity on West Ship Island of 2,000 visitors per day. In addition, since the camping areas on East and West Ship Islands will have a specified total number of camping sites, the annual capacity of these camping sites can be estimated, assuming that the daily and monthly trends remain constant.

The development plan for West Ship Island includes 30 campsites. Assuming 4 people per site (the average number of campers per campsite estimated by the National Park Service), the camping area can accommodate a maximum of 120 people on the peak day. Since 80 percent of the average week's total campers will camp on the peak night, Saturday night, the total number of weekly campers can be approximated by dividing the one day usage by 80 percent (120 divided by

TABLE A-10

PROJECTED VISITATION TO DAVIS BAYOU AND
PROJECTED VISITATION BY THE BOATING PUBLIC

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Year</u>	<u>Visitation at Davis Bayou</u>	<u>Boating Public Visitation</u>
1978	431,710 ¹	80,013 ^{1,2}
1979	453,300	84,000
1980	476,000	88,200
1985	607,500	112,600
1990	775,400	143,700
1995	989,600	183,400

¹ 1978 visitation was projected by adding the visitation in November and December, 1977 to the 10 month total shown in Table 1.

² Determined by summing visitation at Petit Bois Island, Horn Island and Ship Island and then subtracting the ferry service patronage (54,757). The November and December 1977 visitation at Petis Bois Island was assumed to be equal to the Horn Island visitation.

TABLE A-11
PROJECTED ANNUAL VISITATION
GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

<u>Year</u>	<u>Projected Visitation</u>
1978	566,480
1979	596,400
1980	628,150
1985	819,100
1990	1,045,400
1995	1,334,300

0.8 equals 150) resulting in 150 campers in one week. The total number of campers per month can be estimated by multiplying the weekly total by 52, the number of weeks in a year and dividing this result by 12, the number of months in a year. As a result, it is projected that about 650 campers can camp at West Ship Island in the peak month. To determine the annual number of campers, divide the peak month number of campers, 650, by the factor for July shown in Table A-3 (650 divided by 0.283 equals 2,300) resulting in 2,300 annual campers. The National Park Service estimates that about one-half of these campers would be persons arriving in private boats. Thus, the total number of campers using the transportation system, which could be accommodated, would be one-half of 2,300 or about 1,150 campers. By comparing this total with the projected number of campers at West Ship Island in Table A-6, it can be expected that the capacity of the West Ship Island camping area will be reached after 1982. It is assumed that once the capacity of the camping area at West Ship Island is exceeded, that the campers desiring to camp on West Ship Island will camp on East Ship Island until the capacity of East Ship Island camping area is exceeded. As a result, the projected campers that would use a transportation system was modified as shown in Table A-12.

The Final Environmental Statement states that a 50 site, walk-in campground will be developed on 2.5 acres on East Ship Island. Assuming 4 people per campsite, a maximum of 200 people can be accommodated on a single day. Since 80 percent of a week's total number of campers will camp on the peak night, Saturday night, the total number of campers who would camp in one week can be approximated by dividing the daily usage by 80 percent (200 divided by 0.8 equals 250). As a result, the camping area can accommodate 250 campers during one week. This weekly total can be converted to a monthly total by multiplying by 52, the number of weeks in a year, and by dividing by 12, the number of months in a year (250 times 52 divided by 12 equals 1,080). Thus, East Ship Island can accommodate about 1,080 campers in the peak month. This peak month number of campers can be converted to total annual campers by dividing by the factor for the peak month (July) shown in Table A-3 (1,080 divided by 0.283 equals 3,800). As a result, approximately 3,800 campers can be accommodated on East Ship Island. The National Park Service estimates that about 30 percent of these campers would be persons arriving in private boats. Thus, the total number of annual campers that would use a public transportation system can be approximated by multiplying the total annual campers by 70 percent (3,800 times 0.70 equals 2,660). Therefore, about 2,660 annual campers using the transportation can be accommodated on East Ship Island. By assuming that the campers who desire to camp on West Ship Island but cannot

TABLE A-12

MODIFIED PROJECTED CAMPERS THAT WOULD USE
A TRANSPORTATION SYSTEM

GULF ISLANDS NATIONAL SEASHORE - MISSISSIPPI
TRANSPORTATION STUDY

	<u>Total Campers</u>	<u>West Ship Island¹</u>		<u>East Ship Island³</u>		<u>Horn Island</u>
	<u>Projected Campers</u>	<u>Projected Campers</u>	<u>Overflow²</u>	<u>Projected Campers⁴</u>	<u>Overflow²</u>	<u>Projected Campers⁵</u>
1980	950	190	0	230	0	530
1981	3230	645	0	775	0	1810
1982	5490	1100	0	1320	0	3070
1985	6355	1270	120	1645	0	3560
1990	8110	1620	470	2415	0	4545
1995	10,350	2070	920	3400	740	6540

¹Capacity of the West Ship Island camping area is 2300 annual campers with one-half or 1150 campers riding the transportation system.

²Overflow equals projected campers minus capacity.

³Capacity of the East Ship Island camping area is 3800 annual campers with 70 percent or 2660 campers.

⁴Includes overflow from West Ship Island.

⁵Includes overflow from East Ship Island.

due to capacity limitation would camp on East Ship Island, the capacity of East Ship Island would be exceeded between 1990 and 1995. It is assumed that those persons who wish to camp on East Ship Island but cannot due to capacity limitations will camp on Horn Island. As a result, the modified projected campers desiring to camp on East Ship Island is shown in Table A-12.

A capacity limitation at Horn Island has not been established at this time. It should be noted that, based upon the modified projected number of campers at Horn Island in 1995, 6,540, that the peak day number of campers would approximate 340. If the National Park Service determines that Horn Island cannot accommodate 340 campers on a peak day, then these campers would either have to be refused camping permits or be forced to camp on Petit Bois Island.

As stated previously, the capacity of West Ship Island is 2,000 persons per day. To determine the maximum number of persons who may arrive via the ferry boat system without exceeding the capacity of West Ship Island, the number of persons in private boats must be subtracted from the daily capacity. According to the Final Environmental Statement, the boat refuge will have a capacity of 30 to 40 private boats, and an additional 10 to 15 private boats could either dock along the new dock, moor offshore or be beached. Thus, between 40 and 55 private boats could be accommodated at West Ship Island. Assuming 4 persons per boat, between 160 and 220 persons or an average of 190 persons would arrive at West Ship Island on private boats. Thus, a total of 1,810 persons (2,000 minus 190) could arrive at West Ship Island on the ferry system. Assuming that the daily and monthly distributions of patronage shown in Tables A-8 and A-9 remain constant, the capacity on West Ship Island will be reached when the ferry system patronage exceeds 111,000. As shown in Table A-7, the 1990 patronage was estimated at 118,200. Thus, either the number of persons riding the ferry system must be restricted or the capacity of West Ship Island should be increased before 1990. To accommodate the original projected ferry system patronage of 150,900 (See Table A-7), the capacity of West Ship Island should be increased to about 2,650 persons per day (190 arriving on private boats and about 2,460 arriving on the ferry system).

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APPENDIX B

WATERBORNE VEHICLES
CHARACTERISTICS OF CONVENTIONAL VESSELS

	<u>Water Jet</u>	<u>High Speed Crew Boat</u>
Representative Manufacturer:	Dynamic Shipbuilders, Inc., Marrero, La.	Camcraft, Inc. Marrero, La.
Passenger Capacity:	150 passengers	100 passengers
Sustained Sea Speed:	23 knots	22-26 knots
Dimensions: Length - 100'		77'
Width - 23'		18'
Draft - 5'6"		3'-10"
Hull Design & Construction:	Semi-planing aluminum	Semi-planing aluminum
Propulsion:	Twin or triple water jets	Triple screw propellers
Initial Costs:	\$540,000	\$600,000
Required Crew Competence:	High	High
Seaworthiness:	Fair	Good

WATERBORNE VEHICLES
CHARACTERISTICS OF CONVENTIONAL VESSELS

	<u>East Chop</u>	<u>Island Wanderer</u>
Representative Manufacturer:	Blount Marine Warren, Rhode Island	Blount Marine Warren, Rhode Island
Passenger Capacity:	350 passengers	250 passengers
Sustained Sea Speed:	13 knots	9 knots
Dimensions: Length -	94'	65'
Width -	28'	20'
Draft -	6'	3'-6"
Hull Design & Construction:	Deep-V hull "Semi-foil" steel	Twin-hull "Semi-foil" steel
Propulsion:	Two GM 12V71 engines	Twin screw propellers
Initial Costs:	\$450,000-\$500,000	\$250,000-\$300,000
Required Crew Competence:	High	Good
Seaworthiness:	Good	Good

WATERBORNE VEHICLES
CHARACTERISTICS OF CONVENTIONAL VESSELS

	<u>Modified Fishing Boat</u>	<u>Blount 65</u>
Representative Manufacturer:	Rhode Island Marine Services, Inc. Snug Harbor, R.I.	Blount Marine Corp. Warren, Rhode Island
Passenger Capacity:	100 to 120 passengers	150 passengers
Sustained Sea Speed:	9 to 11 knots	19 knots
Dimensions:	Length - 55' to 65' Width - 16' Draft - 4'-10"	65' 28' 6"
Hull Design & Construction:	Single chine steel	"Semi-foil" steel
Propulsion:	Single or twin screw propeller(s)	Single or twin screw propeller (s)
Initial Costs:	\$165,000 to \$225,000	\$280,000 to \$350,000
Required Crew Competence:	Fair	Good
Seaworthiness:	Good	Good

WATERBORNE VEHICLES
CHARACTERISTICS OF CONVENTIONAL VESSELS

	<u>65-Foot Passenger Ferry</u>	<u>Short-Haul Passenger Boat</u>
Representative Manufacturer:	Halter Marine Services New Orleans, La.	Lantana Boatyards Lantana, Fla.
Passenger Capacity:	150 passengers	161 passengers
Sustained Sea Speed:	20 knots	13 knots
Dimensions:	Length - 65' Width - 20' Draft - 4'	65' 22' 4'-5"
Hull Design & Construction:	Hard chine steel or aluminum	Hard chine aluminum
Propulsion:	Twin or triple screw propeller(s) or water jets	Single or twin screw propeller(s)
Initial Costs:	\$275,000 to \$350,000	\$250,000 to \$300,000
Required Crew Competence:	Average	Average
Seaworthiness:	Good	Good

WATERBORNE VEHICLES

CHARACTERISTICS OF CONVENTIONAL VESSELS

	<u>25 Passenger</u>	<u>Waterbus</u>
Representative Manufacturer:	James S. Krogen Miami, Fla.	Raider Marine Corp. Anacortes, Wash.
Passenger Capacity:	25 passengers	20 passengers
Sustained Sea Speed:	17 knots	17 knots
Dimensions:	Length - 36' Width - 13'8" Draft - 2'4"	34' 12' 1'
Hull Design & Construction:	Fiberglass	Trihedral, foam filled fiberglass
Propulsion:	2 Volvo AQ D40A/280	Single, twin or triple inboard- outboard outboard screw propellers
Initial Costs:	\$53,000	\$125,000
Required Crew Competence:	Minimal	Minimal
Seaworthiness	Fair	Poor

WATERBORNE VEHICLES
CHARACTERISTICS OF CONVENTIONAL VESSELS

	<u>Fishing Model</u>	<u>4014-V</u>
Representative Manufacturer:	Rosecraft Boatworks Beaufort, N.C.	Monark Boats Monticello, Arkansas
Passenger Capacity:	25 passengers	26 passengers
Sustained Sea Speed:	10 knots	10 knots
Dimensions:	Length- 48' Width- 17' Draft- 3'	40'9" 14'0" 3'9"
Hull Design & Construction:	Troller hull fiberglass	Aluminum Deep-V Hull
Propulsion:	2 diesel engines	Twin 8V-71N Detroit Diesels
Initial Costs:	\$110,000	\$100,000
Required Crew Competence:	Fair	Minimum
Seaworthiness:	Good	Fair

WATERBORNE VEHICLES
CHARACTERISTICS OF LANDING CRAFT

OML-40

Representative Manufacturer:	Omega Marine West Palm Beach, Fla.
Passenger Capacity	20 passengers
Sustained Sea Speed:	14 knots
Dimensions:	Length - 39'4" Width - 10'-0" Draft - 1'-10"
Hull Design & Construction:	Aluminum plate
Propulsion:	Stewart-Stevenson 4-53TI (diesel) Inboard/Outboard
Initial Costs:	\$75,000-\$85,000
Required Crew Competence:	Fair
Seaworthiness:	Fair

WATERBORNE VEHICLES
CHARACTERISTICS OF LANDING CRAFT

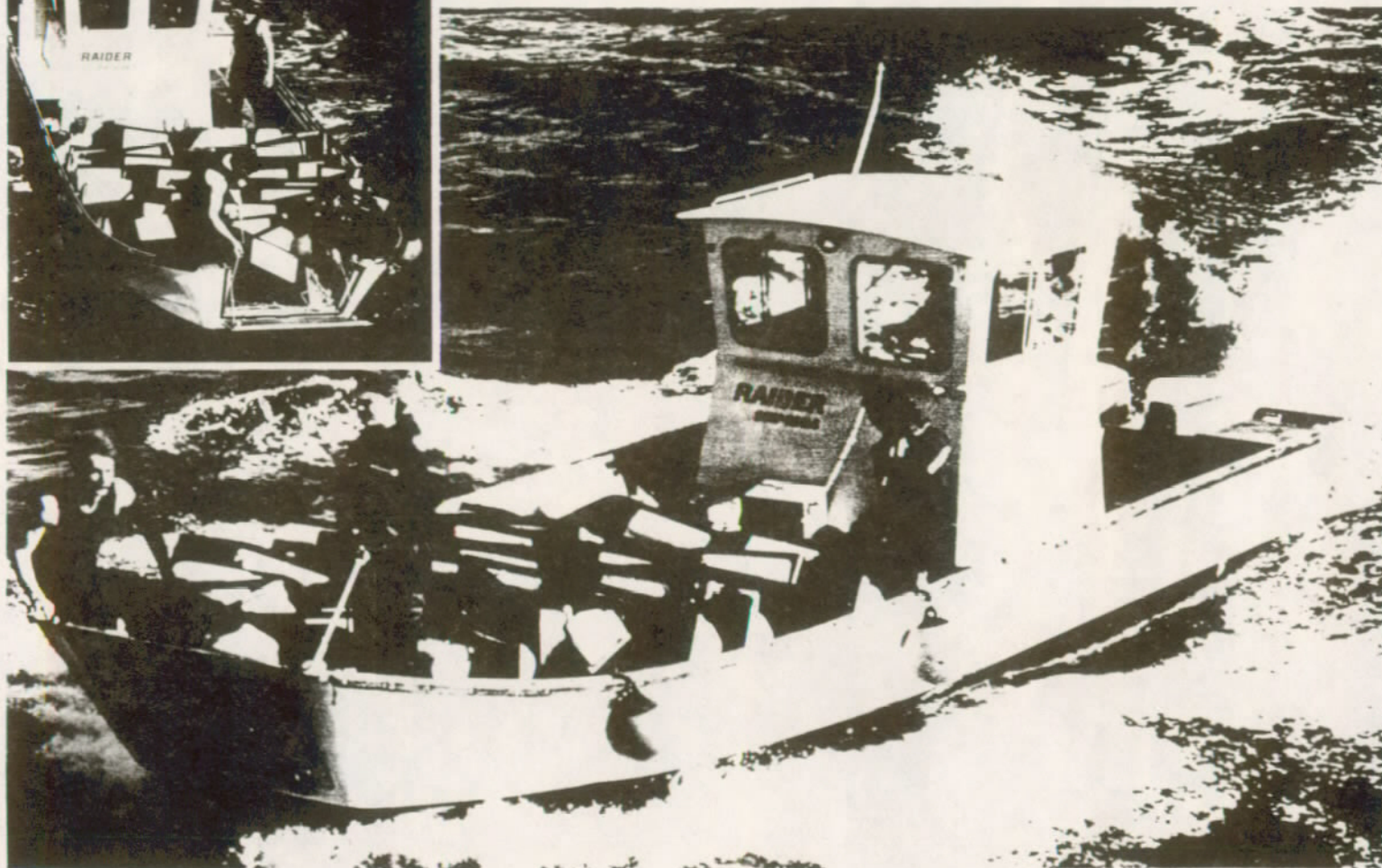
	<u>SRV-1034</u>	<u>34 FT. WORK BOAT</u>
Representative Manufacturer:	Raider Marine Corp. Anacortes, Wash.	J. S. Krogen & Co. Miami, Fla.
Passenger Capacity:	25 Passengers	Approx. 20 passengers
Sustained Sea Speed:	10 Knots	9 Knots
Dimensions:	Length: 34' Width: 10' Draft: 12" with engine up 32" with engine down	34' 10'8" 3'3"
Hull Design & Construction:	Fiberglass and balsa core	Steel
Propulsion:	4-53 Diesel engines and outdrives that lift out of the water for beaching	Single screw diesel
Initial Costs:	\$80,000	\$70,000-\$80,000
Required Crew Competence:	Minimal	Minimal
Seaworthiness	Fair	Poor

WATERBORNE VEHICLES
CHARACTERISTICS OF CONVENTIONAL VESSELS

	<u>Catamaran</u>
Representative Manufacturer:	Alumaship Corporation Jeanerette, Louisiana
Passenger Capacity:	120 to 150 passengers
Sustained Sea Speed:	17 knots
Dimensions:	Length - 65' to 80' Width - 26' to 32' Draft - 4'
Hull Design & Construction:	Twin-hull aluminum
Propulsion:	Twin screw propeller(s)
Initial Costs:	\$400,000 to \$550,000
Required Crew Competence:	Average
Seaworthiness:	Good

WATERBORNE VEHICLES
CHARACTERISTICS OF CONVENTIONAL VESSELS

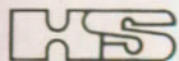
	<u>110-Foot Passenger Ferry</u>
Representative Manufacturer:	Blount Marine Corp. Warren, Rhode Island
Passenger Capacity:	335 passengers
Sustained Sea Speed:	17 knots
Dimensions:	Length - 103' Width - 32'-5" Draft - 7'-4"
Hull Design & Construction:	"Semi-foil" steel
Propulsion:	30M Diesel 40 HP each
Initial Costs:	\$200,000
Required Crew Competence:	Good
Seaworthiness:	Good



REPRESENTATIVE
MANUFACTURER

RAIDER MARINE CORP.
ANACORTES, WASHINGTON

CAPACITY: 25 PASSENGERS

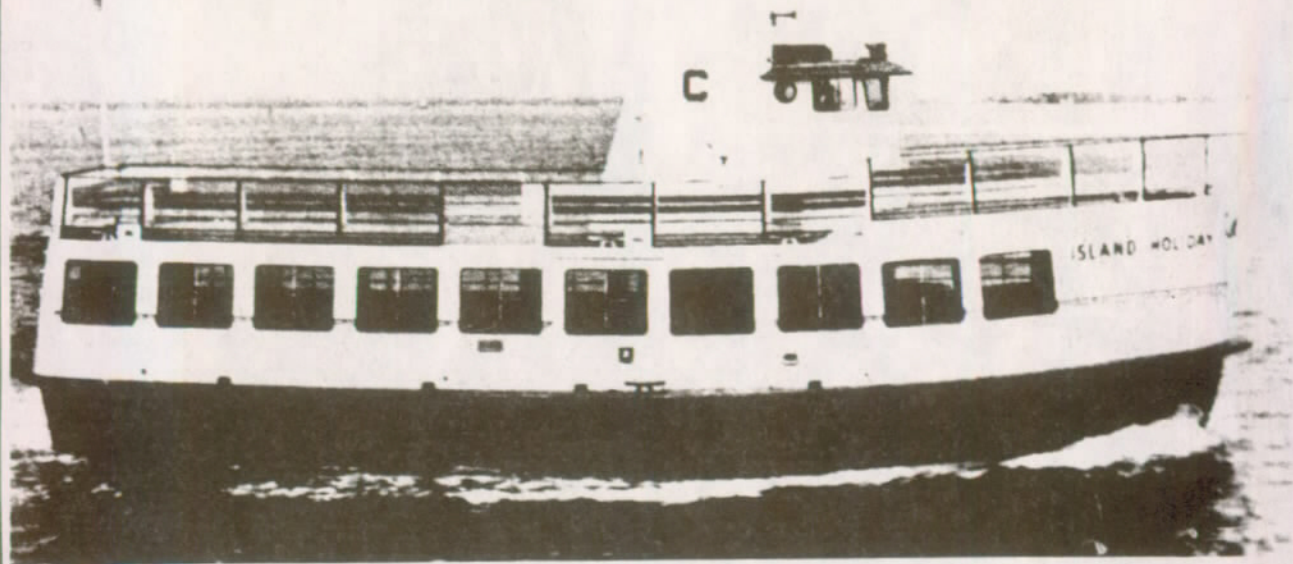




REPRESENTATIVE
MANUFACTURER:

LANTANA BOATYARDS, INC.
LANTANA, FLORIDA

CAPACITY: 161 PASSENGERS

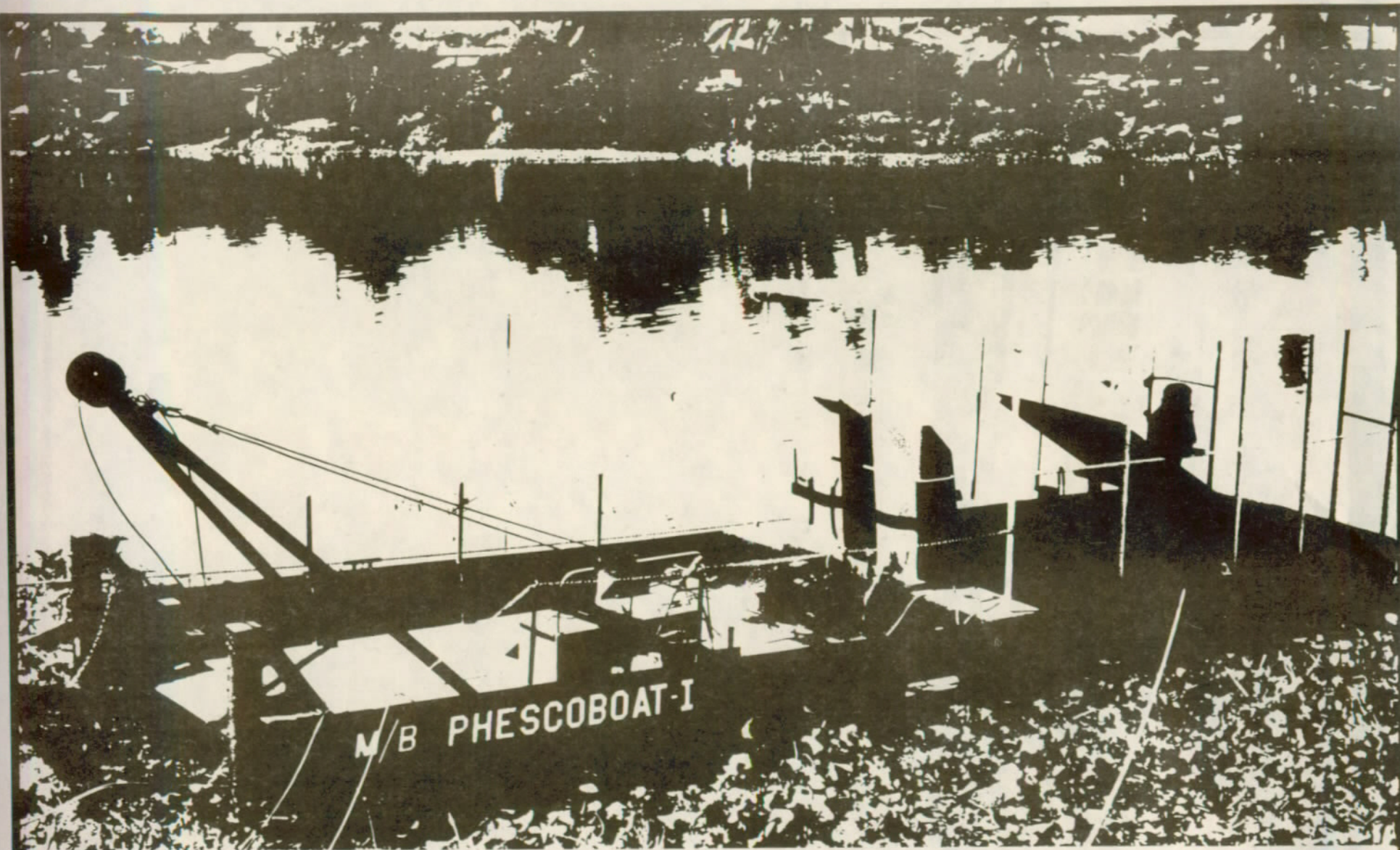


REPRESENTATIVE
MANUFACTURER:

BLOUNT MARINE CORP.
WARREN, RHODE ISLAND

CAPACITY: 150 PASSENGERS

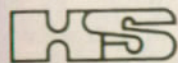
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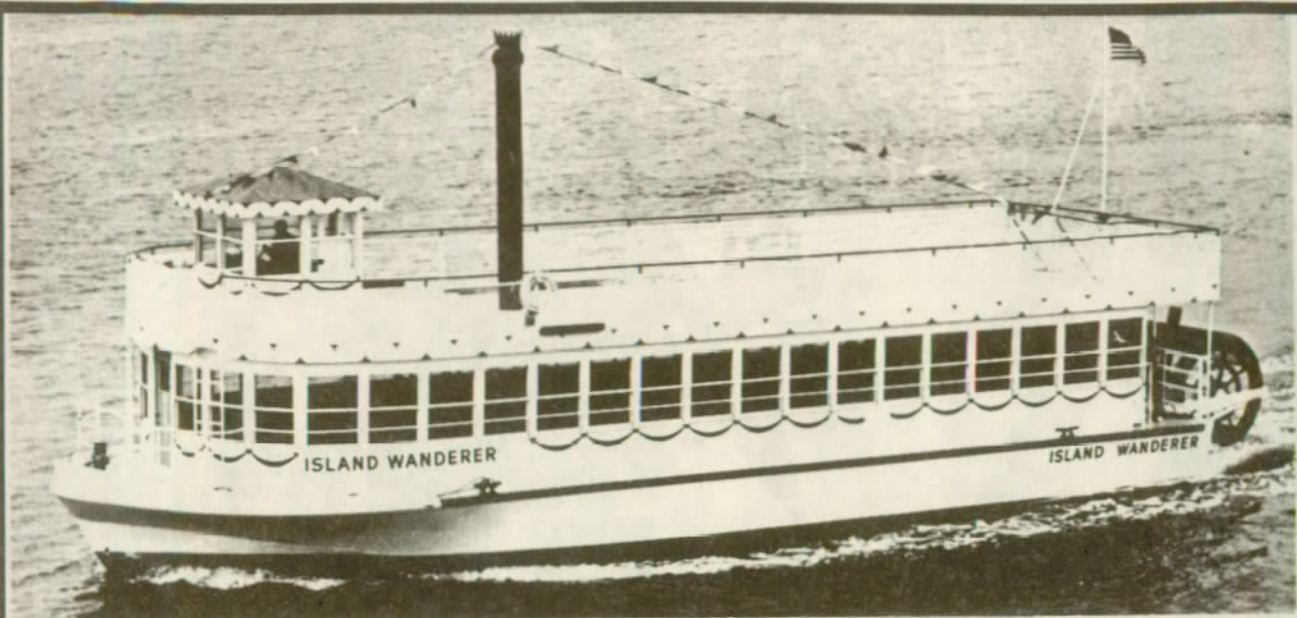


DESIGNED BY:

J.S. KROGEN AND CO., INC.
MIAMI, FLORIDA

CAPACITY: 25 PASSENGERS





REPRESENTATIVE
MANUFACTURER:

BLOUNT MARINE CORP
WARREN, RHODE ISLAND

CAPACITY: 250 PASSENGERS