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PLANNING FOR THE CREATION AND  
UTILIZATION OF SHORELINE FILLS

A THESIS

Presented to  
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PLANNING FOR THE CREATION AND  
UTILIZATION OF SHORELINE FILLS

Approved by: *[Signature]*

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*[Signature]*

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## ABSTRACT

The purpose of this study is to determine, identify, and recommend planning studies that will be useful in formulating comprehensive plans for the creation and utilization of shoreline fills; to recommend methods of implementing these plans; and to set forth a procedural framework for the regulation of fill developments.

Throughout the United States many cities located along or near large waterways are reclaiming submerged lands to meet the various needs of an expanding population. Submerged land is being filled to provide building sites for business and industry, for residential subdivisions, and for public facilities. Unfortunately, in many areas there is an obvious lack of planning for shoreline fill developments. Few, if any, attempts are made to relate a proposed reclamation project to the remainder of the shoreline or to other developments occurring within the community and the region. Where unplanned shoreline fills are permitted, serious problems frequently arise which adversely affect not only the fill development itself, but also adjoining properties and the entire community.

It was found that consideration has seldom been given to all of the factors influencing the location and use of proposed fills and that all levels of government are poorly organized to meet the critical needs of an effective control program.

To regulate shoreline fills, it is recommended that detailed studies be made of all factors--physical, social, and economic--affecting the area. Based on the information gained from these planning studies, a long-range development plan for the shoreline, which is co-ordinated with over-all community and regional plans, should be formulated. Regulation of individual fill projects and control over shoreline developments can then be achieved through the adoption of a full range of statutory and administrative devices.



## CHAPTER I

### INTRODUCTION

The rapid urbanization which has occurred in our country during this century has resulted in an endless sprawl of one complex urban center after another. Physical limits, in terms of space and distance beyond which further development appears impractical, already have been reached by some cities. In countless numbers of cities there is keen competition for land that is convenient to the central city. Land is needed for commercial and industrial expansion, for new subdivisions, and for recreational purposes.

Within recent years there have been increased demands for waterfront land to serve the numerous needs of our expanding population. Challenging opportunities for greater utilization of submerged lands are available to those cities that are fortunate enough to be located along or near large waterways.

The filling of shorelines outward into bodies of water is the process by which the elevation of peripheral land areas is raised. Reclamation of submerged or partially submerged lands is usually obtained by dredging the bottom of a waterway. Underwater soil is sucked-up by a dredge and pumped to the reclaiming site where the soil settles into a base and the

water drains off. Depending upon the type of fill material used and therefore, the length of time required for compacting, the land may subsequently be used for development.

The use to which filled land may be put is practically unlimited. Through the application of advanced engineering techniques, fills have even been developed as heavy industrial plant sites. Generally, however, the most common land uses for fills have been for residential and public purposes.

Shoreline filling is not a new practice in the United States. As early as 1849 filling of submerged land was being accomplished along the shores of San Francisco Bay, and, by the turn of the century, parts of downtown San Francisco were resting on filled land. (1) Elsewhere, there are to be found other examples of the utilization of waterfront fills. (2) However, it has only been during recent decades that the advantages of filling have been recognized to any great extent, and then chiefly by private developers. In several regions of the nation, notably in Florida, land speculators have come to realize the natural assets of waterfront subdivision development. Some developers, taking advantage of ineffective local and state regulations, have indiscriminately filled submerged coastal land without regard to the public interests.

Some irresponsible developers have failed to fully comprehend or even to consider the effects filling may have on adjacent properties and the harm that often results from unplanned fills. In many cases, the problems which are cre-

ated through uncontrolled filling practices outweigh by far any benefits that may result.

Certainly not all fills can be judged as harmful or detrimental to the public interest. Shoreline fills that are based on comprehensive planning studies and constructed according to minimum safe standards can be a positive influence upon a community rather than a negative one. There are excellent examples of shoreline fills which have directly improved the physical, social, and economic conditions of communities making use of this process. Fills that are carried out for special purposes, such as mosquito control and elimination; or the filling of irregular shorelines to make them uniform; and those that provide sites for needed public facilities (e.g., marinas, airports, waterfront parks, public building sites) may contribute immeasurably to the over-all development of the city.

Waterfront development, and more particularly, submerged land reclamation, constitutes a new frontier in large-scale land development. In the years ahead more and more local planning agencies will be called upon to formulate long-range development plans for their shorelines that will reflect a proper balance between both public and private interests.

The principal purposes of this study are to determine, identify, and recommend applicable planning studies that will be useful in formulating comprehensive plans for the creation

and utilization of shoreline fills. Methods of implementing these plans are also recommended; and a procedural framework to regulate and control fill developments is set forth. It is hoped that this study will be beneficial to city planners, administrators, and other public officials concerned with shoreline fills.

## CHAPTER II

### SHORELINE FILLS--PROBLEMS AND ATTEMPTED SOLUTIONS

While the actual process of filling submerged land may be an engineering problem and therefore, relatively minor, there are many aspects or factors which need careful appraisal. Failure to consider these factors and their far-reaching implications has resulted in the creation of many serious problems affecting the public health and welfare. This chapter will cite and discuss these problems and the attempts that have been made to solve them.

#### Problems

The general problems outlined here are related in varying degrees to all fills. However, such factors as public attitudes, market demands for waterfront property, legal limitations, and physiographic conditions in any given locality will determine the seriousness of the problems.

#### Water Quality and Pollution

Numerous cities discharge untreated domestic and industrial wastes into waterways and rely on currents and tidal action to disperse these polluting materials. Frequently, because of the combined effects of tides, currents, and wind on a particular shore configuration, stagnant pools of pol-

luted water are formed. In some instances, the improper location of fills may further aggravate the situation by restricting or altering the circulation of water necessary to prevent stagnation. In the case of finger fills that have long, narrow channels, pools of stagnant water and debris pockets often occur at the inner ends of channels. Even when provision is made for circulation of water through culverts in finger fills, debris may still be trapped in channels because of winds continually blowing from one direction.

Extensive filling into bays or confined waterways may retard the decomposition of organic matter by reducing the amount of water surface area available for oxygen assimilation. The volume of water necessary for diluting mineralized solids also may be diminished by extensive reclamation projects. Authorities in San Francisco have expressed concern for the effect that additional fill projects will have on the quality of water in San Francisco Bay and that, "living near the future shore area could be intolerable." (3)

### Currents

Waterfront fills will affect the direction and velocity of existing currents and may result in the formation of new channels. (4) Depending on the type of material in suspension, increased current flow may cause scouring of submerged lands. (5) In certain cases the deepening of channels will improve circulation but usually channels and cuts found adjacent to finger

fills provide little in the way of circulation. (6) Filling may bring about changes in currents which will have harmful effects on adjacent waterfront property and possibly even on distant sections of shorelines.

#### Tidal Flow

As yet, there are comparatively few theories of tidal hydraulics that engineers generally accept. (7) However, there is general agreement that fills directly affect tides and tidal currents and when improperly placed can cause a decrease in tidal flow through channels, passes, and inlets. (8) A reduction in tidal velocity could mean that scouring or flushing action, which keeps channels clear of sedimentation, might be retarded. When this happens costly mechanical dredging is often necessary. In San Francisco, the Army Corps of Engineers, responsible for maintaining a clear channel through the Golden Gate, is concerned with effects extensive filling in various parts of San Francisco Bay will have on tidal flow and whether siltation will occur in the channel. (9)

#### Wave Action

Fills create problems that are of concern not only to residents of filled property but also to other waterfront owners. Where no consideration is given to the potential effects caused by a change in wave action, serious damage may occur in the form of erosion. The combined forces of wave action, wind, tidal flow, and currents may intensify erosion

problems. On the other hand, some sectors of the shoreline may become built up through accretion. While wind and wave action may not be a major problem for filled areas that are protected by properly designed and adequately reinforced seawalls, the deflected waves may create navigational problems for small craft and cause oversplashing on nearby properties. (10)

#### Storm Hazards and Flooding

Although not a direct problem brought on by filling, storm winds and exceptionally high tides can do severe damage to poorly constructed fills, resulting in the needless loss of property. Strong winds have been observed to push up considerable amounts of water and deposit it on the windward end of bays and large lakes. (11) For those exposed areas that are subject to wind tides and flooding, additional safeguards, such as higher fill elevation, stronger seawalls, and riprap may be required.

#### Wildlife and Marine Life

Many forms of marine life, such as pink shrimp, mullet, snook, striped bass, sea trout, red fish, and black drum, spend their early life stages upon shallow grass flats which serve as feeding grounds. (12) When these underwater pastures are covered by fill developments the loss of such grass flats as places of refuge and breeding is always permanent. The damage to commercial fishing and recreational interests can be severe. It is no wonder that conservationists in Florida



are alarmed about dredging and filling operations currently taking place in that state. It has been observed that:

The dredging and filling of shallow flats with their attached marine grasses and algal cover have posed the most serious threat to the marine resources of the State that has ever confronted conservationists, sports and commercial fishermen and the seafood-consuming public. (13)

The effects of fill developments on wildlife are seldom taken into account by developers of submerged land. However, the biologist is well aware of the fact that unrestricted dredging and filling, in addition to being harmful to marine life, can be detrimental to certain other forms of wildlife. Grass flats and marshlands along lakes, bays, rivers, and other bodies of water provide places of refuge for migratory waterfowl. Naturally, the destruction of these habitats through filling would make the areas useless for waterfowl. In some communities the revenue derived from expenditures for hunting may represent an important source of income for local residents. Where such is the case, unrestricted filling of marshes and grass flats could jeopardize a significant segment of a community's economy.

#### Public Access and Use

Shoreline fills, besides reducing the size of the public domain which the state holds in trust for all its citizens, frequently prevent passage along the shore. In many instances filled areas are retained by a seawall rising vertically out of shallow water. What was once a public beach, even just a

narrow strip, is no longer available for use by the public. As more and more waterfront property passes into private ownership, without regard for the inherent public rights of enjoyment of the state's natural resources, the problem of access becomes increasingly more acute.

Activities such as swimming, boating, fishing, and hunting can be drastically curtailed if provision is not made for convenient and safe public access to water bodies. Dredging of shallow submerged land along a shoreline can have tragic results for vacationists and sportsmen. The unwary bather or wading fisherman may step into an excavated depression inconsistent with the general shoreline.

#### Land-Use Problems

Land-use planning, which attempts to bring together those uses which are compatible and separate those that are not, has its primary objective in promoting the most appropriate utilization of land. (14) Planning with respect to submerged lands must take into account not only their use for residential purposes, but must also consider their best utilization for commercial, industrial, and public uses. Where local authorities fail to accept responsibility for the proper management of submerged lands, unrestricted filling and development by speculative operators will create land-use patterns that eventually may prove unfavorable. While the developer may have taken all precautions necessary to minimize

the physical problems already mentioned, there still remain other equally important considerations. Among these are the relationship the fill development has to present and future patterns of transportation, schools and other public areas, commercial centers, places of employment, recreation areas and facilities, and public utilities. Will the local governing authority be able to provide police and fire protection, maintain streets and bridges, service and repair underwater public utilities efficiently and economically? Or, will costly expenditures of public funds be required?

Shoreline fills and their subsequent uses, as well as other types of land development, if poorly regulated and not considered as an integral part of land-use planning can have a detrimental effect upon the entire community.

### Aesthetics

Among the many problems which frequently result from unplanned and improperly located fills are those involving scenic or aesthetic values. In many cases, the qualities that make waterfront sites attractive--sandy beaches, wooded coastline, and panoramic vistas--are sacrificed for a complex arrangement of fill projects cluttering the shoreline. Both waterfront property owners and non-riparians often find, to their chagrin, that poorly placed fill developments restrict or at least detract from the enjoyment of scenic views. In some jurisdictions, the riparian owner's right to an un-

obstructed view, as well as his more traditional rights of ingress and egress to the waterway, has been judicially defended. (15) Rights of the public, or non-riparians, to scenic views of sovereign waters have not yet been firmly established. In Wisconsin, however, this right is protected under the trust doctrine which contends that all lands under navigable waters are held in trust for all the people. (16)

### Attempted Solutions

Existing regulations for the control of shoreline fills are inadequate to meet all or even most of the problems already discussed. The failure of attempts to regulate fills stems, at least in part, from the fact that responsibility for determining suitable fill policies, setting standards, and requiring appropriate planning studies is frequently shared by a multiplicity of governmental agencies. As a result, little, if any, co-ordination exists except where state laws require the following of established administrative procedures in the purchase and filling of sovereign submerged lands by riparian owners.

The attempts that have been made to solve the problems frequently caused by shoreline fills can be conveniently discussed when grouped according to action taken at national, state, and local governmental levels.

### Federal Regulation of Fills

The primary concern of the federal government with

regard to filling of shorelines is to insure that the public rights of navigation are not obstructed or infringed upon. This, of course, applies only to those water bodies which have been classed as navigable and over which the government has jurisdiction. The U. S. Army Corps of Engineers is responsible for the protection of navigational rights. Before any filling of submerged land in navigable waters can be undertaken, authorization must be obtained from this agency. Through its District Engineers, the Corps of Engineers administers the federal program of establishing pierhead and bulkhead lines for harbors and channels. This authority is delegated by Section 11 of the River and Harbor Act of March 3, 1899, (30 Stat. 1151; 33 USC 404). Proposals for filling or requests to establish a bulkhead line along a navigable waterway are of major concern to the federal government but only as they may affect navigation. Other problems are not taken into account when permits are issued or withheld.

The National Park Service, through the Department of Interior, while not directly involved with the regulation of shoreline fills, has for many years called attention to the fact that one of our greatest natural resources--the seashore--is rapidly vanishing from public use. As early as 1935 the National Park Service proposed 12 major strips totaling 437 miles of beach be preserved as national seashore parks. (17) The result of this recommendation was that 70 miles of Cape Hatteras was preserved while the other 11 areas gave way

to private and commercial development. More recently, at the request of the Department of Interior, a bill was prepared for Congress in the 1959 session which would have established ten new national seashore parks and provided funds on a matching basis to assist states in the acquisition of coastal lands. In Congress the bill was drastically cut to preserve only three national seashore parks. (18)

There is, in effect, no established national policy regarding filling of shorelines except as such filling may influence navigation, and then only along navigable waterways. No principles guiding private development of submerged lands have as yet been formulated by the federal government. This is in spite of the fact that the federal government has an important stake in wildlife preservation, pollution abatement, erosion and accretion, and public access to sovereign waters.

#### State Regulation of Fills.

Until recently, state governments have largely ignored the problems caused by improperly planned fills. In fact, many states have disposed of valuable submerged lands which previously were held in public trust. Such an approach can largely be traced to the efforts of some states to encourage development of vast, underpopulated regions within their borders. A situation such as this existed in Florida where at one time the State held control of more than 23 million acres of the 35 million acres of land and water area in the

state. (19) Today, nearly all of that land has been disposed of to private individuals.

The State of Florida, while not representative of action taken by other states, has attempted to regulate the filling of sovereign submerged lands through the adoption of a "bulkhead law." This act, in general, provides that before the State's submerged tidelands can be sold to riparian owners local units of government must first establish a bulkhead line. (20) The purpose of the bulkhead line is to limit the extent of filling, beyond which further filling into sovereign waters would not be permitted. Theoretically, the establishment of a bulkhead line would:

- a. protect the coastal and intracoastal waters of the state in the interest of navigation and commerce;
- b. regulate and control what may be done in and to such waters;
- c. conserve the natural resources of such waters and the submerged bottoms thereof;
- d. protect public and private rights in lands running with such waters; and
- e. provide for and encourage improvement of land and water areas suitable therefore. (21)

Experience under the bulkhead act thus far indicates several limitations of the act as an effective measure to control fills and minimize fill problems. The act itself is indicative of the state's failure to assume full responsibility for management of its sovereign submerged lands. Management and administration of such lands is thrust upon local units of government which, in the majority of cases, are poorly equipped to assume so great a burden. In addition, there is

no agency at the state level having authority to co-ordinate action among counties and municipalities. Consequently, the establishment of bulkhead lines is often piecemeal and inconsistent between local governing bodies sharing a common waterway.

Suitable design standards and specifications for filling, if in force at all, are left up to local governments to adopt. The state plays no role in seeing that safe, minimum standards are followed. Another problem inherent in the Florida legislation controlling fills deals with the act itself, which, through the same administrative procedures, permits the alteration of a bulkhead line or establishment of an entirely different one. A former official of the Florida Internal Improvement Fund has pointed out:

Naturally this power of changing or replacing an officially established bulkhead line serves a valuable purpose in cases where the original line is genuinely unsatisfactory, but it may be used with equal facility to accommodate ends less noble and less respectful of the public interest. (22)

Whereas the Florida approach to managing submerged tidelands is principally one of disposal to upland owners, other states have developed more positive programs to meet the problems brought on by fills. There is a growing awareness that the state must take the lead in formulating comprehensive plans for the management and proper utilization of state owned submerged lands. In California, for example, the Division of State Lands administers the state's submerged lands. However, other state agencies, such as the Division of Beaches and



Parks of the Department of Natural Resources and the Division of Water Resources of the Department of Public Works are also concerned with submerged lands. Unlike other states, California, through its Division of Beaches and Parks, has an energetic program underway to acquire shoreline property for parks, bathing beaches, and small boat harbors. Cities and counties, attracted by state financial assistance, can participate in the program. However, before state funds can be used to develop beaches for public use, a master plan for shoreline development must be officially adopted by a county and approved by the State Park Commission. (23) The master plan must provide for the acquisition, development, and control of ocean beaches in the county. In addition, the county must make available to the state, funds in an amount equal to or in excess of state funds.

Prior to 1879, California alienated portions of its public waterfront by selling the fee interest to submerged lands to private individuals. A new state constitution, adopted in 1879, stopped this practice but contained provisions for granting tide and submerged lands to be held in trust to municipalities having such lands within their corporate boundaries. Since 1879 submerged lands can only be leased for limited periods of 15 years with renewals extending to a total of 45 years. The state retains mineral rights in all tidelands it grants to cities.

As with other states, California has divided the au-

thority and responsibility for tideland development among numerous state and local agencies. Some agencies are directly involved with regulating shorelines, while others offer advice and conduct research. Again, no central agency exists which serves to unify state and local action in regulating and planning for shoreline fills. As an example of the complex overlapping of interests, the following governmental units would be concerned with any fill proposal for San Francisco Bay:

1. U. S. Corps of Engineers
2. U. S. Department of Agriculture
3. U. S. Public Health Service
4. U. S. Navy
5. Regional Water Pollution Control Board
6. State Department of Health
7. State Division of Water Resources
8. State Division of Small Craft Harbors
9. State Division of Beaches and Parks
10. State Division of Fish and Game Studies
11. State Division of Highways and Bay Toll Crossings
12. State Lands Commission
13. Various Port Authorities
14. The affected Counties and Municipalities

The Alameda County Planning Department adequately summed up the situation in one of its recent reports when it stated:

It is questionable whether any government agency could actually stop a reclamation project that was sanctioned by a local jurisdiction and approved by the Army Corps of Engineers. If a fill involves state-held or state-controlled land, the State government could restrict reclamation work, in most cases, where the health and welfare of other communities is threatened. At the present time the State Lands Commission has control over a major portion of the submerged bay lands, but to what extent non-state lands (privately or municipally owned) can be restricted--other than for navigational purposes by the Army Corps of Engineers--has yet to be clearly determined. (24)

### Local Regulation of Fills

There has been a diversity of attempts by municipalities and counties to regulate fills and more generally, waterfront development. In the majority of cases these regulatory measures fail to recognize the numerous aspects of the fill problem. At the local governmental level the devices commonly relied upon to control fills are found in subdivision regulations, zoning ordinances, and special ordinances and resolutions.

Subdivision regulations.--One of the major problems created by fills is the limitation of public access to waterways. In San Diego, California the subdivision of waterfront land must meet the following requirement:

Whenever any new subdivision of land is bounded on any side, or in any way, by the Bay of San Diego, or by any bay in the City of San Diego, or by the Pacific Ocean, there shall be dedicated upon and by such map or plat, a street along said bay or ocean front, and such street shall be given a distinct name; and all such streets, and all those streets leading to said bay front or ocean front shall run and be open to the mean high tide line.

The St. Petersburg, Florida Subdivision Ordinance (1958) contains a provision designed to control channel widths between finger fills thereby insuring water circulation and small craft movements. The requirements are stated as follows:

Where a plat does not incorporate covenants, either excluding or setting limits on boat houses, docks and beaches, the minimum width for waterways shall be 100'.

Where a finger projection of land is proposed that exceeds 1000' in length, minimum width of waterways shall be 200', rather than 100'.

In the state of Washington, regulations governing tideland development, proposed by the Association of Washington Cities, are more comprehensive than most regulations. Besides other statements required of the developer there is proposed the following additional requirement:

A statement relating to the proposed development of the subdivision indicating requirements for land fill, if any, waterways, moorage, wharves, or other proposed improvements, together with a map showing the location of the shorelands or tidelands proposed to be subdivided, the inner harbor line, line of navigability, and the line of ordinary highwater. (25)

The Association also recommends that, in addition to being reviewed by the Planning Commission, the proposed subdivision also come under the scrutiny of the State Land Commissioner, Town Engineer, Health Officer, and the Port Authority. From each of the officials a report is requested in which the desirable standards for the development of the particular site are indicated. The Planning Commission then compiles a special report containing a set of standards necessary to meet the recommendations of the other agencies and

submits it to the developer. Approval of the plat is based on conformity to the standards required in the Planning Commission's report. (26)

Marin County, California, regulates the minimum height of fill developments and requires adequate provision for storm water drainage. Its Subdivision Ordinance (1953) contains the following provision.

Where marsh or low lands are proposed for subdivision, the subdivider shall have a soil investigation and recommendation made by a recognized, qualified soil mechanics engineer and the program for development shall be made on the basis thereof. In no case, however, shall any subdivision be approved which has any street curb grade at an elevation of less than seven (7) feet on the standard mean sea level datum as established by the U. S. Coast and Geodetic Survey, and then only where there is an adequate provision for the passage of storm water run-off.

Under a minimum standards section of the regulations there is also the following provision.

Required fill shall be of suitable filling materials and placed in such a manner as to insure that the finished elevation of all lots and roadway areas will be adequate to protect the subdivision from floods and in any event no less than an elevation of seven (7) feet on the standard mean sea level datum as established by the U. S. Coast and Geodetic Survey, and then only where there is an adequate provision for the passage of storm water run-off and after settlement and compaction. No building or construction on filled land shall be commenced until satisfactory evidence has been submitted that the required elevation has been obtained and that the fill will provide a stable base for the construction proposed. Such evidence of satisfactory fill shall be submitted to the County Road Commissioner and the approval for construction of improvements upon said fill shall be granted by the County Road Commissioner.

In general, the regulation of fills by land subdivision regulations is limited. Suitable design standards capable of

meeting the peculiar requirements created by waterfront filled lands are, in most cases, not included in local subdivision controls. Furthermore, fill developments are only indirectly affected when regulations refer to the subdivision of lands bordering water bodies. In Wisconsin, for example, a state platting statute requires that access roads at not more than one-half-mile intervals along the shore be provided in all waterfront subdivisions. This assures public access including elimination of the possibility of large-scale fill developments blocking public access to a navigable water body.

Zoning ordinances.--Limited attempts to regulate shoreline fills and their subsequent land uses have been made through zoning ordinances. The problem of setting district boundaries over waterways in anticipation of any possible change in the shoreline is a perplexing one. Furthermore, the interpretation of a boundary's exact location is often difficult. Generally, the methods of setting district boundaries to regulate waterfront developments consist of the following:

1. projection of zone boundaries from the landward side into the water up to the pierhead, harbor, or other lines set at a distance from the shore;
2. projection of boundary lines into the water;
3. zoning the water by reference to the zoning of abutting land; and
4. using the shoreline as the boundary of all zones (the water, therefore, remains unzoned unless specific districts are included on the map over water areas). (27)

The zoning of submerged land has frequently been neglected by municipalities chiefly because, until recently,

there has been only a limited amount of reclamation activity. If land under water was zoned at all, it was done in reference to land uses in an adjoining district. In the past there was a strong tendency to use shorelines as district boundaries because of the apparent ease with which such boundaries could be located. This method of setting district boundaries is inadequate for regulating land uses in the event that submerged land adjacent to the shore is reclaimed and developed. In one recent court decision in New York it was held that submerged land had not been zoned because the zoning map showed district boundaries extending only to the water line. (28)

Special regulations.---Some local governmental bodies have adopted special regulations for the control of fill development. This is usually the case for those cities or counties that do not have zoning or subdivision controls in force. The special regulation is designed to meet a particular need and while it may prove highly effective in accomplishing its intended purpose, it frequently does not solve other equally pressing problems.

One of the most stringent of such measures is the Pasco County, Florida, resolution. The Board of County Commissioners in an effort to retain public access to its coastal waters adopted the following policy:

Bulkhead applicant or applicants shall hereafter be required to provide a deed or legal description of property to be equal to 2% of the bulkhead acreage, to be granted for public usage, with not less than 10% of the total

water front bulkhead, to be filled, pumped-up and dedicated as a public beach with the developers providing an access road to said beach property. (29)

Eventually, as a result of this regulation, Pasco County expects to acquire up to two miles of improved public waterfront along its coast.

#### Lack of Comprehensiveness

The preceding cursory review of the problems resulting from unwise filling practices and the apparent weak attempts at finding solutions to these problems reveals two major shortcomings. First, the entire range of factors, i.e., public access, recreation, conservation, pollution, drainage, land use, transportation, and others, are seldom evaluated when proposals are made for waterfront fill developments. Second, all levels of government are poorly organized to meet the critical needs of an effective control program.

Planning for the creation and proper utilization of fills involves numerous technical studies. All of the factors which influence the location and use of shoreline fills have not received adequate attention in many cities. Among other things, a sound and workable relationship has not been established between private and public interests. A comprehensive planning approach to the problems inherent in fill proposals is urgently needed.

Responsibility for the management and administration of submerged lands is dispersed among a proliferation of feder-



al and state agencies. Complicating the situation even further  
is the division of authority to local units of government.

There is no unit of government capable of synchronizing the  
functions and activities among these governmental groups.

Again, a comprehensive approach aimed at the promulgation of  
unified fill policies is needed.

### CHAPTER III

#### PLANNING FOR SHORELINE FILLS

Planning for the creation and utilization of shoreline fills should not be approached on a limited scale. It has been the practice in many cities, however, to give consideration only to the effect a proposed fill project would have on adjacent properties. Little, if any, attempt is made to relate the proposed project to the remainder of the shoreline or to developments occurring within the urban area. Such a narrow view, in addition to neglecting the public interest, may lead to inappropriate land use patterns; create unattractive shorelines; and impose restrictions on further development of the community. By itself a single fill development may not appear important enough to appreciably affect conditions elsewhere. However, when the number of projects is multiplied over a period of years, serious and lasting impact may be felt by the community.

Shoreline fills should be seen in their proper perspective--as integral parts in the orderly development of the entire shoreline, the community, the region, and the state. Planning for individual shoreline fills, therefore, also involves planning for the full length of the shoreline. In turn, these plans, if they are to be realistic, must be

co-ordinated with community and regional plans.

The preceding chapter discussed the problems frequently caused by unplanned shoreline fill developments and the attempts by different governing units to control such developments. The first part of this chapter will describe how, through appropriate planning studies, fill problems may be minimized or entirely eliminated. To achieve this purpose it is necessary that all forces--physical, social, and economic--affecting the community and its shores be studied. When this information has been assembled, the planner then has a proper foundation upon which to formulate a land-use plan for the shore. To implement the plan, certain techniques or tools should be adopted. The second part of this chapter discusses these effectuation tools and how they should be utilized.

### Planning Studies

In order to plan for shoreline fills, the entire shore, as well as the adjoining waters, must be studied. The studies discussed in this chapter are comprehensive in nature, and have as their objective the formulation of a sound shoreline development plan within which the reclamation of submerged land plays a major role. Through such a plan, both public and private developments can be guided.

Several of the studies do not ordinarily fall within the scope of the planning profession. Such matters as tidal hydraulics, marine life, soil mechanics, water pollution, and

others should be analyzed by their respective specialists. However, the planner, by defining common goals, giving direction, and co-ordinating the efforts of these various experts, can adapt the information to the needs of his planning program. The end result of these studies--a comprehensive plan for the development of the shoreline--will reflect the efforts of experts from many fields.

At this point it should be emphasized that the process of planning is a dynamic one. No attempt should be made to prepare a planned shoreline. Unforeseen events often bring abrupt and dramatic changes which make even the most carefully drawn plans incomplete. Changing conditions of the shoreline, the community, and the region should be continually re-appraised and plans for shoreline development revised accordingly.

It is essential that accurate charts and maps of the area be assembled prior to undertaking a comprehensive study program. Since a large amount of the information to be collected must be shown graphically, a base map should be prepared. The waterway, shoreline, and interior land areas can then be delineated to indicate the total area being studied.

#### Hydrologic Study

Perhaps the first study that should be conducted is a study of the physical features of the water and surrounding land. Most of the information needed for a hydrologic study

will be obtained by field observations and research. From marine navigational charts information can be obtained on mean-high and mean-low water levels, currents, bottom contour levels and water depths, and location of shipping channels. These data should be plotted on the area map, together with information on the soil composition of submerged land and the location of fresh water outfalls, such as rivers, streams, and drainage ditches. Pierhead and bulkhead lines, established by the federal government, should also be indicated. Off-shore lands, which are periodically exposed and covered by fluctuating tides, should also be located and shown. From an investigation of local records, information should be compiled on shoreline areas which have been inundated by floods or excessive storm tides. Areas that have been flooded or which are subject to flooding should be indicated on the base map. The study should also investigate shoreline areas that are subject to erosion or accretion because of the combined effect of currents, tides, and winds.

Hydraulic models, built to scale, can be a valuable aid in understanding the complex relationships of wave action, tidal flow, storm tides, dead water, and their effects on a particular shore configuration. Such models can duplicate actual conditions existing in a particular locale and can be highly useful in determining acceptable and beneficial shoreline designs. Some state universities have coastal engineering laboratories that will assist communities in hydraulic

model experiments.

The purpose of the hydrologic study should be to reveal submerged land areas which can be reclaimed without adversely affecting physical conditions of either land or water. Such a study will establish the physical limits within which shoreline fills will prove beneficial to the community.

#### Land Ownership Study

A study of the legal ownership of submerged lands is an essential requirement in any program for the future development of the shoreline. In some areas of the country it will be found that title to submerged lands is divided among state and local governments and private owners. The extent of these holdings should be mapped and areas of jurisdiction correctly shown. Tax maps will prove helpful in locating boundaries. This study will enable planning authorities to formulate future programs for regulation of fill areas. Furthermore, it will be useful in a land acquisition program, if such measures are necessary at a later date.

#### Marine Life Study

Another important study that should be conducted is of marine life found in local waters. The species of marine life (including fish, shellfish, and sponges), their seasonal habits, and their value to sport and commercial interests in the region should be carefully analyzed. Such a study should reveal areas used by marine life as places of feeding and

spawning. Grass flats located along the shore which would be most affected by fill coverage should be indicated on the chart. Those marine grass areas situated on submerged land that is not proposed for reclamation but which is subject to dredging operations should also be shown and restrictions placed upon dredging in those areas. Where bottom conditions are such that marine life is not affected, dredging for fill material could be permitted.

Whether the preservation of marine life or an extensive reclamation project which destroys grass flats is more important is a question local authorities must decide. The long-term benefits to the public must be constantly borne in mind. A marine-life study as proposed here would provide authorities with a common reference point from which to reach rational and objective decisions.

#### Recreation Study

An integral part of developing a program for the utilization of submerged lands is a determination of recreational needs. Today, because of increased leisure time, higher per capita income, greater mobility, and a widespread desire to enjoy outdoor recreation, there is a growing need for park and recreational space. (30) This is especially true for water-oriented activities.

In the future, while increased demand for public shore areas can be expected, cities and counties can partially meet

this demand through a submerged-land-reclamation program. In anticipation of such a program, information on such matters as present and future space needs, facilities and equipment, parking areas, public-access places, and the relationship of commercial tourist and recreational facilities should be compiled and studied.

### Transportation Study

The importance of planning a comprehensive transportation system with respect to an urban area's shoreline cannot be stressed too highly. A major thoroughfare plan that fails to consider the potential uses of reclaimed submerged land will often prove inadequate and incomplete. Because transportation systems require large expenditures of funds for construction and maintenance, great care and foresight should be used in developing plans for them. Once built they are relatively permanent and exert a continuing influence upon the direction and form of future urban growth.

There are several basic components of the community's existing transportation system which should be analyzed.

These include:

- a. major streets and highways;
- b. water-borne cargo and passenger terminals;
- c. railroad facilities; and
- d. air transportation.

Major streets and highways.--Existing major streets in the



vicinity of the shoreline should be inventoried in terms of width, condition, and volume of traffic carried. Traffic generating land use along or near the shoreline should receive detailed study. The ability of existing major streets to provide for the efficient movement of goods and people to and from these areas should be determined. Any plans for street widening, resurfacing, and re-routing of traffic should be co-ordinated with plans for the future development of the shoreline.

The location of limited-access highways or scenic drives which parallel the shoreline should also be given close investigation. Plans for such major arteries as these should take into account the future development of the shoreline for industry, residences, and public recreation areas. Provision should be made for interchanges and overpasses along the shoreline route where major land reclamation projects are anticipated. In this way expensive alterations can be eliminated. Furthermore, by controlling the location of access points, the development of the shoreline can be substantially influenced.

Water transportation.--A study of available harbor and shipping facilities and their relation to rail and highway transportation should be made. The number of ship arrivals and departures; the types of cargo handled; and any changes in dockage requirements should also be studied. A water transportation study should also consider the types of industries

which, if located along the waterfront, would benefit by having access to low-cost water transportation. Space needs, both for water-oriented industries and for shipping facilities, should be determined. The possibility of providing suitable expansion areas by reclaiming submerged lands should be investigated. Preliminary studies of this type can reveal the need for vigorous action programs to correct limitations on present shipping facilities, thus promoting the economic well-being of the city and the region. A point to be remembered is that port development and waterfront industrial growth should be closely co-ordinated.

Rail transportation.--A survey of railroads and railroad facilities and their effect on future shoreline developments would constitute another major phase of the transportation study. Any expansion of port facilities or industrial waterfront land uses should naturally take into account the location of rail facilities. Local authorities may find that one method of providing improved rail transportation services, more efficient terminal operations, and economical rail and port interchange is through the imaginative use of reclaimed submerged land. In this way it would be possible to accomplish a high degree of unification between industrial growth, port expansion, street and highway layouts, and railroad service.

Air transportation.--The role of air transportation as a factor in shoreline fill developments also deserves close scrutiny

by the local planning agency. Rapid technological advancement in aircraft has far exceeded progress in airport improvements. Many municipal airports have runways which lack the length and load-bearing characteristics needed by today's jet-propelled aircraft. Some cities, unable to expand their present facilities, have been forced to locate new airports farther away from the central city. On the other hand, a number of major cities with airports located adjacent to water bodies have provided the additional runway space by reclaiming submerged land.

An air transportation study would entail an investigation of present facilities and the space requirements necessary to insure efficient, safe, and economical operation in the future. Such a study should also consider needs of private aviation enthusiasts and the possible location of small airfields on reclaimed submerged land.

One element that should be given special study is the growing importance of helicopter transportation. For short flights, such as between airports, or between the central business district and the airport, helicopter service offers distinct advantages over other forms of travel. The production of larger craft capable of lifting greater loads makes the economical operation of helicopter service more feasible. The potential use of submerged land as helicopter landing terminals should not be overlooked, especially in those areas where the central business district can be conveniently

reached from the waterfront.

#### Land-Use Study

Essential to the preparation of a planning program for the creation and utilization of shoreline fills is a detailed land-use survey of the area. The exact use of every parcel of land in the vicinity of the shore should be classified and mapped. The amount of acreage for residential, commercial, industrial, and public uses should be compiled and their ratio to the total shore area determined. Quantitative data of this type will provide a clear picture of existing characteristics and serve as a framework for developing a land-use plan for the shoreline.

Certain land uses have a definite need for waterfront locations. Such locations are important because they afford access to the large quantities of water necessary in various manufacturing and processing industries; access to inexpensive water-borne transportation; visual access; and access to the water itself. Because certain land uses do require location along the waterfront, special consideration should be given these uses in planning for the future development of the shoreline. A survey of existing land uses would disclose any misuse of waterfront properties by inappropriate land uses. For example, if there is a preponderance of residential waterfront uses and a lack of water-oriented industrial sites, then priority should perhaps be given to development of submerged

lands for industrial expansion purposes. A priority system, of course, would depend on the present and future character of the urban environment, the prospects for economic growth, and the amount of submerged land available for reclamation.

In addition to the quantitative land-use analysis there should be a qualitative inventory of land uses. Such a study would evaluate conditions of structures in the area, define and delineate areas of deterioration and blight, and disclose the type and location of public improvements that are needed to promote the development of the area. As part of this study, consideration should be devoted to the over-all appearance of the area. A disorganized and unattractive appearance of the shoreline will discourage the future development of desirable shoreline land uses.

Another phase of the land-use study that should be investigated is the assessed value and real market value of all land in the shore area. Such a study would also include the value of all existing structures. Information of this nature would be instrumental in locating areas which, through a progressive land acquisition program, could be purchased at a minimum of expense to the local government. Results from other studies and the proposed re-use of the site, of course, would be considered in determining the suitability of such an acquisition program.

Depending on the extent of shoreline development, size of the planning staff, and its financial resources, there are

other land-use studies that may desirably be conducted. These would include cost-revenue studies; market studies for various types of fill development; and, public attitude studies regarding the redesign of the shoreline.

#### Utilities Study

The creation of new lands through shoreline fill development will place additional burdens on existing public utilities and other related service facilities. Therefore, it is of primary importance that information be obtained on the location, capacity, and condition of existing utilities in the shore area. The utilities study should contain information on water supply and distribution, sanitary sewerage, storm sewers and outfalls, gas, electricity, telephone, and other related facilities.

Considerable forethought should be exercised in planning for the extension or enlargement of utility systems which serve waterfront properties. If utility expansion is contemplated, thought should be given to designing the system so that future fill developments may be effectively and economically served. The designing of utility systems to serve future anticipated needs, of course, should be attempted only when it is known that fill development in a particular area is feasible, imminent, and in accordance with land-use plans.

While the capacity requirements of utilities are profoundly influenced by changes in land development, it should

also be pointed out that the location and size of utilities can be used to guide future growth. By withholding or extending basic utility services the city can direct and time shoreline fill development and thereby promote desired land-use patterns.

#### Implementation of the Program

Once a comprehensive plan of development for the shoreline has been formulated and given approval, it is then necessary to put the plan into execution. Several tools or techniques are available for this purpose. Which ones are available for use by any given community will depend on that city's charter and state enabling legislation. Because each is intended to accomplish a certain goal, every effort should be made to utilize as many of them as possible. In this way, the optimum amount of control can be exercised over shoreline development.

#### Zoning Ordinances

Zoning, as a regulatory device under the police power, has long been recognized as a valuable planning tool in guiding urban land-use development. Through the zoning of the shoreline, as well as the waterbody itself, it is possible to control the use of reclaimed submerged land. Zoning district boundaries should be extended into the water until they intersect other district boundaries or jurisdictional limits. By zoning submerged land it is possible to insure that compatible

land uses will result; that sufficient space will be available for each type of development; that density will be regulated; and, that adequate light, air, and privacy will be available between structures, when the land is eventually reclaimed. In the meantime water uses may be controlled.

Based on the results of planning studies, provision can be made for land uses which require location on a waterway. The zoning ordinance should then designate special districts for those land uses. For example, in a waterfront industrial district, only those industries which require large amounts of water to perform their particular function, or those industries which need access to inexpensive waterborne transportation would be permitted. Measures should be taken to provide that only those industries which would not adversely affect future development of a more restricted nature, would be located along the shoreline. Similar zoning districts can be established for residential and commercial land uses.

The limitations of zoning as a method of implementing the land-use plan should be clearly recognized. Zoning should not be used as a device to regulate the type of materials used in the construction of buildings or the design of shoreline fills. These matters are more effectively regulated by building codes and subdivision regulations. The major purpose of zoning is to provide for the development of compatible land uses, rather than to serve as a correction device to eliminate



existing disorganized land-use arrangements. While it is true that non-conforming land uses can be eliminated, this procedure is frequently time consuming. More effective measures can be taken through the adoption and vigorous enforcement of minimum codes, and through urban renewal.

#### Subdivision Regulations

One method of implementing the shoreline development plan and, consequently, fill developments, is through the use of land subdivision regulations. Through the adoption of appropriate subdivision requirements it is possible to lessen--even eliminate--many of the problems resulting from poorly located and improperly designed fill developments. Knowledge gained from the previous planning studies will enable the planning agency to formulate appropriate local standards to guide fill developers in constructing suitable shoreline fills.

The subdivision regulations should contain provisions dealing with such matters as:

- a. the minimum height of fill elevation;
- b. width of waterways and channels between fills;
- c. length and width of finger fills;
- d. public access roads and streets to the water; and
- e. amount of developed land that will be devoted to public use.

It should not be necessary to adopt separate subdivision regulations applicable only to shoreline fills. Standards for

shoreline fill developments can be incorporated into existing subdivision regulations.

#### Bulkhead Lines

Another important device to be used in carrying out the shoreline planning program is the establishment of bulkhead lines. A line of demarcation limiting the areas in which fill developments would be permissible, should be drawn at a reasonable distance from the existing shoreline. Shoreward of this line fill developments would be permitted, while beyond this line no fill would be allowed. It would not be necessary that the entire area between the bulkhead line and the shoreline be reclaimed and constructed as solid fill.

Local units of government, by authority of appropriate state legislation, should establish the location of bulkhead lines, subject to approval by the state. Where the federal government has an interest in navigable waterways, local governments must also obtain approval from the Corps of Engineers. The distance from the shoreline at which bulkhead lines are located will be guided by data obtained through planning and engineering studies, and by the land-use plans for the area. The interests of riparian property owners will also influence the location of bulkhead lines. Frequently, the property owner prefers that the bulkhead line be drawn at a distance beyond that which the public interest requires. Where conflicts arise between public and private interests,

compromises between the two may be necessary. However, the determining factors which govern bulkhead line location should always be the public welfare and the unique physical conditions of the area. Bulkhead lines, in addition to restricting areas which can be filled, would also prevent the obstruction of channels for water flow and pleasure boating. Where it is apparent that because of hydrographical conditions, serious problems would result from fills, the bulkhead line should follow the existing shoreline and prohibit land reclamation in the area.

#### Urban Renewal

In many cities, plans for the sound development of the shoreline will be restricted because of blight and deterioration in the area. Such undesirable characteristics as mixed land uses, poor drainage, flooding, substandard dwellings, obsolete industrial and commercial structures, traffic congestion, air pollution, inadequate transportation facilities, poor street design, small lot sizes, overcrowding of land by people and structures--to name only a few--can adversely affect the unified development of the shoreline. These conditions could be overcome through a program of urban renewal. The term "urban renewal" is used here in its broadest meaning to include both public and private action to eliminate and prevent deterioration.

Urban renewal is a valuable tool for plan effectuation.

Through such a program, land can be acquired for critical uses such as public recreation areas or industrial sites with deep water frontage. In this way, the blighted area can be cleared and redesigned in accordance with the comprehensive plan of the community. Amenities which are vitally important for healthful, pleasant living and working conditions can be provided. In conjunction with an urban renewal program, submerged land adjacent to a project area could be reclaimed and its desirable future use co-ordinated with land development proposals within the urban renewal site.

#### Land Acquisition and Open Space

Another means of implementing the shoreline land-use plan is through a land-acquisition program. From information provided by the land-use study and the land-ownership study, key properties along the shore could be purchased by the city. Once acquired, submerged lands could be reclaimed and developed or left as open land in accordance with the land-use plan of the city. This is an excellent method of obtaining space for public beaches, marinas, waterfront parks, and public building sites where provision was not made for such facilities during original development.

Not to be overlooked in any land-acquisition program is the possibility of developing a shoreline fill as a model demonstration project. The city, acting as land developer, could reclaim the submerged land, make site improvements, and

lay out lots, all in conformity with zoning and subdivision regulations. Realtors in the community could handle the sale of lots for the customary commissions. The purpose of the project should be to show private builders and land developers how shoreline fills can best be created and developed. A standard of comparison by which other residential fill developments could be evaluated would promote the up-grading of the shoreline.

Outright purchase of waterfront land by the governing body can be expensive, depending on the location, the amount and type of adjacent land uses, and the demand for waterfront property. However, assistance from the federal government to aid cities in the acquisition and preservation of open space appears forthcoming. A bill known as the "Open Space and Urban Development Act of 1961" was introduced February 9, 1961 in the First Session of the Eighty-seventh Congress by Senator Harrison A. Williams, Jr. The bill would:

. . . authorize the Administrator of the Housing and Home Finance Agency to assist States and their political subdivisions in preserving open space land in and around urban areas which for economic, social, conservation, recreation, or aesthetic reasons, is essential to the proper long-range development and welfare of the Nation's urban areas and their suburban and rural environs . . . (31)

The major provisions of the bill are:

- a. the federal government will provide 25 per cent of the costs of acquiring and preserving open space land;
- b. where open space land has regional importance grants may be made to regional agencies covering 35 per cent

of land-acquisition costs;

c. disposal of any land acquired or preserved under this bill must have the approval of the Housing and Home Finance Administrator and must be in accordance with a comprehensive plan for the area; and

d. federal funds are limited to acquisition costs and are not available for development or operational costs.

#### Easements

In many cases it is not necessary to purchase the fee simple of property in order to preserve or acquire open space. Fundamentally, this same purpose may sometimes be achieved, at much less cost, by the purchase of easements or development rights to shoreline property. Properly used, the purchase of development rights to shoreline property and submerged land can be an effective tool of plan implementation. Through the use of this device, control may be exercised over the location of shoreline fill developments. In areas where it is considered necessary to discourage submerged-land reclamation, easements should be obtained by the local governing body. This tool is especially applicable in fringe areas of cities where there is less intensive development of shore property. Costs of an easement program become prohibitive, however, as more urbanized areas are approached. When easement costs become comparable to full acquisition costs, it is, perhaps, more effective to purchase the property outright.

## Official Map

Many cities throughout the nation have adopted official maps which establish the location and width of streets and the boundaries of sites intended for public use. The purpose of the official map is to prevent the building of structures in the path of proposed streets and other public sites until such time as the street can be opened or the area developed. This device also has useful application in implementing a shoreline land-use plan. The function of the official map is not to secure dedication of land for streets or parks without compensation but rather to prevent the owners of land from building in areas which the city proposes to acquire at some future date. Generally, for recreation areas a time limit of perhaps one year is given the city within which it can purchase or condemn the land. After that time period has elapsed, the property owner is not compelled to observe the official map. In the case of undeveloped areas along the shoreline, access roads and public open spaces could be adopted in an official map ordinance and reserved until such time as development occurs.

An additional provision of official map legislation should be the requirement that after the official map is formally adopted, no public utilities should be located in any street not shown on the official map. (32) In this way, the installation of vital public utilities may be co-ordinated with street plans. This technique can be especially useful

with shoreline fills by directing private and public action toward the goals established by the shoreline plan.

#### Long-Range Capital Improvements

The tools discussed thus far are principally designed to guide private action in developing shorelines according to comprehensive plans. Municipal governments, however, must also be given guidance in developing the public services and facilities required by the community's plan. To attain this purpose a long-range capital improvements program, covering 20 to 25 years, should be adopted. Without such financial planning, the public improvements proposed by the shoreline plan would be difficult, if not impossible, to achieve.

Generally, the financial plan is based upon estimates of expenditures required for the provision of public services, the community's financial resources, and the costs of capital improvements. To carry out the long-range financial plan, the community must:

- a. establish a priority listing of those major improvements which it hopes to accomplish;
- b. adopt a capital expenditures budget; and
- c. adopt an annual administrative budget.

By setting a priority schedule, those physical improvements of a more urgent nature would be developed first. Based upon this priority schedule, a capital expenditures budget, usually covering five or six years, can be prepared. The



actual capital improvements programmed for a specific year are then incorporated into that year's annual budget. At the end of each year the capital expenditures budget is re-evaluated, and extended another year.

The long-range capital improvements program is a necessary adjunct to the comprehensive plan. Indeed, it is essential that financial planning proceed concurrently with physical planning. Through the use of the capital-expenditures budget, together with the annual budget the community can effectively implement plans for shoreline development. From a standpoint of governmental responsibility, both of these administrative devices are important as tools for plan effectuation.

#### Special Improvement Districts

Not all of the improvements envisioned in the shoreline plan will have to be financed from public funds. Various parts of the plan can be financed through the use of special improvement or assessment districts. It has become an increasingly common practice for communities to insist that all or part of the costs of certain improvements or services be borne by properties which are directly benefited. Many cities use the technique of special assessments to pave streets, to extend utility services, and to develop neighborhood parks where such improvements will result in increased property values to adjoining properties.

If a group of waterfront property owners sought assistance from a city to make improvements along a shoreline, a special improvements district could be established to finance the program. Such improvements might well include the building of seawalls or other protective barriers, draining marsh land, filling eroded sections of beaches, or providing waterfront parks. The full costs of such improvements could then be assessed to properties in direct proportion to the benefits received, but not exceeding the net increase in value accruing to the property.

The use of special assessment or improvement districts can be an effective device to implement important parts of the shoreline plan. This technique, however, can only be used where increased property values will result, and the costs of the improvements are less than the net increase in property values.

### Summary

A municipality's shoreline is an exceedingly valuable asset which should be protected from misuse. Its value to the physical, economic, and social well-being of the community can be greatly enhanced through the reclamation of submerged lands. The creation and utilization of shoreline fills should not be without purpose, but, rather should proceed according to a preconceived image of what the future shoreline will be. To accomplish this, a plan for the unified and orderly develop-

ment of the shoreline should be prepared and adopted. Such a plan should be considered as part of the community's comprehensive plan.

Before plans for shoreline development can be drawn, it is essential that the waters, shorelines, and adjacent areas receive intensive study. Information contributed by the studies discussed in this chapter will serve as a broad foundation upon which realistic plans can be prepared.

Once the plan has been formulated and endorsed by citizen approval, certain tools or techniques should be adopted to bring about the desired goals embodied in the plan. The tools for plan execution discussed in this chapter are designed to guide private and public action. If available under the city's charter or state enabling legislation, all of these tools should be used in order to gain maximum control over shoreline developments.

## CHAPTER IV

### CONCLUSIONS AND RECOMMENDATIONS

There are numerous communities throughout the United States which have access to waterways. In many instances, the shorelines of these waterways include large areas of submerged land which, if reclaimed and properly developed, can add to the orderly growth of the whole area. Because of rapid population expansion, increased urbanization, and a growing demand for waterfront property by industry, commerce, homeowners, and the public, vast amounts of submerged land are being reclaimed annually. Unfortunately, in many areas there is an obvious lack of planning, not only for fills but for entire shorelines as well. Where unplanned shoreline fills are permitted, serious problems frequently arise which adversely affect the fill development itself, adjoining properties, and the community.

If reclamation of submerged land is to be effectively controlled, and the wise development of the shoreline actively promoted, then governments must prepare comprehensive plans for the future orderly growth of their waterfronts. To achieve this dual purpose, the community must rely on a full range of statutory and administrative tools, realizing that individually these tools can bring only partial success, while used

collectively, they can bring highly favorable results.

Summary of conclusions.--Based on the research conducted in this study the following conclusions are drawn.

1. Rapid urbanization has led to increased demands for waterfront land to serve the various needs of an expanding population.

2. In many cities submerged land is being reclaimed for development.

3. Frequently, land developers have failed to fully comprehend or even to consider the effects shoreline fills have on adjacent properties and the harm that results from unplanned fills.

4. In reclaiming submerged land consideration has not been given to all of the factors influencing the location and use of proposed fills.

5. All levels of government are poorly organized to meet the critical needs of an effective control program.

6. Substantial physical, social, and economic benefits can be attained through submerged land reclamation, but only if a comprehensive approach to the problems of development is used.

7. Development of shorelines should not be without purpose, but rather should proceed according to a preconceived image of what the future shape of the shoreline will be.

8. To accomplish this, a plan for the unified and order-

ly development of the shoreline, in which submerged land will play a major role, should be prepared.

9. Before a shoreline plan can be drawn, studies must be made of the waters, shorelines, and adjacent areas. These studies will serve as a cornerstone for planning proposals.

10. Once a plan has been formulated certain tools or techniques can be used to implement the plan.

Summary of recommendations.---The regulation of shoreline fills has, for the most part, been primarily based on a negative approach. Communities seldom attempt to determine in advance what areas of their shoreline should be filled, when development should take place, or how such lands should subsequently be used. Communities should take a more positive approach by initiating programs designed to achieve desirable long-range goals. To do less is to invite the misuse of valuable waterfront lands to the detriment of public interests now and in the future.

Based upon research, correspondence, personal interviews with responsible officials, field observations, and the conclusions presented in the preceding section, the following recommendations are set forth.

1. To regulate shoreline fills, local units of government are strongly urged to adopt the following procedures:

a. the waterway, shoreline, and adjoining land areas should be delineated;

b. detailed studies should be made of all factors--physical, social, and economic--affecting the area;

c. based on information gained from planning studies a determination should be made of those areas which can be filled, those areas which should be filled, and those areas which should not be filled;

d. with this information available the community should then formulate a long-range development plan for the shoreline, which should be co-ordinated with over-all community and regional plans; and

e. the planning tools cited in the preceding chapter should then be utilized to implement the plan.

2. One of the central ideas of this study has been that planning for shoreline development cannot stop at arbitrarily-fixed political boundaries, but must be comprehensive in scope and purpose. Frequently, a community concerned with its own specific problems fails to see that similar problems confront other nearby cities and counties. Such problems as pollution and flooding do not respect corporate limits. Where several cities and counties share an interest in the development of a common shoreline, an opportunity exists for united action. A regional planning commission or association should be formed. By planning on an area-wide basis, the unified development of a shoreline may produce greater benefits to an entire region.

3. State governments have a major responsibility to

insure that their shorelines are properly developed and wisely utilized. However, as trustee over sovereign submerged lands, states should actively participate in the administration, management, and development of such lands. State governments should become full partners with local levels of government in formulating sound programs for shoreline development.

This can be achieved by:

- a. giving technical planning assistance;
- b. providing financial grants-in-aid;
- c. permanently dedicating submerged lands and shorelines for beaches and parks;
- d. providing the appropriate state enabling legislation necessary to implement shoreline plans; and
- e. requiring that before submerged land be developed a plan for the comprehensive development of the shoreline must first be prepared.

Location on or near large waterways provides communities with excellent opportunities for planning. By capitalizing on this natural asset, the well-being of the entire area can be greatly enhanced. A well developed shoreline with adequate provision for the needs of industry, commerce, and the public is of immeasurable value to the community, the region, and the state.



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