Strategies for Recreational Boating Development on The Chicago Lakefront

COASTAL ZONE
INFORMATION CENTER

TC
223.3
.D38
1975

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

15058

STRATEGIES FOR RECREATIONAL BOATING DEVELOPMENT ON THE CHICAGO LAKEFRONT

CZIC COLLECTION

1979

The preparation of this report was financed, in part, by the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, through the State of Illinois, Department of Transportation, Division of Water Resources

COASTAL ZONE
INFORMATION CENTER

City of Chicago
Michael A. Bilandic
Mayor

Department of Planning
City and Community Development
Thomas Kapsalis, Commissioner

Illinois Dept. of Transportation, Div. of Water Resources

PREFACE

Under the rules of the Lake Michigan and Chicago Lake-Front Protection Ordinance, the Department of Planning, City, and Community Development has a responsibility to review development proposals within the lakefront protection district. Concurrent with this function, the Department has been charged with the implementation of the 1972 Lakefront Plan of Chicago. In order to better fulfill these responsibilities, which in part relate to the construction of new and improved boating facilities, the Department has prepared a series of documents related to urban recreational boating. This series includes the Chicago Lakefront Recreational Boating Survey Report; Design Concepts and Standards for Chicago Lakefront Recreational Boating Facilities, and this report.

The role of this report in that series is to establish a planning framework for determining the size and scope of harbor development projects and for locating these facilities along the shoreline. The recommended procedure is an iterative process starting with the demand for facilities identified in the boating survey and other sources, determining the potential expansion capabilities within existing facilities, and then analyzing the prospects for new development along the Chicago shoreline. This procedure attempts to accommodate boating demand within the context of existing public policies and physical constraints encountered along the shoreline and in so doing serves as a bridge between the other reports in this series.

TABLE OF CONTENTS

Title	Page
Preface	i
Table of Contents	ii
CHAPTER ONE: INTRODUCTION	1
BACKGROUND	1
Overview of Chicago Lakefront Development	3
Landfill as a Method of Park Expansion	5
Synopsis of Environmental Conditions	7
Geology and Landforms	7
Hydrologic Setting	8
Climate	9
Bathymetry	10
Littoral Setting	10
Aquatic Biology	11
EXISTING BOATING PATTERNS AND FACILITIES	12
Boating Facilities	14
Boating Fleet Characteristics	23
The Survey Instrument	25
Survey Findings	27
Lake Michigan Boating Fleet	32
Chicago Park District Boaters	33
NEED FOR NEW FACILITIES	36
STATEMENT OF THE PROBLEM	43

CHAPTER TWO: ALTERNATIVE DEVELOPMENT STRATEGIES 46

INTRODUCTION 46

Defining Development Objectives 47

STRATEGY ONE - INFILLING 49

Practical Constraints on Infilling 51

Conclusions - Feasibility of Continued Infilling 57

STRATEGY TWO - SHELTERED WATER DEVELOPMENT 58

Basic Features of Sheltered Water Development 58

Conclusion - Potential for Sheltered Water Development 61

STRATEGY THREE - OPEN LAKE DEVELOPMENT 62

Conclusions - The Role of Open Lake Development 65

ADDITIONAL CONSIDERATIONS 65

CHAPTER THREE: DECISION CONCEPTS AND PROCEDURES 68

THE DECISION PROCESS 68

Introduction 68

Decision Steps 69

DECISION FACTORS AND DETERMINANTS 79

Demand Determinants 79

Siting Factors 82

Feasibility Factors 86

Design Factors 90

CHAPTER FOUR: CASE STUDY 94

INTRODUCTION 94

Background 95

Focus of Case Study 98
SITE DESCRIPTION 99
Physical Characteristics 99
Wave Action 99
Land Use 101
Water Use 102
Initial Assessment of Suitability 102
FACILITY DEMAND 103
Background 103
Berthage Demand 104
DESIGN CONSIDERATIONS 106
Engineering Constraints 106
Environmental Considerations 108
FORMULATING THE ALTERNATIVES 116
Preliminary Considerations 116
Alternative I 117
Alternative II 122
Alternative III 127
COMPARISON OF ALTERNATIVES 132
CONCLUSIONS AND RECOMMENDATIONS 143

CHAPTER I

INTRODUCTION

BACKGROUND

The Recreational Boating element of the Great Lakes Basin Framework Study, which was published in 1975 makes the following observations concerning boating on the Great Lakes:

> "Prior to 1900 little thought was given to recreational boating potential of our rivers and lakes. Waterways were routes of commerce. Since that time recreational boats in use in the United States have increased from an estimated 15,000 in 1904 to almost 9 million registered boats in 1970.
> Data released by the Boating Industry Association indicate that in 1970 Americans spent $3.4 billion on boats and boat related expenses..." (GLBC, 1975; 1)

The remarkable shift in public perception of the rivers and lakes and the vast increases in boating activity that have occurred in the Twentieth Century make it necessary to prepare plans to accommodate the public demand for boating opportunities in a safe and economical manner. As early as 1909, Chicago had established public policies which promoted the use of Lake Michigan for recreational boating and recognized the need for safe harbors to protect boaters from storms and inclement weather.

> "The sport of yachting is very greatly in need of encouragement of this form, as the navigation of Lake Michigan is rather dangerous..." (Burhnham, 1909; 52)

This statement appeared as part of Daniel Burnham's recommendations for constructing new lakefront parks and boating facilities. The 1972 Lakefront Plan of Chicago

proposed a vastly expanded lakefront park system including islands and land extensions which would include a tripling of seasonal berthages, 9 new boat launching ramps and 4 boat rental facilities. Clearly, there is a willingness to accept and promote the vigorous public attitudes with respect to recreational boating.

The recently completed Illinois Statewide Comprehensive Outdoor Recreation Plan concludes that Illinois residents spent one million activity days participating in sailing and 2.4 million activity days motorboating on Lake Michigan during 1976. These figures are expected to increase by 53% and 52% respectively by 1995. As a statewide policy, this plan urges that priority be given to expanding boating opportunities in shoreland recreation planning. The plan goes on to mention concepts proposed in the Lakefront Plan of Chicago such as landfills and island construction as a method of increasing the amount of sheltered water in Lake Michigan if these can be constructed in an ecologically and economically sound manner. Furthermore, the SCORP document endorses the idea of constructing harbors, full service marina facilities, launching ramps, and necessary ancillary services in order to improve the quality and quantity of boating opportunities available to Illinois residents.

The SCORP document identifies a number of problems which need to be addressed in planning shoreline recreational uses, among which are:

1) How to prevent shoreline developments from causing negative aesthetic impacts and reducing visual quality?

2) How to prevent urban pressures from upsetting the balance of terrestrial and aquatic ecosystems?
3) How to prevent fluctuating lake levels and shoreline erosion from threatening recreation developments and environmentally sensitive areas?
4) How can boating hazards be minimized and safe harbors of refuge be provided?
5) How can the increased demand for boat launching and berthing facilities be accommodated?
6) How can vehicular and pedestrian access be provided to shoreline recreation facilities?
7) How can vandalism and trespass into recreation facilities be curtailed and surveillance of criminal activities be increased?

These are among the problems that the series of Chicago recreational boating reports will attempt to answer. This particular element of the series will attempt to develop a strategy for the improvement, expansion and construction of boating facilities along Chicago's shoreline. In doing this, it will contribute to the statewide effort to improve and increase boating opportunities.

Overview of Chicago Lakefront Development

The historic vitality of Chicago is a result of its location at the junction between two major modes of water transportation (great lakes vessels and river vessels), at a time when no other alternatives existed. Chicago benefitted from its natural transportation advantages and its shoreline became the focus of intensive industrial and commercial activity which contributed to the rapid development of the United States. As a result of its pivotal role in this national growth Chicago itself developed into a highly commercialized urban center. However, as transportation modes evolved the emphasis shifted away from primary dependence on waterborne vessels to railroads, then highways, and

finally airplanes.

As the direct linkage between commercial activity and waterborne transportation began to lose its significance it became possible to consider alternative uses of the shoreline. One of the most profound proposals for use of Chicago's shoreline came from Daniel Burnham in his 1909 Plan of Chicago. Burnham's concern with the natural beauty and aesthetic quality of the shoreline prompted him to propose the construction of a system of public parks along the entire Chicago waterfront. This proposal received tremendous support and has proven to be one of the guiding lights for recreational development of the shoreline.

The first steps toward recreational development of the shoreline came in the 1870's when work commenced on Jackson Park, Midway Plaisance, and Washington Park on the city's south side. In 1890, Chicago was chosen as the host for the World's Columbian Exposition and Jackson Park was chosen as the site. As a result of the Columbian Exposition Jackson Park was completely developed and became a prominent addition to the City's park system. In 1894, two yacht harbors were activated in Jackson Park adding fine recreational boating opportunities to the city's lakefront parks.

As Chicago continued to expand in the early 1900's the development of the lakefront parks continued. The ever increasing population of Chicago created a demand for recreational opportunities which served as an incentive to develop new and improved parkland and recreational facilities.

As early as 1896, the Chicago Harbor in Grant Park was operational and served as an access point for recreational boaters to the waters of Lake Michigan. By 1930, significant progress had been made toward expanding the park system along the shoreline. Within these parks there were many water-oriented recreational opportunities as well as cultural facilities, museums, and open space. During 1933-34, the Century of Progress Exposition was held in Burnham Park. Also during 1934, the South, West, and North Park Commissions were consolidated into the Chicago Park District, which now administers all the public parks in Chicago.

Opening of Chicago Harbors

Name	Year Opened
Diversey	1891
Jackson Park	1894
59th Street	1894
Monroe Street	1896
Belmont	1910
Burnham	1935
Montrose	1931

Landfill as a Method of Park Expansion

During the period that Chicago's shoreline was being developed for industrial and commercial purposes the practice of extending land by filling in the lake was used to consolidate and stabilize lakefront properties. As commercial activities along the shoreline began to decline in numbers and importance the emphasis of landfilling shifted to the creation of new parkland. After the Chicago Fire of 1871,

debris from this great tragedy was used to create new parkland. Over the years, a large number of landfill projects have been undertaken along Chicago's shoreline thereby greatly expanding the public parkland and enhancing the usability of the shoreline.

A variety of reasons combined to promote the use of landfill as a method of creating new parkland. Part of the reason had to do with the natural swampiness of the Chicago area. Park planning at the time tended towards formal designs and this finished product was often incompatible with existing conditions. This task was further complicated along a natural shoreline subject to erosion, wave attack during storms, and poor drainage. Thus, the creation of new land over which the designer exercised more exacting control helped to produce the desired finished product.

Another factor was the fact that much of the shoreline was privately owned and developed with commercial and residential structures. Rather than trying to acquire this land and remove the structures to create parkland the choice was made to create new land. The cost of land was also a concern which entered into the decision process. Also, from time to time, it was advantageous to have a site which could absorb large quantitites of materials, such as the rubble from the Chicago Fire. Finally, there was the need for vast land areas for such activities as the World's Columbian Exposition and the Century of Progress Exposition. It was much easier to create new tracts of land and develop them

specifically for the purpose at hand rather than attempting to restructure existing areas for these uses.

Synopsis of Environmental Conditions

Environmental conditions are an important concern to any planning program which proposes changes to a natural system. The prospect of developing boating facilities in Lake Michigan, which may include construction in the lake and creation of islands or land extensions, will most certainly have an effect on the lake. A brief description of the environmental conditions around Lake Michigan will help to provide a background for the discussions that will follow. It would be erroneous to assume that a strategy could be developed on the basis of information at this level of detail. Before any construction occurs a great deal of environmental analysis and engineering will take place and actual construction will be accompanied by an environmental monitoring program.

Geology and Landforms

The significant events in the formation of the present landforms of Chicago and Lake Michigan are very recent in origin. Essentially, the geologic history of Chicago is the history of the formation of Lake Michigan and the other Great Lakes. Lake Michigan lies on the western edge of the Michigan Basin, a geosyncline made up of sedimentary rock formations. Lake Michigan and its drainage basin are comprised of unconsolidated deposits overlying sandstone, shale, and limestone. The coastal terrain took shape with

the retreat of the last glacial episode, the Wisconsin Stage of the Pleistocene, 15,000 years ago. Glacial processes formed the lake basin and waters as we know it today and deposited glacial till throughout the Northeastern Illinois region. More recently, waves, currents, and winds have formed the present shoreline, which is continually changing due to natural erosion and accretion processes. The shoreline from the northern city limits to Hollywood Boulevard is a low-lying coastal plain with extensive man made shore protection, mostly breakwalls - high energy vertical structures. From Hollywood south to the Indiana Stateline, the shoreline has been extended lakeward by artificial fill. More comprehensive and detailed geologic & geographic information can be found in the sources cited in Appendix A.

Hydrologic Setting

The Chicago shoreline is in the shallower, warmer southern basin of Lake Michigan. Water levels respond to natural variations in weather (i.e. amount of precipitation and rate of evaporation); and to man made dams and water diversions. Low Water Datum for Lake Michigan is 576.8 feet above mean water level at Father Point, Quebec (International Great Lakes Datum, 1955). Monthly mean water levels recorded by the National Ocean Survey show a variation of 6.5 feet in the 117 year period since 1860, from 575.4 feet IGLD to 581.9 feet IGLD. The highest levels in the last 90 years occurred in 1973 and 1974.

Ice, which generally begins to form around the shoreline in mid-December, attains an average thickness of 6 to 8 inches with extremes of about 24 inches during severe winters. Expansion of the ice sheets and shifts under wind stress may gouge an unprotected shoreline and, during severe winters, ice masses may be piled up to 15 to 20 feet. The ice does not normally cause appreciable or lasting damage to beaches or ripraps, but it may damage timber, steel, or concrete structures by overloading them with excessive horizontal or vertical stresses.

Detailed hydrologic information concerning water levels, lake turnover, seiche action, and ice, as well as water movement, near-shore circulation, surface water hydrology, and runoff can be found in the sources mentioned in Appendix A.

Climate

The presence of Lake Michigan tempers the climate of northeastern Illinois and influences the movement of storms through the region. The moderate climate is typified by a mean annual temperature of 51° F with low and high mean monthly extremes of 26° F and 76° F. Precipitation averages 33 inches annually while snowfall averages 38 inches. Wind storms generally result from the frontal passage of a low-pressure center along with the movement of extensive areas of high pressure. Storm movement is generally in a southwest to northeast direction. More extensive information on weather conditions & storm analysis can be found in the sources

noted in Appendix A.

Bathymetry

The lakebed of Lake Michigan along the Chicago shoreline is gently sloping with very few aberrations of any significance. Throughout the shoreline, 25 foot depths appear between 6,000 and 7,000 feet offshore. This is significant because the Lakefront Plan defines the zone between the shore and the 25 foot depth limit as the opportunity area for land extensions. From the northern city limits to Hollywood Beach depths drop gradually from the shore to 6 feet at 500 feet offshore and 15 feet at 1,000 feet offshore. From Hollywood south to the City limits the bathymetry is relatively uniform. Where landfill activities have taken place in the recent past, the hydrography is generally abrupt with a steep drop immediately offshore, except at beach locations. At the shore, bulkhead depths are generally between 3 and 5 feet, then drop quickly to 15 feet 100 to 300 feet offshore. At beaches, the slope is gentle; approximately 6 foot depths 100 feet offshore dropping to 15 foot depths 1,500 feet offshore.

Littoral Setting

Recorded wave data is unavailable for the Chicago shoreline. In such a situation, an accurate set of wind field patterns can be developed by analyzing isobar patterns of synoptic weather charts and using this information in a wave hindcasting model. This information can be found in the list of reports cited in Appendix A.

These wind-generated waves induce longshore currents--currents that flow parallel to the shoreline. These longshore currents are the primary means of longshore sediment transport. Littoral drift is the sediment, usually sand, that moves in the littoral zone under action of waves and currents, and its movement is termed "Longshore transport rate." Sediment transport is important when discussing the Chicago shoreline because of man-made shore protection structures.

The wave regime along the Chicago shoreline causes a "net longshore transport" (continues net loss from one littoral cell to the next down shore). Therefore, all segments of Chicago's shoreline are dependent upon continuous littoral nourishment from the updrift shore to maintain stability.

Aquatic Biology

Lake Michigan is an oligotrophic lake-a lake characterized by low concentrations of dissolved nutrients, simple food chains and high concentrations of dissolved oxygen. The enrichment of lake water with nutrients, which produces eutrophication, is a natural process which will eventually take place over geological scales of time. In nearshore Lake Michigan, eutrophication has been accelerated by the discharge of effluents and materials into the lake. Changes in communities of phytoplankton and zooplankton have taken place in the recent past. Most significant are the disappearance of some species commonly found in oligotrophic lakes and the increase in abundance of species tolerant of more eutrophic conditions.

Human activities have seriously affected the fish population as well. Sea lamprey were introduced into Lake Michigan after the construction of the Welland Canal (1936). The lamprey selectively removed the large predatory species from the lake, resulting in great increases in other small and medium sized fish. The over-harvest of these small and medium size fish left a gap in the simple food chain which was quickly filled by the alewife, coming from the Atlantic. This species has become notorious for its regular and massive die-offs. More information on Lake Michigan biology andecology can be found in the sources noted in Appendix A.

Existing Boating Patterns and Facilities

The City of Chicago has approximately 30 miles of shoreline which is 50% of the 60 mile long Illinois shoreline. There are 30 miles of public open space along the Illinois shoreline, 80% or 25 miles of which are located within the City of Chicago. The Chicago park system contains 3,080 acres of land and 1,200 acres of sheltered water which is about 20% of the 15,000+ acres of public open space along the Illinois shoreline. The following is a list of the major parks along the Chicago shoreline:

Name	Acres
Loyola Park	22
Lincoln Park	1,185
Grant Park	308
Burnham Park	598
Jackson Park	543
South Shore Country Club	65
Rainbow Park	62
Calumet Park	194

A diverse range of recreational and cultural activities are accommodated in these parks, including items such as boat harbors and launching ramps, yacht clubs, beaches, museums, performing arts, a zoo, a conservatory, outdoor and indoor sports, golf courses, and picnic areas. An example of the intense use this park system experiences is that 28 million people used the City's 30 beaches during 1977.

In addition to recreational use of the shoreline, there are substantial areas devoted to residential, institutional, and industrial activities. At the northern end of the city there are approximately 2.5 miles of shoreline in private residential ownership as well as the lakefront campuses of Loyola University and Mundelein College. The South Shore community also has about one-half mile of shoreline in private residential ownership. Another significant use of the shoreline are the two filtration plants that treat more than one billion gallons of water daily to serve over 4.25 million people. At the extreme south end of the city there is a major industrial complex covering 2 miles of

shoreline property. A major 190 acre site within this area was recently acquired by the Chicago Regional Port District for development as a containerized port facility. This can be expected to increase the flow of goods through Chicago's port facilities, which included 3.3 million tons of import/export commodities during 1977.

Boating Facilities

The Illinois shoreline north of Chicago has 4 recreational boating facilities. The 1974 Lake Michigan Regional Boating Survey and Analysis administered by the Corps of Engineers identified boating use at these harbors as follows: Waukegan Harbor, 150 berthages, 64 dry sailing spaces, and 12 launching lanes; Great Lakes Naval Training Center, 130 berthages, 60 dry sailing spaces, and 1 launch lane; Highland Park, 3 launch lanes; and Wilmette Harbor, 280 berthages, and 40 dry sailing spaces. The Corps of Engineers report identifies a need in this area for an additional 800 berthages and 6 launch lanes by 1980, and an additional 1,170 berthages and 8 launch lanes by 1990. At present, a proposal is being considered for the development of a 500 to 1,500 boat harbor in Illinois Beach State Park, near Zion, Illinois. Another proposal is also in the works for a 500 to 1,000 boat harbor in Highland Park, Illinois. It can be assumed that the number of berthages within the 4 existing harbors has increased somewhat since the 1974 survey.

The Chicago shoreline of Lake Michigan presently has 7 recreational boating harbors which house approximately 4,040

1978 PARK DISTRICT HARBOR SUMMARY

Harbor	Boat Type	Size Categories 15'	16-25'	26'	Boat Type Totals	Harbor Totals
Montrose	Motor	2	36	131	169	
	Sail	10	237	149	396	
	Total	12	273	280		565
Belmont	Motor	0	27	117	144	
	Sail	1	95	198	294	
	Total	1	122	315		438
Diversey	Motor	0	194	264	458	
	Sail	0	0	0	0	
	Total	0	194	264		458
Monroe	Motor	0	35	58	93	
	Sail	0	362	639	1001	
	Total	0	397	697		1094
Burnham	Motor	8	69	547	624	
	Sail	2	172	165	339	
	Total	10	241	712		963
59th	Motor	2	95	27	124	
	Sail	0	0	0	0	
	Total	2	95	27		124
Jackson Outer	Motor	1	12	11	24	
	Sail	0	110	93	203	
	Total	1	122	104		227
Jackson Inner	Motor	0	83	83	166	
	Sail	0	0	0	0	
	Total	0	83	83		166
All Park District Harbors	Motor	13	551	1238	1802	
	Sail	13	976	1244	2230	
	Total	26	1527	2482		4035

boats for the 5 month boating season. Diversey Harbor, 59th Street Harbor and the inner basin of Jackson Park Harbor are used exclusively for power boats because bridges span the harbor entrances, and the other 5 harbors accommodate a combination of power and sailing craft in floating moorings, star docks, slips, and dry storage. A variety of services are provided to the boater, including fuel pumps, sanitary pump-outs, shuttle service, dinghy storage, private yacht clubs, parking, and comfort stations. The following is a summary of harbor usage during the 1978 boating season by size and type of boat and location. So as to avoid confusion it should be explained that although there are 7 harbors in Chicago, 8 categories appear in the table because the inner and outer basins of Jackson Park Harbor have been listed separately.

Other important characteristics of these harbors are; their size, the density of berthages, the amount of land devoted to boating services, and the number of parking spaces available to harbor patrons. The following table summarizes these characteristics for the Chicago boating harbors.

Space Utilization at Park District Harbors

Name	Harbor Acres	Boats/ Acre	Service Acres	Parking Acres	# Cars	Adj Boat/Acre
Montrose	31	13.5	3.7	5.1	714	16.9
Belmont	51	7.5	1.4	4.6	644	9.7
Diversey	28	16.7	.5	6.4	896	
Monroe	179	6.1	2.0	ungnd	3500	
Burnhan	74	12.2	1.9	13.8	1932	
59th	3	38.8	.1	1.4	196	
Jackson Out	22	10.3	.5	2.8	392	
Jackson In	15	11.3	.5	7.4	518	18.6
Citywide	403	10				11

The first column provides an indication of the actual water area within the various harbors as well as the relative sizes of the harbors in comparison with each other. The second column indicates the density of boat berthages within the harbors. The wide variation is a result of the different berthing systems utilized (floating moorings in Monroe as opposed to slips almost exclusively in 59th) and the space requirements of those systems. The figure of 39 boats/acre can be compared with car parking standards which indicate that 90-140 cars can be accommodated per acre. The density of the boat berthages is much lower because more space is needed for maneuvering and many boats are larger than the average car. It should be mentioned that the figure for Montrose is somewhat inflated because it has a large number of boats which are temporarily berthed along the harbor wall. The last column reports an adjusted berthage density as a result of the addition of star docks to three harbors which is discussed elsewhere in this report.

The third column is an estimate of the land area surrounding the harbors which is devoted exclusively to harbor services such as pump outs, fuel pumps, harbormaster's office, washrooms, dinghy storage, yacht club, etc. This figure does not include access roads or parking. The estimates of parking area must be used cautiously because very few of these spaces at any harbor are reserved for harbor users. Because these parking spaces are used by all park patrons, no figures have been presented for the number of parking spaces available per boat. It can be seen from these figures that parking is generally adequate to satisfy demand by boaters except during periods when there is very heavy usage of other park facilities

In order to provide a background for discussions pertaining to the design of harbor facilities and the provision of services at harbors the existing harbor facilities and services will be catalogued at this time. The facilities shown are only those which are available to the general pubic. The yacht clubs provide a number of services which were not counted because they are provided exclusively to members. These services include such items as lockers, showers, washrooms, restaurants, bars, maintenance facilities, public address systems, and dinghy storage. Public services such as showers or washrooms in structures which are far removed from a harbor complex were not counted because they are not convenient to harbor patrons and the season during which they

FACILITIES AT PARK DISTRICT HARBORS

	MONTROSE	BELMONT	DIVERSEY	MONROE	BURNHAM	59th	JACKSON OUT	JACKSON IN
Harbormaster	X	X	X	X	X	X	X	
Yacht Club	X	X	X	X	X	X	X	X
Boat Rental								
Charter Fishing					X			
Rainbow Fleet					X			
Sailing School	YC			YC				
Shuttle Service		X		X	X			
Power Squadron	X		X		X		X	
Weather/Pub. Addr.		YC		YC	YC			
Fishing Supplies	X				X			
Fish Clean Station	X				X			
Maintenance Facil.		X		YC	X		YC	
Emer. Rep./HaulOut		X						
Crane	X	X			X		X	
Boating Supplies								
Grocery Store				X				
Restaurant	YC	YC	YC	X-YC	YC		YC	YC
Fast Food								
Fuel Pumps	1	2	1	2	2	1	1	1
Pump Out	1	2	1	2	2	1	1	1
Storage Lockers	YC	YC	YC	YC	X-YC		YC	YC
Washrooms	8	4	16		20			
Showers	20				16			
Slips			30		123	124		57
Slips w/Utilities	68	140	142		400			
Star Docks	48		32		62			
Moorings	302	242	254	1094	313		227	109
Dry Storage	147	56			65			
Dinghy Storage	200	140	120	560	210		150	80
Launch Ramp			3		3			3
Transient Slips	2	6		20	8	2	2	4

are available may not coincide with the boating season.

In the recent past, there has been a steady growth in the number of berthages provided at the seven harbors. In 1972, the Lakefront Plan identified 2,500 berthages in Chicago's 7 harbors. During 1974, a Corps of Engineers survey indicated that there were 3,000 berthages and in 1977 the Park District reported 3,540 berthages. By 1978, the number had risen to 4,040 berthages in the same 7 harbors. This increase of 60% in the number of available berthages in Chicago harbors was accomplished without any expansion of the water area within the harbors. It is questionable whether it is possible to continue to increase harbor usage at this pace without creating or utilizing new water areas.

The 1979 boating season will witness an increase of 330 new berthages, again without any expansion in water area. The key to the increase accomplished in 1979 is the replacement of inefficient individual floating moorings with floating star docks. With this system, 16 boats can be berthed in the same area as 3-4 boats on individual mooring cans. The fact that the number of berthages could be increased so dramatically since 1972 without there being any vacancies is evidence of the tremendous demand for boating opportunities along the Chicago Lakefront. Although it may be possible to continue expanding facilities without the benefit of survey statistics, it will be possible to better meet the needs of boaters when their views are incorporated into the planning for new facilities. One of the objectives of this report is

to illustrate procedures for incorporating boaters views into new programs.

The situation with respect to launch ramps is similar to that of seasonal berthages. In 1974, the Corps of Engineers identified twelve launch ramp lanes at 4 locations along Chicago's Lakefront. During the 1979 boating season, there will be 24 launch ramp lanes at 6 locations along the Chicago Lakefront. The increase of twelve lanes resulted from the construction of new launching ramps at Wilson Avenue, Jackson Park Harbor and Calumet Park. Despite this improvement in services congestion is experienced quite often, especially on weekends and holidays during the hottest weeks of the summer. Many boaters indicate that they will drive to other areas (Chain-of-Lakes, Wisconsin, Michigan, etc.) rather than attempt to launch their boat under those circumstances. Because of the variable nature of launch ramp use it is especially useful to have good information upon which to base a program for expansion and improvement of existing facilities.

At present, there are launching ramps at the following locations; 6 lanes at Wilson Avenue, 3 lanes in Diversey Harbor, 3 lanes in Burnham Harbor, 3 lanes in 59th Street Harbor, 3 lanes in the inner basin of Jackson Park Harbor, and 6 lanes at Calumet Park. The ramps within harbors benefit from the fact that more services are available to launchers. The use of these ramps is also safer than those on an exposed shoreline, especially during storms. Because

of the potential hazards existing at an exposed location the construction of new ramps should be based on design guidelines which are discussed in the design handbook.

In addition to the public boating facilities along the shoreline, there are a number of private boat yards and marinas along the Chicago and Calumet Rivers. In some cases, these facilities are exclusively service operations offering maintenance and winter storage. Prior to the 1978 boating season, all winter storage took place along these rivers except for people who might trailer their boats to their houses. In 1978, the Park District began offering limited winter storage facilities. Other boat yards offer berthing, recreational facilities, yacht clubs, and restaurants in addition to winter storage and maintenance. Those offering berthing slips cater to motor craft because of the conflicts with bridges that a sailboat would encounter along the rivers. A windshield survey was conducted to determine the type and amount of boating activities along the river.

There are 11 boat yards along the Chicago River and the Sanitary and Ship Canal, and the Calumet River has 13 boat yards. Three of these facilities provide dry stack storage, one of the most prominent of which is the Marina City high rise residential multi-use complex in downtown Chicago. At least two of these facilities are involved in yacht sales and service exclusively. Along the Calumet River almost all boat yards offer slips for berthing boats during the summer boat season in addition to haul-out facilities,

repair services and winter storage. Along the Chicago River there are very few slips for summer use, with the emphasis being on haul-out, repair services, and winter storage. Most of the yards offer both indoor and outdoor storage.

Many of the boat yards were haphazardly organized and poorly maintained but were apparently profitable because of the high demand for their services. Almost every boat yard contained a large number of abandoned boats which may be indicative of the short supply of berthings on the lakefront. In a situation where it is not possible to obtain a berthage along Lake Michigan it may not be possible to sell a boat, thereby forcing an owner to abandon it if he has lost interest in boating, is experiencing financial difficulties, or is moving away from the Chicago area. The Calumet Yacht Club which was the only private marina along the Chicago shoreline has recently been sold to the Chicago Park District. This presents an opportunity to expand the public boating facilities in Chicago, a prospect which will be discussed later in this report.

Boating Fleet Characteristics

There are four distinct contexts in which the term boating fleet can be used in this report. The Northeastern Illinois Boating Fleet will be used to refer to all 94,487 registered and documented boats in the six county SMSA of northeastern Illinois. It is from this boating fleet that the random sample was drawn for the Chicago Lakefront Recreational Boating Needs Survey. The primary usefulness of the results

of that survey will be in describing the characteristics of this boating fleet. Another boating fleet which can be described is the Lake Michigan Boating Fleet. This fleet is composed of all boat owners in northeastern Illinois who use their boats on Lake Michigan. These people can be either launch ramp users or seasonal berthers. The ability to accurately describe the characteristics of this boating fleet is more limited because the sheer number of responses from boaters in this category is more limited, and may not provide a statistically valid sample. The information gathered in the survey provides an indication of the characteristics of this fleet, but its reliability is less assured than for the northeastern Illinois boating fleet.

A third type of boating fleet is the boaters who use Chicago Park District facilities. Information pertaining to this boating fleet is of particular interest because these boaters will be the most acutely affected by any changes in the Park District harbor system. At another level, the characteristics of the Park District boating fleet may provide the greatest insights into the type of boater who is attracted to the Chicago lakefront. The fourth group which is relevant to this report is the demand population. The method of choosing this demand population is explained in the boating survey report. Because this group is chosen on the basis of boater responses to multiple questions in the survey, it does not have a coherent identity (such as positive identification as a Park District boater). It will be

referred to as the demand population rather than the demand fleet. Other than the fact that these boaters can be defined as representing a demand for Park District boating facilities the accuracy of describing the characteristics of these boaters is less assured than any of the other boating fleets.

The Survey Instrument

Subsequent to the publication of the Lakefront Plan of Chicago in 1972 and the initiation of the Chicago Lakefront Demonstration Project in 1977, the Lakefront Coordination Section of the Chicago Department of Planning, City and Community Development determined that detailed information would be needed to guide future decisions relating to the improvement of boating facilities along the Chicago shoreline. To accomplish this task, a study effort was initiated to investigate the present condition of boating facilities and boating activities. At the very outset of this effort the Lakefront Coordination Section met with the Chicago Park District, the Illinois Coastal Zone Management Program and other parties with expertise in this area to establish the scope and purpose of the survey which would be conducted to gather information. It was decided that a survey of registered boat owners in the six counties of northeastern Illinois would give the most relevant information. Consultants were to be used as needed to assist with certain technical aspects of the survey.

With this general format as guidance the Lakefront Section began to refine the issues the survey would focus upon

and the survey instrument and analysis procedures that would be used to prepare the data for use in the decision making process. To facilitate analysis the Chicago Lakefront was divided into four areas; Area 1 runs from the northern city limits to Irving Park Road, Area 2 runs from Irving to the Chicago River; Area 3 runs from the Chicago River to 55th Street, and Area 4 is from 55th Street to the southern city limits. As a result of detailed discussions, it was decided that the following issues could reasonably be investigated through a randomly administered mail-out survey of registered boaters:

1) What are the major characteristics of the Chicago area recreational boating fleet (physical makeup, usage patterns, storage needs)?
2) Where do users prefer to see new facilities and services located?
3) Will the provision of substantial areas of sheltered water as envisioned in the Lakefront Plan have an appreciable effect on the demand for boating facilities?
4) What are boater perceptions of safety problems and recent trends in boating?
5) What is the extent and distribution of demand for berthages and launching facilities along Chicago's Lakefront?

The detailed findings of this survey are reported in the Chicago Lakefront Recreational Boating Survey Report. Certain statistics and observations will be mentioned in this report as needed to provide guidance to the decision making process. Although some of the information is only useful in terms of establishing baseline conditions it is necessary to have such information to compare projections against and to evaluate the role or existing facilities.

Survey Findings

The Northeastern Illinois Boating Fleet is composed of 94,487 boats which are distributed across the three size categories as follows:

Fleet Breakdown By Size & Type

	#	% of Total	Motor	Sail	Other
0-15'	48,331	51%	43%	6%	2%
16-25'	40,865	43%	37%	5%	1%
26'+	5,291	6%	3%	2%	1%
	94,487				

In addition to knowing the size distribution of these boats, it is sometimes useful to know the breakdown of the fleet by type of boat. These figures are important from the standpoint that detailed use of the survey data requires expansion of the responses from the survey population to the overall boating fleet on the basis of weighting factors applied to the three size categories. This procedure is explained in the boating survey report.

Another way of describing the boating fleet is by the activities the boaters engaged in and the preferences they expressed in response to questions in the survey. In terms of activities for boats 26 feet and above:

17% cruised 100% of the time;
62% cruised more than 50% of the time;
21% used their boat at a slip or mooring more than 50% of the time;
8% fished more than 50% of the time; and
7% raced more than 50% of the time.

The 16 to 25 foot boats had the following activity patterns:

10% cruised 100% of the time;
43% cruised more than 50% of the time;
10% fished 100% of the time;
30% fished more than 50% of the time;
19% water skied more than 50% of the time.

For boats shorter than 15 feet the following activity patterns were reported:

40% fished 100% of the time;
56% fished more than 50% of the time;
20% cruised more than 50% of the time;
10% water skied more than 50% of the time.

This information will be useful in deciding cetain design and management issues that may arise as harbor planning proceeds.

The most useful information in this respect may be the perceptions of boaters concerning the prospect of new development along the shoreline. A series of questions were incorporated into the boating survey to elicit responses on these issues. The following percentages of boaters responded in favor of new boating facility development along the Chicago lakefront: 92% of 26'+ boats; 75% of 16'-25' boats; and 60% of boats smaller than 15'.

Furthermore, of those who favored development, the following preferences were expressed in terms of the type of facility considered appropriate and the area in which they desired to see development:

FACILITY TYPE DESIRED

Size Category	Slip	Mooring	Dry	Ramp
0-15'	14%	10%	12%	72%
16'-25'	39%	18%	9%	52%
26'+	75%	31%	5%	6%

Preferred Location of Development

Size Category	Area 1	Area 2	Area 3	Area 4	Other
0-15'	27%	12%	17%	16%	29%
16'-25'	35%	17%	16%	13%	21%
26'+	24%	20%	24%	9%	14%

It may appear that the large boats pose a greater demand for the development of new facilities because the percentage of boaters wanting development is higher in that category. However, in real numbers, the largest volume appears in the 16'-25' range, then the 0-15' range and finally the 26' range. After weighting factors are applied, it is found that 52% of the overall fleet, or 48,878 boaters desire to see new boating facility development along Chicago's shoreline. A more rigorous analysis of the survey responses has been performed in the hope of determining how many boaters are actually prepared to make use of new facilities if they are developed. The analysis procedure is covered in the survey report and the results will be mentioned later in this report.

It is apparent that boaters in the larger size category prefer in-water seasonal storage in slips if possible, or at a mooring as a second alternative. Both dry storage and ramps are not regarded very highly by these boaters. The middle category of boat sizes is more flexible with slightly more than half preferring launch ramps, but also a high percentage preferring slips and a lower percentage receptive to moorings. The small boaters have a clear preference for launch ramps, with the three categories of berthages appeal-

ing to a low but almost uniform percentage of these boaters.

To some degree, the development preferences of the various size categories can be related to the activity patterns which emerged from the survey. In the large boat category, the tendency toward slips or moorings relates strongly to the leisure time use of the boat for cruising or simply enjoying the water while tied up at dockside or at a mooring. For these people, the boat and its use are probably less of a sport than a social experience.

The flexibility of the intermediate group is evidenced in the activity responses which included cruising as the strongest element, but which also showed fishing and water skiing as prevalent activities. Part of the preference for launch ramps can be attributed to the fishermen who may want to launch in different places depending on fish movements, weather or water conditions and skiers who are looking for good water conditions. It is possible that for many in this category the boat is considered part of an active sporting event rather than a passive social encounter.

For the small boater, his active use of the boat for fishing primarily, but also for cruising and water skiing indicates that launch ramps may more nearly meet his needs than a seasonal berthage. Many of these people keep their boats at home, do not store their boat in a commercial boat yard and prefer the lower cost and higher versatility of launch ramps to a berthage. Finding the right area of calm water for skiing, the migrating school of fish, or possibly an uncongested area for cruising would be important to

these people.

From the responses to area preference, the far north sector of the city emerges as having a uniformly high rate of demand. The shoreline north of Chicago also receives a strong response. The central area holds a strong appeal to the large boatowners, probably because of proximity to their jobs. The far south sector receives a healthy response from the small boatowner, but is weak with the large boats, possibly as a result of socio-economic parameters. The near north section of the city receives a moderate response from all boat categories.

In order to decide how many people who do not currently use the lake, but who would if conditions were safer as a result of the creation of new sheltered water areas with land extensions, islands, or breakwaters; a particular analysis was performed. The responses to two questions were cross-tabulated and then compared with the responses to two other questions.

Size & Type of Non-Users Who Would Use with Sheltered Water

Size Category	Motor	Sail	% of Non-Users
0-15'	154	22	43%
16'-25'	175	12	60%
26'+	43	6	60%

It is significant to note that the greatest number of non-users are in the smallest size category and that sheltered water has less of an effect on their perception of the safety of boating on the lake than in the other categories.

It should not be overlooked that the creation of sheltered water would apparently have a dramatic effect on boating demand.

The locational preferences of the boaters who desired sheltered water are as follows: 34%-Area 1; 15%-Area 2; 10%-Area 3; 12% Area 4; and 17%-other. This is taken to mean that Areas 1 and 2 are preferred as locations for landfill projects. This response reinforces the far north end of the city as a location for both landfill projects and boat facility development, whereas the central area is a low priority for landfill projects but a relatively strong priority for boat facility development. The near north and far south are moderately strong in relation to both priorities, as is the shoreline north of Chicago.

Lake Michigan Boating Fleet

The characteristics of current boaters on Lake Michigan will be described briefly. The Lake Michigan boaters were distributed across the size categories as follows:

Lake Michigan Boats By Size

	#	% of Users	% of Size Category
0-15'	51	9%	11%
16'-25'	213	36%	40%
26'+	327	55%	79%

Lake Michigan Boats By Type

	#	% of Users	% of Type Category
Motor	373	63%	34%
Sail	223	37%	80%

It can be seen from the above Figures that the percentage of sailboaters and large boats using the lake relative to the numbers of boats in those categories is higher than might be expected. Despite this fact, the overall number of users in the middle size range is greater. In terms of origin of these boaters 75% are from Cook County, 12% from Lake County, 10% from DuPage County and less than 2% from each of the other three counties in the region.

Chicago Park District Boaters

A great deal of the discussion of Park District boaters is derived from direct observation, interaction with Park District personnel, and analysis of official records. Information derived from the survey will be used primarily to describe preferences of these boaters that are not available from other sources. Earlier in this report, a presentation was made of the actual number of boaters at each Park District harbor by size and type of boat. This table showed a clear preponderance of boaters in the largest size category (61.5%) which also amounts to 46.9% of all boats that size in Northeastern Illinois. Boats of this size were evenly distributed between the motor and sail categories. In the harbor system overall, there was a slightly greater number of sail boats (55%) than motor boats (45%).

Boats in the 16'-25' range accounted for 37.8% of the Park District berthers although this was only 3.7% of the boats that size in northeastern Illinois. There is a much higher percentage of sail boats (64%) in this size category

which is probably a result of the fact that motorboats of this size are less safe on the lake than sailboats. Less than 1% of the boats in the Park District system are smaller than 15'. These are evenly distributed between motor and sail but this amounts to .05% of the registered boats in this size category. When compared to the analysis of boaters who did not use the lake but who would with sheltered water, it is clear that the 16'-25' boats are the largest group looking for boating opportunities along the Chicago shoreline.

It is known from direct observation that there are a great number of sailing regattas held along the Chicago shoreline and also races from Chicago to other cities around Lake Michigan. Participation rates in these events are quite high, indicating that a healthy percentage of sailboat owners actively seek out opportunities to compete against each other. It is also evident on a hot summer day that a great number of boaters, both sail and motor, use their boat to escape the heat of the city and to enjoy the relative peace and quite of the water. To some, the boat serves as a source of adventure, as evidenced by the fact that even during storms some of the larger, more seaworthy boats can be seen plying the rough waters of the lake. This is more characteristic of sailboats than motorboaters.

Some of the motorboats are actively used by their owners for fishing and water skiing. This may be more true for launch ramp users than it is for berthers, but there are still a good number of fishermen and skiers amongst the berthed boats. At times the larger boats, both sail and

motor will be used by their owners for extended trips around Lake Michigan and the other Great Lakes. Unfortunately, Chicago does not experience a great number of visiting boats because there are very few transient slips available in the harbors.

When asked whether they would use the lake if sheltered water were provided the response from Park District boater who answered the question was 98% positive. Although this could be expected, it does serve as an indication that landfill projects for this purpose would not turn away present boaters. Park District boaters were also 97% in favor of boating facility development which indicates that they are sensitive to the needs of other boaters who have not been able to secure a berthing along the lakefront. The type of development desired was clearly slips (73% preferred), followed closely by moorings (55% preferred), with dry storage and ramps receiving very little positive response from Park District boaters. The location preference for new development was the near north area, the central area was second, and the far north area was third.

Earlier in this report a summary was presented showing the berthing types, berthing densities, and ancillary facilities for the various Park District harbors. This information should serve as a background to the discussion of strategies for improving the harbors and developing new harbor areas and facilities. At this time, attention will be turned to the evaluation of the quantities and types of development that are needed, based on the information gathered in the

survey.

C. Need for New Facilities

The actual demand analysis procedure, from which the information in this section of the report was derived, is reported in the Chicago Lakefront Recreational Boating Survey Report. As much as possible, the numbers reported here will be the most conservative estimates from the demand analysis. Working with the conservative estimates will help to insure that if any actions are taken as a result of the final recommendations of this report, they will have a very high probability of succeeding.

There are two ways to obtain a conservative figure for the number of berthages desired on the lakefront. The first is to choose only those boaters who have been defined as representing a "strong" demand for a berthage. The total number in this category is 3,757 boaters, and is composed of the following size breakdown; 303-0-15' boats; 2,857-16'-25' boats; 597-26'+ boats. As mentioned earlier, the largest demand group is the mid-sized boats because many boats in this category are suitable for use on Lake Michigan but relatively few of them currently have berthages in Park District harbors.

Another group of boaters, defined as "moderate" demand, consists of 5,035 boaters distributed across the size categories as follows: 707-0-15' boats; 4,060-16'-25' boats; 538-26'+ boats. The difference between the "strong" and "moderate" demand group is based on the fact that the strong

demanders had actually applied for a Park District space whereas the moderate demanders showed characteristics which indicated they would want to boat on the Chicago lakefront, but had not sought space from the Park District because they thought they had no chance or else they intended to try in the future. The degree to which these people desire Park District space is therefore lower, and the definition of demand becomes more liberal when this group is added to the demand population. Together these groups are the berthing demand population identified in the boating survey report.

The second method of determining a conservative demand population is to apply statistical evaluation formulas to the methodology used to define the demand population. The use of these procedures provides an estimate of the validity or reliability of the information. As a result of these analyses it was determined that a 95% confidence level is associated with a range of demand between 6,047 and 10,203 boaters. Thus, it can be stated with 95% confidence that there is a demand for a minimum of 6,047 additional lakefront berthages and that this demand may actually be as high 10,203 berthages. Further refinement of the overall demand estimate is not necessary at this time. Even the most conservative estimates indicate that the present boating capacity along the entire lakefront can be increased by 2-2½ times without taking a great risk that they will be used. In fact, many would argue that creating new spaces would induce even high demand by sparking boat sales.

One of the tasks of detailed planning efforts will be to develop precise estimates of the characteristics of boaters in the demand population in terms of size, type, and use of boat, ancillary facility preferences, etc. This information will allow the design proce-s to be targeted in a more precise manner at the people who will eventually use the facility. This improvement in the design process would serve to increase user satisfaction which may be an additional impetus to increasing demand for lakefront boating opportunities.

If the decision is made to accommodate the level of boating activity that appears to be needed as a result of the survey findings, then a comprehensive planning approach such as that recommended in this report should be used to develop a comprehensive development strategy for the entire lakefront and to define individual projects as part of this strategy. As part of this effort, a decision concerning the range of services that will be provided in harbors is necessary. On the basis of this policy a program of facilities and services at individual harbors should be determined. The specific elements of the planning and decision process are explained later in this report.

Another area in which demand exists is in terms of launching ramps. By and large, launch ramps serve a distinct function not served by harbors, but it is possible that individual boaters will make use of both facilities. One fact is clear, which is that the demand for berthages exists

in discrete units because a slip or moooring holds one boat, which is usually the same boat for the entire boating season. The demand for launch ramps is much more variable because a different number of boaters launch on any given day. Even though it is possible to define the number of boaters who desire to use launch ramps the actual daily demand for the use of launch ramps is much more elusive.

Factors that may affect daily launch ramp demand are weather, temperature, fish migrations, weekends, holidays, etc. The peak demand usually occurs on summer holidays when weather conditions are optimum and temperatures are high. When this happens, facilities are invariably overloaded which often results in fights and arguments because of the heat, etc. Although, it may never be possible to completely meet the peak demand it is possible to come closer to meeting this objective than is currently the case, which would relieve some of the tension that often builds up.

Rather than attempt to determine an exact number of launch ramps that are needed based on some hypothetical formula, it was decided that the demand estimates should be analyzed according to levels of service that may be desireable. In doing this, a range of development options emerges and the decision as to which is most feasible can be made on the basis of space availability, construction costs, revenue generation, etc. The results of that analysis will be reported along with the assumptions that were used in its formulation.

Average Daily Launch Ramp Demand

	5%	10%
Existing Seasonal Permits	75	155
Existing Daily Permits	27	27
Demand R1 & R2	859	1718
Total	961	1900
(-) Existing Capacity	-600	-600
Excess Demand	361	1300
Number of Lanes to satisfy demand	15	52
Demand R3		
(Sheltered Water Demand)	1057	2114
Number of Lanes to satisfy demand	42	84
Grand Total (Number of Lanes)	57	136

Peak Day Launch Ramp Demand

	25%	50%
Existing Seasonal Permits	333	666
Existing Daily Permits	27	27
Demand R1 & R2	4296	8593
Total	4656	9286
(-) Existing Capacity	-1200	-1200
Excess Demand	3456	8086
Number of Lanes Needed	69	162
Demand R3	5284	10,568
Number of Lanes Needed	105	211
Grand Total	174	373

In preparing these estimates, an initial assumption was made that there are relatively few peak days during the summer, probably only holidays and a few very hot weekends. It is assumed that all ramps operate at maximum capacity on these days (50 launchings and retrievals). This assumption is backed up by actual experience. The majority of days, there is much less boat launching activity which also indicates that maximum usage figures cannot be applied to these days. Therefore, only 50% of capacity (25 launchings and retrievals) will be used for the average day calculations. The figures shown in the tables indicate the number of daily launchings to be expected based on the various percentages of boaters using their boat on that day as indicated by the column headings.

The existing usage figures are based on the actual number of seasonal and daily launch ramp permits sold by the Chicago Park District during 1978. Daily permits are held constant at 1/180 of the number sold (6 month launching season) because there is no basis for any other breakdown. Demand R1 and R2 represent two categories of persons identified in the boating survey as potential launch ramp users. Demand R3 are boaters who would use Lake Michigan if sheltered water were provided and so this is handled as a separate calculation. The total number of daily launchings for the various conditions is calculated and the capacity of existing ramps is subtracted from that figure. The remaining excess demand is converted to a number of launch

lanes needed to accommodate that level of activity based on the previously cited capacity assumptions. The result is a number of launch ramps that would need to be constructed if a policy was established to provide the specified level of service.

The Demand R3 figure is included to indicate the potential demand that would exist if new sheltered water areas are created, such as those described in the Lakefront Plan of Chicago. At this time, there is little reason to anticipate this level of demand unless sheltered whater is created. One obvious conclusion from this analysis is that it would be almost impossible to provide services of 50% of the boaters decided to launch on any given day. This is an extreme upper limit, the 25% activity level being something more of a realistic upper limit. Somewhere between the 5% and 10% activity levels is probably the current usage pattern.

To check these figures an alternative analysis was performed on the basis of launch ramp usage reported in the boating survey. An average number of launches per season was calculated and applied to the demand population. The total number of launchings was then split 50% to the two weekend days (peak demand) and 50% to the remaining 5 days of the week (average demand). The results of this analysis reinforce the previous analysis in that a low estimate of 26 new lanes on weekdays and 40 lanes on weekends; and a high estimate of 65 lanes on weekdays and 87 lanes on weekends was identified.

The precise magnitude of these estimates is not as important as the fact that a very large demand has been identified. This would indicate that a very great amount of construction would have to take place before any danger of creating an over-supply of facilities exists. As new facilities are constructed the data base upon which projections are made should be updated. If new information is periodically gathered and incorporated into the planning process, there will be little chance of ever-constructing facilities.

One factor needs to be mentioned with respect to the demand estimates reported here, which is that the analyses performed really only relate to existing demand. Essentially, this means that the demand currently exists and is not being satisfied. There has been no effort to calculate the latent demand resulting from such factors as market stimulation as a result of new facility construction, changing perceptions of Lake Michigan and the lakefront parks, population shifts, income escalation, increased leisure time, etc. The latent demand could well be much higher than the existing demand. Future studies should be performed to analyze factors contributing to latent demand and to quantify the extent to which it exists.

Statement of the Problem

The publication and adoption by the Chicago City Council of the Lakefront Plan of Chicago in 1972, established public policy regarding Chicago's shoreline. The expansion of the

lakefront park system and the enhancement of recreational opportunities within those parks are policies of this plan. At present, the lakefront park system is a major recreational resource, not only for the people of Chicago, but for the entire northeastern Illinois region, and also, for the entire United States.

By any objective measure, the City of Chicago suffers from an undersupply of recreational land and facilities. One option for solving this problem is to expand the amount of parkland along the shoreline, an option identified in the Lakefront Plan.

The results of the recently administered survey of boat owners in northeastern Illinois indicates that there is a vast unmet need for boating facilities along the shoreline. Stated simply, the task before us is to decide how the City of Chicago will meet this need for new boating opportunities. However, nothing is that simple. In addition, to trying to satisfy demand there is a need to conform with environmental regulations, financial constraints, and a myriad of other factors that will enter the decision making process.

In view of the great number of constraints on the situation, overall public policy with respect to recreational boating development needs to clarified. For all intents and purposes, the decision to promote such development was made when the Lakefront Plan was adopted because it strongly favored boating development. The next step is to develop a strategy for determining what type of boating facilities to develop and where to locate them. The remainder of this

report deals specifically with these issues. The comprehensive planning approach described in this report is an attempt to establish a systematic procedure for evaluating steps in the decision process, relating these evaluations to the entire context of the lakefront and the demand for facilities, and finally reaching a decision as to the best possible course of action. Upon completion of these tasks the City of Chicago will have a sound basis for any actions it takes with respect to recreational boating development.

CHAPTER II

ALTERNATIVE DEVELOPMENT STRATEGIES

INTRODUCTION

It will be the task of this chapter to present three generic strategies by which boating development may take place along the Chicago shoreline. In general terms, these strategies can be described as:

1) Infilling/expansion of existing facilities;
2) Construction in existing sheltered water areas; and
3) New development in open lake areas.

The specifics of the various strategies will be explained in this chapter. Each strategy has a distinct but limited potential for meeting the demand for recreational boating development outlined in the Chicago Lakefront Recreational Boating Survey Report. No one strategy can or should be expected to meet the entire demand that has been shown to exist. A balanced approach to development is necessary, otherwise new problems will be created in place of the old ones. The decision processes described in the following chapter are designed to promote a balanced approach to recreational boating development which will meet the needs of the boating public.

The three strategies mentioned above must be formulated in such a way as to meet the needs for three distinct types of development. The three types of development identified as a result of the survey statistics are:

1) additional boat berthage space;
2) additional boat launching ramps; and
3) improved and expanded ancillary facilities at harbors and launching ramps.

The results of the survey analysis indicate that there is presently a demand for 6,000 to 10,000 berthages, between 40 and 70 new launching lanes, and a wide variety of services not curently offered in lakefront parks or in short supply.

Defining Development Objectives

If the lakefront parks were a commercial enterprise, the decision on how to respond to the 'market' or expressed demand would be based on what investment would return the greatest profit. However, the Chicago Lakefront Parks are a civic resource rather than a commercial enterprise. The decision on how to respond to a particular 'market potential' must be balanced against a variety of public objectives which are much broader and often more elusive than those of the private sector. For instance, it is incumbent upon the public sector to provide services and satisfy needs which cannot return a profit or generate a revenue, a constraint not often encountered in the private sector.

Since the lakefront cannot be devoted solely to the purpose of satisfying the needs of recreational boaters, it will be advantageous to all involved if those spaces devoted to boating activities are used effectively and efficiently. Of the total land base comprising the current lakeshore park system less than 3% is devoted solely to use

by boaters. This contrasts quite sharply with the public perception, held by many, that the lakefront parks were constructed for and cater to the boater at the expense of the general public. It is entirely clear that public lakefront objectives are not always synonymous or even fully compatible with the specific interests of recreational boaters. On the other hand, the lakefront serves as an important and vital access point to the lake for boaters from the Chicago area and much of Illinois. This role for the shoreline was identified and supported as early as the Burnham Plan, and was reaffirmed in the Lakefront Plan of Chicago and even more recently in the Illinois Statewide Comprehensive Outdoor Recreation Plan.

Although some lakeshore objectives are quite specific and explicit such as those found in the Lakefront Plan and Lakefront Protection Ordinance, others are not. A number of constraints on the lakefront are a product of historical trends, changing public attitudes, and implicit feelings people have toward the lake. These constraints can be translated into criteria against which lakefront projects can be evaluated, such as the following two examples:

- Any future lakefront development must be compatible with the existing network of lakefront activities and facilities, both functionally and aesthetically.
- Future lakefront development projects must be environmentally sound in terms of both the social and recreational environment of the urban waterfront as well as the natural ecological balances which may exist.

The formulation of projects on the basis of these far-

reaching objectives will result in a much different type of project than one which emerged from the private sector. In evaluating alternative strategies, economics cannot be the sole criteria, nor can the unquestioned accommodation of all of the boating demand identified in the survey report. The process of formulating and evaluating project proposals will be a very involved process, as identified in the next section of this report. Although economics must, of necessity, play an important role in project review, a workable solution will be determined on the basis of public policy, politics, social acceptance, and a myriad of technical factors. Some elements of a project may well be included for economic reasons, and may even 'turn a profit', but they will not be included solely for that reason if they conflict with other vital public interests, either explicit or implicit.

With these points in mind, the three alternative development strategies will be explained in detail. An attempt will be made to realistically evaluate the role that each of these strategies may play in future lakefront development. In cases where a particular strategy appears appropriate for a given location, these preliminary findings will be reported. In some cases, discrete projects are suggested so that more detailed work can commence in the near future.

STRATEGY ONE - INFILLING

As described in Chapter I of this report, there has already been a steady growth in the number of berthages provided at the seven lakefront harbors. In 1972, there were

approximately 2,500 berthages in the Park District harbor system. By 1978, the number had risen to 4,040 berthages, or a 60% increase without expanding the water area contained within the harbors. The entire 60% increase has been achieved through the strategy of infilling, or increasing the density of the mooring arrangement within existing recreational boat harbors.

The existing lakefront harbors currently contain widely varying densities of boats per acre of surface water. The density in Monroe Harbor is a low 6.1 boats per acre because there are many large boats and all boats are on individual floating moorings. At 59th Street Harbor, the density is 39 boats per acre because all boats are in slips and there are few large boats. These two factors; the size of boats, and the type of berthage system utilized, are the major sources of variation in achievable berthing density. Another factor in the cases cited is that Monroe is much larger and busier than 59th Street, which requires that much more space be devoted to fairways. The potential variation is much wider than the two figures reported, with feasible maximums reported at about 65 boats per acre (Adie: 1977, p.129).

The success achieved by the Park District in the past 6 years can be attributed to: the replanning of water areas used for individual floating moorings; the conversion of some mooring areas to slip space; and the replacement of other moorings with floating star docks. The star dock program appears very promising because the cost is much lower than

slip construction and the problems of waves and seiche affect star docks less acutely than slips. An example of the promise star docks hold is that 330 mooring spaces will be added to 3 harbors; Montrose, Belmont, and Jackson Inner, during the 1979 boating season. This change will increase the berthage density at Montrose from 13.5 to 16.9 boats/acre, at Belmont from 7.5 to 9.7 boats/acre, and at Jackson Inner from 11.3 to 18.6 boats/acre.

Although the achievements from the recent infilling strategy of the Park District are remarkable, it cannot be assumed that each year the available berthages can be increased ad infinitum. Due to the complex nature of the aquatic environment as well as the complexity of the existing usage patterns in lakeshore parks, there are constraints on this strategy which will place practical limits on its ultimate achievements. Some of these constraints will be explained in the following pages, but more detailed discussions of design limitations appear in the design report and limiting public perceptions appear in the survey report.

Practical Constraints on Infilling

As indicated above, a significant increase in berthage densities has already been achieved in lakefront harbors in part by shifting from moorings to star docks. Theoretically, using this strategy, it would be possible to double or even triple the number of boats in lakefront harbors. Although, it is presumed that this strategy will continue to be used in future years, it may not reach the theoretical maximum density.

For in fact, there are several important limitations to the use of this strategy, some of which relate to basic issues concerning lakefront usage and others of which are technical in nature. Various considerations which limit the degree to which infilling can be used include:

Boat size: Moorings can be used for any size boat, and may represent the most cost-effective method of berthing large sailaboats, which are an important part of the lakefront fleet and appear to be continuing to grow in popularity. The type of star dock currently in use by the Park District is limited to boats under 30 feet in length. Thus, not all of the boats seeking lakefront berthages could use the star docks as are presently available.

Lake Michigan Crowding: Recreational boating is in fact a network of activities, services and facilities, and berthage is but one part of this. The waters adjacent to lakefront harbors are used not only for recreational boating, but also for commercial navigation. On summer weekends, the waters near the lakeshore harbors are heavily congested with a wide mixture of sail and motor recreational craft as well as commercial traffic. At some point, the spatial capacity of specific water areas to accommodate safe and enjoyable commercial and recreational boating may be surpassed, if the number of boats in harbors were incr-ased until maximum harbor densities were in fact achieved.

Boater Satisfaction: The survey report revealed some existing degree of boater dissatisfaction with the present

density levels in lakefront harbors, indicating that some harbors are beginning to present problems to users. There have also been incidents of rudder and line entanglement, suggesting that conditions may be in some instances not only 'crowded', but also unsafe. "Crowding" is a difficult condition to establish with certainty; and those wanting berthage space may be willing to accept higher densities and inconvenience than those boaters already having berthage who may perceive higher densities as a diminuation rather than a positive achievement. It is important that additional surveys and analyses be undertaken to obtain more precise measures not only of the quality of the boating experience under various berthing densities, but also to develop some objective measures of safety/hazard conditions.

Channel and Fairway Requirements: As described in the design report, there are certain minimum channel and fairway requirements if a recreational boating harbor is to be able to not only provide berthage and/or launching capabilities, but also allow those boats to gain access to and from Lake Michigan. As the density of berthages increases, the capacity of both fairways and channels may have to be expanded, thus requiring that a significant portion of water within the protected harbor area be reserved for circulation.

Harbor Water Quality: As the density of boats increases in a harbor, the level of pollutants generated by those boats increases proportionally. As yet, there are few, if any, accurate methods of calculating the incremental effects on

water quanlity as a result of increased boating activity. It can be safely asserted at the present time that the water quality of Lake Michigan is not in jeopardy as a result of recreational boating activity. However, the existence of Federal and State, and local water quality regulations makes it necessary to develop predictive capabilities to insure the integrity of the lake.

These considerations represent some of the practical constraints upon infilling of lakefront harbors to their theoretically maximum density. However, there is another set of considerations which relate to the basic nature of lakefront recreational boating, and lakefront recreation generally.

Ancillary Services: As mentioned throughout this report, and as emphasized by the findings of the recreational boating survey, many Chicago lakefront boaters question the relatively limited amount and type of services and facilities available at lakefront recreational boating sites. Respondents to the 1978 survey indicated a considerable interest in additional restrooms, emergency repair facilities, restaurants, and boating supply stores. In general, this appears to represent a recognition that the presence of these services and facilities enhances rather than detracts from the boating experience. In the past, the primary role of the harbor was merely a parking space for the boat with any additional services provided at private yacht clubs. This situation is changing, and as indicated by response to the survey boaters hope that it continues to change.

This points to what may become a limiting factor on the

degree to which boating opportunities can be expanded within the confines of the existing harbor configurations and surrounding landforms. The current strategy of infilling has been primarily directed at expanding water based facilities, namely berthages and has had very few tangible effects on land based harbor facilities, where most, if not all primary and ancillary services are provided. To the degree that the boating public begins to view support services and facilities as necessities rather than luxuries it may no longer be possible to increase the number of berthages without increasing the level of services being provided. Since available land is already limited and the competition for its use is intense, it may not be possible to find sufficient space to construct facilities to provide boater services. The need for parking near harbors is one of the most space consuming services and possibly the one which will become critical the soonest if harbor infilling continues at its current pace.

Use of Parkland: A basic issue involved in developing strategies for increasing lakefront recreational boating facilities is the amount of lakefront park land to use for boating versus open space or other types of recreational activity.

Whether the result of explicit policies or implied concepts, the lakefront harbors have been developed utilizing a minimum amount of land area, focusing upon water areas for berthages, fairways and channels, and primary services such as fuel stations and pump-out facilities. When additional facilities or services have been provided, it has either been

through commercial enterprises, located along the Chicago and Calumet rivers, or through private lakefront yacht clubs. In terms of the percentage of lakefront park lands devoted to recreational boating, the total amount is less than three percent, including that portion of parking spaces which are used primarily by boaters, even though few parking areas are exclusively dedicated to boating.

Eighty-five percent of the total lakefront space devoted to recreational boating consists of water areas, and only fifteen percent is land. By comparison, Adie in his guidebook on marina design (Marinas; 1977) suggests that the usual ratio of land to water at commercial marinas is approximately 50/50. To achieve that ratio of land to water along the Chicago lakefront, approximately 13 percent of the lakeshore land would have to be utilized for boating, which would represent an increase of approximately 500-600% in land area.

If the amount of existing lakefront park land used for boating were increased, then a great number of additional ancillary services could be provided, as desired by many of the boaters currently using the lakefront harbors.

In many instances, these ancillary services could conceivably be leasehold operations, generating revenue to support the overall boating facilities. If carefully designed and located, these might be for the most part shared facilities, available to several types of lakefront recreation, and representing a net gain for the entire recreational capacity of the park.

However, there is also a long history of support for a wide mixture of recreational opportunities along the lakeshore, and a commonly held opinion that the lakefront parks cater too much to the needs of boaters. It is not clear if a significant increase in land-side boating services or facilities would be acceptable by the majority of park users. While there is a very real possibility that such improvements could represent a net gain for all park users, such gains would require a considerable amount of careful planning and cooperation among a wide range of user groups in designing a workable mix. It is possible that this level of cooperation may be difficult to achieve.

Conclusions - Feasibility of Continued Infilling

The strategy of infilling berthage areas has proven to be quite successful, and indications are that there will continue to be opportunities to use this strategy to increase area capacity, especially through the use of such berthage techniques as star docks.

Infilling of berthage densities is not a complete answer to the large demand for additional boating facilities, and other strategies will also be needed.

Maximum appropriate densities should be determined through further research and analysis of boater opinion and actual monitoring and evaluation of conditions, especially with erference to safety.

- Additional attention must be given to the Lake Michigan water areas adjacent to the lakefront, to ensure that as

boating densities increase in the recreational harbors that surface water traffic does not become too crowded or conflict with necessary commercial navigation.

- Methods of increasing land based facilities warrants additional attention as part of the infilling strategy.
- Water quality will be a continuing concern as harbor capacities are increased. Research should be performed to develop an understanding of the incremental effects of water quality including a predictive capability to be applied to future proposals.

STRATEGY TWO-SHELTERED WATER DEVELOPMENT

At the present time, there are areas of sheltered water along the Chicago lakefront which are outside of the protected water areas of the seven boating harbors. One possible strategy to increase the amount of recreational boating facilities would be to convert these sheltered water areas into some type of berthage and service complex. A particular instance of an opportunity for applying such a strategy is in the Navy/Dime Pier area at the mouth of the Chicago River. A detailed description of this strategy is provided as a case study in Chapter IV of this report. The details of that discussion will not be repeated here. However, certain basic features of the strategy can be considered in general terms at this time.

Basic Features of Sheltered Water Development

Cost: This strategy is inherently more expensive than the infilling option because of the much more extensive

construction activities associated with sheltered water development. Sheltered waters, when compared with the protected waters of the existing boat harbors are not sufficiently calm or safe for immediate use as berthing for the majority of boats using the Chicago lakefront. Therefore, some degree of protection (breakwaters, revetments, landfill, etc.) will almost always have to be constructed to secure these areas for use as recreational boat harbors. This type of construction is very costly in comparison with the relatively nominal expenditures associated with infilling in already protected water areas.

Permits: Because of the greater complexity of construction activities associated with this strategy, many more local, state, and Federal permits will be required, requiring much more inter-governmental coordination, research, site analysis, and also much more time to complete a project.

Lake Michigan Crowding: To the extent that sheltered water areas are separated from existing boat harbors and their entrance channels, it is possible to prevent further increases in crowding at these places by constructing new boat harbors which are detached from existing harbors. However, there remains the issue of the intensity of boating use (both commercial and recreational) in the entire near-shore zone of Lake Michigan. It will be necessary to determine acceptable use levels in this zone and use this information as an input to harbor locational and scaling decisions.

Harbor Walter Quality: Given the fact that the final configuration of harbors constructed within existing sheltered water areas is a product of construction activities performed for the purpose of creating that harbor the potential exists to incorporate design features which will preserve water quality within the new harbors. Essentially, this means that internal water circulation and flushing of the harbor basin should be factors considered in the design of all protective structures. As recommended in the infilling strategy, the water quality effects of projected boat loadings should be calculated and used as an input to the design process.

Ancillary Services: As with any construction project, the final product is largely in the hands of planners and designers. When a new harbor is constructed, it is possible to determine the level of services that are desired and to program the necessary facilities which will supply these services. The greater degree of control existing in the design process allows locational, scaling, and design issues to be determined by functional, aesthetic, and environmental considerations rather than retrofitting a facility to a given infrastructure which may not be totally compatible.

Use of Parkland: One important benefit of this strategy is that a new park area would most likely be created. This new area, devoted to and designed for boating use, would be less likely to intrude upon or compete with existing uses of surrounding or adjacent parklands.

However, one of the basic lakefront boating issues would

remain, as previously discussed. If new land areas are established as part of a sheltered water development strategy, how much of that land should be devoted to recreational boating? If at present, less than 3% of the land area of the park is devoted primarily to boating, should that ratio be continued for new developments? The strength of the argument is now in favor of the boater, but as with all public facilities competing interests must be balanced.

Use of Water Areas: In addition, the sheltered water development strategy raises another basic issue, which is: To what degree should sheltered water areas be developed for recreational boat berthage space, or to what degree should they be left undeveloped as an aesthetic asset and as a water activity arena for the active use of boats and other water-based activities. At the present time, there are no clear guidelines on this issue, and it will require not only careful analysis but also the evolution of a public policy, specifically addressed to these issues. The Lakefront Protection Ordinance as it presently exists provides an arena in which this public policy can be developed, adopted, and used to regulate the situation if the need arises.

Conclusion: Potential for Sheltered Water Development

- Sheltered water development is more complicated than infilling, requiring more time, money, and effort to achieve tangible results, but it is a strategy that holds great promise for mid to long-term accomplishments.

- There are a limited number of sites currently existing along the shoreline where this strategy can be applied (such as the case study outlined in Chapter IV) with any chance of achieving success.
- The full costs of this option are considerably higher than those encountered with infilling. However, infilling is limited in terms of its absolute achievements, and sheltered water development will be less costly than other potential alternatives.
- All potential areas need to be analyzed to determine their feasibility as sites for harbor development, environmental constraints, and use conflicts.
- The Navy/Dime Pier area warrants particular attention under this strategy, since this area is presently being considered for significant renovation. If this strategy were used in combination with Navy Pier renovation, the benefits might be greater for both projects, and the opportunity for sharing and enhancement of facilities would be greatly improved.

STRATEGY THREE - OPEN LAKE DEVELOPMENT

This concept is a continuation and extension of the strategy which was employed to create a majority of the existing lakefront recreational and open space resources, including the boating harbors. At times, this strategy is referred to as lakebed reclamation, but essentially it involves the emplacement of landfill areas in configurations which create new park land as well as sheltered and/or protected water.

This strategy has been used in Chicago for well over 100 years with extraordinary success. The 1972 Lakefront Plan of Chicago endorses the continued use of this strategy for the purposes of securing new and improved recreational resources along the shoreline, as well as protecting existing shoreline areas from erosion and flooding which are experienced periodically.

The Department of Planning, City, and Community Development is charged with the implementation of the Lakefront Plan, and a major thrust of its work since the passage of the Lakefront Plan and the subsequent Lakefront Protection Ordinance has been to develop concepts, principles, and information which will allow the City to determine when and if this strategy should be used. A full discussion of this strategy is beyond the scope of this single report, and in fact, has been the topic of several Department reports cited in the Appendixes to this report. However, some basic sondierations specifically related to the topic of landfilling as a strategy for recreational boating development will be discussed, if only briefly.

- While landfill expansion has been a basic and successful strategy used by the City to establish Lake Michigan recreational boating opportunities, it is also an extraordinary undertaking, made more complicated today by the existence of the present landfill park system as well as a myriad of public regulations affecting this activity.

- Landfill expansion is a major financial undertaking. In terms of costs and benefits, it would be difficult to justify on any significant scale if it were solely performed for the purpose of providing recreational boating facilities. Given the major increases in most types of construction costs, it will be a major challenge to design and construct such a project in such a way as to minimize costs and maximize the benefits.
- To finance such a project under present and forseeable economic conditions, it may be not only desirable but necessary to give increased attention to ancillary facilities as sources of revenue. This would suggest the dedication of a somewhat larger percentage of future lakeshore land areas to recreational boating services and to recreation oriented leasehold operations which both enhance and assist in financing the public recreational opportunities.
- Any landfill extension will require an extraordinary amount of planning and coordination. The present lakefront was constructed before existing Federal and State water quality regulations operative, and before detailed environmental assessments were required. Also, future landfill extensions must assume the added planning and design burden of fitting properly not only within Lake Michigan, the urban environment, but also within the existing lakefront park system.

Conclusions: The Role of Open Lake Development

- Open lake development is not a strategy that can meet immediate recreational boating demand.
- Neither is it a strategy that can be used solely for recreational boating expansion; it can only be used as part of a multi-purpose project providing benefits and opportunities for all the residents of the City.
- At some point in time, as Chicago expands its efforts to provide public recreational boating facilities along the lakeshore, this strategy may be necessary; as the only means of creating sufficient protected water areas to accommodate the required number of berthages.
- If other reasons for establishing a landfill extension are identified, it will be important to insure that they are planned and designed to most effectively meet boating demand while also satisfying other lakeshore needs.

Additional Considerations

A majority of Lake Michigan access not only for citizens of the Chicago metropolitan area, but for the entire state of Illinois, exists along the lakefront of Chicago. It is an extraordinary resource which has been established with great care and at considerable expense. The amount and type of recreational boating taking place on Lake Michigan within the Chicago metropolitan area depends to a considerable extent upon the type of facilities and services; and the future development strategies that are utilized along the Chicago shoreline.

Since the Chicago lakefront park system is a major point of recreational access to Lake Michigan, it must serve a variety of recreational needs; and since it is directly adjacent to the City, it must be compatible with a wide range of municipal needs including but not confined to recreation. Therefore, it is not probably that all existing or latent recreational boating demand can or will be accommodated along the lakefront.

However, it is important to keep in mind that to a very real extent, there are few if any private sector options at the present time. Whether additional boaters will have the opportunity to use a Lake Michigan berthage, and what types of services and facilities will be available to them, depends upon future strategies utilized for public lakefront park expansion. Future demand for boating facilities needs to be more carefully identified, but is, on the basis of initial surveys, far beyond the ability of the present lakefront facilities to accommodate.

The major strategies which appear to offer some promise of satisfying a major portion of this existing demand involve extensive construction and significant expenditures. To warrant such strategies, and to finance the necessary construction recreational boating will have to be treated as only one part of lakefront recreational development, with increased emphasis placed upon leaseholding, ancillary facilities, and shared facilities. However, it must also be emphasized that the Lakefront Plan requires that any future development enhance rather than detract from the lake-

front park system. The lakefront is the edge of the City, not just a marina, and there are no strategies which provide an easy way of accommodating all of the demands and interests which the lakefront faces. In the next chapter, consideration is given to the problem of how decisions related to recreational boating facility development can be approached, given all of these complexities.

CHAPTER III

DECISION CONCEPTS AND PROCEDURES

THE DECISION PROCESS

Introduction

The accommodation of substantial numbers of additional recreational boats along Chicago's Lakefront will depend largely on whether planning, design, and management approaches can be systematically developed to respond to public policies and environmental regulations while also meeting the needs of the boating community. Although it is a relatively simple task to develop facility management policies based on evolving problems and trends, it is extremely difficult to develop reliable planning procedures (to facilitate decision making) and design principles/criteria which are based on measurable facts.

Among the most important requirements of a systematic approach are the need to estimate the intensity of sustained boating activity that can be accommodated in the nearshore zone of Lake Michigan without disrupting commercial navigation and in conformance with public policy (e.g., the Lakefront Plan of Chicago); to define a reasonable distribution of boating facilities along the lakefront to provide boating access, berthages, and other services; to select the most feasible forms of development (e.g., infilling, sheltered water development, open lake development) based on environmental, economic, and policy factors; to locate specific sites for boating development based on the above considerations,

and to formulate the designs of individual boating facilities based upon reasonable principles, practices, and standards. The purpose of this chapter is to present the outline of such an approach and to discuss the makeup of some of the individual elements involved.

Decision Steps

Figure 1 is a graphical representation of the decision process developed during the boating study to meet the requirements outlined above. Many of the elements of the process are discussed elsewhere in this report, in the Chicago Lakefront Recreational Boating Survey Report, or in the Design Concepts and Standards for Chicago Lakefront Recreational Boating Facilities report. What follows is an outline of the decision steps together with a brief listing of the tasks involved in executing the steps.

Premise: The demand for recreational boating facilities along the Chicago Lakefront is far above the present supply and it is in the public interest to satisfy this excess demand where possible.

Step I: Needs Analysis

Objective: To quantify the extent and distribution of demand for recreational boating facilities along the Chicago Lakefront.

A. Determine the size, type, and use characteristics of the recreational boating fleet presently utilizing, and those not now but interested in utilizing Chicago Lakefront boating facilities.

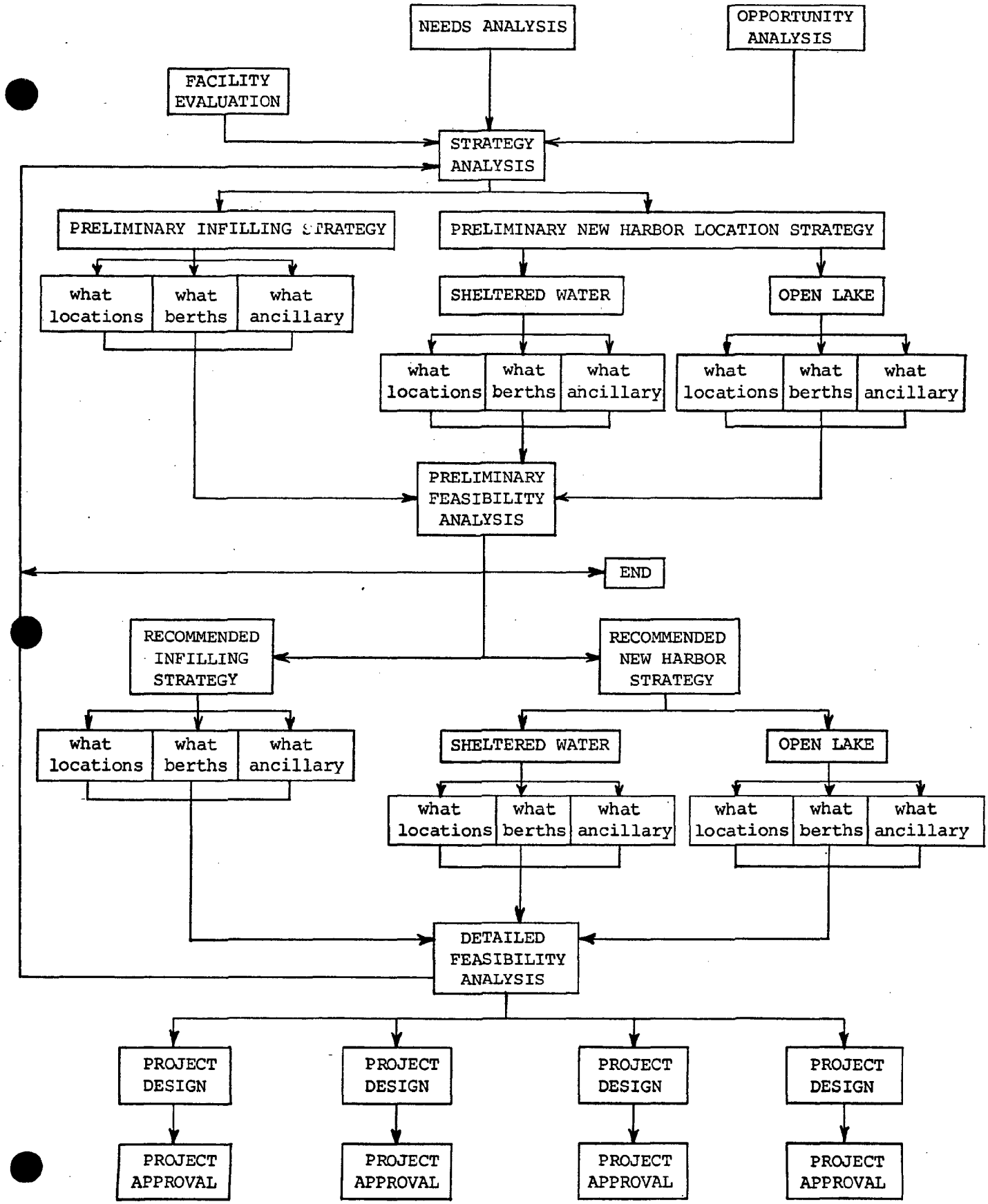
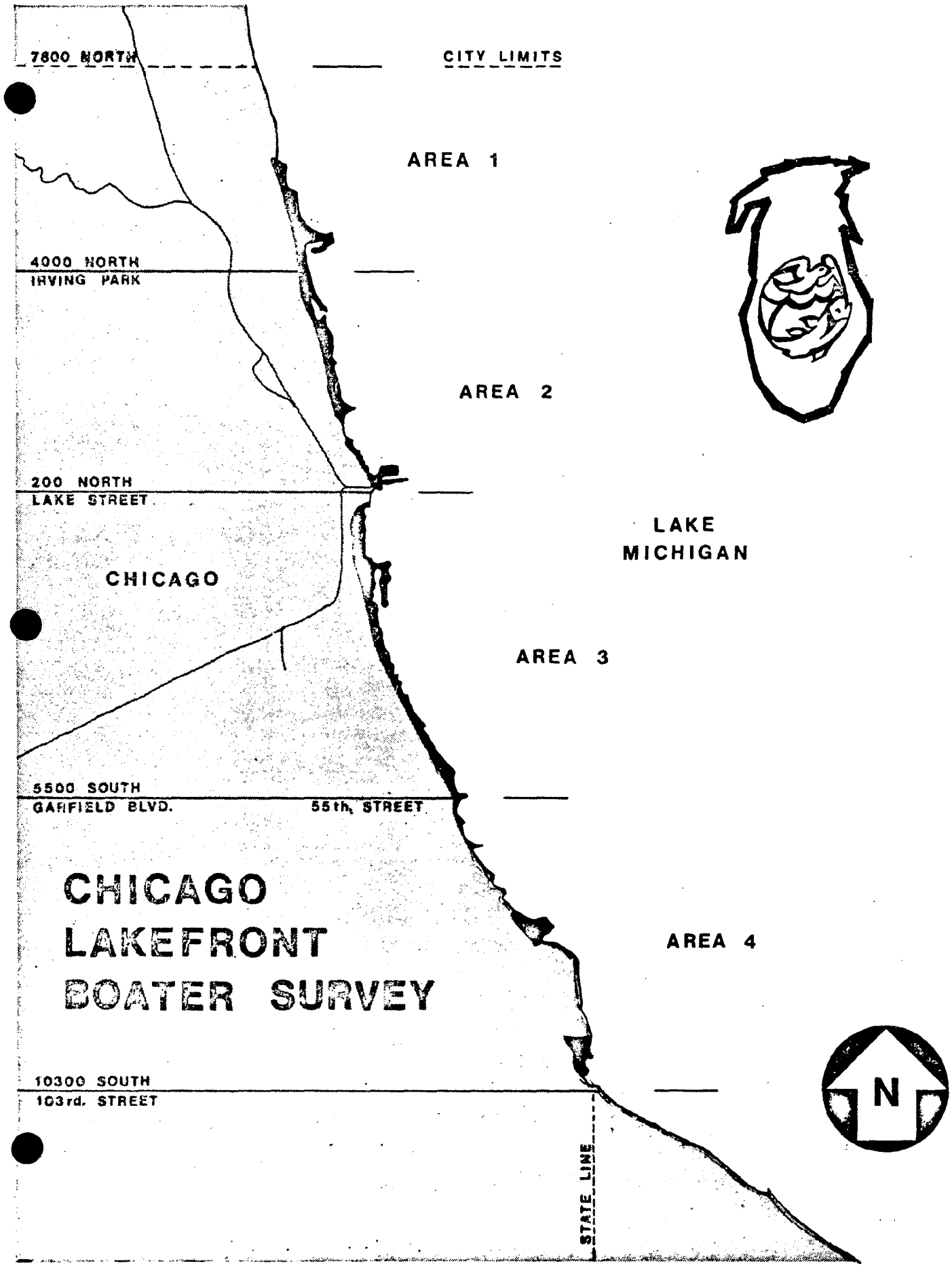

NEEDS ANALYSIS
OPPORTUNITY ANALYSIS
FACILITY EVALUATION
STRATEGY ANALYSIS
PRELIMINARY INFILLING STRATEGY
PRELIMINARY NEW HARBOR LOCATION STRATEGY
what locations
what berths
what ancillary
SHELTERED WATER
OPEN LAKE
what locations
what berths
what ancillary
what locations
what berths
what ancillary
PRELIMINARY FEASIBILITY ANALYSIS
END
RECOMMENDED INFILLING STRATEGY
RECOMMENDED NEW HARBOR STRATEGY
what locations
what berths
what ancillary
SHELTERED WATER
OPEN LAKE
what locations
what berths
what ancillary
what locations
what berths
what ancillary
DETAILED FEASIBILITY ANALYSIS
PROJECT DESIGN
PROJECT DESIGN
PROJECT DESIGN
PROJECT DESIGN
PROJECT APPROVAL
PROJECT APPROVAL
PROJECT APPROVAL
PROJECT APPROVAL

FIGURE 1


7800 NORTH
CITY LIMITS
AREA 1
4000 NORTH
IRVING PARK
AREA 2
200 NORTH
LAKE STREET
LAKE
MICHIGAN
CHICAGO
AREA 3
5500 SOUTH
GARFIELD BLVD.
55th. STREET
CHICAGO
LAKEFRONT
BOATER SURVEY
AREA 4
10300 SOUTH
103rd. STREET
STATE LINE
N

B. Estimate the number, size, and type of berthages (wet and dry) required to accommodate the boating fleet within each of the four lakefront areas (see Figure 2).

C. Estimte the number of launching ramps required to accommodate the trailerable boating fleet within each of the four lakefront areas (see Figure 2).

D. Identify the type and extent of the ancillary/ support service facilities needed or desired by existing and potential Chicago Lakefront Boaters.

E. Identify the real and perceived concerns regarding boating safety along the Chicago Lakefront.

Step II: Facility Evaluation

Objective: To characterize the present recreational boating facilities in terms of physical components and utilization of space.

A. Identify the physical characteristics and elements of the seven existing lakefront recreational boating harbors and the 6 boat launching ramp locations along the lakefront.

B. Investigate incidents of congestion in the existing harbors and in the nearshore waters of Lake Michigan to determine the tolerance of boaters to crowding.

C. Estimate of the capacity of existing harbors to accommodate additional berthages without adversely affecting; the satisfaction of boaters and other lakefront users, environmental quality, and the safety of boating and other water uses for each

of the following berth types:

slips
star docks
moorings
dry storage

D. Identify the extent and spatial requirements for the ancillary services, needed or desired by boaters, to support existing and additional berthges.

E. Investigate the real and perceived problems of the present users of recreational boating facilities.

F. Identify the extent of and spatial requirements for the ancillary service facilities needed or desired by boaters, to support the boat launching ramps.

Step III: Opportunity Analysis

Objective: To describe the lakefront in terms of opportunities and capabilities for boating facility development.

A. Estimate the spatial capacity of the nearshore waters of Lake Michigan for recreational boating activities based on the maximum number of boats that can be accommodated without a decline in user satisfaction.

B. Identify potential shoreline opportunity areas where new recreational boating facilities might be located within existing sheltered water areas.

C. Identify potential open lake opportunity areas where new recreational boating facilities might be located as part of a lakefront expansion project.

Step IV: Strategy Analysis

Objective: To evaluate the types and forms of recreational

boating development in terms of constraints that could affect their viability.

A. Identify those parts of the shoreline and landfill opportunity areas that are unsuitable for the development of recreational boating facilities due to environmental constraints, potential for conflict with other land and water uses, and/or existing policies and regulations.

B. Identify those access points along the existing lakefront that are capable of accommodating traffic from throughout the region.

C. Identify those harbors (or parts of harbors) that are unsuitable for infilling due to existing crowding conditions, environmental constraints, potential for conflicts with adjacent land and water uses, and/or existing policies and regulations.

D. Determine the circumstances under which desirable but nonessential unnecessary ancillary/support service facilities would be a feasible part of a boating facility.

E. Estimate the location, type, and strategy for recreational boating facility development based on the findings of the facility evaluation, needs analysis, and opportunity analysis.

Step V: <u>Preliminary Feasibility Analysis</u>

Objective: To evaluate the viability of the various concepts for boating facility development

as proposed, in environmental institutional, and economic terms.

A. Identify the standards and criteria that will serve as the basis for analyzing the proposed concepts (e.g., environmental impact, regulations, costs, accessibility, time frame for completion).

B. Determine the compatibility of each proposed concept with adopted public policies.

C. Determine the probable environmental affects(s) resulting from the implementation of each concept and identify mitigation techniques, if any, which can ameliorate adverse impacts.

D. Determine the relative economic feasibility of the various concepts based upon probable benefits and costs.

E. Determine the probable regulatory constraints associated with each proposal concept and identify all likely prohibitions.

F. Determine the extent of other practical constraints inherent to each concept (e.g., required time frame, public reaction) and identify all likely prohibitions.

G. Determine the circumstances under which multi-purpose and shared facilities should be provided (e.g., shared parking areas, picnicking or fishing within harbor areas).

Step VI: <u>Detailed Feasibility Analysis</u>

Objective: To determine the circumstances if any, under

which a strategy to provide recreational boating facilities along the Chicago lakefront should be carried out.

A. Determine the number, size, and type of boats that can be accommodated within each of the four lakefront areas (see Figure 2) utilizing each of the following berth types:

slips
star docks
moorings
dry storage

B. Determine the primary and secondary ancillary service facilities for each of the development concepts (i.e., infilling, sheltered water development, open lake development, and construction, boat launching ramp construction) along with spatial standards for each.

C. Determine the number and size of boat launching ramps that can be accommodated within each of the four lakefront areas (see Figure 2).

D. Identify the circumstances under which the following development strategies are feasible (within acceptable environmental, economic, policy, and practical limits):

- infilling existng harbors
- constructing new facilities in existing sheltered water areas
- constructing new facilities in the open lake as part of a major landfill activity resulting in shoreline extensions, pennisulas, and/or islands.

E. Identify the circumstances under which multi-purpose and/or shared facilities should be included as part of a recreation boating development.

Step VII: Project Design

Objective: To formulate discrete projects which respond to the need for recreational boating facilities and which utilize reliable and sound design practices.

A. Determine the number and type of boats to be accommodated by the project and the berthage mode to be utilized.

B. Determine the type and scale of the ancillary/support service facilities needed by the proposed project.

C. Determine the spatial requirements (land and water) necessary to accommodate the proposed project.

D. Determine the environmental safeguards that are to be incorporated into the project design.

E. Prepare a site plan for the proposed project that incorporates the necessary safeguards and design principles to ensure compliance with public policies, standards, and regulations.

Step VIII: Project Approval and Implementation

Objective: To formulate and carry out a plan of action for the development and operation of specific projects.

A. Determine environmental impacts that could result from constructing the project.

B. Refine project design, if necessary, to ensure adequate environmental safeguards.

C. Determine the organization and sequence of tasks to be incorporated into the plan of action.

D. Determine the phasing and financing strategy to use in implementing the project.

E. Prepare necessary requests for clearance, compile required supportive materials, and submit for approval.

F. Prepare detailed plans and specifications if project is approved.

DECISION FACTORS AND DETERMINANTS

Demand Determinants

The demand for lakefront boating facilities, as discussed elsewhere in this report and in the Chicago Recreation Boating Survey Report, is a key element of the decision process. In order for any future Chicago boating facilities to be successful they must respond to boaters' needs and, if feasible, desires. This means that it is important to characterize that portion of the existing or potential Lake Michigan boating fleet interested in Chicago lakefront facilities in terms of the number, type, width, and draft for each of several size categories. It is also important to determine the locational distribution of this demand as well as the preferred type of facilities (i.e., berthages or launching ramps). Finally, it is important to determine the preferred types of berthages (e.g., slips, moorings, dry storage) and the extent of the ancillary services (e.g., restrooms, parking, fuel stations) the boaters are looking for.

During the 1978, boating season there was a waiting list for every lakefront boating harbor in Illinois. The Chicago Park District, for example, had 780 boaters on its waiting list composed of the following:

	Boat Length	
	under 25'	26+ ft.
Sail	230	210
Motor	210	130

In response to this in early 1979, the Park District proposed to construct star docks in three harbors accommodating 330 new boats up to 30 feet in length. Although additional analysis of the information provided by the 1978 boating survey is needed, a rather clear picture of what is needed or desired begins to emerge. First, there are four categories of potential facility users; those Lake Michigan boaters who berth their boat outside Chicago, but are interested in Chicago facilities; those boaters who do not use Lake Michigan, but would do so if facilities were provided; those Lake Michigan and other boaters who prefer boat launching ramps; and those boaters with craft too small to use on Lake Michigan, but who would be interested in lakefront facilities if major expanes of sheltered water were created. The following is an estimate of the potential users:

	Boat Length		
Chicago Lakefront Demand Categories	0-15 ft.	16-25 ft.	26 + ft.
Lake Michigan users wanting berths	505	4,660	772
Non-Lake Michigan users wanting berths	505	2,255	363
Launch ramp users wanting additional launch ramps	5,959	11,204	23
Boaters wanting facilities if sheltered water is available	14,847	6,242	47

Based on an analysis of the boating survey results, an estimated 82% of the boaters wanting berths prefer slips. However, it is unclear at this time whether those expressing

this preference would be willing to pay the costs involved (slips are generally much more expensive than moorings.

A preliminary analysis of the survey results regarding those boaters interest in additional lakefront development in Chicago showed the following:

Preferred Location	Boat Length		
	0-15 ft.	16-25 ft.	26 + ft.
Lakefront Area 1	37.8%	43.2%	31%
Lakefront Area 2	16.3%	20.9%	26.3%
Lakefront Area 3	23.7%	20.1%	30.3%
Lakefront Area 4	22.2%	15.8%	12.4%
TOTAL	100%	100%	100%

If the boaters preferred location was unavailable, their second preference would be as follows:

Preferred Location	Boat Length		
	0-15 ft.	16-25 ft.	26 + ft.
Lakefront Area 1	27.6%	26.0%	25.5%
Lakefront Area 2	43.7%	45.4%	45.8%
Lakefront Area 3	13.8%	17.4%	20.3%
Lakefront Area 4	14.9%	11.2%	8.4%
TOTAL	100%	100%	100%

A review of these statistics shows a well defined preference for Lakefront Areas 1 and 2 (See Figure 2) by those boaters with craft twenty-five feet long or less and a less clearly define preference for Lakefront Areas 1, 2, and 3 (See Figure 2) by those boaters with craft twenty-six feet

long or longer.

A preliminary analysis of the survey results regarding preferred ancillary services by the boaters showed the following:

Facility	Ranking by Boaters
Restrooms/Showers	1
Emergency Repair	2
Restaurants/Fast Foods	3
Boating Supplies	4
Routine Maintenance	5
Groceries/Convenience Item	6
Winter Storage	7
Fishing Supplies	8
Storage Lockers	9
Fish Cleaning Station	10
Others	11

Fueling and pumpout facilities, both of which are considered essential elements of a harbor, were not included in the listing. As a point of information here, restrooms and winter storage, on a limited basis, are the only ancillary services provided within existing Chicago harbors by the Park District.

Siting Factors

Generally, the siting of a recreational boating facility involves the evaluation of one or more areas' ability to fulfill several needs. First, the site must provide safe boating access to the cruising waters (Lake Michigan in this case).

Second, the site must provide adequate access for boaters to conveniently reach their crafts. Third, the site must provide enough land area to accommodate boat storage and/or ancillary service functions. Fourth, adequate land and protected water should be available for planned future expansion. Fifth, the site must have geophysical characteristics (e.g., water depth, bathymetry, soil conditions, wind conditions, character of waves, ice conditions, that would not present serious problems in facility design. Sixth, the site should not be in or adjacent to an environmentally sensitive area.

Although, these general guidelines are quite germain to the location of a recreational boating facility along the Chicago lakefront, there are many other considerations that make the siting task extremely complex. Site investigations in non-urban areas usually involve the evaluation of specific areas (e.g., river mouths, inlets) that have potential due to the attributes required by boating facilities that may be available there. However, this is generally not the case along the Chicago lakefront, because of the level of existing development and the fact that the present lakefront is man-made. For example, the seven existing recreational boating harbors were created as part of landfill projects.

The distribution of demand for boating facilities, as discussed earlier, is a key consideration in determining the extent of the facilities that should be located in each of the lakefront areas. Equally important, however, is the

development strategy being considered (ranging from minor shoreline modifications to extensive lakefront expansion). For example, the desires of 1,000 boaters to be located at a facility in the northermost lakefront area may only be able to be satisfied by the development of a recreational peninsula and harbor complex there. Whereas, a comparable set of needs in the central area may only be able to be satisfied by in-filling in two existing harbors.

The policies of the Lakefront Plan of Chicago encourage the provision of Lake-oriented leisure time activities. However, there is a concern that new projects be harmonious with existing public enjoyment of the lakefront parks and Lake Michigan waters. New development must fit within the landscape of existing lakefront parks and must also be compatible with their surroundings. The relationship of a new project to adjacent communities and potential conflicts among uses are also policy concerns; especially the use of Lake Michigan for water supply and commercial navigation. Each of these policy concerns has implications in the siting of recreational boating facilities.

It will be necessary to secure a variety of permits and clearances in order to construct new boating facilities and these requirements should be kept in mind in deciding where to locate them. For example, the U.S. Army Corps of Engineers has jurisdiction over the navigable waterways in and adjacent to Lake Michigan and is responsible for preserving and protecting these waters and for protecting shorelines from

erosion. In making a regulatory decision, the Corps must consider all relevant factors; including the effect of the proposed project on navigation, fish, and wildlife, conservation, pollution, aesthetics, ecology, and the general public interest. The Illinois Department of Transportation has jurisdiction over the lands under the waters of Lake Michigan which are held as "public trust" resources for the people of Illinois. In making its regulatory decision, the department must consider many of the factors considered important by the Corps as well as the degree to which the public trust would be protected. The Chicago Plan Commission has jurisdiction over any construction that occurs in Lake Michigan or elsewhere in the district defined by the Lake Michigan and Chicago Lakefront Protection Ordinance. In making its decision, the Plan Commission must consider the fourteen policies of the Lakefront Plan and the thirteen purposes of the Ordinance. The intent of these and other regulatory requirements should be understood and should be very carefully considered in making a sitting decision for a lakefront boating facility.

The economic feasibility of a development strategy and the extent of services associated with a proposed facility at any specific location is also a key consideration in the siting of a boating facility. For example, the cost of constructing a rubble mound breakwater becomes extremely expensive in water deeper than fifteen feet (e.g., approximately $1,000 per running foot in water fifteen feet deep

versus approximately $3,100 per running foot in water thirty feet deep). With this in mind, it would be extremely difficult to justify an open lake location in water deeper than fifteen feet without the facility being part of a larger scale recreational project. In addition, although the boaters' survey showed the desirability of numerous ancillary services, the economic feasibility of providing many of them is questionable due to the extremely short boating season. This will have implications in terms of the spatial requirements of the land and water areas at any proposed location.

The need to "retrofit" any new boating development to the existing infrastructure (e.g., roads, sewers, water mains) is another important consideration in the siting of boating facilities. Existing streets that might serve as access corridors to a potential facility would not be viable if traffic congestion problems already exist there. The available capacity of existing sewers and the likely distance to the nearest acceptable sewer connection could both be constraints.

Finally, the "spatial capacity" of Lake Michigan (i.e., the number of craft involved in various boating activities) adjacent to the Chicago lakefront is also an important siting consideration. It will be important to assure that no one lakefront area has a boating facility capacity that exceeds reasonable spatial use standards.

Feasibility Factors

There are two levels of analysis that should be performed

GV776.I32C55 1979 c.2

in determining the strategies to use in satisfying the demand for recreational boating facilities. A preliminary analysis would focus on the qualifications of a proposed concept in light of a set of very basic concerns (e.g., consistency with public policy, geophysical conditions). A detailed analysis would focus on the determination of an optimum development strategy for boating facilities. The difference between the analyses would be in function and in detail.

In order for a proposed concept/strategy to be acceptable at the preliminary stage, it must satisfy certain conditions. For example, a documented demand for boating facilities must exist, public policies (e.g., Lakefront Plan of Chicago) must be adhered to, regulations and standards must be compiled with, and the geophysical constraints must be overcome. If these conditions are not satisfied, the concept/strategy should be modified or should be dropped.

There are a number of factors that could serve to disqualify a concept/strategy. First, the concept/strategy could be contrary to existing public policy (e.g., does not allow for public access called for in the Lakefront Plan of Chicago.) Second, it could result in environmental impacts that could preclude obtaining the necessary permits (e.g., inadequate water circulation resulting in water quality degradation. Third, the concept/strategy is unsuitable due to the existing geophysical characteristics (e.g. bearing capacity of soil is not sufficient for proposed structures). Fourth, the concept/strategy could be inconsistent with sound engineering prac-

tices (e.g., floating breakwaters would provide inadequate protection in the open lake). Fifth, the scale of the concept/strategy is too great for the available resources (e.g., a major landfill in water twenty-five deep could require more fill than is available). Sixth, the concept/strategy is too controversial to gain public acceptance (e.g., a landfill project adjacent to Grant Park could result in a public uproar and possibly litigation. Seven, the concept/strategy would take too long to build to satisfy existing demand (e.g., it could take ten years to design and construct an island that includes recreational boating facilities).

If not disqualified earlier, the concept/strategy must be subjected to a more detailed analysis and a more exacting set of conditions in order for it to be optimized. If these conditions are not satisfied, then the concept/strategy should be refined or dropped.

Many of the same generic factors that are used in the preliminary analysis are also germain here. First, whereas the preliminary analysis focused on generic areas of public policy, the detailed analysis should focus on determining the most desirable concept/strategy for each section of the lakefront (e.g., harbor infilling would be most desirable, where possible, along the Lincoln Park lakefront). Another policy-related factor would involve determining the degree of appropriateness of a given strategy (e.g., shoreline modification lakefront expansion) to specific sites along the lake-

front. Second, whereas the preliminary analysis focused on potential impacts that could prejudice the issuance of permits, the detailed analysis would focus on specific areas of concern, i.e., water quality, traffic, noise) and what could be done to mitigate them. Third, whereas the preliminary analysis focused on geophysical characteristics as constraining factors, the detailed analysis would focus on determining which strategy/concept would be best suited to the geophysical characteristics of a given site. Fourth, whereas the preliminary analysis would focus on the adequacy of the engineering practices, the detailed analysis would focus on determining the most appropriate engineering practices to use with each of the development strategies (e.g., littoral movement of sand should be treated differently for near shore modifications than for landfill in deeper water). Fifth, whereas the preliminary analysis would focus on a comparison of project scale to available resources, the detailed analysis would focus on determining the most appropriate scale of a project based upon available resources. The detailed analysis would also include a determination of costs and benefits together with a comparison of costs with revenues.

The detailed feasibility analysis would also focus on determining the optimal distribution of berthages (and the ancillary services to support them) along the lakefront. Included here as well would be a determination of the optimal use of joint or shared facilities (e.g., parking areas, restrooms).

Design Factors

Recreational boating facilities, if properly designed, can become a natural and attractive component of the lakefront system while also functioning for their intended purpose. A facility must be more than a place to store or launch a recreational craft, if it is to coexist with other lakefront uses and if it is to respond to user needs. The facility should comply with certain standards, where appropriate, for ancillary services (e.g., parking, restrooms) and for environmental protection. Certain principles and practices should be incorporated into the facility design as well (e.g., landscape treatment, impact mitigation).

The policies of the Lakefront Plan of Chicago emphasize that care must be taken to insure that new developments fit within the landscape of the existing lakefront parks; that they enhance public enjoyment of the parks; and that they are compatible with their surroundings. These requirements have very substantial design implications.

The concept of "fitting into the landscape" (and "waterscape" in the case of theprotected water areas) offers a special challenge along the Chicago lakefront. Where usable land and water space are to be created, it is important to design them "around" the facilities and activities that are to be accommodated. This is further complicated by the aspiration to have new development build upon or be compatible with the overall historical context of existing development. Included here would be the design treatment in terms of the

color and texture of construction materials, types of plant materials (where appropriate), the sizes and shapes of specific structural elements (e.g., buildings, topography) as they relate to one another and with the existing elements, and the development intensity to be accommodated.

The Lakefront Plan policies also emphasize the need for coexistence among lakefront uses which also has substantial design implications. It will be important to avoid locating several activities in nodes or complexes that would create congestion and other problems. This would be so for both the land and water area. In those cases where a residential neighborhood is nearby a proposed development, it will be important to establish "physical ties" that would result in a transition of flow from the neighborhood to the facility.

One of the governing principles in designing future recreational boating complexes should be the accommodation of ancillary/support services and facilities to the degree that it is feasible and reasonable. Informulating the layout of the complex, it will be necessary to very carefully consider how the ancillary/support components (e.g., parking areas, restrooms, yacht clubs, gas pumps, harbormaster's office) will functionally fit together and aesthetically fit their surroundings. Equally important will be the treatment of multi-purpose or shared facilities (e.g., a building that houses a harbormaster's office, restrooms, leaseholds; a parking area shared by a boating complex and other lakefront recreational facilities).

Both types of facilities should be designed to be consistent with appropriate guidelines recommended in Chapter II of the report, "Design Concepts and Standards for Chicago Lakefront Recreational Boating Facilities.

Design strategies must incorporate environmental protection standards in order to comply with the policies of the Lakefront Plan and the Lake Michigan and Chicago Lakefront Protection Ordinance and to qualify for the necessary permits from the appropriate stage and federal agencies (e.g., U.S. Army Corps of Engineers under the jurisdiction of the River and Harbors Act of 1899). Such diverse concerns as water quality, noise, traffic congestion, shoreline erosion, and benthic habitats are all facets of the environment with mandated and/or adopted regulatory standards which will need to be incorporated into the design strategies.

In order for a recreational boating complex to function for its intended purpose, its design must utilize certain principles, many of which are discussed in detail in the report, "Design Concepts and Standards for Chicago Lakefront Recreational Boating Facilities." This is especially important along the Chicago lakefront where boating is one of many recreational activities that must be accommodated and where additional land and sheltered water space will need to be created to provide for the activities. Boat storage will need to share any new protected water area with fishing, sailing, and possibly swimming. The shore-based boating operations will need to share the new land area with numerous

other leisure pursuits (e.g., picnicking, sports, tennis, sunbathing). In addition, the land and water space upon which boating facilities are to be accommodated must contain certain essential attributes (e.g., water area for berths with water fluctuation of no more than one foot, a flatland area to accommodate parking).

Finally, it will be necessary to adopt and utilize certain design practices and standards to ensure that the boating facilities will withstand the close scrutiny of many public bodies and will comply with appropriate statutory requirements. Spatial standards (e.g., parking lots accommodating no more than 142 cars per acre) as well as structural standards (e.g., floating finger piers must be capable of bearing twenty pounds per square foot) and development standards (e.g., 1.5 parking spaces for each berth accommodating a boat 30 feet long or longer), are all essential elements here. Guidance in this area of concern is provided within the report, "Design Concepts and Standards for Chicago Lakefront Recreational Boating Facilities."

CHAPTER IV

CASE STUDY

INTRODUCTION

To clarify the options and complexities involved in formulating strategies for developing additional lakefront recreational boating facilities, a more detailed analysis has been undertaken for a specific lakefront site: The Navy/Dime Pier area.

The intent of this case study is to assess the physical, environmental, and economic feasibility of constructing a recreational boating development (i.e. marina) in the immediate vicinity of Navy Pier. Initial observations indicate that marina development is desirable and potentially feasible at the proposed site. The validity of these initial indications will be investigated in this chapter. To achieve this purpose, the following tasks will be undertaken:

- Investigate current demand for and the needs which should be satisfied by a marina at Navy Pier;
- Determine what specific delimiting criteria must be adhered to in planning and design of a marina at this specific site;
- Formulate alternative plans for marina development and integrate these plans into the overall redevelopment of Navy Pier; and,
- Evaluate the alternative plans according to their physical, environmental and economic impacts, and their adherence to public policy and regulation.

Specifically, this study will illustrate a suggested methodology to evaluate the feasibility of a recreational

boating development at a specific site. This methodology will specify the types of analyses which should be undertaken to accomplish a complete evaluation. Secondly, this case study will illustrate the desirability or undesirability of specific project components within the development based on the specific opportunities and limitations of the chosen site.

Background

Since its completion in 1916, Navy Pier has seen a variety of uses. It was predominantly as municipal port facility serving the heart of Chicago's river edge industrial and commercial development. In recent years, many of the industries which Navy Pier had traditionally serviced have vacated the central area. This, coupled with changes in transportation technology has diminished the viability of port operations at this location. Port operations have been discontinued and plans are underway to develop the pier as a municipal cultural/recreation center with exhibition halls, theaters, museums, and shops. It appears that the recreational development potential of Navy Pier is great if certain problems (e.g., parking, pedestrian access, security) can be overcome. There are three major Navy Pier proposals currently being considered:

Ad Hoc Committee for the Expansion and Enhancement of Lakefront Facilities: This proposals calls for the construction of a marina to accommodate 400 boats in the basin north of Navy Pier and south of the Jardine central Water Filtration

Plant. It would also include a dry dock, fuel station, pump-out station, restaurant, sailing school, and a retail outlet all of which are to be located on a "floating breakwater" at the easterly end of the slips. The facility would be financed entirely with private money raised by leasing berthage slips. In 10 years, when the marina is paid for, it would be turned over to the City of Chicago.

Department of Public Works, Bureau of Architecture: This proposal (Navy Pier Rehabilitation, 1979) calls for the rehabilitation of Navy Pier to accommodate "current and evolving cultural and recreational needs of the City."

The North Shed of Navy Pier would continue to serve as exhibition space, with occasional overflow to the lower level and across to the South Shed, 2nd level. The ground level of the North Shed would provide overflow exhibition space, a circulation and utility core, merchandising and concession space as support for a marina and other Navy Pier events. Portions of the South Shed would be removed to establish grade-level plaza's and energy production equipment. The remaining portions of the South Shed would house solar collectors and could be enlarged to display other examples of alternative energy while fulfilling the pier's energy requirements. The upper level of the South Shed could serve as permanent exhibition space for various energy displays while complimenting the North Shed exhibition space. The South Shed could house a variety of additional elements in the space available including yacht clubs, a commercial

museum, restaurants, a children's museum/playground, ethnic market/meeting hall, and other cultural entertainment offerings.

The East end complex, currently a cultural performance center, would be expanded to include gallery and restaurant space. The central courts would become pedestrian circulation space. Exterior plaza's would remain open with temporary seating erected for Chicagofest or other mass attendance events.

Incorporated into this overall revitalization proposal could be the construction of two separate marinas, located in the basins north and south of Navy Pier to accommodate a total of 900 boats and appropriate support facilities. The marina support elements as well as ancillary industries can all be housed in Navy Pier.

Department of Planning, City, and Community Development: This proposal calls for construction of marina facilities in the basin north and south of Dime Pier; utilizing Dime Pier as the access point and structural spine for floating piers and the attached floating slips. This proposal also includes such ancillary facilities as an administration building, restaurant, yacht club, marine supply store, restrooms and showers, gear lockers, security station, emergency boat repair area, first aid station, boat rental operation, charterboat fishing operation, fast food outlet, retail store(s), and maintenance shed(s).

Focus of Case Study

The Navy Pier area is one of the most attractive sites along the lakefront to develop recreational boating facilities to help satisfy this need. Although currently underutilized, the pier has the potential to be a major recreational and cultural attraction. It's attributes make it especially suitable for the development a full service recreational boat marina (e.g., area sheltered from northeast storms, adequate water depth, lack of environmental constraints). The challenge is to incorporate a marina design into the overall recreational development of Navy Pier; to overcome any potential conflicts between the two developments.

SITE DESCRIPTION

Physical Characteristics

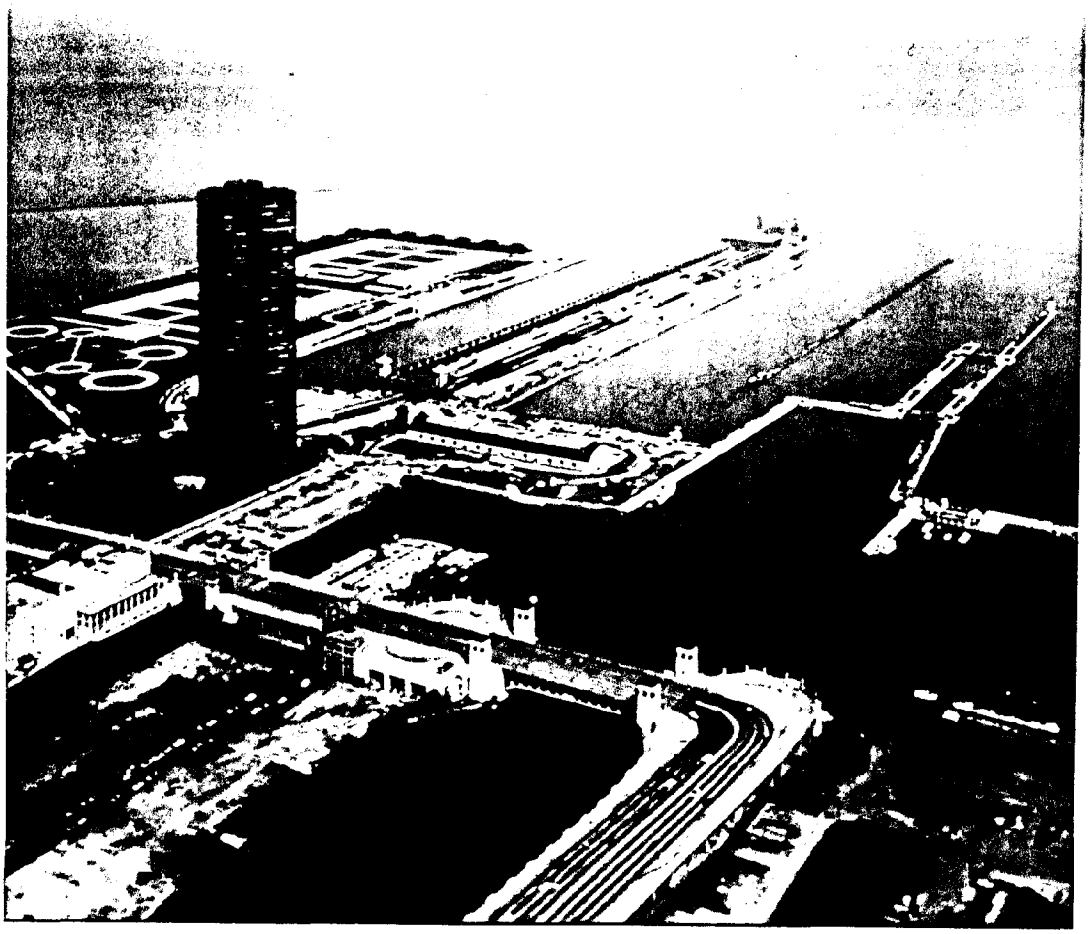
The site under consideration for the development of a recreational boat marina encompasses the three water basins which surround Navy Pier and Dime Pier (see Figure IV-1). This area extends a distance of approximately 2,750 feet east of the existing shoreline. The northern boundary of the case study area is delimited by the Jardine Central Water Filtration Plant. The U.S. Army Corps of Engineers channel dredging zone marks the east and part of the southern boundary. The southern boundary is completed by the control works at the mouth of the Chicago River. The western limit of Streeter Drive forms the western edge of the study area.

The basin north of Navy Pier covers an area of 25 acres and water depths range from 14 to 20 feet (LWD). The basin between Navy Pier and Dime Pier covers an area of 30 acres and depths range from 23 to 28 feet (LWD). The basin south of Dime Pier covers an area of approximately 20 acres and depths range from 15 to 19 feet (LWD).

The perimeter treatment in all three basins consists of verticle structures. Dime Pier consists of a wood crib with rock fill. All other structures in the area are predominantly concrete.

Wave Action

There are two types of waves that are likely to occur in the vicinity of Navy Pier which may adversely affect recreational boating facilities located there. The first occurs



infrequently during particular weather conditions when the size and direction of incoming waves reacts with the geometry and perimeter treatment of the basin to produce short-period oscillations which may reach four to six feet in height. This phenomenon can only be combatted by installing wave absorbers and changing the geometry of the basin. The second wave condition is more closely associated with storm driven waves and is evidenced by the existence of "chop" and "surge" in the basin. This condition usually occurs during and immediately after a storm event. It will be necessary to install wave absorbers and/or breakwaters to control this condition.

Land Use

The study area presently includes Navy Pier, Olive Park, Navy Pier Park, the Central Water Filtration Plant, Lake Point Tower, Mayor Daley's Youth Foundation Gymnasium, a Coast Guard reservation, and several parking areas. Lake Shore Drive, an elevated roadway, is a significant physical feature to the west of the study area, as is the Chicago River to the south. The land to the west of Lake Shore Drive is currently underutilized and may soon be redeveloped.

Prior to the end of the 1978 shipping season the south side of Navy Pier was operated as a general cargo port facility by the Chicago Department of Public Works. During the time when Navy Pier was used as a port, Dime Pier was used as a temporary anchorage and protective structure for Navy Pier. The shoreline adjacent to Streeter Drive is occupied by a snack shop, storage sheds, and a marshalling yard for the

Navy Pier port operation.

Water Use

Water uses in the vicinity of Navy Pier include water supply for the City of Chicago, commercial shipping, fishing, and recreational boating. The Central Water Filtration Plant has an intake structure on the north side of the plant, only a few hundred yards from the north basin of Navy Pier. This intake is used to augment the flow from the off-shore water intakes when demand is excessive, a condition that often exists during the hot summer months. This intake is also used at such times as the water quality is higher there than at the off-shore structures.

The Corps of Engineers navigation channel at the mouth of the river is kept open and is utilized throughout the year for commercial and recreational traffic. The sheltered water area within the outer breakwater serves as a harbor-of-refuge for commercial and recreational craft.

There has traditionally been active fishing use of the Chicago River control structures as well as Navy Pier and other shoreline areas. This activity peaks during the spring smelt runs and the autumn salmon spawning season.

Initial Assessment of Suitability

The study area is a desirable recreational boating facility location for a number of reasons. The existence of partially sheltered water minimizes the need for construction of new shore/harbor protection structures, thereby reducing

the cost of boating facility constrution considerably. The discontinuation of the port operation at Navy Pier creates an opportunity to utilize the southern basin for recreational boating development without creating a conflict between recreational and commercial craft. The water depths in the area are sufficient for recreational use, thereby eliminating the need for any dredging. The proximity of the area to the downtown area assures maximum accessibility and provides a scenic vista for boaters. Current proposals for the recreational/cultural development of Navy Pier present the possibility of combining boating and other recreational facilities in multi-use complexes.

FACILITY DEMAND

Background

The popularity of recreational boating has been growing steadily in the recent past and it can be expected to continue to increase in popularity in the future. As of the 1978 boating season there were 251,432 registered boats in the State of Illinois, of which 94,487 were registered in the six counties of northeastern Illinois. The Chicago Park District harbor system currently provides 4,000 berthages along the Chicago lakefront. During the summer of 1978 the Chicago Department of Planning, City and Community Development administered a Recreational Boating Needs Survey to a random sample of registered boaters within the six county Chicago SMSA to determine the demand for lakefront boating facilities. Of the total respondents to this survey 41.9% use Lake Michigan

and 58.1% did not.

Analysis of the survey response indicated that a substantial excess demand exists for recreational boating opportunities along the Chicago shoreline. A very conservative estimate of the magnitude of this demand indicates that at the very least 6,000 additional spaces could be rented. The actual demand may be in excess of 9,000 spaces as identified in the survey report. Chapter VII of that report explains the procedures used in determining this demand and provides a more detailed explanation of the demand numbers.

Berthage Demand

Number, Size, and Type of Berths: During the 1978 boating season there was a waiting list for every lakefront boating harbor in Illinois. The sizeable Chicago Park District waitinglist, for example was composed of 64% boats less than 26'long and and 36% greater than 26'long. The demand population identified in the boating survey report was distributed as follows:

1,010 boats or 11.1%	0-15'
6,917 boats or 76.3%	16'-25'
1.135 boats or 12.6%	26'+

Analysis of the survey response also indicated that of those respondents that sought a space from the Chicago Park District 80% chose slips as their preferred type of berthage. However, it is unclear at this time whether those expressing this preference would be willing to pay the costs involved. As part of the planning process it is recommended that market studies be performed to determine whether boaters are willing

to pay for the berthing they prefer.

Locational Preference: An analysis of the survey respondents who desired additional lakefront boating facility development showed that the area in which Navy Pier is located ranked a close second to the far north area of the city as the first choice, but that it ranked well above the other areas as the second choice of a location for development. It can be inferred from these findings that a facility at this location would prove acceptable to boaters. It should be mentioned at this time that a common written comment on many of the questionnaires suggested the study area as a likely target for boating facility development.

Ancillary Facilities and Services: Almost universally those survey respondents that used Lake Michigan indicated that a much wider variety of ancillary facilities and services be provided at lakefront harbors. The following is a ranking of the various types of facilities and services according to the preferences of boaters:

1 - Restrooms/Showers
2 - Emergency Repair
3 - Restauants/Fast Food
4 - Boating Supplies
5 - Routine Maintenance
6 - Groceries/Convenience Items
7 - Winter Storage
8 - Fishing Supplies
9 - Storage Lockers
10 - Fish Cleaning Station

Fueling and pump-out stations were not included in this list because they are considered essential elements of a harbor. In view of the stated desires of the boating public plans for new boating facilities should include a range of relevant ancillary facilities.

DESIGN CONSIDERATIONS

Engineering Constraints

The two types of wave conditions previously explained place constraints on the facility types that can be considered for the basin north of Navy Pier. In addition to these constraint it will be necessary for any facility located there to include certain structural elements to control these wave conditions. The four to six foot oscillations experienced at this location are a result of the interaction of the basin geometry and edge treatment with water conditions. Any boats moored in this location would experience severe damage unless steps are taken to alleviate the problem.

A solution to this problem would require that at least one and possibly all of the constituent causes be alterd or controlled. This means, changing the rectangular geometry of the basin, altering the vertical bulkhead walls surrounding the basin, and controlling or eliminating incoming waves. In, the past, floating breakwaters at the mouth of the basin have been proposed as a solution to this problem. The effectiveness of such a structure in controlling this condition has never been tested in sufficient detail to determine whether

this basin could be made safe for boat berthing. It is highly probable that an effective solution will require action to be taken on all three causes of the problem.

The wave chop and surge conditions explained earlier can be experienced in any of the three basins under consideration. The actual solution to the problem at each of the locations will be distinct, but it will probably include some amount of breakwater construction, installation of wave absorbers, and softening of the vertical bulkhead walls that surround the basins. If it is found that these measures do not achieve complete elimination of the problem it may be necessary to utilize floating slips instead of fixed structures so as to reduce the amount of movement between boat and dock.

The existing physical characteristics of the various basins will have implications for the design of facilities and will ultimately affect the cost of construction. The water depths in the three basins is greater than what would normally be required for a recreational boat harbor. At present much of this area has a 28 foot water depth. The cost of construction of any non-floating structures in this area will be much higher than the normally expected costs for recreational facilities. For example, an anchored steel piling bulkhead in 28 feet of water would cost approximately $2,200 per linear foot, and a rubble mound revetment would cost over $3,000 per linear foot. A similar steel bulkhead in 14 feet of water would cost between $1,100 and $1,200 per linear foot.

A factor of importance is the long narrow shape of the basins. The use of star docks or wet moorings (two low cost berthage alternatives) is probably infeasible because of the great amonts of space that would be required for freeways. This would result in a relatively low density and low overall capacity for the area. In view of the large demand for berthing spaces these would not be desired alternatives. The use of slips would greatly increase the capacity of the area. It is also important to note that the relatively long distance from the shoreline to the end of the basins will require substantially greater expenditures to run utility lines to the far end of the berthing area.

Environmental Considerations

An assessment of the potential environmental impacts of marina construction is an essential element of the design process. Environmental review of potential development schemes will facilitate subsequent planning and regulatory processes and will identify possible mitigating strategies. Appropriate and timely use of mitigating strategies can reduce or eliminate adverse impacts of a project, particularly if the design process was an iterative procedure allowing design to be adjusted to environmental considerations.

Most construction activities have some effect on the environment, but these impacts are usually short- term in nature if designs have been appropriately formulated and mitigating strategies have been identified. The following construction activities are likely to entail some level of

environmental impact:

- Pier Rehabilitation - Emplacement of steel pilings around Dime Pier for structural reinforcement and the construction of a new concrete cap for the pier.
- Excavation - Submarine construction work for bulkhead and breakwater structures.
- Bulkhead and Breakwater Construction - Usage of rock steel sheet piling, and concrete to construct wave and shore protection structures.
- Landfill Construction - Emplacement of various types of fill material within steel pile bulkheads or rubble revetments.
- Platform and Causeway Costruction - Construction of of raised platforms on pilons or concrete-filled tubes.

The long-term operation of the marina will also have certain associated impacts:

- Marina Operations - It is likely that the marina will be intensively used by boaters, fishermen, tourists, and sight-seers. The likely impacts from these activities include; fuel and oil spills, solid and liquid wastes, noise, vehicle and vessel traffic, ice control and potential fire hazards.
- Marina Maintenance - Spill cleanup operations, facility and landscape maintenance, waste removal, etc.

The following pages will present an overview of the major environmental impacts that can be anticipated as a result of the construction, maintenance, and operation of a marina

in the vicinity of Navy and Dime Piers.

Water Quality - Temporary local deterioration of water quality will result from increased turbidity caused by the disturbance of the lake bottom during structural rehabilitation and landfill, bulkhead, and breakwater construction operations. Turbidity generally causes depressions in the water's dissolved oxygen, and increases in both the conductivity and nutrient levels. These localized conditions will be short-lived, however, and can be mitigated to a great degree by the use of turbidity curtains and filters, if necessary, and by the endikement of landfill areas to allow fill to stabilize.

When the marina is operational water quality will be affected by engine exhaust, solid waste, vessel maintenance , and storm water runoff. Bacterial contamination of the water basins is possible if the discharge of solid and human wastes from vessels is not properly controlled. Carbon monoxide, carbon dioxide, and hydrocarbon emmissions will result from the operation of gas and deisel powered marine engines. Fuels cotaining lead and motor oils may occasionally be released into the water body with possible effects on lake biota and the municipal water supply. Surface runoff from the breakwaters, landfills, or platforms may introduce grease, oils or particulates into the water body.

Since it is probable that the marina water body will be partially enclosed these problems may be compounded within the marina, but may be considerably reduced in the open lake.

Water circulation within the marina is important to the maintenance of water quality there but a balance must be reached between this need and the need to prevent the degradation of the water quality in the lake.

A number of mitigating strategies exist to minimize the adverse water quality effects associated with marina operation. There are a variety of regulations in effect regarding waste discharge from vessels and these should be strictly enforced. Vessel maintenance activities (scraping and sanding of hulls, engine work, etc.) should be isolated or prohibited altogether. Surface water runoff from harbor structures must be collected in sewers so that it can be properly treated.

Water quality within the marina can be protected to a great degree simply by proper design with respect to optimum circulation and flushing rates. One of the methods of achieving internal circulation and thereby preventing the concentration of pollutants is the installation of pipes under Navy and Dime Piers to allow water to move between the various basins. Another method is the construction of causeways as opposed to solid structures at intervals along the length of Dime Pier.

At a very early stage the potential effects of marina pollutants on the water supply system should be investigated in detail. The fact that the Filtration Plant exists in close proximity to the study area indicates that water quality considerations will be of paramount importance. Mitigating strategies should result for such items as fuel spill and

solid waste containment and cleanup.

Air Quality - Particulate dust emissions are likely to during constrution of such elements as landfills and breakwaters. Construction equipment will result in increased emissions of hydrocarbons, carbon monoxide, nitrogen oxides, and particulates during the construction phase. However, considering the location, the quantitative increase in emissions in the area will probably be slight and are not expected to create a significant problem.

Ice - Various ice control mechanisms snd techniques have been discussed as part of marina proposals as a method of allowing year round boat storage. One such system is a bubbler that promotes water circulation and inhibits ice formation.

Aquatic Ecosystem - For the purpose of this discussion the aquatic ecosystem is characterized by the life forms (flora and fauna) and the habitat area in which the life forms exist. Marina development involving possible landfill, bulkhead and breakwater construction could alter habitats and smother benthic organisms immobile fish fry and other small fauna. However, since the contemplated construction is confined to an area which has been previously dredged for navigation purposes, it is not expected that any habitats will be destroyed.

Visual Impacts - Marina construction will produce visual impacts by way of barges, bulldozers, trucks, cranes,etc. which will be used in the construction process. These machines

are not unlike those used in the Navy Pier port operation. The marina itself can be carefully designed so as to produce a positive visual image in temrs of slip areas, facilities, and associated landscaping.

Noise Impacts - It is unavoidable that the construction and operation of a marina facility will produce noise impacts. However, these cannot be expected to produce a significant increase in the already high noise levels currently experienced in the area.

Access and Traffic

There are several groups of motor vehicles that will need to be accommodated at or in the vicinity of Navy Pier. It is to be expected that traffic congestion may occur during special events, summer weekends, and other periods of intensive use. The various groups of vehicles include:

- people in automobiles trying to get to their boats;
- people in their automobiles attempting to find so they can visit Navy Pier;
- service vehicles attempting to gain access to the Central Filtration Plant, Navy Pier,the boat harbor, and nearby residences;
- residents of or visitors to Lake Point Tower;
- Emergency vehicles responding to an alarm (police, fire, ambulance) from any part of the area.

The probable cogestion is a concern that should be studied as part of preparing an overall development scheme for the

area. Additional concerns that must be addressed include:

- How should access to and from Illinois Street, Grand Avenue, and Ohio Street be treated?
- How should access from and to Lake Shore Drive be treated?
- Is it possible or feasible to separate the boat-related traffic from other Navy Pier traffic?
- Should bicycle traffic be encouraged or discouraged and if so, how?
- How should public transportation access be treated?

Parking

The demand for parking in this area will be substantial if one of the boating facility alternatives is constructed and other actions are taken to make Navy Pier a popular attraction. There are presently three parking areas north of Ogden Slip and east of Lake Shore Drive that can accommodate approximately 680 automobiles. It might also be possible to provide for additional parking through the rededication of the area bounded by Streeter Drive and Grand Avenue. However, the parking will be inadequate even with surface parking provided at all possible locations. With this in mind, the feasibility of a parking garage should be determined that could accommodate boaters, visitors to Navy Pier, and workers (serving as a fringe parking area).

Security

It is important to keep open as many opportunities as possible in preparing a revitalization strategy for Navy Pier.

It is also important to allow as diverse a group of compatible opportunities as possible to satisfy the needs of the widest possible audience. In this way, it will be possible to attract and satisfy a wide variety of users.

However, during the recreational boating study, it has become apparent that security is a major concern at the harbor facilities in Chicago; both in terms of protecting the boats and in protecting the Park District from liability against theft or accidents. In the case of boating facilities, this can most effectively be done through limiting and controlling access to the areas where the boats are berthed.

FORMULATING THE ALTERNATIVES

Preliminary Considerations:

In order to prepare these alternative development schemes, it was necessary to standardize the distribution of berths for each. Three elements were included in the analysis to determine the optimal distribution of berths for this particular site:

- The Chicago Park District mooring's waiting list;
- The results of the Department of Planning, City, and Community Development's Recreational Boating needs questionnaire; and
- The on-going Park District expansion program.

The percentage distributions on the waiting list and the demand distribution projected by the boating needs survey are compared below.

	0-25 feet	25 feet+
Chicago Park District Waiting List	64%	36%
Boating Need Questionnaire	87%	13%

It appears from this comparison that some compromise between the two groups would best accommodate demand. However, the effects of the on-going Park District's expansion program must also be taken into account. The expansion program is an infilling of harbors involving the conversion of spaces devoted to wet moorings into star dock floating slips. This program greatly increases the boat densities in given sheltered water areas, thereby increasing the number of boat

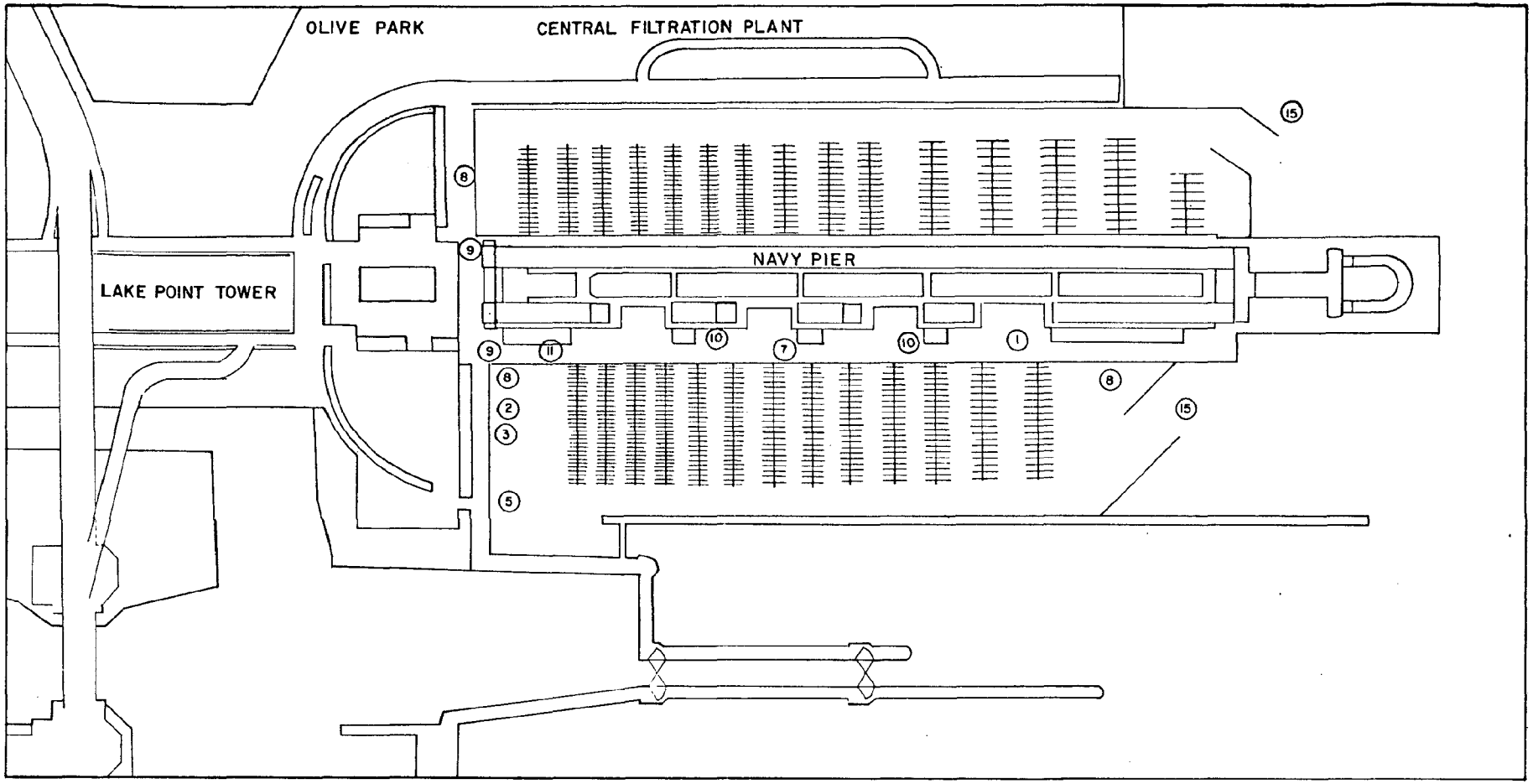
which can be accommodated. Star docks can feasibly accommodated boats under 30 feet in length.

It is assumed that this program of "infilling" within exist harbors will continue. In light of the fact that this program favors boat in the shorter length category, it was decided to opt for a percentage distribution more resembling that of the Chicago Park District wait list.

Alternative I

Configuration: This concept proposes the use of Navy Pier as a combined recreational complex and small craft marina. It calls for the construction of two separate marinas to be located in the two basins adjacent to Navy Pier. Floating piers and finger slips will be attached to both sides of Navy Pier. Support and ancillary facilities (e.g., administrative offices, yacht club, maintenance shed, etc.) will be provided on Navy Pier. A total of 1,074 boats will be accommodated; 572 in the north basin and 502 in the south basin. Four steel sheet piling breakwaters (two in each basin) will be constructed at the entrances of the basins to provide maximum protection from wave attack. Dime Pier will be rehabilitated to shelter the south basin and to insure safe navigation. Minimal marina support facilities will also be located along the shoreline adjacent to the western edge of the two basins. Figure IV-2 show the schematic plan of Alternative I.

Facilities and Coverage: The Navy Pier Marina scheme has the following approximate area coverage:



LOCATION KEY

1. ADMINISTRATION BUILDING
2. MAINTENANCE BUILDING
3. EMERGENCY REPAIR SLIP
4. CAUSEWAY
5. SANITARY SEWAGE PUMPOUT
6. SNACK SHOP & OPEN AIR CAFE
7. YACHT CLUB
8. FUEL & SEWAGE PUMPOUT AREA
9. SECURITY OFFICE
10. RESTROOMS & LOCKERS
11. CHARTER BOAT DOCK
12. EXISTING PARKING
13. POTENTIAL PARKING
14. NEW PLATFORM
15. BREAKWATER EXTENSION
16. LANDFILL
17. PUBLIC OVERLOOK

—·— CORPS OF ENGINEERS DREDGING LIMIT

PROPOSED RECREATIONAL DEVELOPMENT

ALTERNATIVE I - NAVY PIER MARINA

CITY OF CHICAGO
MICHAEL A. BILANDIC
Mayor

DEPARTMENT OF PLANNING,
CITY AND COMMUNITY DEVELOPMENT
THOMAS KAPSALIS
Commissioner

N

0 100 200 300 400

Land Area	5 Acres
Water Area	55 Acres
TOTAL	60 Acres
Berthing Density	19.5 Boats/Acre

The facilities provided in Alternative I reflects a mix of support facilities essential to harbors or marinas (fuel station, pumpout facility, etc.) plus additional ancillary facilities desired by boaters (emergency repair, boating supplies, etc.). The mix of ancillary facilities was selected from the preferred list of services indicated in the Boating Needs Questionnaire, with modifications to accommodate specific local requirements.

Services/Facilities Providing by Marina Administration

Admin. Area (10,000 s.f.)	Double Slips (537-1074 Boats)
Maint. Area (3,750 s.f.)	Yacht Club Space (9000 s.t., to be lessee operated)
Emergency Repair	Restrooms
Serv. Utilities (Power and Water Distribution to 390 slips	Lockers
	Fuel Stations
Parking	Pumpout Facilities
Security Area	Security Fencing

Cost Estimates: To determine the economic feasibility of this configuration, a preliminary project cost estimate was calculated. All costs were considered in 1979 dollars.

Several sources were utilized to obtain this preliminary estimate including:

- U.S. Army Corps of Engineers (North Central District Office, Chicago);

- Safewater Harbor Feasibility Study, Illinois Beach State Park, Prep. by Moffatt & Nichol, Engineers, 1978; and,
- Marquette Park Small Boat Harbor, Wendell Campbell Associates, Inc., East Chicago, Ind. 1976.

Cost estimates include the total marina development and the structural rehabilitation and redevelopment of Navy Pier necessary to accommodate marina facilities. Necessary infrastructure elements are included in all cost elements (e.g., water distribution, electrical utilities, sanitary sewer etc.). Any roadway redevelopment required west of the project site is not included in these estimates.

Table IV-1 summarizes the development cost estimates of Alternative I, the Navy Pier marina proposal.

TABLE IV-1

TOTAL COST ESTIMATES

ALTERNATIVE I - NAVY PIER MARINA DEVELOPMENT PLAN

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT ($)
Pre-Construction				
Planning & Research	-	-	LS	50,000
Preliminary & Detailed Analysis	-	-	LS	394,250
Environmental Clearances	-	-	LS	50,000
TOTAL:				494,250
Construction				
Breakwater Construction	2,800	LF	2,200	6,160,000
Rehabilitate Dime Pier	57,500	SF	30	1,725,000
Construction Management	-	-	LS	236,550
TOTAL:				8,121,550
Development				
Double Slips (1,074 Boats)	109,656	SF	14.50	1,590,012
Pathways	4,750	SF	1.05	5,000
Landscaping	1	Acre	50,000	50,000
Parking Area	175,000	SF	1.05	185,750
Administration Space (Rehab.)	10,000	SF	25	250,000
Maintenance Space (Rehab.)	3,750	SF	25	93,750
Yacht Club Space (Rehab.)	9,000	SF	25	225,000
Security Structures (2)	1,250	SF	25	31,250
Cyclone Fencing	4,965	LF	17	84,405
Service Utilities	390	Slip	1,000	390,000
Gym Demolition	-	-	LS	25,000
Construction Management	-	-	LS	87,905
TOTAL:				3,018,072
Combined Total				
Pre-Construction	-	-	-	494,250
Construction	-	-	-	8,121,550
Development	-	-	-	3,018,072
TOTAL:				11,633,072

Alternative II

Configuration: This proposal presents a preliminary design concept for a full-service recreation boat marina at Dime Pier, which would be incorporated into the overall development scheme for the Navy Pier area. This design concept has been developed in response to an objective of providing for functional recreational boating development with minimal changes in other parts or elements of the area. No attempt was made to optimize an overall development scheme for the area.

The proposed marina will be located on approximately 50 acres of water between Navy Pier and the Chicago River. Dime Pier will serve as the central axis of the harbor with walkways and associated berthages extending from its north and south edges. Dime Pier, as it exists today is approximately 2,300 feet long and approximately 25 feet wide.

The design concept calls for the construction of 1,240 berthages utilizing Dime Pier as the central axis. In addition, a structural platform pier measuring approximately 25 feet by 580 feet would be constructed adjacent to the eastern end of Dime Pier and connected to the Pier by a causeway. A landfill area, measuring approximately 130 feet by 250 feet (0.75 acres) would be constructed between the existing shoreline and the west end of Dime Pier; with the landfill being connected to Dime Pier by a second causeway. Most support and ancillary facilities will be provided in the area of Dime Pier. Minimal ancillary facilities (e.g.,

yacht club, restaurant) will be located on Navy Pier. Figure IV-3 shows the schematic plan of Alternative II.

Facilities and Coverage: This Dime Pier marina scheme has the following appropriate area coverage:

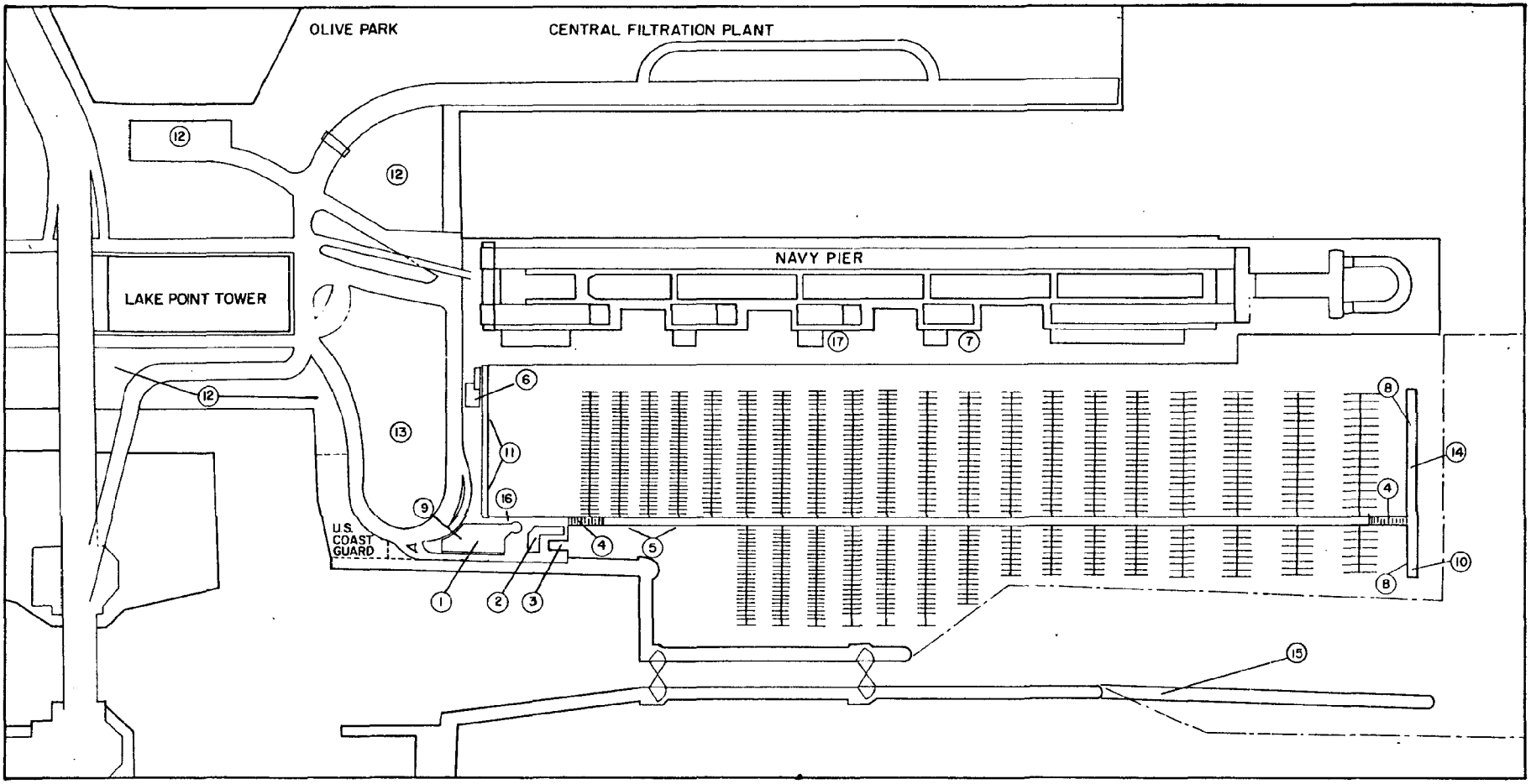
Land Area	10 Acres
Water Area	50 Acres
TOTAL:	60 Acres
Berthing Density	24.8 Boats/Acre

The facilities provided in Alternative II reflect a mix of support facilities essential to harbors or marinas (fuel station, pumpout facility, etc.) plus additional ancillary facilities desired by boaters (emergency repair, boating supplies, etc.). The mix of ancillary facilities was selected from the preferred list of services indicated in the Boating Needs Questionnaire, with modifications to accommodate specific recreational requirements.

Services/Facilities Provided by Marina Administration

Admin. Building (10,000 s.f.)	Double Slips (620-1240 Boats)
Maint. Building (3,750 s.f.)	Yacht Club Space (9,000 s.f., to be lessee operated)
Emergency Repair Area	
Service Utilities (Power and Water Distribution to 449 slips)	Restrooms Lockers
Parking	Fuel Stations
Security Building	Pumpout Facilities

Cost Estimates: To determine the economic feasibility of this configuration a preliminary project cost estimate



LOCATION KEY

1. ADMINISTRATION BUILDING
2. MAINTENANCE BUILDING
3. EMERGENCY REPAIR SLIP
4. CAUSEWAY
5. SANITARY SEWAGE PUMPOUT
6. SNACK SHOP & OPEN AIR CAFE
7. YACHT CLUB
8. FUEL & SEWAGE PUMPOUT AREA
9. SECURITY OFFICE
10. RESTROOMS & LOCKERS
11. CHARTER BOAT DOCK
12. EXISTING PARKING
13. POTENTIAL PARKING
14. NEW PLATFORM
15. BREAKWATER EXTENSION
16. LANDFILL
17. PUBLIC OVERLOOK

—·— CORPS OF ENGINEERS DREDGING LIMIT

PROPOSED RECREATIONAL DEVELOPMENT

ALTERNATIVE II - DIME PIER MARINA

CITY OF CHICAGO
MICHAEL A. BILANDIC
Mayor

DEPARTMENT OF PLANNING,
CITY AND COMMUNITY DEVELOPMENT
THOMAS KAPSALIS
Commissioner

N

0 100 200 300 400

was calculated. All costs were considered in 1979 dollars.

Basis for cost estimates include a number of sources including the following:

- U.S. Army Corps of Engineers (North Central District Office, Chicago);
- Safewater Harbor Feasibility Study, Illinois Beach State Park, Prep. by Moffatt & Nichol, Engineers, 1978;
- Marquette Park Small Boat Harbor, Wendell Campbell Associates, Inc., East Chicago, Ind. 1976;and,
- Site Investigation and Preliminary Studies for Land Creation for Battery Park City, Mueser, Rutledge, Wentworth & Johnston, New York, 1971.

Cost estimates include the total marina development and the structural rehabilitation and redevelopment of Dime Pier necessary to accommodate marina facilities. Necessary infrastructure elements are included in all cost elements (e.g., water distribution, electrical utilities, sanitary sewer etc.). Any roadway redevelopment required west of the project site is not included in these estimates.

Table IV-2 summarizes the development cost estimates of Alternative I, the Dime Pier marina proposal.

TABLE IV-2

TOTAL COST ESTIMATES

ALTERNATIVE II - DIME PIER MARINA DEVELOPMENT PLAN

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT ($)
Pre-Construction				
Planning & Research	-	-	LS	50,000
Preliminary & Detailed Analysis	-	-	LS	426,116
Environmental Clearances	-	-	LS	50,000
TOTAL:				526,116
Construction				
Bulkhead	490	LF	2,200	1,078,000
Breakwater Extension	2,150	LF	2,200	4,730,000
Landfill	-	-	-	*
Causeway	9,250	SF	20	185,000
Rehabilitate Dime Pier	2,300	SF	25	1,725,000
Platform Pier Construction	14,625	SF	55	804,375
Construction Management	-	-	LS	255,671
TOTAL:				8,778,046
Development				
Double Slips (1,240 Boats)	125,940	SF	14.50	1,826,130
Roadways	82,000	SF	1.05	86,100
Pathways	4,700	SF	1.05	4,935
Landscaping	.91	Acre	50,000	45,500
Parking Area	175,000	SF	1.05	185,750
Administration Building	10,000	SF	55	550,000
Maintenance Building	3,750	SF	45	168,000
Yacht Club (Rrhab. - Navy P.)	9,000	SF	25	225,000
Security Structure	625	SF	45	28,125
Sewers	3,650	LF	130	474,500
Water Mains	3,650	LF	120	438,000
Service Utilities	444	Slip	1,000	444,000
Gym Demolition	-	-	LS	25,000
Restroom & Storage Building	1,000	SF	55	55,000
Construction Management	-	-	LS	136,686
TOTAL:				4,692,896
Combined Total				
Pre-Construction	-	-	-	526,118
Construction	-	-	-	8,778,046
Development	-	-	-	4,692,896
TOTAL:				13,997,060

* It is assumed that fill can be acquired at no cost from public works projects and building demolition.

Alternative III

Configuration: This proposal presents a preliminary design concept for a full-service marina and recreation complex at Dime Pier, which would be incorporated into the overall development scheme for the Navy Pier area. The development of this concept was spirited by the need to consider other uses of lakefront space when designing a recreational boating facility. By modifying the design concept of Alternative II, Alternative III proposes a scheme which provides for added land area in order to accommodate a more diverse set of recreational opportunities. In doing so, this alternative attempts to optimize use of the land and water zone.

The proposed marina will be located on approximately 50 acres of water between Navy Pier and the Chicago River. Dime Pier will serve as the central axis of the harbor with walkways and associated berthages extending from its north and south edges.

The design concept calls for the construction of 948 berthages utilizing Dime Pier as a central axis. In addition, a total of 198,000 square feel of platform piers would be constructed along Dime Pier and at the eastern end of Dime Pier. Platform construction at the east end of the Pier would comprise 90,000 square feet of this total and would be connected to the Pier by a causeway. A landfill area, measuring approximately 130 feet by 250 feet (0.75 acres) would be constructed between the existing shoreline and the west end of Dime Pier; with the landfill being connected to Dime Pier by a second causeway.

All support and ancillary facilities will be provided in

the area of Dime Pier. Figure IV-4 shows the schematic plan of Alternative III.

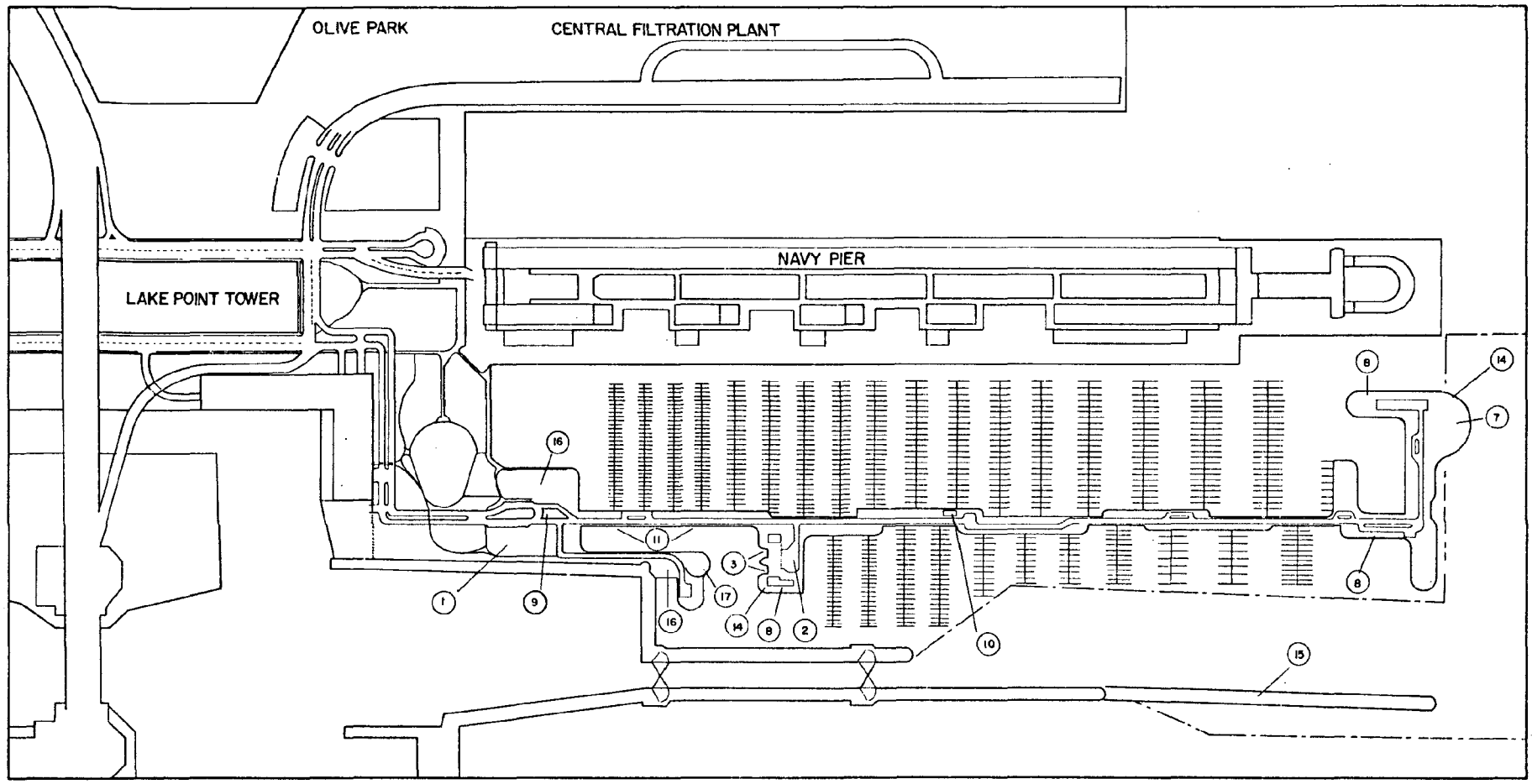
Facilities and Coverages: This Dime Pier marina scheme has the following approximate coverage:

Land Area	14 Acres
Water Area	50 Acres
Total	64 Acres
Berthing Density	19 Boats/Acre

The facilities provided in Alternative II reflect a mix of support facilities essential to harbors or marinas (fuel station, pumpout facility, etc) plus additional ancillary facilities desired by boaters (emergency repair, boating supplies, etc.). The mix of ancillary facility was selected from the preferred list of services indicated in the Boating Needs Questionnaire, with modifications to accommodate specific locational requirements.

Services/Facilities Provided By Marina Administration

Admin. Building (10,000 s.f.)	Double Slips (474-948 Boats)
Maint. Building (3,750 s.f.)	Yacht Club Building (9,000 s.f., to be lessee operated)
Emergency Repair Area	
Service Utilities (Power and Water Distribution to 346 slips)	Restaurant Space (lessee operated)
	Restrooms
Parking	Lockers
Security Building	Fuel Stations
Scenic Overlook	Pumpout Facilities
Mid-Pier Rest Area	



LOCATION KEY

1. ADMINISTRATION BUILDING
2. MAINTENANCE BUILDING
3. EMERGENCY REPAIR SLIP
4. CAUSEWAY
5. SANITARY SEWAGE PUMPOUT
6. SNACK SHOP & OPEN AIR CAFE
7. YACHT CLUB
8. FUEL & SEWAGE PUMPOUT AREA
9. SECURITY OFFICE
10. RESTROOMS & LOCKERS
11. CHARTER BOAT DOCK
12. EXISTING PARKING
13. POTENTIAL PARKING
14. NEW PLATFORM
15. BREAKWATER EXTENSION
16. LANDFILL
17. PUBLIC OVERLOOK

—— · —— CORPS OF ENGINEERS DREDGING LIMIT

PROPOSED RECREATIONAL DEVELOPMENT

ALTERNATIVE III - RECREATIONAL MARINA COMPLEX

CITY OF CHICAGO
MICHAEL A. BILANDIC
Mayor

DEPARTMENT OF PLANNING,
CITY AND COMMUNITY DEVELOPMENT
THOMAS KAPSALIS
Commissioner

N

0 100 200 300 400

Cost Estimates: To determine the economic feasibility of this configuration a preliminary project cost estimate was calculated. All costs were considered in 1979 dollars.

Basis for cost estimates include a number of sources including the following:

- U.S. Army Corps of Engineers (North Central District Office, Chicago);
- Safewater Harbor Feasibility Study, Illinois Beach State Park, Prep. by Moffatt & Nichol, Engineers, 1978;
- Marquette Park Small Boat Harbor, Wendell Campbell Associates, Inc., East Chicago, Ind. 1976; and,
- Site Investigation and Preliminary Studies for Land Creation for Battery Park City, Mueser, Rutledge, Wentworth & Johnston, New York, 1971.

Cost estimates include the total marina development and the structural rehabilitation and redevelopment of Dime Pier necessary to accommodate marina facilities. Necessary infrastructure elements are included in all cost elements (e.g., water distribution, electrical utilities, sanitary sewer etc.). Any roadway redevelopment required west of the project site is not included in these estimates.

Table IV-3 summarizes the development cost estimates of Alternative I, the Dime Pier Marina Proposal.

TABLE IV-3

TOTAL COST ESTIMATES

ALTERNATIVE III - DIME PIER MARINA DEVELOPMENT PLAN

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT ($)
Pre-Construction				
Planning & Research	-	-	LS	50,000
Preliminary & Detailed Analysis	-	-	LS	1,900,000
Environmental Clearances	-	-	LS	50,000
TOTAL:				2,000,000
Construction				
Bulkhead	490	LF	2,200	2,662,000
Breakwater Extension	2,150	LF	2,200	4,730,000
Landfill	-	-	LS	*
Causeway	9,250	SF	20	185,000
Rehabilitate Dime Pier	2,300	SF	25	1,725,000
Platform Pier Construction	198,000	SF	55	10,890,000
Construction Management	-	-	LS	605,760
TOTAL:				20,797,760
Development				
Double Slips (948 Boats)	125,940	SF	14.50	1,450,000
Roadways	82,000	SF	1.05	97,913
Pathways	4,700	SF	1.05	33,080
Landscaping	91	Acre	50,000	416,093
Parking Area	175,000	SF	1.05	185,750
Administration Building	10,000	SF	55	550,000
Maintenance Building	3,750	SF	45	168,000
Yacht Club (Rehab. Navy P.)	9,000	SF	25	495,000
Security Structure	625	SF	45	28,125
Water Mains	3,650	LF	130	474,500
Service Utilities	346	Slip	1,000	346,000
Gym Demolition	-	-	LS	25,000
Rest Area	-	-	LS	33,000
Scenic Overlook	-	-	LS	15,000
Construction Management	-	-	LS	142,663
TOTAL:				4,898,124
Combined Total				
Pre-Construction				2,000,000
Construction				20,797,760
Development				4,898,884
TOTAL:				27,690,884

* It is assumed that fill can be acquired at no cost from public works projects and building demolition.

COMPARISON OF ALTERNATIVES

The following is a comparative evaluation of the three alternative marina development schemes for Navy and/or Dime Pier. The discussion of these proposals addresses the following areas of concern:

- Protection from Wave Action
- Environmental Considerations
- Access and Traffic
- Parking
- Security
- Usability of Navy Pier
- Economic Analysis

Protection from Wave Action

The following is a comparison of the technique employed by each of the alternatives to control wave attack within the marinas:

Alternative I: This alternative will utilize four permanent breakwaters, two at the entrance of each basin, to break waves an shelter the basins. These breakwaters will consist of a rock filled bulkhead made of steel sheet piling on either side. Dime Pier will be structurally rehabilitated and capped with concrete. The basin south of Navy Pier should be well-protected by this structure. However, the basin north of Navy Pier will still be subject to 4 to 6 foot wave oscillations, a size which is unacceptable, even with floating piers and slips.

Alternative II: This alternative is not likely to be subject to the wave oscillations experienced in Alternative I. These basins will require protection from wave "chop" and

"surge " conditions occurring during and after storms. In order to protect against the second type of wave action caused by storms from the east and northeast, a concrete platform suspended on stilts will be constructed. In order to provide protection from wave conditions due to storms from the southeast, the southerly jetty of the control works at the mouth of the Chicago River will extend eastward 1,075 feet.

Alternative III: This alternative will employ the same shore protection strategy as Alternative II.

Environmental Considerations

In order to obtain the necessary state and federal permits and other environmental clearances, it will be necessary to carefully determine the environmental impacts of any recreational boating development. In addition, it would be desirable to do everything feasible to mitigate any potentially harmful impacts.

Although it will be important to identify and evaluate all significant concerns in the context of a full-scale environmental impact statement, four specific water equality concerns are considered in this case study. These concerns are most essential in establishing feasibility or infeasibility of the overall project, and the comparison of alternatives. One involves turbidity induced by landfill construction in Alternatives I & II. The second involves the ability to keep harbors relatively clean by providing for proper circulation through induced flushing. The third involves

the effect of the boating facility on the operation of the Central Filtration Plant. The fourth involves the possible water quality problems caused by runoff into Lake Michigan.

Alternative I: This alternative will induce minimal turbidity problems since no landfill is involved. However, this alternative is likely to have a major impact on the operation of the Central Water Filtration Plant due to its proximity to the shore water intakes. It will be necessary to install some type of culvert/pipe under the west end of Navy Pier to allow the north basin to flush into the south basin. Also, runoff from the permanent breakwater would need to be collected and treated. Improved water circulation could minimize the potential of contaminating the water entering the intakes. But, it would be necessary to do a substantial amount of research to prove that this problem would be eliminated.

Alternative II: This alternative will cause notable impacts upon water quality during the construction of the proposed landfill. Turbidity will be the major construction-related problem. It will need to be controlled using turbidity curtains or screens.

Two causeways will be constructed at the east and west ends of Dime Pier to facilitate circulation of water between the basins on the north and south sides of Dime Pier. Improved circulation will enhance the flushing of both basins and limit the water quality degradation. In addition, the fuel stations are located on the landfill at the east end of Dime Pier to minimize the effect of an oil spill in an

enclosed water area. Also, runoff from the landfill area and platform piers will have to be collected and treated.

It appears that impacts upon the Central Water Filtration Plant can be more effectively mitigated so as not to impair its operation. Although the plant had experienced difficulties caused by the port operation on the south side of Navy Pier, it is expected that the added measures incorporated to improve the flushing of the south basin (of Navy Pier) will eliminate any water supply contamination threat. This conclusion should be verified by more detailed study.

Alternative III: The environmental considerations of this alternative will be the same as Alternative II.

Access and Traffic

The existing roadway network in the area east of Lake Shore Drive and north of Ogden Slip is presently structured to service Navy Pier. Since Navy Pier is to be phased out as a port, the network of streets is functionally obsolescent. In addition, Lake Shore Drive is currently undergoing reconstruction that will have implications for the proposed harbor.

Alternative I: It will be impossible to separate the boating-related traffic from other visitors to Navy Pier if this alternative is constructed. Boaters will need to have one (if not two) loading zone(s) at the east end of both basins (north and south of Navy Pier) to drop off and pick up people and gear. A complex realignment of the street network east of Lake Shore Drive will be required to facilitate traffic movement into and out of the loading zones

for both basins.

Access to the Navy Pier will be from Illinois Street and the Illinois Street exit from Lake Shore Drive once the Drive construction is completed. The closing of Ohio Street east of Lake Shore Drive and the use of Grand Avenue as a one way pair with Illinois Street (Illinois will be east bound and Grand will be westbound) will simplify traffic movements to Navy Pier.

Alternative II: It will be possible to separate the boating-related traffic from other visitors to Navy Pier if this alternative is constructed. In order to accomplish this major realignment of the present street network will be required. The traffic headed toward the marina will be separated from the traffic headed toward Navy Pier at the intersection of Illinois Street and Streeter Drive. Streeter Drive will serve as the sole access road to the harbor utilizing a one way counterclockwise flow on the street with a drop off point for the marina located adjacent to the administration building for the marina. Boating-related traffic from Streeter Drive will flow onto the extension and head west on Grand Avenue. Buses will be travelling eastbound on Illinois Street, utilizing the turnaround just east of Lake Point Tower, and then travelling westbound on Grand Avenue. The length of Dime Pier itself will be served by a "jitney-type" shuttle service.

Alternative III: The access configuration for this alternative would be similar to that of Alternative II,

allowing for the separation of boating-related traffic from other visitors to Navy Pier.

Parking

The six existing parking areas east of Lake Shore Drive and north of Ogden Slip have an estimated design capacity of 680 cars. The demolition of Mayor Daley's Yourth Foundation Gymnasium and the dedication of the area encompassed within Streeter Drive for parking could provide an estimated additional 580 spaces and the use of the parking area under the proposed Lake Shore Drive offramp south of Illinois Street would add an additional 190 spaces. This combination of areas would provide for a total of 1,450 cars.

The following estimates of parking requirements for each alternative are based on recommended standards of allotment which are 0.75 parking spaces/slip for boats up to 30 feet long and 1.5 parking spaces per slip for boats longer than 30 feet.

Alternative I: This alternative would require parking for an estimated 1,113 cars, and possibly more during periods of peak demand. This would more than fill all existing parking available and 76% of all potential ground level parking.

Alternative II: This alternative would require parking for an estimated 1,283 cars, and possibly more during periods of peak demand. This would more than fill all existing parking available and 88% of all potential ground level parking.

Alternative III: This alternative would require parking for an estimated 970 cars, and possibly more during periods of peak demand. This would more than fill all existing parking available and 66% of all potential ground level parking.

Security

Security is a very pragmatic concern at harbor/marina facilities. It will be necessary to limit and control access to a marina at Navy or Dime Pier. The ability to provide such security will evaluated for each of the marina alternatives.

Alternative I: In order to properly secure the proposed Navy Pier Marina, it would be necessary to install a cyclone fence along the entire length of both sides of Navy Pier and around the west ends of both basins. Entrance gates and a security staging area would be installed at some point along the west end of both basins to allow tenants to gain access to their boats. This fence would substantially limit the usability of both sides of Navy Pier and would be somewhat of an eyesore. In addition, the security force would need to be expanded to handle both the Navy Pier recreational complex and the marina.

Alternative II: In order to properly secure Dime Pier, fencing would be installed to enclose part of a landfill area constructed at the westerly limit of Dime Pier, traverse the west end of the basin to the south of Navy Pier, and cut off pedestrian access to the control works at the mouth of the

Chicago River. A security structure and entrance gate would be constructed at the access point to Dime Pier. The Dime Pier Marina would clearly have separate access roads and access points, minimizing any problems with security provisions.

Alternative III: This configuration would require the same facilities as in Alternative II. However, since more recreational activities, the marina alone are proposed on this configuration (i.e., restaurant, scenic overlook, strolling area) the additional security provision would be operational in nature. A security policy would be formulated to handle the general public and their presence in the marina.

Usability of Navy Pier

It is important to efficiently utilize the space on Navy, to allow flexibility in development and operation of the pier and to take advantage of the unique characteristics of the Pier and individual elements of the Pier.

Alternative I: This alternative forecloses the use of both north and south sides of Navy Pier for other than boating activities. Since it will be necessary to fence off part of the lower (ground) level of the Pier to ensure the security of the boating facility, there will be no sense of openness that would be possible if the fence were not there. It will also make any walkways, observation areas, sidewalk cafes, etc., located to take advantage of proximity to the water's edge much less desirable.

Alternative II: This alternative will not foreclose any opportunities on the north side of Navy Pier and throughout most of the sourthern perimeter. Yacht club space will be established on the south edge and some degree of access control will be required there. Cleats would be install along the perimeter of the Navy Pier in order to tie boats patronizing the yacht club, as well as other activities on Navy Pier. The presence of the marina will enhance those uses of the south side of the Pier that are designed to take advantage of proximity to the water's edge and/or proximity to boating activities.

Alternative III: This alternative would not foreclose any opportunities for the use of Navy Pier while (as Alternative II) enhancing all south side uses which can take advantage of proximity to the marina.

Economic Analysis

A comparative listing of the combined project development costs for each of the three alternatives if presented in Table IV-4. Table IV-5 presents a yearly revenue analysis for each of the alternatives.

Alternative I: The total project costs for the Navy Pier Marina proposal amount to $11,633,872. Pre-construction costs total 494,250; construction costs are $8,121,550; and development costs are $3,018,072. Yearly revenues would amount to an estimated $1,067,680. Operating costs would be $307,400 per year, leaving a total of $760,280 for debt service.

Alternative II: The total project costs for this Dime

TABLE IV-4

COMPARATIVE ECONOMIC ANALYSIS

DESCRIPTION	ALTERN. I	ALTERN. II	ALTERN. III
Pre-Construction			
Planning & Research	50,000	50,000	50,000
Prelim. & Detailed Design	394,250	426,118	1,900,000
Environmental Clearances	50,000	50,000	50,000
TOTAL:	494,250	526,118	2,000,000
Construction			
Bulkhead	0	1,078,000	2,662,000
Breakwater Construction	6,160,000	4,730,000	4,730,000
Landfill	0	*	*
Causeway	0	185,000	185,000
Rehabilitate Dime Pier	1,725,000	1,725,000	1,725,000
Platform Pier Construction	0	804,375	10,890,000
Construction Management	236,550	255,671	605,760
TOTAL:	8,121,550	8,778,046	20,797,760
Development			
Slips	1,590,012	1,826,300	1,450,000
Roadways	0	86,100	97,913
Pathways	5,000	4,935	33,080
Landscaping	50,000	45,500	416,093
Parking Area	185,750	185,750	185,750
Administration Bldg./Space	250,000	550,000	550,000
Maintenance Bldg./Space	93,750	168,000	168,000
Yacht Club	225,000	225,000	495,000
Security Structure (s)	31,250	28,125	28,125
Cyclone Fencing	84,405	0	0
Sewers	0	474,500	474,500
Water Mains	0	438,000	438,000
Service Utilities	390,000	444,000	346,000
Gym Demolition	25,000	25,000	25,000
Rest Area	0	0	33,000
Scenic Overlook	0	0	15,000
Restroom & Storage Area	0	55,000	0
Construction Management	87,905	136,686	142,663
TOTAL:	3,018,072	4,692,896	4,898,124
Combined Total			
Pre-Construction	494,250	526,118	2,000,000
Construction	8,121,550	8,778,046	20,792,760
Development	3,018,072	4,692,896	4,898,124
TOTAL:	11,633,872	13,997,060	27,690,884

* It is assumed that landfill can be aquired at no cost from various public works and demolition projects.

TABLE IV-5

REVENUE ANALYSIS

DESCRIPTION	ALTERN. I	ALTERN. II	ALTERN. III
Marina Operation Revenues			
Berth Rentals (15 per foot) per year; approx. $500 per boat)	$ 537,000	$ 620,000	$ 474,000
Ground Lease Income			
Yacht Club	90,000	90,000	90,000
Fuel/Pumpout Stations	40,000	40,000	40,000
Other Revenues			
Parking ($2.00/car/day)	400,680	454,680	347,200
TOTAL REVENUES:	1,067,680	1,204,680	951,200
Less Operating Costs			
Administration	200,000	200,000	200,000
Maintenance($100/boat/year)	107,400	124,000	94,800
TOTAL OPERATING COSTS:	307,400	324,200	294,800
NET INCOME AVAILABLE FOR DEBT SERVICE:	$760,280	$880,680	$656,280

Pier Marina proposal amount to $13,997,060. Pre-construction costs total $526,118; construction costs are $8,778,046; and development costs are $4,692,896. Yearly revenues would amount to an estimated $1,204,680. Operating costs would be $324,000 per year, leaving a total of $880,680 for debt service.

Alternative III: The total project costs for the Dime Pier Marina/Recreational Complex amount to $27,690,884. Pre-construction costs total $2,000,000; construction costs are $20,792,760; and development costs are $4,898,124. Yearly revenues would amount to an estimated $951,200. Operating costs would be 294,800 per year, leaving a total of $656,200 for debt service.

CONCLUSIONS AND RECOMMENDATIONS

Due to the special environmental problems in the basin to the north of Navy Pier (proximity to the Central Filtration Plant and subjectivity to wave action problems) it is not feasible to locate recreational boating facilities there. In order to change this conclusion, it will be necessary to provide a substantial body of detailed information that would prove these conclusions to be wrong.

Due to the special nature of Navy Pier as a recreational complex, it is too valuable and unique a resource to have some of its best features serve solely as a recreational boating facility. The overall usability of Navy Pier is not well served by the use of its perimeter for such purposes. In addition, adequate security would be difficult to provide,

especially when major events take place at the Pier. Dime Pier would be a better focus for the marina, because its proximity to Navy Pier allows Navy Pier uses to benefit from the view of the marina without suffering the disabilities. In addition, marina access can be separated from Navy Pier access, facilitating traffic flow and provision of security.

Therefore, a marina at Navy Pier (Alternative I) does not appear to be feasible, even though it is the least costly of the three alternatives.

The overall conclusion of this case study is that a full-service marina is indeed feasible at Dime Pier (Alternatives II and III), and is responsive to the present demand population for lakefront facilities. To determine which of these proposals is the best alternative, the following concerns must be addressed and additional studies carried out.

Alternatives II and III do have environmental problems which must be dealt with; the more serious of which being the water quality impacts upon the operation of the Central Water Filtration Plant and water circulation. Initial analysis indicates that these problems can be more effectively dealt with if marina facilities are located in the basins south of Navy Pier, rather than in the north basin. Detailed research in the areas of marina-induced water quality degradation and water circulation in the study area is recommended to assure that serious problems can be avoided.

In terms of cost, Alternative III is more expensive, (by a factor of two) than Alternative II. This reflects costs

incurred in construction of additional platform piers which provide additional space to accommodate more recreation facilities. It appears that revenue generated by the combination of uses in Alternative III will not compensate for the cost differential. However, other non-quatifiable amenities may result from this configuration in Alternative III. It is recommended that a benefit-cost analysis be undertaken to accurately compare the costs and benefits of the marina proposed Alternative II versus recreation complex/ marina proposed in Alternative III.

APPENDIX A

ENVIRONMENTAL CONDITIONS BIBLIOGRAPHY

Acherman, Karen, 1975, Rare and Endangered Vertebrates of Illinois, Bureau of Environmental Science, Illinois Departmental Science, Illinois Department of Transportation.

Blair, W. Frank, Albert Blair, Pierce Brodkoth, Fred Cagle and George Moore, 1957, Vertebrates of the United States McGraw-Hill Book Co., Inc.

Brendel, Frederich, 1887, Flora Peoriana; The Vegetation in the Climate of Middle Illinois, T. W. Frank and Sons, Peoria, Illinois.

Burt, William Henry, 1957, Mammals of the Great Lakes Region. University of Michigan Press, Ann Arbor, Michigan.

Chicago District Office, U.S. Army Corps of Engineers, Illinois Shore Study, 1949.

Chicago District, U.S. Army Corps of Engineers, Interior Report on Illinois Shoreline Erosion.

Coastal Engineering Research Center, U.S. Army Corps of Engineers, 1975, Shore Protection Manual.

Illinois Coastal Zone Management Program, Component Study of Biological Communities, Illinois Natural History Survey, September, 1976, Appendix: "Biological Inventory."

Illinois State Geological Survey, Hydrography of the Lake Michigan Nearshore in Illinois, 1977, Division of Water Resources, Illinois Department of Transportation.

Illinois State Geological Survey, Map Atlas Lake Michigan Shore in Illinois, 1978, Division of Water Resources, Illinois Department of Transportation.

Illinois Environmental Protection Agency, Water Quality Network, 1974 Summary of Data, Volume 5.

Illinois Environmental Protection Agency, Water Quality Network 1975 Summary of Data, Volume 5.

Moffatt and Nichol, Engineers, Illinois Beach State Park Safe-water Harbor Feasibility Study, 1978, State of Illinois, Department of Transportation.

Papke, G. and G. Harmon, Lake Michigan Water Quality Trends and Monitoring Programs in Illinois Waters, Northeastern Illinois Planning Commission, December, 1976.

Pepoon, H.S., 1927, Flora of the Chicago Regions, The Chicago Academy of Sciences, R. R. Donnelley and Sons Company, Chicago, Illinois.

Smith, Phillip W., 1961, The Amphibians and Reptiles of Illinois, Illinois Natural History Survey, Urbana, Illinois

State of Illinois, 1975, The Environmental Protection Act.

Swink, Floyd, 1969, Plants of the Chicago Region, Morton Arboretum, Lisle, Illinois.

Wells, L., Distribution of Fish Fry in Nearshore Waters of Southern and Central Lake Michigan, May-August, 1973, U.S. Fish and Wildlife Service, August, 1974.

Wells, L., Seasonal Depth Distribution of Fish in Southeastern Lake Michigan, Bureau of Commercial Fisheries Biological Laboratory, Ann Arbor, Michigan, June, 1968.

Additional sources of environmental information on the Chicago and Illinois lakefront are catalogued in the following: Chicago Lakefront Demonstration Project: An Environmental Information Directory; Paul Borek, Russell Davenport, Carol Unzieker; Department of Development and Planning, July, 1977.

NOAA COASTAL SERVICES CENTER LIBRARY
3 6668 14103 7509