URBAN DEVELOPMENT IN THE LOUISIANA COASTAL ZONE : PROBLEMS AND GUIDELINES

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URBAN DEVELOPMENT IN THE LOUISIANA COASTAL ZONE:

PROBLEMS AND GUIDELINES

by

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ABSTRACT

The Louisiana Coastal Zone comprises all or a portion of twenty-two parishes and encompasses almost seven million acres. Within this extensive area are a number of thriving urban centers which have developed directly as a result of the easy access to shipping channels, oil and gas reserves, seafood beds and other natural resources. However, expansion of these urban areas has been hindered by the scarcity of naturally dry land suitable for development. Nonetheless, technology has made possible the spread of urbanization into the wetlands, but this process is not without a number of serious ecological drawbacks and developmental problems. This study seeks to examine all steps in the urban development process as it impacts wetlands and to identify resulting problems and propose guidelines which mitigate them.

Chapter 1 reviews existing coastal zone ordinances, regulations and codes at the parish level. An attempt is made to show to what degree, if any, special wetland characteristics have been considered in these ordinances. This chapter also examines restrictive mechanisms placed on wetlands development by the National Flood Insurance Program and the U.S. Army Corps of Engineers permitting process. Appendix 1.3 provides an annotated bibliography of existing and proposed urban development regulations by parish.

A problem identification methodology is used in Chapter 2 to examine the urban development process as it occurs in the coastal zone. Moving through each of the stages of wetlands development in sequence, this methodology is used to identify potential developmental problems and their results and to specify how the regulatory system for urban wetlands development needs to be strengthened.

For those development practices determined to be not or inadequately regulated, development guidelines are recommended in Chapter 3. These suggestions are grouped into two broad categories: 1) statewide policy guidelines are outlined with a brief discussion of some other states' coastal zone regulations, and 2) parish-wide ordinance amendments and other restrictive measures applicable to specific development stages are proposed.

Chapter 4 concludes the study with a brief discussion of a process for developing future urban development regulations in the coastal zone.

The information and suggestions presented in this study are intended to assist local parish coastal zone regulatory and planning efforts. Hopefully, the ultimate result will be improved planning and wiser use of the region's coastal lands and resources.

PREFACE

The intent of this study is to survey existing urban development practices in Louisiana's coastal zone, to identify problem areas in wetlands development, and to assess the adequacy of and suggest improvements for current coastal zone development regulatory mechanisms. The development guidelines proposed are presented as a step toward problem mitigation and more beneficial urban development practices for the coastal area.

A number of persons assisted in the preparation of this study and many are named in references throughout the text. They include representatives from various local parish planning and governmental bodies within the coastal zone as well as individuals at regional planning and development commissions. Also of great assistance in providing necessary information were individuals at various state and federal agencies, private firms, and universities. Danny Clement of the U.S. Soil Conservation Service and Roger Swindler of the U.S. Army Corps of Engineers were particularly helpful in providing technical advice. James Renner of the State Planning Office (SPO) served as administrative coordinator between the SPO and the Urban Studies Institute providing both assistance and guidance. The authors wish to express their gratitude to all those who provided valuable assistance.

AJM, Jr.
JSB
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EXISTING DEVELOPMENT REGULATIONS

INTRODUCTION

Of the thirty million acres of estuarine waters and wetlands nationally in thirty-four coastal states and territories, Louisiana has about seven million acres, surpassing all other states (Louisiana Advisory Commission on Coastal and Marine Resources, 1973: 19). However, with the economic blessing of a productive wetlands area rich in mineral, marine and wildlife resources, goes a scarcity of land suitable for urban land uses (Figure 1.1).

Various urban centers have developed along the Louisiana coastline, thriving on the easy accessibility to shipping channels, oil and gas fields, seafood beds, wildlife hunting and trapping grounds, etc. Those Standard Metropolitan Statistical Areas (SMSA's) which are included in the Louisiana coastal zone are New Orleans, Lake Charles, and a portion of the Baton Rouge SMSA.[1] Major cities of coastal Louisiana as well as smaller, satellite cities and towns have quickly

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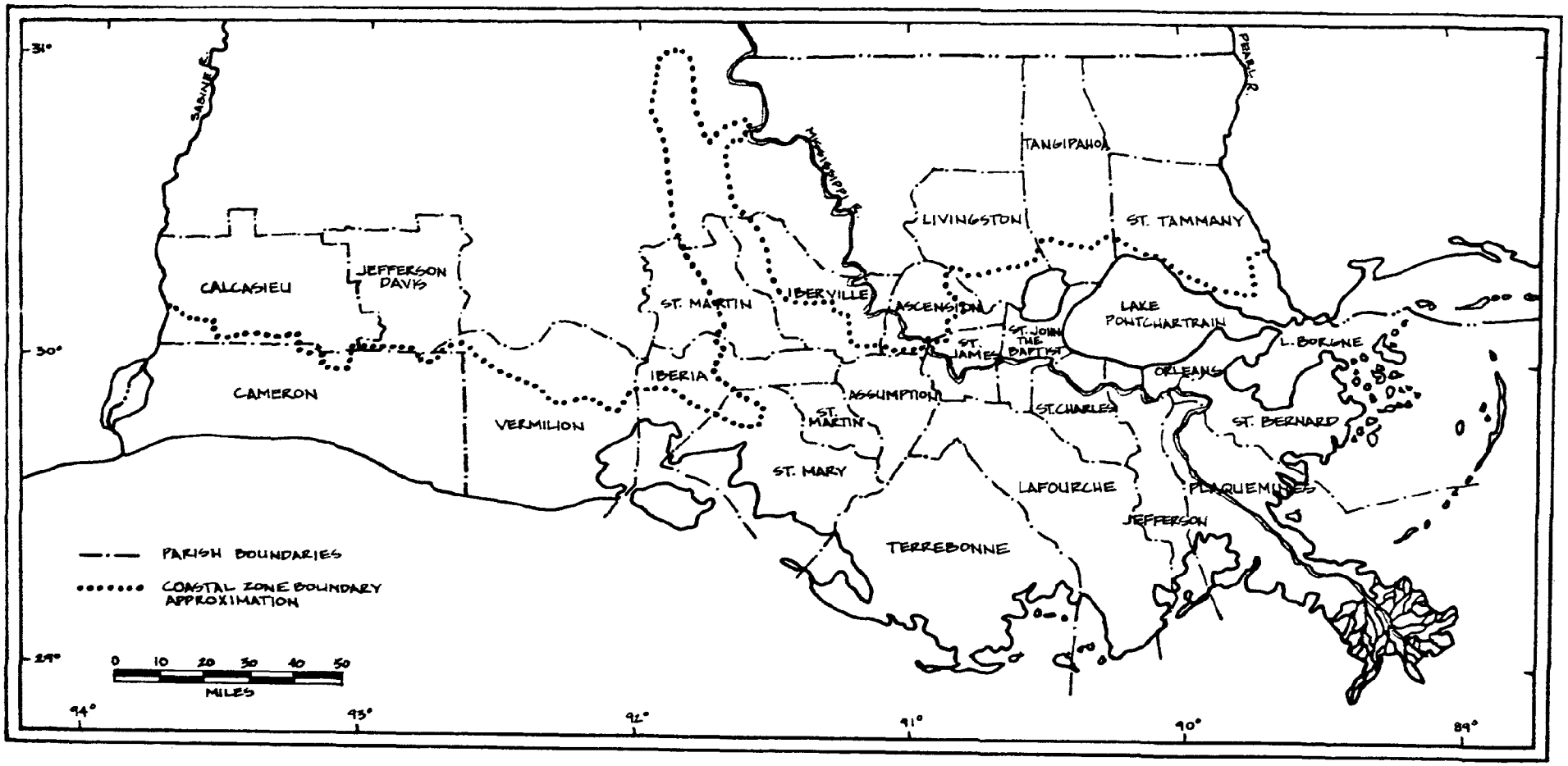
[1]The New Orleans SMSA is composed of Orleans, Jefferson, St. Bernard and St. Tammany Parishes. St. Charles Parish, while not formally a part of the SMSA, has already felt development pressure from the expanding New Orleans area. Calcasieu Parish comprises the Lake Charles SMSA. Only the parishes of Ascension and Livingston within the Baton Rouge SMSA (Ascension, Assumption, East Baton Rouge, West Baton Rouge, Livingston) are included in the definition of the Louisiana coastal zone. The Lafayette SMSA composed entirely of the parish of Lafayette is not included in the defined coastal zone. A thin strip of wetlands lies in the extreme eastern portion of Lafayette Parish with most of the nearby wetlands lying in St. Martin Parish (Mumphrey et al., 1975 and McIntire et al., 1975).

FIGURE 1.1

PROPOSED BOUNDARY OF THE COASTAL ZONE OF LOUISIANA



Source: Proposed by McIntire et al., 1975:3 to Louisiana State Planning Office. Actual boundary pending approval by Louisiana legislature.

utilized existing high ground on natural levees, etc. for residential, commercial, and industrial centers. This left reclamation of surrounding wetlands as the most common means of urban expansion.

Considering the span of time over which the reclamation process has taken place, it is only recently that the value of viable wetlands has been recognized (Mumphrey et al., 1975: 96-137) and efforts made to control urban sprawl. Chapter 1 reviews current development ordinances and codes in the twenty-two parish Louisiana Coastal Zone, showing to what degree special wetland characteristics restricting urban development potential have been considered.

For the purposes of this study, a distinction is made between the terms non-fast land and fast land. Non-fast land is herein defined as an area in its wetland state, subject to tidal inundation. Fast land is defined as a former wetland which has been separated from the estuarine system by means of a levee or floodwall and is no longer subject to frequent flooding.

Current practices of parish-wide development regulation (i.e. zoning ordinances, building codes, subdivision regulations) apply to construction on dry land, with existing fast lands falling into this category. Most large scale development in coastal areas takes place only after the wetland has been leveed, drained, cleared, and filled. Only minor development such as residential camps and duck blinds takes place on non-fast lands due to state and federal restrictions

related to flood insurance requirements, health standards, navigation controls, etc. These restrictions on fast and non-fast lands will also be discussed in this chapter.

Appendix 1.3 is an annotated bibliography of planning and regulation documents which have been prepared in the twenty-two coastal parishes.

ZONING ORDINANCES

Table 1.1 illustrates the current state of zoning in the twenty-two parishes of Louisiana comprising the coastal zone. The zoning ordinance is a governmental tool for controlling the use of land in such a way as to make it compatible with contiguous land uses.

> Actually the zoning ordinance protects the property owner by preserving the value of his property. Adjacent property owners are also controlled by the ordinance so that one cannot jeopardize the value of his neighbor's property by using his property in a manner which would have this result (Imperial Calcasieu Regional Planning and Development Commission, 1975: 29).

While the usefulness of a zoning ordinance as a tool in maintaining orderly growth and preserving private property values has become more widely accepted, only approximately 30 percent of the coastal parishes have as yet adopted zoning. A number of additional parishes are currently considering zoning ordinances on a parish-wide scale.

Current Zoning Constraints

Of those parishes which have enacted zoning ordinances, few restrictions are placed specifically on development in

fast and non-fast lands. Existing restrictive wetlands districts in each of the currently zoned parishes are described and compared in the following summary:

Calcasieu Parish — U -- Unclassified District

This district includes wetlands located within the parish. There are no zoning restrictions placed on lands in this district and all land uses are allowed. Structures built in the "U" District are subject only to the state sanitary code with no other building code restrictions. Unclassified lands are termed "under study" for possible future zoning changes (Calcasieu Parish Police Jury, 1962).

Jefferson Parish — U-1 -- Unrestricted District

This includes lands where "it has been determined that development will be retarded due to the natural topography of the area". All land uses are allowed other than those which emit offensive odors, gases, noise, etc. However these can be allowed by special permit from the parish council (Jefferson Parish Council, 1974: 70).

Orleans Parish — NU -- Non-Urban District

This district allows "limited development" in areas outside the protective levees of the Board of Commissioners of the Orleans Levee District. All land uses are permitted subject to the provisions and performance

TABLE 1.1 CURRENT COASTAL ZONE PARISH ORDINANCES,
(See Appendix 1.3 -- Annotated Bibliography Under Parish

PARISH	ZONING ORDINANCE	SUBDIVISION REGULATIONS
ASCENSION	———	———
ASSUMPTION	Code Proposed, 1973; Not Adopted	Code Proposed, 1973; Not Adopted
CALCASIEU	Comprehensive Zoning Ordinance, 1962; Adopted (Revised ordinance drafted, not yet adopted)	Subdivision Regulations, 1974; Adopted
CAMERON	No Code	No Code
IBERIA	Code Proposed, 1974; Not Adopted	Subdivision Regulations, (n.d.); Adopted
IBERVILLE	———	———
JEFFERSON	Comprehensive Zoning Ordinance, As Amended, 1974; Adopted	Subdivision Regulations, As Amended, 1972; Adopted
JEFFERSON DAVIS	No Code	No Code
LAFOURCHE	Ward 10 Code Proposed, 1974; Not Adopted	Subdivision Regulations; Central (1975), South, Parish-wide, and Thibodaux; Adopted
LIVINGSTON	No Code	Subdivision Regulations currently being drafted
ORLEANS	Comprehensive Zoning Ordinance, 1971 Revised; Adopted	Regulations Governing the Subdivision of Land in New Orleans, La., 1950; Adopted

REGULATIONS, AND CODES -- DECEMBER 31, 1976

Listing for Further Details On Existing Regulations)

BUILDING CODE	REMARKS
———	No information available after contacting both the parish government and the Capitol Region Planning Commission, Baton Rouge, Louisiana.
Code Proposed, 1973; Not Adopted	Source: Letter from Assumption Parish Police Jury, Oct. 12, 1976
Southern Standard Building Code; Adopted (not enforced)	Sources: Allen Cartier and Dean Ford, Imperial Calcasieu Regional Planning and Development Commission
Southern Standard Building Code; Adopted (not enforced)	Source: Allen Cartier, Imperial Calcasieu Regional Planning and Development Commission
Building Code Currently under consideration	Sources: Bert Landry, Acadiana Planning and Evangeline Economic Development District; Acadiana Coastal Zone Resources Inventory
———	No information available after contacting both the parish government and the Capital Region Planning Commission, Baton Rouge, Louisiana
Building Code and Related Regulations, 1952; Adopted	———
Southern Standard Building Code; Adopted (not enforced)	Source: Allen Cartier, Imperial Calcasieu Regional Planning and Development Commission
No Code	Sources: Irwin Joubert, South Central Planning and Development Commission Letter from Central Lafourche Planning Commission, Oct. 15, 1976
No Code	Source: Letter from Livingston Parish Planning Commission, Oct. 11, 1976
Building Code, Parish of Orleans, 1975 Revised; Adopted	Also: Coastal Zone Management Plan, 1975; Not Adopted (as of this date)

TABLE 1.1 CURRENT COASTAL ZONE PARISH ORDINANCES,
(See Appendix 1.3 -- Annotated Bibliography Under Parish

PARISH	ZONING ORDINANCE	SUBDIVISION REGULATIONS
PLAQUEMINES	Comprehensive Zoning Ordinance, 1975; Adopted	Subdivision and Resubdivision Ordinance, 1970; Adopted
ST. BERNARD	Comprehensive Zoning Ordinance, 1971; Adopted	Subdivision Regulations, 1956; Adopted (not in use) Revised Code Proposed, 1963; Not Adopted
ST. CHARLES	Comprehensive Zoning Ordinance, 1966; Adopted	Subdivision Regulations, 1969; Adopted
ST. JAMES	No Code	No Code
ST. JOHN THE BAPTIST	No Code	Subdivision Regulations, (n.d.); Adopted
ST. MARTIN	No Code	Subdivision Regulations, 1969; Adopted Updated to 1976
ST. MARY	No Code	Subdivision Regulations, 1960; Adopted Updated to 1974
ST. TAMMANY	Land Use Ordinance, 1972; Adopted	Subdivision Regulatory Ordinance, As Amended, 1975; Adopted
TANGIPAHOA	Code Proposed, 1973; Status of adoption not known	Code Proposed, 1973; Status of adoption not known
TERREBONNE	No Code	Subdivision Regulations, 1975; Adopted
VERMILION	No Code	Subdivision Regulations, 1975; Adopted

REGULATIONS, AND CODES -- DECEMBER 31, 1976
Listing for Further Details On Existing Regulations)

BUILDING CODE	REMARKS
Building Code Ordin. No. 15, As Amended, (n.d.); Adopted National Building Code, Abbrev. Ed., As Amended; Adopted	———
Building Code, Parish of St. Bernard, 1965; Adopted	Also: Environmental Baseline Study, 1972 Resource Management, St. Bernard Parish Wetlands, 1976
Southern Standard Building Code Proposed, 1973; Not Adopted	Source: Letter from St. Charles Parish Police Jury, Oct. 11, 1976
Building Code, (n.d.); Adopted	Source: Irwin Joubert, South Central Planning and Development Commission
No Code	Source: Irwin Joubert, South Central Planning and Development Commission
No Code	Source: Letter from St. Martin Parish Planning Commission, Oct. 15, 1976
Building Code Ordinance No. 777, 1973; Adopted	Source: Letter from St. Mary Parish Police Jury, Oct. 12, 1976
No Code	Source: Craig Sinden, St. Tammany Parish Planning Department
———	No confirmation of code adoption available after contacting both the parish government and the Capital Region Planning Commission, Baton Rouge, Louisiana
No Code	Source: Letter from Houma-Terrebonne Regional Planning Commission, Oct. 12, 1976
No Code	Source: Bert Landry, Acadiana Planning and Evangeline Economic Development District

standards of the Building Code of the City of New Orleans (New Orleans City Council, 1971rev.: 92-93).

Plaquemines Parish — FP -- Flood Plain District

This district comprises areas subject to periodic or occasional inundation from stream overflows, storms and tidal conditions which are not within publicly owned hurricane protection levees and pump drainage systems. All residential, commercial and industrial structures are permitted if they meet the requirements of the parish building and sanitary codes (Plaquemines Parish Commission Council, 1975: 41).

St. Bernard Parish — A-1 -- Rural District

This classifies all existing non-urbanized sections of the parish under one district. The majority of the land contained within this classification is wetlands. All land uses are allowed by right, however, heavy industry must comply with special conditions (St. Bernard Parish Police Jury, 1971: 21).

St. Charles Parish — A-1 -- Rural District

This district includes the major proportion of wetlands within the parish and is set aside for agricultural and low density residential uses. Structures built in the A-1 District are subject to the state sanitary code with no other building code restrictions at present.

Industrial, commercial, and high density residential developments are excluded from this district (St. Charles Parish Police Jury, 1966).

St. Tammany Parish F -- Inundation District

This district is unique in that it applies special land use regulations to areas subject to severe inundation at frequent intervals, while permitting reasonable economic use of such property. The "F" District requires elevation of main floor levels for all structures to a height of not less than one foot above the highest recorded flood levels since 1921. Within the "F" District along the coast of Lake Pontchartrain, main floor elevation is set at a minimum of eight feet above mean sea level. In other inundation areas of the "F" District, floor levels may not be less than indicated on the district map unless the level is amended by a report of the parish engineer based on improved data. The stated purpose of this control is "to protect human life, prevent or minimize material losses and reduce the cost to the public of rescue and relief efforts occassioned by the unwise occupancy of such flood areas" (St. Tammany Parish Police Jury, 1972: 7).

Based on available data, the St. Tammany Parish Inundation District is the only currently enacted zoning control which places special constraints on development in fast and

non-fast lands. This is accomplished by means of the minimum required structural floor elevation above mean sea level.

SUBDIVISION REGULATIONS

Another method of land use control currently in practice in the coastal parishes is subdivision regulations. While usually intended to work together with the zoning ordinance to insure an orderly pattern of growth, many parishes have adopted subdivision regulations without the accompanying zoning controls. This immediate measure has been taken to regulate the layout of numerous recently constructed subdivision developments.

> The subdivision regulation governs the partitioning of land into smaller portions for the eventual sale of these newly created areas. The regulations include as a minimum, specifications for road construction as well as drainage requirements.
>
> The idea is not to limit or stop growth, but rather to insure that the community will not suffer in the future from ill-planned and ill-executed development. This suffering on the part of a community usually takes the form of having to assume maintenance of roads and drainage that were not constructed to acceptable specifications (Imperial Calcasieu Regional Planning and Development Commission, 1975: 33).

Twice as many (approximately 60 percent) of the Louisiana coastal parishes have adopted subdivision regulations as have enacted zoning ordinances. Common characteristics and unique features of these regulations are examined next.

Common Characteristics of Subdivision Regulations

There are a number of standard items found in all current parish-wide subdivision regulations. These include:

Standards of Design and Improvements

1. street alignment, construction specifications and minimum width for all classes of thoroughfares
2. lot and block configuration and minimum sizes
3. minimum set-backs for structures on lots
4. sanitary provisions for water supply and sewage disposal
5. drainage system design to accommodate runoff from a specified storm intensity (as determined by the local parish engineer)
6. utility servitudes for electric, gas, telephone, water lines, etc.

Procedural Requirements for Plan Approval

1. preliminary plan submission with all specified design information prior to commencing construction
2. final plat submission with proof that all required roadway and utility improvements have been completed
3. jurisdictional assignments as to which official must certify various phases during the subdivision construction process.

Unique Characteristics in Various Parish Ordinances

While extremely similar in basic format to the standard subdivision regulatory ordinance pattern, there are unique features of subdivision regulations in some parishes making them more responsive to local coastal zone concerns.[2]

Lafourche Parish

Central Lafourche Planning Area Subdivision Regulations specify that all drainage design must be predicated on a ten year storm frequency of one hour duration. Areas under five feet mean sea level must be indicated on the final plat (Lafourche Parish Police Jury, 1975: 16, 20).

Plaquemines Parish

The Subdivision and Resubdivision Ordinance of the Parish of Plaquemines requires the surface elevation of each lot to be a minimum of one foot above mean sea level and at least one foot above the street elevation. The floor slab or first floor elevation for residences must be at least 2½ feet above mean sea level. Land to be subdivided must be within a public drainage district or private drainage system meeting standards set by the Corps of Engineers, the Louisiana Department of Public

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[2]A selected number of parish subdivision regulations are examined in this section. Other parishes which have adopted regulations are as follows: Calcasieu, Iberia, Jefferson, Orleans, St. Charles, St. John the Baptist, Vermilion (see Table 1.1 and Appendix 1.3 accompanying this chapter).

Works and the Plaquemines Parish Commission Council. However, these drainage provisions are not applicable to campsites and subdivisions along waterways providing they meet required parish construction provisions (Plaquemines Parish Commission Council, 1970: 3, 6).

St. Martin Parish

The Subdivision Regulations of St. Martin Parish, Louisiana state that land subject to flooding and land deemed to be "topographically unsuitable" or below certain flood elevations as established by the local engineering authority cannot be platted for residential occupancy, or "for any other uses that might increase flood hazard, endanger health, life or property, or aggravate erosion". Such land must be set aside for uses not endangered by periodic inundation. Fill may be used to raise land in areas subject to flood if the fill proposed does not restrict the flow of water so as to increase flood heights. Elevation requirements can be met by raising floor levels to "safe" heights (St. Martin Parish Police Jury, 1976: 17).

St. Mary Parish

Ordinance Number 655 - Governing the Subdivision of Land in the Parish of St. Mary, Louisiana requires that the final plat submitted to the parish engineer include delineation of any areas which have been subject to

floods within a period of ten years prior to the date of the final plat (St. Mary Parish Police Jury, 1960: 11).

St. Tammany Parish

The Subdivision Regulatory Ordinance of St. Tammany Parish, Louisiana makes special provisions for subdivisions with lots fronting on canals or water bodies primarily used as recreational part-time residences. Street grades must be of such elevations that they are not inundated by normal high tides. Also the subdivision plat for any residential development must show areas subject to inundation at flood stage (St. Tammany Parish Police Jury, 1975 rev.: 9.01, 4.02).

Terrebonne Parish

Terrebonne Parish, Louisiana Subdivision Regulations require that subsurface drainage be designed to accommodate a five year recurrent storm interval (Terrebonne Parish Police Jury, 1975: 19).

Other parish subdivision regulations need to be reviewed and updated by local authorities to include standards for development in all flood-prone and subsidence-prone coastal areas.

BUILDING CODES

As in the case of parish-wide zoning ordinances, not all parishes have as yet adopted building codes. A large

percentage of those codes which are currently in use are not thoroughly responsive to the special problems of construction in wetlands.

> The building code is designed primarily as a device to protect the public health, safety and general welfare of the community by establishing minimum standards for the construction or renovation of buildings.
>
> The building code accomplishes two important tasks, the first of which is to form or develop a basic understanding between the builder and buyer that the structure is in conformance with the requirements of the code. Secondly, the building code forms a basis for continuing understanding between the community and each citizen as to what exactly constitutes a safe and acceptable structure (Imperial Calcasieu Regional Planning and Development Commission, 1975: 7).

Of those parishes which do have building codes, the majority have taken the simplest route and adopted, unaltered, the regulations of one of the standard national codes. The model codes considered acceptable by the U.S. Department of Housing and Urban Development (as quoted in Imperial Calcasieu Regional Planning and Development Commission, 1975: 10) are as follows:

Building Officials and Code Administrators (BOCA) BOCA Basic Building Codes. 1975.

American Insurance Association (AIA) National Building Code. 1967.

Southern Building Code Congress, International (SBCC) Southern Standard Building Code. 1973, with 1975 supplements.

International Conference of Building Officials (ICBO) Uniform Building Code. 1973.

In some cases, the codes have been adopted in total. In other instances, the standards have been selectively incorporated into specific parish-wide codes.

Orleans Parish exemplifies this second approach. Using standard national codes as a basis, the parish has derived its own more restrictive construction standards. Recently, Orleans Parish has also updated various sections of its building code to further increase controls (Gates, 1976). Jefferson Parish's building code, which along with that of St. Bernard Parish is based on the Orleans code, is currently undergoing revisions as well which will make it more restrictive on development practices (Chalona, 1976).

Among the standard national codes adopted by a number of the twenty-two coastal parishes, the Southern Standard Building Code (Southern Building Code Congress, 1973) is perhaps the most widespread. Because it is a regional code, it does relate to some of the local conditions of the southern coastal states. Although comprehensive in its coverage of general factors related to coastal development, the Southern Standard Code makes no specially identified provisions for construction on the unstable soils of fast lands which were at one time part of the estuarine system.

Since the foundation code of each parish may be the most significant aspect of the building code in terms of coastal zone development guidelines, the following comparative discussion of the Southern Standard and Orleans Parish

foundation codes will attempt to point out areas of special concern in the existing building code structure.

Southern Standard Building Code

Chapter XIII of the code addresses itself to standards for excavations, footings and foundations. Since it is written in terms which can be applied to any locality throughout the South, there is a great deal of emphasis placed on design of footings and foundations down to natural solid ground. Consideration is given to the presumptive bearing capacities of soils indigenous to the South, with stricter controls imposed than in other national codes because of the existing substratums (Southern Building Code Congress, 1973: 13-3). The major problem with construction in the coastal zone is a lack of natural solid ground at any reasonable depth; therefore, many of these recommendations are still inappropriate for coastal Louisiana.

The Southern Standard Code does specify two sets of figures for wind pressures as they apply to wind loads on structures. One set of figures deals with normal inland wind velocities and the other takes into consideration the hurricane influence of the coastal area. An appendix to the code also deals with wood preservatives for pilings, etc. which is of regional importance (N-Y Associates, Inc., 1973: 2-2).

Orleans Parish Building Code

Part X, Chapter 28 of the Orleans code was published in its newly revised form in July, 1975. This code, on excavations, footings and foundations, has been strengthened in the areas which apply specifically to coastal development, namely specifications for pile foundations. Due to the unstable conditions of the highly organic soils of former wetlands, it is the "skin friction" between piles and soil particles, rather than transfer of loads to a stable subsoil strata, which supports structures.

The following items are covered under the foundation code and relate to construction in the coastal zone:

- Subsoil investigation
- Excavations
- Spread foundations
- Pile foundations
  - Design
  - Pile load
  - Splices
- Timber piles
  - Treated
  - Untreated
  - Wood-concrete composite
- Concrete piles
  - Precast
  - Cast-in-place
- Steel piles
- Combination piles
- Lightly loaded piles
- Wind pressure and combined loads

(New Orleans City Council, 1975 rev.: Chapter 28).

The last two items are of particular concern for development in both fast and non-fast lands. Special allowances are made for pile support of light structures such as houses, camps, etc. Required pile penetration is reduced from 50 to

30 feet and soil borings are not required. Also specific attention is given to the danger of wind pressure from hurricane force storms on pile supports. Bearing values required for piles are increased by one-third when subjected to wind and other loads and the combined load cannot exceed the safe allowable capacity of the soil or pile (New Orleans City Council, 1975 rev.: Chapter 28, 8-9).

The Orleans Parish foundation code, under Article 2805--"Notification to City", also requires a minimum of 24 hours notice to the Director of the Department of Safety and Permits in advance of any pile driving. This allows for even greater control through supervision on the quality of construction materials and methods used in structural foundation support.

While it should not be considered as a model code, the Orleans Parish building code is more strict in most aspects of construction on former wetlands than the Southern Standard code. Currently it is the most comprehensive available building code among those in effect in coastal Louisiana.

COASTAL ZONE MANAGEMENT CONTROLS UNDER CONSIDERATION

Certain of the coastal parishes have gone one step further than their existing zoning, subdivision regulations and building code controls by initiating coastal zone management studies. Completed reports include information on special problem areas of the parish wetlands as they are impacted by urban development pressure, expansion of oil

and gas extractive operations, etc. Remedies for these problems are suggested in some instances. The following discussion briefly summarizes these ongoing parish efforts.[3]

Orleans Parish

The three-volume Coastal Zone Management Plan (1975) prepared by the City Planning Commission identifies distinct environmental areas within the City of New Orleans and recognizes the fact that present land use control devices do not provide any real remedy for problems peculiar to the wetlands. Subsidence problems in recently urbanized fast lands and water pollution problems in Lake Pontchartrain and the Mississippi River from urban sources are among those concerns identified. Recommendations are made that alternative construction techniques for reclaimed wetlands be studied along with alternative drainage methods reducing subsidence for already leveed, but presently undeveloped areas. Also the Coastal Zone Management (CZM) plan urges parish-wide enforcement of the Federal Water Pollution Control Act (U.S. Congress, 1972) and federal funding to construct secondary sewage treatment facilities as a water pollution abatement measure. The CZM plan incorporates minimum first floor elevation restrictions and additional flood-proofing

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[3]For a more complete discussion of coastal zone management efforts in the New Orleans SMSA, see Mumphrey et al., 1976: 137-161 and 342-357.

requirements as specified by the Federal Insurance Administration (FIA) Flood Insurance Program (City Planning Commission of New Orleans, 1975: Volumes II and III).

St. Bernard Parish

While not having formally completed a CZM plan, St. Bernard Parish has commissioned two comprehensive studies dealing with wetland characteristics, present and potential development problems, and proposed solutions. The Environmental Baseline Study (1972) recommends a system of priority uses and management policies for each of ten units within the parish. The suggested management policies range from preservation which prohibits any permanent structures, urban services or canals, to some degree of urban use with adequate flood protection and drainage provided (Coastal Environments, Inc., 1972).

A recently completed report, Resource Management -- St. Bernard Parish Wetlands (1976), delves further into the wetlands policy area. Specific options open to the parish for wetlands control are discussed. These include direct acquisition of land, stronger regulatory controls and permitting systems, transfer of development rights, etc. These policy suggestions take into consideration existing parish programs and regulations. Procedures for St. Bernard to use in identifying goals for wetland development or conservation are also outlined (Coastal Environments, Inc., 1976: 114-134).

In late 1976, all parishes in the Louisiana coastal zone except Plaquemines, Livingston, Iberville, and Ascension have agree to participate with the Louisiana State Planning Office in deriving parish CZM plans.

H.U.D. FLOOD INSURANCE REGULATIONS[4]

This section outlines restrictions placed on development practices by the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The National Flood Insurance Program, which was created by this legislation, is administered by the Federal Insurance Administration, an arm of the Department of Housing and Urban Development.

Background of the National Flood Insurance Program

A 1965 flood insurance feasibility study undertaken by the Secretary of Housing and Urban Development concluded that many people in high flood risk areas are seriously uninformed about the risks of flood damage to their property. However, when the inevitable flood disaster does strike, they fully expect public assistance in re-building their community. The study also found that the majority of people in flood risk areas do not consider a requirement of flood insurance as a condition for obtaining a loan on property to be unreasonable (U.S. Congress, Senate, 1966).

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[4]Derived from the Department of Housing and Urban Development National Flood Insurance Program Section 1910.3 -- Required flood plain management regulations for flood-prone areas (Federal Insurance Administration, 1975).

Congress was encouraged to declare that, as a matter of national policy, all lending institutions with federally insured savings or deposits would require flood insurance on all new mortages in high risk areas as they now generally require fire insurance. This requirement became mandatory for identified special flood hazard areas within communities under Section 102 of the Flood Disaster Protecion Act of 1973 (U.S. Congress, Senate, 1966).

The Federal Insurance Administration adopted the so-called "100-year flood" as the standard for the identification of special flood hazard areas and as the base flood elevation for the adoption of local land use controls. The term "100-year flood" is actually what the Corps of Engineers refers to as an "intermediate" flood and is a compromise between minor floods and the Corps' "standard project flood", which is the greatest flood thought likely to occur in a given area. In many cases, the 100-year or intermediate flood is already far below the flood of record. The "100-year flood" is simply the flood level that is estimated to have a 1-percent chance of occurring each year in a given location (U.S. Department of Housing and Urban Development, 1971: 47).

In justifying the 100-year flood standard, it was felt that the National Flood Insurance Program could not look merely at the local record flood in setting standards since its whole purpose was to alert communities to the degree of

flood hazard before a flood occurs. Thus, the best available, scientifically-valid standard was the predictable periodic flood taking both history and probability into account. This compromise standard is the 100-year flood level (U.S. Department of Housing and Urban Development, 1974: 47).

Stages of Regulation

Regulation of practices within Section 1910.3 of the Program is set up on an accelerating scale based on the amount of flood data currently available for an area. When only general information about the flood-prone nature of an area is available, then restrictions on development practices are broadly defined. As more detailed hydrologic and other technical data is gathered for a particular community by Federal or State agencies, consulting services, or the Administrator of the Flood Insurance Program, then standards for practices become more specific. Once flood insurance regulations are adopted, any new development in a special flood hazard area that does not meet the required construction specifications will not be covered by subsidized flood insurance (Keyes, 1976: 54).

Stages of regulation include the following:

1. The flood plain areas of a community are identified as flood-prone. (Definition of terms follows.)

2. Special flood hazard areas within a community are defined with publication of a Flood Hazard Boundary Map (FHBM).
3. Water surface elevation data for the 100-year flood within certain areas of special flood hazards is provided.
4. Specific floodways are identified.
5. The coastal high hazard area is identified.

Definitions[5]

1. "Flood plain" or "flood-prone area" means a land area adjoining a river, stream, watercourse, ocean, bay, or lake, which is likely to be flooded.
2. "Flood" or flooding" means a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of streams, rivers, or other inland water; or abnormally high tidal waters or rising coastal waters proximately caused by severe storms, hurricanes, or tsunamis. It also includes collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels.

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[5]Federal Insurance Administration, 1976 rev.

3. "Special flood hazard area" or "flood plain area having special flood hazards" means that maximum area of the flood plain that, on the average, is likely to be flooded once every 100 years (i.e., that has a 1-percent chance of being flooded each year).
4. "100-year flood" means the highest level of flooding that, on the average, is likely to occur once every 100 years (i.e., that has a 1-percent chance of occurring each year).
5. "Floodway" means the channel of a river or other watercourse and the adjacent land areas required to carry and discharge a flood of a given magnitude.
6. "Coastal high hazard area" means the portion of a coastal flood plain having special flood hazards that is subject to high velocity waters, including hurricane wave wash and tsunamis.
7. "Substantial improvement" (hereafter referred to as "improvement") means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either, (a) before the improvement is started, or (b) if the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other

structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either (1) any alteration to comply with existing state or local health, sanitary, building, or safety codes or regulations; or (2) any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

Requirements

The requirements for meeting Flood Insurance Program standards are listed for each of the regulatory stages.

1. Minimum restrictions on practices at the stage of information gathering are as follows:
   Subdivision proposals and other proposals for new developments must be reviewed by local authorities to assure that
   a. They are consistent with the need to minimize flood damage.
   b. All public utilities and facilities such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage.
   c. Adequate drainage is provided to reduce exposure to flood hazards.

2. Publication of a Flood Hazard Boundary Map (FHBM) for a community identifying special flood hazard areas increases the regulations as follows:
   a. Any available 100-year flood elevation data must be utilized in administering the standards for all flood plain areas.
   b. Building permits are required for all proposed construction and substantial improvements in the special flood hazard area.
   c. At the time a building permit is issued, information must be obtained concerning the elevation of the lowest floor of the structure (including basement) in relation to mean sea level. Where the lowest floor is below grade on one or more sides, the elevation of the floor immediately above must be obtained. An official record of this information must be maintained.
3. Notice of a final flood elevation determination providing water surface elevations for the 100-year flood within certain areas of special flood hazards increases the regulations as follows:
   a. Review by local authorities of building permit applications for new construction and improvements within the special flood hazard area is required to assure that the proposed construction is designed (or modified) and anchored to prevent flotation, collapse or lateral movement of the structure.

b. New or replacement water supply systems and sanitary sewage systems within the special flood hazard area must be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the system into flood waters. On-site waste disposal systems must be located to avoid impairment of them or contamination by them during or subsequent to flooding.

c. New residential structures and improvements within the special flood hazard area for which base (100-year) flood elevations have been provided must have the lowest floor (including basement) elevated to or above the level of the 100-year flood, unless an exception for basements is granted.

d. New non-residential structures and improvements within the base flood elevation specified area must be flood-proofed (together with attendant utility and sanitary facilities) to or above the 100-year flood level if their lowest floor elevation is below that level. Flood-proofing must be in compliance with the U.S. Army Corps of Engineers' standards.[6]

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[6]See U.S. Army Corps of Engineers (1972) Flood-Proofing Regulations.

e. The adequacy of flood-proofing methods utilized must be certified by a registered professional engineer or architect to withstand the flood depths, pressures, velocities, impact and uplift forces and other factors associated with the 100-year flood. An official record of such certificates must be maintained.

f. New mobile home parks, expansions or improvements must require Mobile Home Manufacturers Association (MHMA) standard ground anchors for tie downs, adequate surface drainage and hauler access, elevation of lots on compacted fill or piers within the base flood elevation specified area to the 100-year flood level, and placement of pier foundations no more than 10 feet apart with steel reinforcement for piers over 6 feet high.

g. For mobile homes moving into existing parks, the fact that the area is in a flood plain with special flood hazards must be disclosed to the purchaser or lessee in the purchase contract, deed or lease. An evacuation plan indicating alternate vehicular access and escape routes must be filed with Disaster Preparedness Authorities.

h. In riverine situations, until a floodway has been designated, no use, including land fill, may be permitted within the identified base flood elevation area unless it is demonstrated that the effect of the proposed use in combination with all other existing and anticipated uses will not increase the 100-year flood water surface elevation more than 1 foot anywhere within the community.

4. Provision of data identifying a floodway(s) increases the regulations as follows (regulations apply only to the designated floodway):
   a. All fill, encroachments, new construction and improvements which would increase 100-year flood heights within the community are prohibited.
   b. Location of any portion of a new mobile home park, expansion of an existing facility and placement of a mobile home other than in an existing facility is prohibited.
5. Identification of a coastal high hazard area increases the development regulations as follows (regulations apply only to the coastal high hazard area):
   a. All new construction and improvements must be located landward of the reach of the mean high tide.

b. All new construction and improvements must be elevated on adequately anchored piles or columns to a lowest floor elevation (including basement) at or above the 100-year flood level. Structures must be securely anchored to such piles or columns.

c. New construction and improvments must have the space below the lowest floor free of obstructions or be constructed with "breakaway walls" intended to collapse under stress without jeopardizing the structural support of the building. This is intended to minimize the impact of abnormally high tides or wind-driven water on the building. Such temporarily enclosed space shall not be used for human habitation.

d. The use of fill for structural support shall be prohibited.

e. Location of any portion of a new mobile home park, expansion of an existing facility, and placement of a mobile home other than in an existing facility is prohibited.

CORPS OF ENGINEERS PERMITTING PROGRAM

All small and large scale development -- residential, commercial, or industrial -- occurring in so called "navigable waters" including unprotected flood areas requires a

permit issued by the U.S. Army Corps of Engineers. The initial legislation that gave the Corps these powers was known as the Federal Water Pollution Control Act Amendments of 1972 (FWPCA), Section 404. Since then, more recent administration and judicial interpretations of what constitutes "navigable waters of the United States" has expanded the Corps' scope of jurisdiction.

On May 6, 1975 the Department of the Army published four alternative proposed regulations as a response to a court order stemming from the trial Natural Resources Defense Council, Inc. v. Callaway, 392 F. Supp. 685 (1975). Each alternative pertained to the regulation by the Corps of Engineers of those activities which involved the discharge of dredge or fill material into navigable waters, and included administrative definitions of the terms "navigable waters", "dredged material", and "fill material". Comments were solicited from private citizens and local and state officials as to the final form the regulations should take (U.S. Army Corps of Engineers, 1975: 31320). An interim final regulation was published by the Corps and put into effect on July 25, 1975 in order to implement a permit program under Section 404 of the FWPCA. This would include those waters which had recently come under the Corps' jurisdiction as a result of the court action (U.S. Army Corps of Engineers, 1975: 31320).

Implementation of the interim final regulation was broken into three phases: Phase I became effective on

July 1, 1975 and extended the Corps' control of discharges of dredged or fill material to contiguous or adjacent wetlands of all navigable coastal waters plus those contiguous or adjacent wetlands relating to navigable inland lakes, rivers, and streams already within the Corps' jurisdiction. Phase II, effective July 1, 1976, further extended control to primary tributaries (the main stems of tributaries directly connecting to navigable waters of the United States). Phase III will become effective July 1, 1977 and will complete the Corps' control to all navigable waters as they have been defined (U.S. Army Corps of Engineers, 1975: 31326).[7]

The definitions of key phrases play an important role in determining the extent of the Corps' control. Included in the definition of "navigable waters" are these three specific paragraphs which directly relate to any proposed wetland development (U.S. Army Corps of Engineers, 1975: 31325):

> All coastal wetlands, mudflats, swamps, and similar areas that are contiguous or adjacent to other navigable waters. 'Coastal wetlands' includes marshes and shallows and means those areas periodically inundated by saline or brackish waters and that are normally characterized by the prevalence of salt or brackish water vegetation capable of growth and reproduction.

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[7] As of September 1976, each house of Congress had passed its own version of a bill which would seriously interfere with the Corps' authority to protect wetlands from developers. The House version would lift regulations from many wetland areas while the Senate's version would only divide authority between the Corps and the EPA. Neither version passed. However, it is obvious that the Corps' authority is being challenged.

> Freshwater wetlands including marshes, shallows, swamps and similar areas that are contiguous or adjacent to other navigable waters and that support freshwater vegetation. 'Freshwater wetlands' means those areas that are periodically inundated and that are normally characterized by the prevalence of vegetation that requires saturated soil conditions for growth and reproduction.
>
> The term 'discharge of fill material' means the addition of fill material into navigable waters for the purpose of creating fastlands, elevations of land beneath navigable waters, or for impoundments of water. The term generally includes, without limitation, the following activities: placement of fill that is necessary to the construction of any structure in a navigable water; the building of any structure or impoundment requiring rock, sand, dirt, or other pollutants for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands, property protection and/or reclamation devices such as riprap, groins, seawalls, breakwalls, and bulkheads and fills; beach nourishment; levees; sanitary landfills....

Some other relevant terms and phrases which were defined included "dredged material" meaning that material excavated or dredged from navigable waters; "discharges of dredged material" meaning any deposition of material in excess of one cubic yard,when used in a single or incidental operation, into navigable waters; and "fill material" meaning the creation of fill in the traditional sense of replacing an aquatic area with dry land or of changing the bottom elevations of a water body for any purpose.

Applications

Permit applications to the Corps are classified as to one of two types (depending upon the way in which they are

handled). General Permits are issued for those activities which are determined by the Corps to have little or no significant impact on the public interest. They normally involve such small and routine activities as small docks for individual residences or the necessary dredging of waterways to maintain predetermined depths. Each Corps District Office usually has the necessary personnel expertise to review and expedite the issuance of these permits after the application has complied with all the requirements (Swindler, 1976).

If the District Engineer decides that an application will have significant impact on the public interest or the environment, he will guide it through a more complex procedure as shown in Figure 2.1. Usually this procedure is followed when it is determined by the District Engineer after his initial review that due to the magnitude of the proposed project or the nature of the area involved, an environmental impact assessment is required (U.S. Army Corps of Engineers, 1975: 31333).

According to Swindler (1976), the formal responsibility for the preparation of the Environmental Impact Statement lies with the Corps of Engineers. But in reality the responsibility lies with the potential developer through the requirement by law that he furnish all the relevant information concerning the proposed project (Mumphrey et al., 1976: 261).

The following is an analysis of some of the more critical steps as shown in Figure 2.1 plus additional

information which might be helpful to the potential developer in obtaining a permit.

An instruction pamphlet entitled "Applications for Department of the Army Permits for Activities in Waterways" can be obtained from the Corps' District Offices and includes all the necessary information for filing the permit applications.[8] The application requires a complete description of the proposed activity; drawings and sketches; location, purpose, and intended use; information concerning adjacent owners; and approvals from the necessary Federal, State, or local agencies (U.S. Army Corps of Engineers, 1975: 31332).

Public Notice

The public notice is the primary method for soliciting comments about and advising all interested parties of a proposed activity for which a permit is being sought. Public notices are of two types depending upon the type of activity being proposed. If the activity involves the deposition of fill material into navigable waters, interested parties are allowed 30 days in which to file a protest with the Corps. In all other cases, the allowed response time is 20 days (U.S. Army Corps of Engineers, 1975: 31335).

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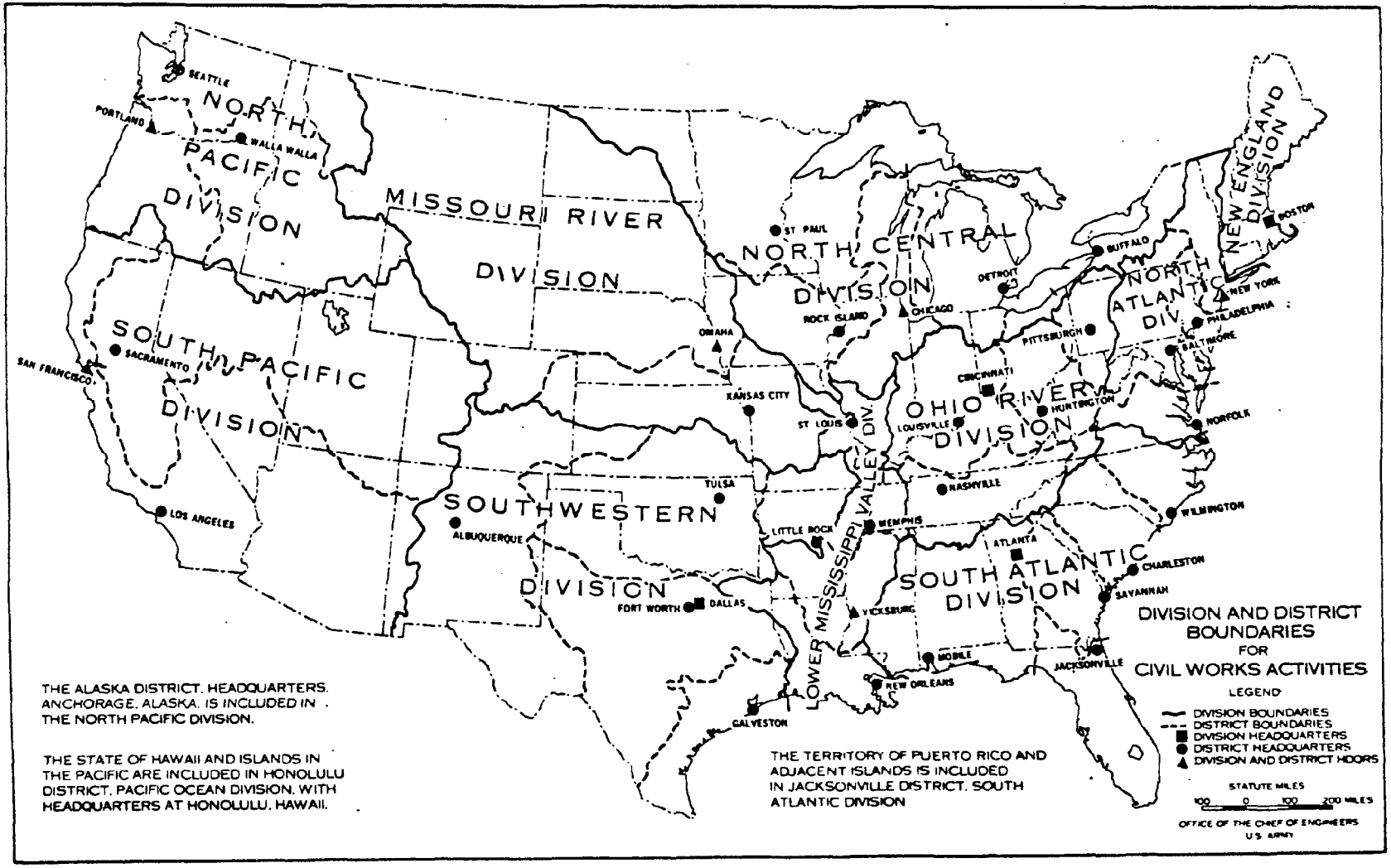
[8]Appendix 1.1 shows the location of the Corps District offices. Appendix 1.2 gives the mailing addresses and telephone numbers of the District Engineers (U.S. Army Corps of Engineers, 1974: F-1 and G-1).

APPENDIX 1.1

LOCATION OF U.S. ARMY CORPS OF ENGINEERS DISTRICT AND DIVISIONAL OFFICES



Source: U.S. Army Corps of Engineers, 1974: F-1.

APPENDIX 1.2

U.S. ARMY CORPS OF ENGINEERS

MAILING ADDRESSES AND TELEPHONE NUMBERS OF THE DISTRICT ENGINEERS

Address correspondence to: The District Engineer, U.S. Army Engineer District		Area Code & Telephone No.
Alaska	PO Box 7002, Anchorage, Alaska 99510	907 753-4192
Albuquerque	PO Box 1580, Albuquerque, N. Mex. 87103	505 766-2764
Baltimore	PO Box 1715, Baltimore, Md. 21203	301 962-4500
Buffalo	1776 Niagara St., Buffalo, N.Y. 14207	716 876-5454
Charleston	PO Box 919, Charleston, S.C. 29402	803 577-4171
Chicago	219 S. Dearborn St., Chicago, Ill. 60604	312 353-6436
Detroit	PO Box 1027, Detroit, Mich. 48231	313 226-6813
Fort Worth	PO Box 17300, Ft. Worth, Tex. 76102	817 334-2153
Galveston	PO Box 1229, Galveston, Tex. 77550	713 763-1211
Huntington	PO Box 2127, Huntington, W. Va. 25721	304 529-2318
Honolulu	Bldg. 96, Ft. Armstrong, Hon, Haw 96813	808 543-2871
Jacksonville	PO Box 4970, Jacksonville, FL 32201	904 791-2211
Kansas City	700 Fed. Bldg, 601 E. 12th St., Kansas City, Mo. 64106	816 374-3756
Little Rock	PO Box 867, Little Rock, Ark. 72203	501 378-5296
Los Angeles	PO Box 2711, Los Angeles, Calif. 90053	213 688-5637
Louisville	PO Box 59, Louisville, KY. 40201	502 582-5607
Memphis	668 Federal Ofc Bldg, Memphis, Tenn. 38103	901 534-3471
Mobile	PO Box 2288, Mobile, Ala. 36628	205 690-2511
Nashville	PO Box 1070, Nashville, Tenn. 37202	615 749-5181
New Orleans	PO Box 60267, New Orleans, La. 70160	504 865-1121
New York	26 Fed. Plaza, New York, N.Y. 10007	212 264-0184
Norfolk	803 Front St., Norfolk, VA 23510	804 625-8201
Omaha	6014 USPO & Courthouse, 215 N 17 St.	402 221-4133
Philadelphia	U S Custom House, 2nd & Chestnut St., Philadelphia, PA 19106	215 597-2812
Pittsburgh	2032 Fed. Bldg, 1000 Liberty Ave., Pittsburgh, PA 15222	412 644-6872
Portland	PO Box 2946, Portland, Ore. 97208	503 777-4359
Rock Island	Clock Tower Bldg, Rock Island, Ill. 61201	309 788-6361
Sacramento	650 Capitol Mall, Sacramento, Cal. 95814	916 449-2580
St. Louis	210 No. 12th St., St. Louis, Mo. 63101	314 268-2106
St. Paul	1210 USPO & Custom House, St. Paul, Minn. 55101	612 725-7557
San Francisco	100 McAllister St., San Francisco, CA 94102	415 556-5178
Savannah	PO Box 889, Savannah, GA 31402	912 233-8822
Seattle	4735 East Marginal Way South, Seattle, Wash 98134	206 764-3495
Tulsa	PO Box 61, Tulsa, OK 74101	918 581-7343
Vicksburg	PO Box 60, Vicksburg, Miss. 39180	601 636-1311
Walla Walla	Bldg. 602, City-County Airport, Walla Walla, Wash. 99362	509 525-5626
Wilmington	PO Box 1890, Wilmington, N.C. 28401	919 763-9971

Source: U.S. Army Corps of Engineers, 1974: G-1.

APPENDIX 1.3

ANNOTATED BIBLIOGRAPHY OF

EXISTING AND PROPOSED REGULATIONS

NOTE: Where applicable, documents contained within this bibliography are noted as being either adopted or not adopted by the local governmental authority.

ASCENSION

No information available after contacting both the parish government and the Capital Region Planning Commission.

ASSUMPTION

Carl Heck Engineers, Inc. (1973) The Comprehensive Plan for Assumption Parish Phase I - Parts I and II; a report prepared for the Assumption Parish Planning Commission. Thibodaux, Louisiana.

Proposes subdivision regulations, a building code, and a zoning ordinance in Part II; places no special constraints on construction in current or former wetlands. Not adopted.

CALCASIEU

Calcasieu Parish Police Jury (1962) Ordinance Number 1097 -- Comprehensive Zoning Ordinance for Calcasieu Parish, Louisiana. Lake Charles, Louisiana: Calcasieu Parish Police Jury.

Places no zoning restrictions on development in areas within the "U"-- Unclassified District including the majority of the parish's wetlands; all land uses are allowed, subject only to the state sanitary code. Adopted.

_____ (1974) Ordinance Number 1498 -- Subdivision Regulatory Ordinance for Calcasieu Parish, Louisiana. Lake Charles, Louisiana: Calcasieu Parish Police Jury.

Not available for review. Adopted.

Diversified Economic and Planning Associates, Inc. (1973) Drainage Study, Calcasieu Parish, Louisiana; a report prepared for the Calcasieu Regional Planning Commission. New Orleans, Louisiana.

Makes recommendations regarding compliance with federal flood insurance requirements.**

_____ (1973) Land Use Plan, Calcasieu Parish, Louisiana; a report prepared for the Calcasieu Regional Planning Commission. New Orleans, Louisiana.

Details methodology by which flood prone areas (as defined by the Drainage Report) were considered in planning future growth patterns; the plan prohibits residential, commercial and industrial land uses in flood prone areas.**

_____ (1973) Modifications of Existing Work Elements, Calcasieu Parish, Louisiana; a report prepared for the Calcasieu Regional Planning Commission. New Orleans, Louisiana.

Recommends amendments to the subdivision regulations pertaining to flood plain regions; proposes changes needed in the existing zoning ordinance to prevent flood damage to urban structures.

CAMERON

No published information available (see Table 1.1).

**Status of adoption not known.

IBERIA

Iberia Parish Police Jury (n.d.) Ordinance Governing the Subdivision of Land in Parish of Iberia, Louisiana. Iberia Parish, Louisiana: Iberia Parish Police Jury.

Not available for review. Adopted.

Simmons J. Barry and Associates (1974) Comprehensive Plan for Iberia Region, Louisiana; a report prepared for the Iberia Regional Planning Commission. Baton Rouge, Louisiana.

Not available for review. Zoning ordinance not adopted; subdivision regulations adopted.

_____ (1973) Future Land Use Plan, Iberia Region, Louisiana; a report prepared for the Louisiana Department of Public Works. Baton Rouge, Louisiana.

Details guidelines for future growth which include prohibiting reclamation of the brackish marsh lands for agriculture and establishing building codes for structures built in flood hazard areas.**

_____ (1973) Storm Drainage and Flood Hazard Report, Iberia Region, Louisiana; a report prepared for the Louisiana Department of Public Works. Baton Rouge, Louisiana.

Recommends adoption of a parish-wide zoning ordinance, and preparation of a set of building codes for structures in flood hazard areas.**

IBERVILLE

No information available after contacting both the parish government and the Capital Region Planning Commission.

**Status of adoption not known.

JEFFERSON

Jefferson Parish Council (1952) Building Code and Related Regulations, Parish of Jefferson. Gretna, Louisiana: Jefferson Parish Council.

Requires in Article 202, Lot Grade, that no structure shall be erected until acceptable grade has been established; this part of the code was revised in 1972 and 1975 making it more restrictive; the entire code is currently undergoing revision to make it more comprehensive in the area of construction on fast lands. Adopted.

_____ (1972) Jefferson Parish Subdivision Regulations, As Amended. Gretna, Louisiana: Jefferson Parish Council.

Places no constraints specifically on housing development in fast lands. Adopted.

_____ (1974) Progressive Jefferson: Comprehensive Zoning Ordinance, As Amended. Gretna, Louisiana: Jefferson Parish Council.

Imposes no special restrictions on development in fast or non-fast lands; U-1 Unrestricted District encompasses lands where "development will be retarded due to the natural topography"; all land uses allowed; industrial or commercial uses which may have offensive characteristics require a special permit. Adopted.

JEFFERSON DAVIS

No published information available (see Table 1.1).

LAFOURCHE

Carl Heck Engineers, Inc. (1973-1975) Comprehensive Plan for Central Lafourche, Phases I, II, and III; a report prepared for the Central Lafourche Regional Planning Commission. Thibodaux, Louisiana.

Considers no specific restrictions on development in fast or non-fast lands.**

Diversified Economic and Planning Associates, Inc. (1974) Model Zoning Ordinance, Ward 10, Lafourche Parish, Louisiana; a report prepared for the South Lafourche Regional Planning Commission. New Orleans, Louisiana.

Proposes a model zoning ordinance which does not consider any special zoning constraints on development in either fast or non-fast lands.**

_____ (1974) Subdivision Regulations, Ward 10, Lafourche Parish, Louisiana; a report prepared for the South Lafourche Regional Planning Commission. New Orleans, Louisiana.

Sets forth no special standards for development on fast or non-fast lands.**

Lafourche Parish Police Jury (1975) Subdivision Regulations of the Central Lafourche Planning Area. Lockport, Louisiana: Central Lafourche Planning Commission.

Requires that areas under 5 feet mean sea level be indicated on the final plat; no restrictions on such lands are specified. Adopted.

URS/Forrest and Cotton, Inc. (1976) Housing Study, Ward 10, Lafourche Parish, Louisiana; a report prepared for the South Lafourche Regional Planning Commission and the Louisiana Commission on Intergovernmental Relations. Metairie, Louisiana.

Describes flood protection levee construction by Corps of Engineers which is currently underway; identifies

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**Status of adoption not known.

flood hazard area south of Golden Meadow which will have "substantially higher costs for new development which must conform to the requirements of the police jury's ordinance controlling development in the 'flood hazard area'".*

LIVINGSTON

No information received after contacting both the parish government and the Capital Region Planning Commission.

ORLEANS

New Orleans City Council (1975 rev.) Building Code, Parish of Orleans. New Orleans, Louisiana: New Orleans City Council.

Details newly revised regulations for pile foundation supports in Chapter 28; places more strict standards on pile preparation and installation including consideration for additional storm wind loads. Adopted.

_____ (1971 rev.) Comprehensive Zoning Ordinance for the City of New Orleans. New Orleans, Louisiana: New Orleans City Council.

Includes all areas that lie outside levee system in the NU Non-Urban District; all land uses are permitted in this district being "consistent with traditional development in these areas"; all buildings are subject to the performance standards of the Building Code of the City of New Orleans. Adopted.

City Planning Commission (1975) Coastal Zone Management Plan Volumes 1, 2, and 3. New Orleans, Louisiana: New Orleans City Planning Commission.

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*Adopted or not adopted not applicable.

Requires the minimum first floor elevation for new residential construction and substantial improvements to be at or above the 100-year base flood level as determined by the Federal Insurance Administration (FIA) Flood Hazard Boundary Maps (ranges from -4 to +12 feet mean sea level); new non-residential construction must either conform to the same elevation restriction or be flood-proofed up to the 100-year base flood level along with its attendant utility and sanitary facilities; construction within special flood hazard areas must utilize materials and utility equipment resistant to flood damage and construction methods which minimize such damage, including anchorage of structures in accordance with the building code to prevent flotation, collapse, or lateral movement. Not Adopted.

_____ (1950) Regulations Governing the Subdivision of Land in New Orleans, Louisiana. New Orleans, Louisiana: New Orleans City Planning Commission.

Requires that subdivider tie into existing sanitary sewer system if feasible; if septic tanks are necessary, they must meet the standards of the Louisiana State Sanitary Code and the New Orleans Board of Health; provisions for storm water disposal are subject to the approval of the Sewerage and Water Board. Adopted.

PLAQUEMINES

Plaquemines Parish Commission Council (1975) Comprehensive Zoning Ordinance of Plaquemines Parish, Louisiana. Pointe-a-la-Hache, Louisiana: Plaquemines Parish Commission Council.

Includes areas which are subject to periodic or occasional inundation and which are not within publicly owned hurricane protection levees and pump drainage systems in the FP Flood Plain District; all commercial and industrial uses are allowed along with residential uses such as camps and mobile homes if they comply with parish sewerage codes. Adopted.

_____ (n.d.) Plaquemines Parish Building Code, Ordinance No. 15, as amended. Point-a-la-Hache, Louisiana: Plaquemines Parish Commission Council.

Not available for review. Adopted.

_____ (1970) Subdivision and Resubdivision Ordinance of the Parish of Plaquemines. Point-a-la-Hache, Louisiana: Plaquemines Parish Commission Council.

Requires the surface elevation of each lot (including those in the above mentioned Flood Plain District) to be a minimum of one foot above mean sea level and at least one foot above the street elevation; the floor slab or first floor elevation for residences must be at least 2½ feet above mean sea level; land to be subdivided must be within a public drainage district or private drainage system meeting certain standards (not applicable to campsites and subdivisions along waterways provided that they meet construction provisions required in the parish building code as amended). Adopted.

ST. BERNARD

Burk and Associates, Inc. (1973) Interim Water Quality Management Plan for Sewerage District No. 2, St. Bernard Parish, Louisiana. New Orleans, Louisiana: Burk and Associates, Inc.

Provides general information on cost effective water pollution abatement strategies considering economic, social and environmental factors.*

Coastal Environments, Inc. (1972) Environmental Baseline Study St. Bernard Parish, Louisiana; a report prepared for the St. Bernard Parish Police Jury. Baton Rouge, Louisiana.

Details background environmental conditions useful for development of policy for future land use control in the parish; describes various management units within the wetlands valuable as a framework in evaluation of future public expenditure and private property interests.*

_____ (1976) Resource Management, St. Bernard Parish Wetlands; a report prepared for the St. Bernard Parish Police Jury -- preliminary. Baton Rouge, Louisiana.

Proposes a series of policy options which are available to the parish ranging from direct control of wetlands to public relations efforts; an approach to setting and implementing goals for resource management is also presented.*

Planning Services, Inc. (1963) Comprehensive Plan for St. Bernard Parish, Louisiana; a report prepared for the St. Bernard Parish Police Jury. New Orleans, Louisiana.

Proposes revised subdivision regulatory ordinance.

Not Adopted.

St. Bernard Parish Police Jury (1971) Comprehensive Zoning Ordinance of the Parish of St. Bernard, Louisiana. Chalmette, Louisiana: St. Bernard Parish Planning Commission.

Zones all non-urbanized sections of the parish (largely wetlands) as A-1 Rural; all land uses are permitted in

*Adopted or not adopted not applicable.

this district, with the exception of heavy industry which must comply with specified conditions. Adopted.

_____ (1965) St. Bernard Parish Building Code. Chalmette, Louisiana: St. Bernard Parish Police Jury.

Follows closely the restrictions detailed in the New Orleans Building Code. Adopted.

_____ (1956) Subdivision Regulatory Ordinance of the Parish of St. Bernard, Louisiana. Chalmette, Louisiana: St. Bernard Parish Police Jury.

Not available for review. Adopted, but not currently in use.

ST. CHARLES

N-Y Associates, Inc. (1974) Existing Land Use and Future Land Use Plan for St. Charles Parish, Louisiana; a report prepared for the St. Charles Parish Planning Commission and Police Jury. Metairie, Louisiana.

Proposes that certain areas of marsh remain undeveloped in the future land use plan; current practices are said to be such that "the parish and state agencies exercise reasonable safeguards and control over these areas to prevent pollution, fires and inappropriate uses of the same".**

_____ (1973) Initial Housing Study, Review of Codes, Subdivision Regulations,Zoning Ordinance for St. Charles Parish, Louisiana; reports prepared for the St. Charles Parish Planning Commission and Police Jury. Metairie, Louisiana.

Reviews the status of various codes within the parish and recommends a number of additions; the study found that there were currently both a zoning ordinance (dated 1966) and subdivision regulations (dated 1969) in effect, but

**Status of adoption not known.

they were felt to be inadequate; adoption of the Southern Standard Building Code was recommended; zoning ordinance addendum proposes creation of a CO-Conservation District with restricted land uses on designated fast and non-fast lands.**

St. Charles Parish Police Jury (1969) St. Charles Parish Subdivision Regulations. Hahnville, Louisiana: St. Charles Parish Police Jury.

Places no restriction on the minimum floor elevation above mean sea level allowable for residences. Adopted.

_____ (1966) The Zoning Ordinance of the Parish of St. Charles, Louisiana. Hahnville, Louisiana: St. Charles Parish Police Jury.

Includes the majority of wetlands within the A-1 Rural District; agricultural and low density residential land uses are allowed within this district with all structures subject to the state sanitary code. Adopted.

ST. JAMES

N-Y Associates, Inc. (1973) Flood Plains and Storm Drainage Study, Revised Population Projections and Future Land Use Plan; Addendum to Subdivision Regulations -- Flood Plains; Addendum to Zoning Ordinance -- Flood Plains; Code Reviews and Recommendations -- Flood Plains; reports prepared for the St. James Parish Planning Commission and Police Jury. Metairie, Louisiana.

Details various land use controls which would assure parish eligibility in the National Flood Insurance Program; proposes flood plain subdivision regulations and building codes which would reduce flood hazards and damage; proposes creation of varying degrees of flood prone districts with gradations in uses permitted and required floor elevations above mean sea level.**

**Status of adoption not known.

_____ (1973) Project Completion Report (for the previous study); a report prepared for the St. James Parish Planning Commission and Police Jury. Metairie, Louisiana.

ST. JOHN THE BAPTIST

N-Y Associates, Inc. (1973) Flood Plains and Storm Drainage Study, Revised Population Projections and Future Land Use Plan; Addendum to Subdivision Regulations -- Flood Plains; Addendum to Zoning Ordinance -- Flood Plains; Code Reviews and Recommendations -- Flood Plains, for St. John the Baptist Parish, Louisiana; reports prepared for the St. John the Baptist Planning Commission and Police Jury. Metairie, Louisiana.

Details various land use controls which would assure parish eligibility in the National Flood Insurance Program; proposes flood plain subdivision regulations and building codes which would reduce flood hazards and damage; proposes creation of varying degrees of flood prone districts with gradations in uses permitted and required floor elevations above mean sea level.**

_____ (1971) Public Utilities and Services for St. John the Baptist Parish, Louisiana; a report prepared for the St. John the Baptist Parish Planning Commission. Metairie, Louisiana.

Proposes a zoning ordinance and subdivision regulations; places no special construction constraints on fast lands.**

_____ (1974) Zoning Ordinance for St. John the Baptist Parish, Louisiana; a report prepared for the St. John the Baptist Parish Planning Commission and Police Jury. Metairie, Louisiana.

Contains no regulations pertaining solely to development in fast lands. Not Adopted.

ST. MARTIN

Community Planners, Inc. (1969) The Comprehensive Plan for St. Martin Parish, Louisiana; a report prepared for the St. Martin Parish Planning Commission. Baton Rouge, Louisiana.

**Status of adoption not known.

Recommends adoption of a zoning ordinance which would be used to limit construction in areas susceptible to flooding and encourage their dedication for park land; proposed zoning ordinance would include an "F" Inundation District. Zoning ordinance not adopted; subdivision regulations adopted.

St. Martin Parish Police Jury (1976 rev.) St. Martin Parish Subdivision Regulations. St. Martinville, Louisiana: St. Martin Parish Police Jury.

Prohibits residential development on land subject to flooding or otherwise deemed "topographically unsuitable" unless some method is used (i.e. fill) to raise floor levels to a safe height (not specified). Adopted.

ST. MARY

Acadiana Planning and Development District (1975) Subdivision Regulations of 1975 for the Parish of St. Mary, Louisiana; a report prepared for the St. Mary Parish Planning Commission. Lafayette, Louisiana: Acadiana Planning and Development District.

Not available for review. Not Adopted.

_____ (1973) Zoning Ordinance of 1975 for the Parish of St. Mary, Louisiana; a report prepared for the St. Mary Parish Planning Commission. Lafayette, Louisiana: Acadiana Planning and Development District.

Not available for review. Not Adopted.

Planning Services, Inc. (1974) Comprehensive Plan for St. Mary Parish Region No. 1, Analysis of Existing and Proposed Land Use; a report prepared for the St. Mary Parish Region No. 1 Planning Commission and the Police Jury. New Orleans, Louisiana.

Contains no proposed restrictions on construction in fast lands.**

**Status of adoption not known.

Professional Planning Associates in association with Community Planners, Inc. (1975) Comprehensive Plan for St. Mary Parish Region No. 2; a report prepared for the St. Mary Parish Region No. 2 Planning Commission and the Police Jury. Baton Rouge, Louisiana.

Not available for review.

St. Mary Parish Police Jury (1960, rev. to 1974) Ordinance Number 655 -- Governing the Subdivision of Land in the Parish of St. Mary, Louisiana. Franklin, Louisiana: St. Mary Parish Police Jury.

Revised through Ordinances 680 (1962), 777 (1973), and 792 (1974); Ordinance Number 655 requires that the final plat show any areas which have been subject to flood within a period of ten years prior to the date of the plat.

Ordinance Number 777 provides for the issuance of building permits; requires that a proposed building site be determined reasonably safe from flooding or that structures be designed to minimize flood damage; outlines requirements for the design and construction of water and sewerage systems to reduce flood damage potential. Adopted.

ST. TAMMANY

Professional Engineering Consultants Corporation (1972) St. Tammany Parish Comprehensive Water and Sewer Study; a report prepared for the St. Tammany Parish Planning Commission. Baton Rouge, Louisiana.

Contains no restraints specifically dealing with development problems in former wetlands; the study does point out that most of the soil in St. Tammany Parish is

unsuitable for septic tanks; it is suggested that consideration be given to absorption pits or oxidation ponds in providing secondary treatment for septic tank installation.*

St. Tammany Parish Police Jury (1972) Land Use Ordinance for the Parish of St. Tammany. Covington, Louisiana: St. Tammany Parish Police Jury.

Includes an "F" Inundation District which requires the elevation of main floor levels to a height of not less than one foot above the highest flood levels as recorded since 1921; along the north shore of Lake Pontchartrain this means main floor levels are not allowed to be constructed at less than 8 feet above mean sea level. Adopted.

_____ (1975 amended) St. Tammany Parish Subdivision Regulatory Ordinance. Covington, Louisiana: St. Tammany Parish Police Jury.

Places no special restrictions on fast lands construction (other than the above elevation requirement); however, the developer must provide information in the preliminary plan on areas which are subject to inundation at flood stage. Adopted.

TANGIPAHOA

Planning Services, Inc. and N-Y Associates, Inc. (1973) Comprehensive Plan for Tangipahoa Parish Region, Louisiana, Existing and Proposed Land Use; a report prepared for the Tangipahoa Parish Regional Planning Commission and Police Jury. New Orleans, Louisiana.

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*Adopted or not adopted not applicable.

Suggests adoption of a zoning ordinance, subdivision regulations and a building code; no specific restrictions are recommended for fast lands.**

_____ (1974) Comprehensive Plan for Tangipahoa Parish, Louisiana, Proposed Subdivision Regulations; a report prepared for the Tangipahoa Parish Regional Planning Commission and Police Jury. New Orleans, Louisiana.

Requires no special standards for construction on fast or non-fast lands; sewerage disposal must either be through existing public sanitary sewer system if accessible, or by means of septic tanks in compliance with the parish health unit and state sanitary code.**

_____ (1973) Comprehensive Plan for Tangipahoa Parish Region, Louisiana, Proposed Zoning Ordinance; a report prepared for the Tangipahoa Parish Regional Planning Commission and Police Jury. New Orleans, Louisiana.

Proposes no restrictions dealing specifically with fast lands.**

TERREBONNE

Diversified Economic and Planning Associates, Inc. (1974) Comprehensive Plan 1973-1974, Houma-Terrebonne, Louisiana; a report prepared for the Houma-Terrebonne Regional Planning Commission. New Orleans, Louisiana.

Considers that lands currently subject to periodic flooding are useable if the area is covered under the forced drainage program or if it appears that the area could be adequately protected by a limited amount of flood control work.**

**Status of adoption not known.

Terrebonne Parish Police Jury (1975) Subdivision Regulations, Terrebonne Parish, Louisiana. Houma, Louisiana: Terrebonne Parish Police Jury.

Contains no restrictions specifically dealing with construction on fast lands. Adopted.

VERMILION

Vermilion Parish Police Jury (1975) Vermilion Parish Subdivision Regulations. Abbeville, Louisiana: Vermilion Parish Police Jury.

Not available for review. Adopted.

REFERENCES

Acadiana Planning and Development District (1976) Acadiana Coastal Zone Resource Inventory. Lafayette, Louisiana: Acadiana Planning and Development District.

American Insurance Association (1967) National Building Code. New York, New York: American Insurance Association.

Assumption Parish Police Jury, Napoleonville, Louisiana, (1976) Letter to Jane S. Brooks, October 12.

Brunner, Dirk R. and Daniel J. Keller (1972) Sanitary Landfill Design and Operation. Washington, D.C.: U.S. Government Printing Office.

Building Officials and Code Administrators (1975) BOCA Basic Building Codes. Chicago, Illinois: Building Officials and Code Administrators.

Calcasieu Parish Police Jury (1962) Ordinance Number 1097 -- Comprehensive Zoning Ordinance for Calcasieu Parish, Louisiana. Lake Charles, Louisiana: Calcasieu Parish Police Jury.

Cartier, Allen (1976) Imperial Calcasieu Regional Planning and Development Commission, Lake Charles, Louisiana, telephone interview, September.

Central Lafourche Planning Commission, Lockport, Louisiana (1976) Letter from Donald T. Bollinger, Secretary, to Jane S. Brooks, October 15.

Chalona, Bert (1976) Division of Regulatory Inspection, Jefferson Parish Department of Safety (Residential Section), telephone interview, October 1.

City Planning Commission of New Orleans (1975) Coastal Zone Management Plan Volumes 1, 2, and 3. New Orleans, Louisiana: New Orleans City Planning Commission.

Coastal Environments, Inc. (1972) Environmental Baseline Study, St. Bernard Parish, Louisiana. Baton Rouge, Louisiana: Coastal Environments, Inc.

_____ (1976) Resource Management, St. Bernard Parish Wetlands, Draft. Baton Rouge, Louisiana: Coastal Environments, Inc.

Federal Insurance Administration, U.S. Department of Housing and Urban Development (1975) "National Flood Insurance Program." Federal Register, Vol. 40, No. 59, Part II, July 25. Washington, D.C.: U.S. Government Printing Office.

_____ (1976) National Flood Insurance Program. Title 24, Code of Federal Regulations. Chapter X, Subchapter B. Washington, D.C.: U.S. Government Printing Office.

Ford, Dean (1976) Imperial Calcasieu Regional Planning and Development Commission, Lake Charles, Louisiana, telephone interview, December.

Gates, Mark (1976) Plan Processing Section, New Orleans Department of Safety and Permits, New Orleans, Louisiana, telephone interview, November 5.

Houma-Terrebonne Regional Planning Commission, Houma, Louisiana (1976) Letter from Cindy Richardson to Jane S. Brooks, October 12.

Imperial Calcasieu Regional Planning and Development Commission (1975) Public Administration Study: Codes and Ordinances. Lake Charles, Louisiana: Imperial Calcasieu Regional Planning and Development Commission.

International Conference of Building Officials (1973) Uniform Building Code. Pasadena, California: International Conference of Building Officials.

Jefferson Parish Council (1974) Progressive Jefferson: Comprehensive Zoning Ordinance, As Amended. Gretna, Louisiana: Jefferson Parish Council.

Joubert, Irwin (1976) South Central Planning and Development Commission, Thibodaux, Louisiana, telephone interview, September.

Keyes, Dale L. (1976) Land Development and the Natural Environment: Estimating Impacts. Washington, D.C.: The Urban Institute.

Lafayette Regional Planning Commission (1973) Flood Prone Area Regulations. Lafayette, Louisiana: Lafayette Regional Planning Commission.

Lafourche Parish Police Jury (1975) Subdivision Regulations of the Central Lafourche Planning Area. Lockport, Louisiana: Central Lafourche Planning Commission.

Landry, Bert (1976) Acadiana Planning and Evangeline Economic Development District, Lafayette, Louisiana, telephone interview, September.

Livingston Parish Planning Commission, Livingston, Louisiana (1976) Letter from Reymond D'Armond, Chairman, to Jane S. Brooks, October 11.

Louisiana Advisory Commission on Coastal and Marine Resources (1973) Louisiana Wetlands Prospectus: Conclusions, Recommendations and Proposals. Baton Rouge, Louisiana: Center for Wetland Resources, Louisiana State University and Louisiana Office of State Planning.

McIntire, G. et al. (1975) A Rationale for Determining Louisiana's Coastal Zone: Report No. 1, Coastal Zone Management Series. Baton Rouge, Louisiana: Center for Wetland Resources, Louisiana State University.

Mumphrey, Anthony J. et al. (1975) Louisiana Metropolitan Wetlands: A Planning Perspective; a report to the Louisiana State Planning Office. New Orleans, Louisiana: Urban Studies Institute, University of New Orleans.

_____ (1976) Coastal Zone Management in the Metropolitan New Orleans Region; a report to the Louisiana State Planning Office. New Orleans, Louisiana: Urban Studies Institute, University of New Orleans.

N-Y Associates, Inc. (1973) St. Charles Parish, Louisiana: Initial Housing Study, Review of Codes, Subdivision Regulations, Zoning Ordinance for St. Charles Parish, Louisiana; reports prepared for the St. Charles Parish Planning Commission and Police Jury. Metairie, Louisiana: N-Y Associates, Inc.

Natural Resources Defense Council, Inc. v. Calloway, 392 Federal Supplement 685 (1975) United States District Court, District of Columbia, March 27.

New Orleans City Council (1971 rev.) Comprehensive Zoning Ordinance for the City of New Orleans. New Orleans, Louisiana: New Orleans City Council.

_____ (1975 rev.) Building Code, Parish of Orleans. New Orleans, Louisiana: New Orleans City Council.

Plaquemines Parish Commission Council (1970) Subdivision and Resubdivision Ordinance of the Parish of Plaquemines. Point-a-la-Hache, Louisiana: Plaquemines Parish Commission Council.

_____ (1975) Comprehensive Zoning Ordinance of Plaquemines Parish, Louisiana. Pointe-a-la-Hache, Louisiana: Plaquemines Parish Commission Council.

St. Bernard Parish Police Jury (1971) Comprehensive Zoning Ordinance of the Parish of St. Bernard, Louisiana. Chalmette, Louisiana: St. Bernard Parish Planning Commission.

St. Charles Parish Police Jury (1966) The Zoning Ordinance of the Parish of St. Charles, Louisiana. Hahnville, Louisiana: St. Charles Parish Police Jury.

_____ Hahnville, Louisiana (1976) Letter from Kevin Friloux, Assistant Administrator, to Jane S. Brooks, October 11.

St. Martin Parish Planning Commission, St. Martinville, Louisiana (1976) Letter from Etienne Doiron, Sr., Chairman, to Jane S. Brooks, October 15.

St. Martin Parish Police Jury (1976 rev.) St. Martin Parish Subdivision Regulations. St. Martinville, Louisiana: St. Martin Parish Police Jury.

St. Mary Parish Police Jury (1960,rev. to 1974) Ordinance Number 655 -- Governing the Subdivision of Land in the Parish of St. Mary, Louisiana. Franklin, Louisiana: St. Mary Parish Police Jury.

_____ Franklin, Louisiana (1976) Letter from Linda P. Landry to Jane S. Brooks, October 12.

St. Tammany Parish Police Jury (1972) Land Use Ordinance for the Parish of St. Tammany. Covington, Louisiana: St. Tammany Parish Police Jury.

_____ (1975 amended) St. Tammany Parish Subdivision Regulatory Ordinance. Covington, Louisiana: St. Tammany Parish Police Jury.

Sinden, Craig (1976) Director, St. Tammany Parish Planning Department, Covington, Louisiana, telephone interview, September.

Southern Building Code Congress, International (1973) Southern Standard Building Code. Birmingham, Alabama: Southern Building Code Congress.

Swindler, Roger D. (1976) U.S. Army Corps of Engineers, New Orleans, Louisiana, personal interview, September 22.

Terrebonne Parish Police Jury (1975) Subdivision Regulations, Terrebonne Parish, Louisiana. Houma, Louisiana: Terrebonne Parish Police Jury.

U.S. Army Corps of Engineers (1972) Flood-Proofing Regulations. Washington, D.C.: U.S. Government Printing Office.

_____ (1974) Applications for Department of the Army Permits for Activities in Waterways, Pamphlet No. 1145-2-1. Washington, D.C.: U.S. Government Printing Office.

_____ (1975) "Permits for Activities in Navigable Waters or Ocean Waters," Federal Register, Vol. 40, No. 144, Part IV, July 25. Washington, D.C.: U.S. Government Printing Office.

U.S. Congress (1972) Public Law 92-500, Federal Water Pollution Control Act Amendments of 1972. Washington, D.C.: U.S. Government Printing Office.

U.S. Congress, Senate (1966) Committee on Banking, Housing, and Urban Affairs, Report No. 93-583. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Housing and Urban Development (1974) National Flood Insurance Program. Washington, D.C.: U.S. Government Printing Office.

Weiss, Kenneth A. (1976) "Environmentalists Win on '404'," The Times-Picayune, October 4.

CHAPTER 2

URBAN DEVELOPMENT PRACTICES TO BE CONSIDERED FOR REGULATION

INTRODUCTION

This chapter examines the urban development process in the coastal zone using a problem identification methodology (Figure 2.1). The methodology moves through the stages of the wetlands development process and presents problems which occur at each stage. When a problem is identified, its result is shown along with current and proposed regulations and practices to mitigate the problem. After one has iterated several times through the stages, a complete listing of problems and solutions should exist. A similar methodology could be used to analyze developmental problems in other landscape environments. An explanation of the stages in wetlands development is given and homeowner and community concerns following residential occupancy are also examined. This methodology is used to identify developmental problems and to observe where and how the regulatory system for urban wetlands development needs to be strengthened. (See Chapter 3 for recommended guidelines for strengthening the regulatory system.)

The methodology should prove useful to many parties including developers, loan institutions, permitting agencies, and prospective homeowners who have an interest in urban

FIGURE 2.1 -- URBAN DEVELOPMENT*

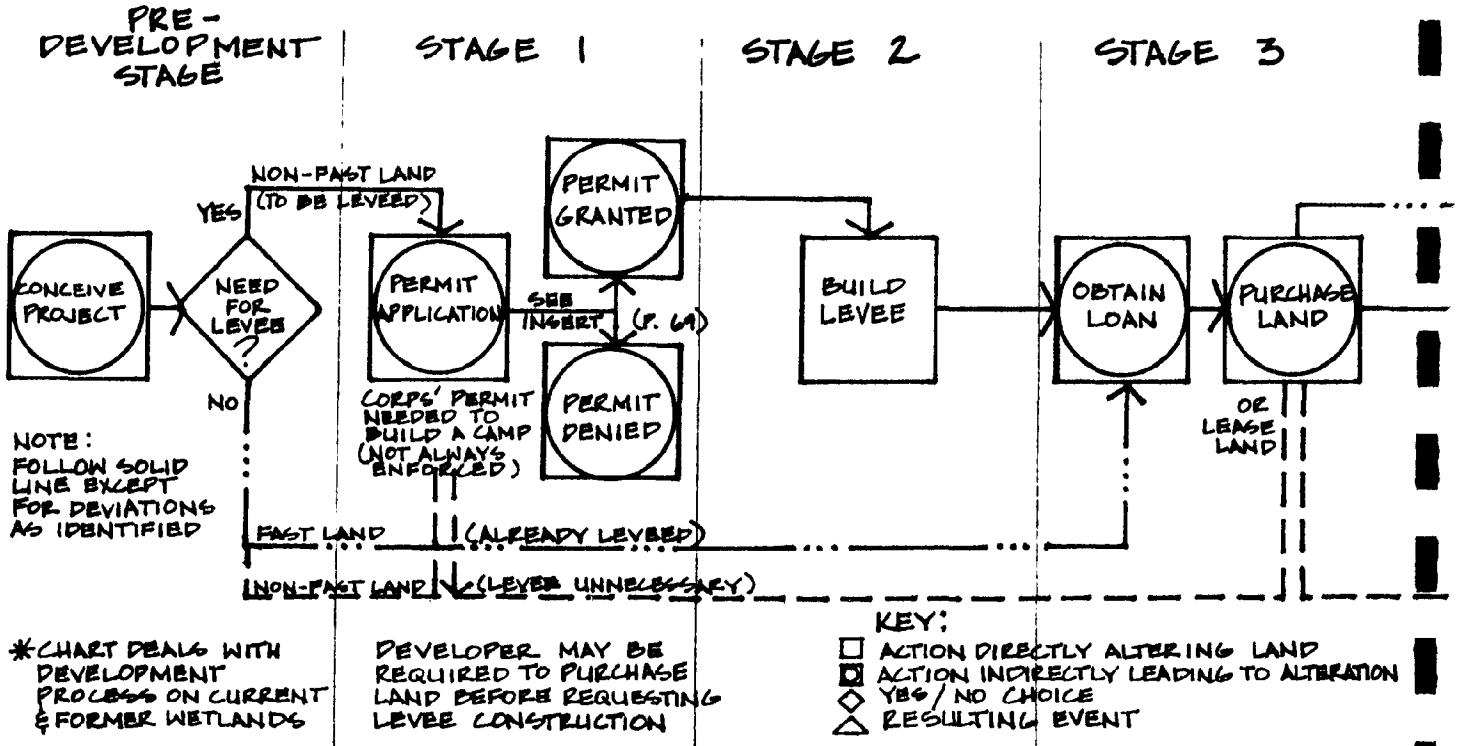
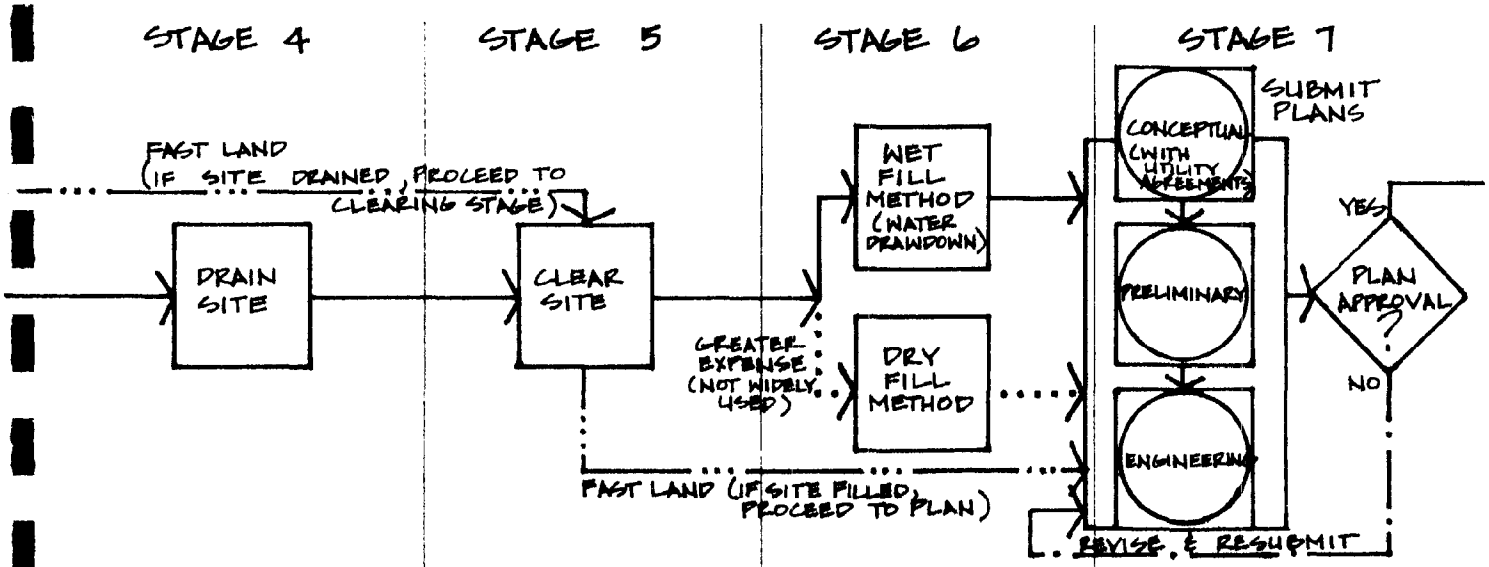


*CHART DEALS WITH DEVELOPMENT PROCESS ON CURRENT & FORMER WETLANDS

DEVELOPER MAY BE REQUIRED TO PURCHASE LAND BEFORE REQUESTING LEVEE CONSTRUCTION

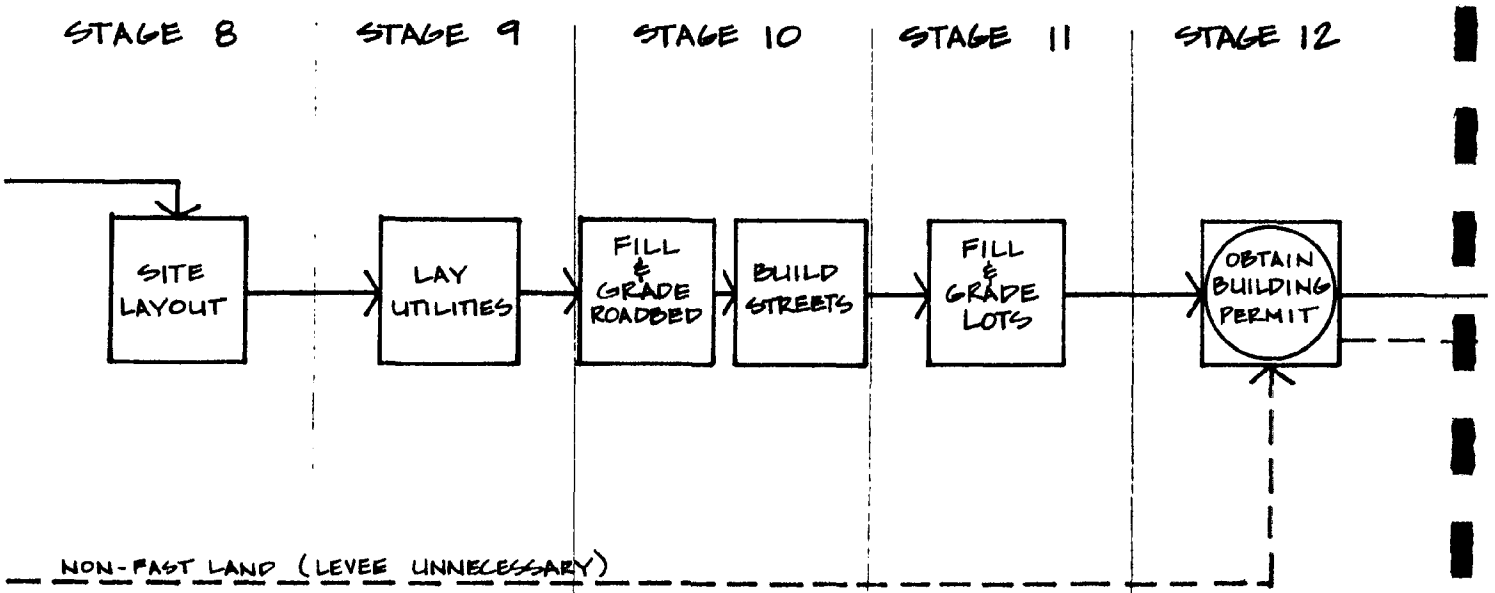
PROBLEM IDENTIFICATION	CORPS OF ENGINEERS PERMIT PROCESS REQUIRES COMPLEX IMPACT ASSESSMENT; FEDERAL CONTROL OF ENTIRE PROCESS	KILLS WETLAND ECOLOGICAL SYSTEM; DREDGED ORGANIC MATERIAL OXIDIZES & SHRINKS -- DOES NOT FORM SOLID LEVEE	———
PROBLEM RESULT	REDUCED STATE & LOCAL CONTROL OF LOCAL ISSUES	FOOD CHAIN & ANIMAL HABITATS DISRUPTED; COMMERCIAL & SPORT FISHING & HUNTING IMPACTED; CRACKS IN LEVEE -- STRUCTURAL INSTABILITY	———
CURRENT REGULATIONS	NATIONAL ENVIRONMENTAL POLICY ACT (N.E.P.A.) 1969 REQUIRES FILING OF E.I.S. ON FEDERALLY FUNDED PROJECTS BEFORE CONSTRUCTION CAN BEGIN	CORPS OF ENGINEERS STANDARDS FOR LEVEE CONSTRUCTION	H.U.D. FLOOD INSURANCE REQUIREMENTS FOR FEDERALLY SUBSIDIZED LOAN
PROPOSED REGULATIONS	CURRENT REGULATIONS INADEQUATE / UNDESIRABLE; PROPOSE NEW SYSTEM OF LOCAL REGULATION UNDER STATE GUIDELINES	CURRENT REGULATIONS INADEQUATE; PROPOSE TOUGHER CONSTRUCTION STANDARDS & STRONGER STAND ON FORCING DEVELOPER TO PAY	CURRENT REGULATIONS ADEQUATE; PROPOSE CONSUMER WARNING ON SUBSIDENCE POTENTIAL

PROBLEM IDENTIFICATION PROCESS

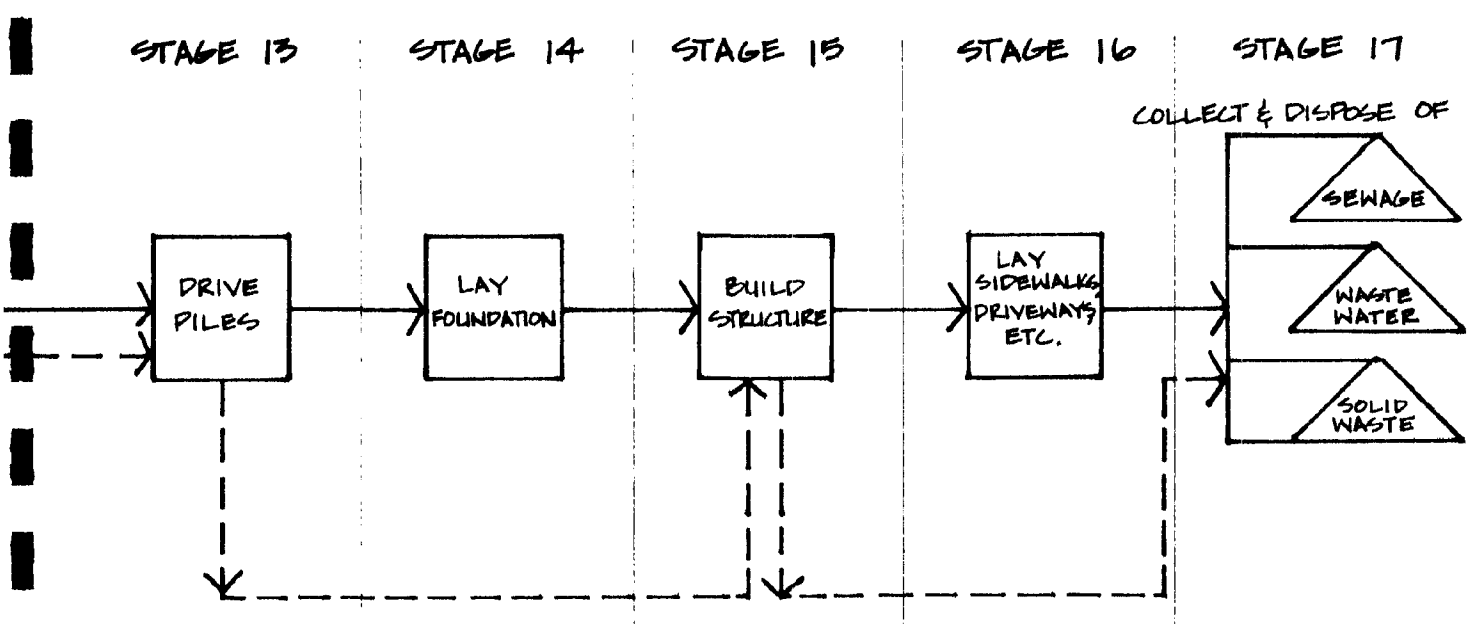


PERIODIC DEEPENING & PUMPING OF CANALS TRIGGERS FURTHER OXIDATION OF PEAT AT LOWER LEVELS -- LAND SUBSIDES	CLAY SOILS DRY OUT, SHRINK, & CRACK WITH INCREASED RUNOFF; IMPROPER CLEARING PRACTICES -- USE BULLDOZER TO BURY DEBRIS	SUBSIDENCE OCCURS WITH BOTH FILL METHODS	———
UNDERGROUND COMBUSTION OF ORGANIC SOILS; HIDDEN COSTS TO HOMEOWNERS	HOMEOWNER PROBLEMS AS LAND SUBSIDES EXPOSING TREE ROOTS, STUMPS, ETC.; MICROCLIMATE CHANGES	DIFFERENT FILL METHODS VARY AS TO OVERALL COST, FLOOD HAZARD POTENTIAL, TOTAL SUBSIDENCE, ETC.; OPTIMUM SOLUTION HARD TO IDENTIFY	———
NONE	NONE	ELEVATION REQUIREMENTS SET BY FEDERAL FLOOD INSURANCE REGULATIONS	SUBJECT TO PARISH PLANNING COMMISSION AND/OR POLICE JURY REVIEW; SUBDIVISION REGULATIONS
NO CURRENT REGULATIONS; PROPOSE INITIAL DRAINAGE OF AREA TO DEEPEST LEVEL EVER NECESSARY, THEN MAINTAIN STEADY WATER LEVEL	NO CURRENT REGULATIONS; PROPOSE STRONG STANDARDS FOR CLEARING PRACTICES & ENFORCEMENT	CURRENT REGULATIONS INADEQUATE; PROPOSE THAT BETTER RECLAMATION & FILL METHODS BE DEVELOPED & ENFORCED	PLANNING COMMISSION SHOULD REVIEW PLANS IN TERMS OF HOW WELL THEY COPE WITH PROBLEMS OF SUBSIDENCE, FLOODING, & POLLUTION

FIGURE 2.1 (CONTINUED)



	STAGE 8	STAGE 9	STAGE 10	STAGE 11	STAGE 12
PROBLEM IDENTIFICATION	———	PIPES SEPARATE WITH SUBSIDENCE; INCREASED MAINTENANCE; "CURB COCKS" ON GAS LINES EASILY DAMAGED POSSIBLE WATER DAMAGE TO UTILITIES	LENGTHY PROCESS TO EXCAVATE PEAT & THEN FILL; MORE ROADBED MATERIALS NEEDED; INCREASED MAINTENANCE	QUALITY CONTROL NEEDED IN MATERIALS USED FOR FILL; EXPENSIVE TO FILL TO SPECIFIED FLOOD ELEVATION	———
PROBLEM RESULT	———	EXTRA PUBLIC COST FOR MAINTENANCE; DANGER OF GAS EXPLOSIONS, SEWAGE & WATER LEAKS; FLOODPROOFING MAY BE NEEDED	INCREASED CONSTRUCTION TIME & COSTS; EXTRA COSTS TO PUBLIC	USE OF ORGANIC MATERIAL FOR FILL CREATES AN UNSTABLE FOUNDATION BASE	———
CURRENT REGULATIONS	SUBDIVISION REGULATIONS	BUILDING CODES; UTILITY CODES; DESIGN CODES (FOR VARIOUS PRODUCTS, MATERIALS, & EQUIPMENT)	BUILDING CODES; DESIGN CODES	BUILDING CODES; ELEVATION ESTABLISHED IN FLOOD INSURANCE REGULATIONS	CITY AND/OR PARISH PERMIT & INSPECTION
PROPOSED REGULATIONS	CURRENT REGULATIONS ADEQUATE	CURRENT REGULATIONS INADEQUATE; PROPOSE STRUCTURAL SUPPORTS FOR UTILITY FEEDER LINES TO HOUSE; ELIMINATE "CURB COCKS"	CURRENT REGULATIONS INADEQUATE; PROPOSE THAT DEEPER EXCAVATION OF PEAT BE REQUIRED AND/OR POSSIBLE SUPPORT OF ROADBED	CURRENT REGULATIONS INADEQUATE; PROPOSE LONGER OXIDATION & SUBSIDENCE PERIOD AND/OR SURCHARGE ON LAND PRIOR TO DEVELOPMENT	CURRENT REGULATIONS ADEQUATE

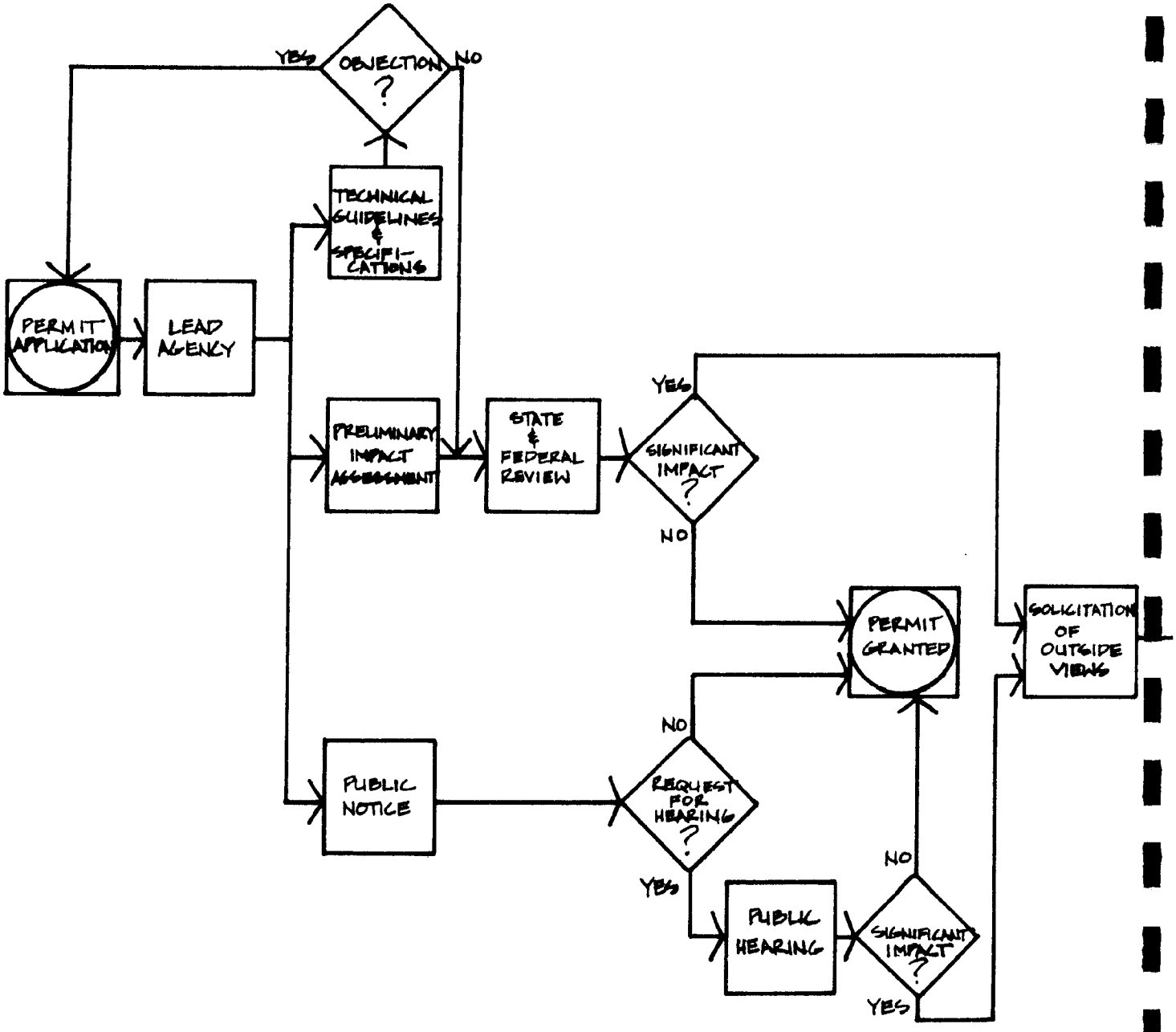


POINTS OF GREATEST LOAD REQUIRE CLOSER SPACING OF PILES

FOUNDATION TYPES:
SLAB ON GRADE (DRY FILL)
SLAB SECURED TO PILES (WET FILL)
SHORT / TALL PIERS

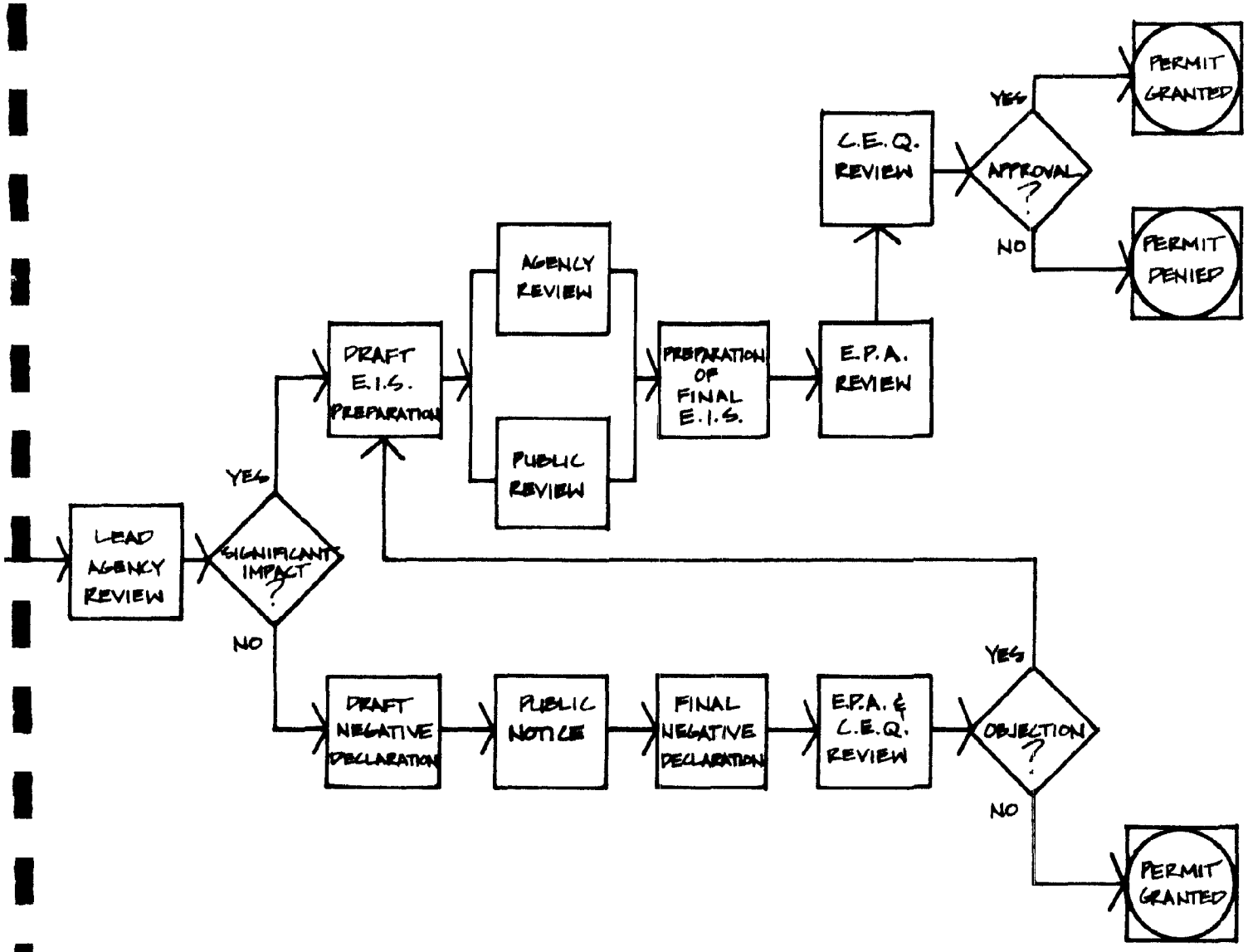
VIBRATIONS IN LAND SURFACE DURING PILE DRIVING	SUBSIDENCE PROBLEMS MAY CAUSE SLAB TO SETTLE UNEVENLY & CRACK OR TILT; IF HOUSE RAISED ON PIERS, TERMITES & DAMPNESS MAY ATTACK WOODEN JOISTS UNDERNEATH	SUBSIDENCE PROBLEMS CAUSING CRACKING OF STRUCTURAL MASONRY WALLS, ETC.; GAS EXPLOSIONS WITH UNVENTILATED SLABS	SUBSIDENCE PROBLEMS AS LAND & LANDSCAPE FEATURES SHRINK AWAY FROM FOUNDATION; SIDEWALKS, ETC. CRACK & TILT	UNTREATED RAIN-WATER RUNOFF & INADEQUATELY TREATED SEWAGE DUMPED INTO WATER BODIES; SANITARY LANDFILLS MAY BE INADEQUATELY SEALED
VIBRATIONS MAY CAUSE SUBSIDENCE IN NEARBY COMPLETED STRUCTURES	UNATTACHED UTILITY LINES BENEATH HOUSE MAY PULL AWAY AND LEAK; INCREASED HOMEOWNER MAINTENANCE COSTS	INCREASED HOMEOWNER MAINTENANCE COSTS	INCREASED HOMEOWNER MAINTENANCE COSTS & PUBLIC COSTS	POLLUTION OF WATER BODIES & GROUNDWATER (ESPECIALLY FROM CAMPS ALONG WATER'S EDGE)
BUILDING CODES	BUILDING CODES; UTILITY CODES; DESIGN CODES	BUILDING CODES; DESIGN CODES	BUILDING CODES; DESIGN CODES	SECTION 404, FED. WATER POLLUTION CONTROL ACT; CITY OR PARISH MUST OBTAIN E.P.A. PERMIT TO DUMP EFFLUENT INTO A WATER BODY
CURRENT REGULATIONS INADEQUATE	CURRENT REGULATIONS INADEQUATE; PROPOSE HANGING UTILITY FEEDER LINES TO SLAB AND FLEXIBLE COIL UTILITY CONNECTIONS	CURRENT REGULATIONS INADEQUATE; PROPOSE THAT VENTILATION OF SLAB BE REQUIRED	CURRENT REGULATIONS INADEQUATE	CURRENT REGULATIONS INADEQUATE; PROPOSE TOUGHER TREATMENT & LANDFILL STANDARDS; LANDFILL LEACHATE MONITORING

FIGURE 2.1 (INSERT) -- GENERALIZED CORPS OF ENGINEERS



SOURCE: ADAPTED FROM MUMPHREY ET AL., 1976 : 268-269

PERMIT APPLICATION AND E.I.S. REVIEW PROCEDURE



development in coastal areas, especially Louisiana. It points out concerns involving subsidence problems, flood hazards, etc. of which all parties should be aware. The developer can benefit from the use of this system which gives step-by-step instructions on what requirements must be met and what permits need to be obtained at each development stage. Governmental permitting agencies can use the methodology to carefully check and enforce quality control throughout the development process.

The following discussion covers problems encountered in building on both fast and non-fast lands.[1] Construction on non-fast lands is confined to mostly second-home camps, duck blinds, etc. For these more limited types of development, problems associated with water quality, sewage collection and treatment methods, and flood hazard potential are examined. However, the bulk of material presented applies to the concerns of residential development on fast lands which comprises a much larger percentage of urban coastal zone development. Problems stemming from high subsidence potential such as natural gas leaks, high home maintenance costs and flood hazards are emphasized.

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[1]Non-fast land is herein defined as an area in its wetland state, subject to tidal inundation. Fast land is defined as a former wetland which has been separated from the estuarine system by means of a levee or floodwall and is no longer subject to frequent flooding.

GENERAL PROBLEMS ASSOCIATED WITH THE DEVELOPMENT PROCESS

This section examines the basic problem areas encountered by homeowners living on former wetlands and their causes. Many of these problems are serious and do pose questions as to the amount and types of urban development which should be permitted to occur in wetland areas. The discussion also points out areas where development practices need to be improved in order to reduce later homeowner expense.

Subsidence

Subsidence is a term used to describe a negative land surface change. In the context of urban expansion in coastal Louisiana, it is generally a regional or area-wide lowering of surface elevation due to local factors. However, geophysical subcontinental movement does contribute to the state's coastal subsidence problem (Earle, 1975: 73).

Subsidence Causes

Possible subsidence factors in coastal urban areas are described by Earle (1975: 73-74). These causes of subsidence are classified as to their relative involvement in creating homeowner problems and costs. Lowering of the water table is considered to be an important cause of subsidence problems. The water table in most reclaimed areas was originally at or near the surface. Using current reclamation practices (see

discussion later in this chapter), canals are constructed and pumping lowers the regional water table leading to the drying out and shrinkage of wet mineral soils, and decomposition of organic soils resulting in soil oxidation and shrinkage. Urbanization causes diversion of much of the water that once replenished the groundwater supply into storm drains to be lost as runoff. Absorption of rain water by wetlands is limited as more areas are developed and paved.

Earle's study pointed out the fact that many of the region's soils are of subaqueous origin, still containing a large percentage of water. Wetland mucks high in organic matter can undergo an 85 percent initial volume loss when dried. Shrinkage continues at a fairly uniform rate until a subsurface layer of mineral material, or the water table,is reached (Earle, 1975: 78). If the water table is once again raised, these organic soils will return to only 50 percent of their original volume (D. Clement, 1976).

Oxidation of organic material plays a very important role in urban coastal subsidence problems. Oxygen levels in the organic soils of drained wetlands are increased with lowering of the water table and subsequent displacement of water with air in the pore spaces. This in turn accelerates bacterial decomposition action on organic material. Subsidence from this factor is a slow, long-term process (D. Clement, 1976).

Other subsidence factors were deemed by Earle as important, but less crucial, than those previously discussed in

terms of urban residential development. These included tectonic movement of the entire coastal zone with its attendant processes of geologic base level sinking, sea level rise and consolidation of sediments (Earle, 1975: 77). The decline in artesian pressure in water sands of confined aquifers due to water withdrawal was proposed to be of regional importance. Further land subsidence at a specific project scale may also be attributed to loading of the land surface with structures resulting in consolidation of clays. Buildings not on pilings and roads, levees, and other constructions are of sufficient weight to consolidate subsurface clay layers. Earle also postulated that the vibration of land and homes during the construction phase of a subdivision development and by nearby highway truck traffic may also be important causes in clay consolidation and subsidence (Earle, 1975: 80). These last two problems are confined to a small area of influence, whereas the shrinking and oxidation of organic materials with lowering of the water table, along with geologic substratum changes has a much broader impact.

Soil Properties Related to Subsidence

The basic reason behind the widespread subsidence problems in urbanized areas of the coastal zone is the soil and its associated properties. Several terms are used to describe the difference between the major soil categories, mineral and organic. Mineral soils are dominated by mineral

particles which are fine rock fragments of sand or silt size along with still smaller particles of clay minerals. The layers of mineral soils are described in terms of soil textures such as clay, silt loam, sandy loam, etc. These mineral soils subside by the process of consolidation which is removal of water due to loading of the soil (U.S. Soil Conservation Service, 1976: V1, V-4).

Organic soils are largely made up of decomposed or partially decomposed plant remains. Materials that contain more than 20-30 percent organic matter (based on dry weight) are classified as organic soil materials. These are commonly referred to as peat, muck, or "coffee grounds". Soils that have organic surface layers more than 16 inches thick are classified as organic soils. They are characterized by a low bulk density (weight per unit volume) and subside through a process of drying, shrinking and oxidation of organic matter which is a biochemical decomposition process (U.S. Soil Conservation Service, 1976: V-1, V-4).

Soils found in the surface layers of newly created fast lands are frequently organic in content, classified as either peat or muck. A distinction is made between these soil types based on the stage of decomposition of the organic material comprising them. In peat, the organic material residue is still recognizable. When the material has undergone considerable oxidation, it is classified as muck with fiber material residues undiscernable in it (D. Clement. 1976).

Loss of surface elevation occurs when a soil with organic or semifluid mineral layers is drained. This subsidence takes place in two distinct phases (U.S. Soil Conservation Service, 1976: V-4):

1. Initial soil subsidence. With lowering of the water table, there is an overall 50 percent immediate volume reduction in organic wetland soils (considering that they are air dried then wet again). This initial subsidence is normally accomplished in about three years after lowering the water table by drainage. Thus, if the water table is lowered 10 feet, the land surface will rapidly lose 5 feet in elevation.
2. Continued soil subsidence. Bacterial decomposition activity increases as more oxidants enter the soil pore spaces following drainage. This process of biochemical oxidation continues gradually and steadily until a subsurface mineral soil layer or the water table is reached. The rate of continued subsidence depends upon the thickness of organic material and depth to water table, ranging from 0.5 to 2 inches per year.

Farming speeds up the oxidation process for organic materials. More oxygen is allowed into the soil by tilling,

and this in turn speeds up bacterial decomposition. On the other hand, subsidence in an already developed area can be slowed down by adding a good mineral soil fill to the land surface. This helps to seal in the organic materials, inhibit oxygen penetration and thereby slow down the oxidation rate (D. Clement, 1976).

Organic soils are considered to be relatively young (2-3,000 years old) in relation to stable mineral soils such as Mandeville soil which is approximately 20,000 years old. Due to their non-mature state, these organic soils tend to shrink and oxidize when dried. Soils throughout the Louisiana coastal zone as indicated in Figure 2.2 and their associated properties include (U.S. Soil Conservation Service, 1976: V-17 to V-28 and D. Clement, 1976):

1. Commerce silt loam
   This soil is found closest to the rivers and along tributaries usually forming natural levees. Because it is composed of well mixed mineral soils carried as sediments by a river, there are no problems associated with building on this soil and no piles are needed. Few, if any, subsidence problems are associated with this soil.

2. Sharkey clay
   This soil is found just inside the natural levees and is composed of finer textured sedimentary deposits. If air dried, this soil reduces in volume by 10 percent and frequently cracks at the surface. However, it will swell back to its original volume when wet. A "floating slab" system is recommended for building on this soil

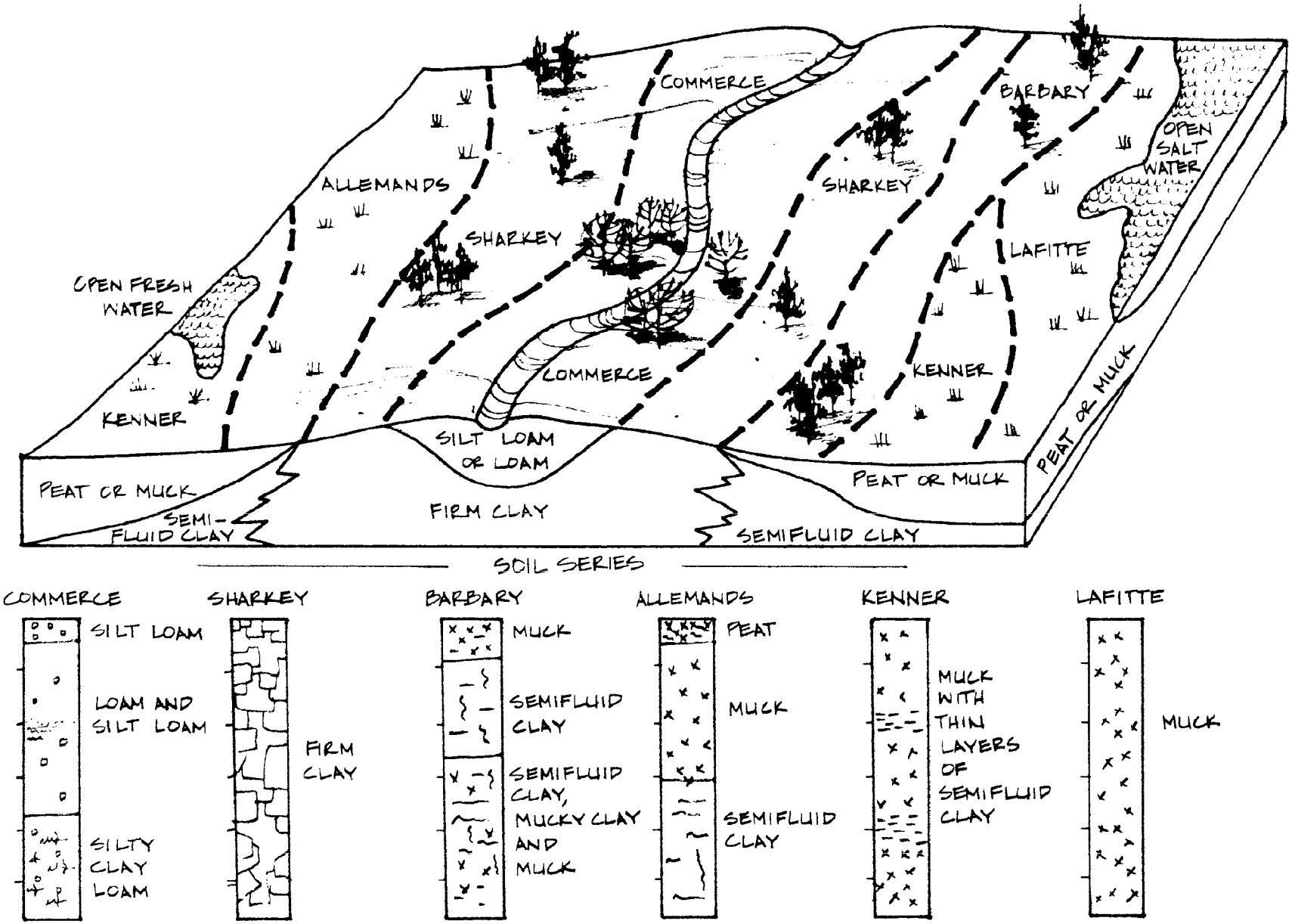

FIGURE 2.2 -- SCHEMATIC RELATIONSHIP OF SOILS TO LAND FORM, VEGETATION AND PARENT MATERIAL

SOURCE : SOIL CONSERVATION SERVICE, 1976 : V-16

since it adjusts with the shrink and swell properties. Consolidation though loading of the surface and resulting water removal does cause subsidence problems with this soil.

3. Barbary soils
   These soils are associated with swamplands and are composed of 12 inches of organic deposits over "supersaturated" mineral soils (clay). While 50 percent water by volume is considered normal for a wet clay, "supersaturated" clay layers may hold as much as 200 percent water by volume. The initial volume loss for normal wet clay soils is 50 percent when dried out by a lowering of the water table. There is no further consolidation after this. "Super-saturated" clay soils, however, reduce in volume 4 times as much when initially dried.

4. Allemands soils
   These soils are associated with freshwater marshes and are composed of an organic surface layer 16 to 50 inches thick over a semifluid, clay layer. They are considered to be organic soils with the water table at or a few inches above the surface in their natural state. Allemands soils consolidate, shrink, and lose approximately 2 feet of surface elevation in the first 1 or 2 years after drainage. Subsidence continues at a rate of ½ to 2 inches per year until the mineral soil or water table is reached. Total potential subsidence is 16 to 50 inches and the surface will recede in most places to elevations below sea level.

5. Kenner muck

This is a very unique soil found only in marsh lands of the Louisiana coastal area. Its uniqueness lies in the fact that there is no clay (mineral) layer within at least the top 50 inches of the surface. As a predominantly organic soil it will shrink and oxidize when dried until it reaches the water table level or a clay layer. Thus surface subsidence of this soil may be 50 or more inches. Initial volume reduction in this highly organic soil is 85 percent when air dried. This process constitutes an irreversible shrinkage since the soil will only return to 50 percent of its original volume if it is once again wet.

6. Lafitte soils

These soils consist of organic materials to a depth of 50 inches or more with an underlying mineral layer of semifluid clay. In their natural state, the water table is always at or a few inches above the surface. If protected and drained,Lafitte soils will consolidate, shrink and lose approximately 3 feet of surface elevation in the first 1 or 2 years after drainage. Subsidence will continue until the water table or underlying mineral layer is reached making total subsidence potential very high.

7. Maurepas soil

These are extremely young soils with as much as 120 inches of organic material in the surface layer. The large quantity of woody material commonly found within these soils causes irregular subsidence of the land surface as the

organic matter oxidizes and the volume shrinks. Construction of roads, utility lines, etc. is hindered by this woody debris.

Subsidence Problems and Costs

There are many serious problems associated with the severe subsidence following wetland reclamation and its subsequent development. Individual homeowners, the community-at-large, developers, utility companies and local government agencies are affected. These problems have associated costs which are ultimately borne by the public. Earle (1975: 82-91) identified a number of significant concerns for each of these interest groups and some of the reasons behind them.

Homeowners in former wetlands must face direct problems and costs by the outlay of capital, time and inconvenience. There are four basic areas of concern (Earle, 1975: 83-84):

1. Landscape elements such as drives, walkways and walks may crack, warp, sink, or suffer structural failure. Plant growth may be inhibited by poor drainage or soil conditions.
2. Sinking of the ground level and actual cracking of the land surface may result in unsightly gaps around foundation edges, etc.
3. Building elements such as walls, foundations and roofs may crack or break with the settling, tilting and uneven stress related to land movement.
4. Utilities systems providing water, sewerage, electricity, gas and telephone services may be interrupted by leakage or breakage of service lines.

In all cases the homeowner must assume all costs for repair or replacement of damaged structures on his property. Yearly maintenance charges may be computed by the number of loads of fill needed to shore up around a house at about $25 per load. Major structural repairs may cost between $1,200 to $6,000 per home (Earle, 1975: 84).

Homeowner subsidence problems manifest themselves also in strained and broken connections to air conditioner condenser units and gas meters. This last item particularly has caused great anxiety for both homeowners and utility companies recently with an increasing incidence of natural gas leaks and house explosions (The States-Item, Oct. 12, 1976 and Frazer, The States-Item, Nov. 23, 1976).

One possible explanation of the natural gas explosion problem in high subsidence areas has been advanced. As organic soils shrink with lowering of the water table, cracks form in the subsurface layers. Unsupported and sagging gas lines connecting houses with the main utility line along the street right-of-way may split apart at joints and leak. "Curb cocks" or valves with screw-type threads located about 15 inches underground and approximately one foot on the house side of the sidewalk are thought to be the weakest link between the gas main and house. The sinking ground or trucks loaded with additional fill material passing over underground gas lines may place enough stress on the threaded curb cock joints to break them. The leaking natural gas under 60 to 80

pounds per square inch pressure can then travel through the network of cracks underground and collect in the cavities beneath pile supported house foundations. These cavities were created as the land beneath the foundation subsided and homeowners only replaced soil along the outer perimeter of the foundation to cover unsightly gaps. By shoring up around the foundation's edge, the homeowner effectively traps the natural gas beneath the concrete foundation slab. It can then travel up the hollow stud walls to the attic or creep up along outside walls entering the attic through eave vents where spontaneous combustion may take place causing an explosion (Frazer, The States-Item, Nov. 20, 1976 and D. Clement, 1976).

The recent natural gas incidents have brought forth a rash of proposals to require ventilation of attics in all building codes. However, there is some question as to whether or not the additional oxygen found in ventilated attics may actually increase the danger of spontaneous natural gas combustion (Frazer, The States-Item, Oct. 30, 1976).

There has been concern over the charge that natural gas leaks may also result from the pressure of heavy trucks rolling on lawns over the gas lines while delivering fill material. An ordinance in Jefferson Parish to prohibit heavy trucks from rolling on lawns was recently proposed and rejected because it was felt it would relieve the gas company of liability in the case of an explosion (Frazer, The States-Item, Dec. 10, 1976). It has been noted that the

natural gas explosions do not always occur in the houses where the leaks originate, since the gas can travel through underground cracks to neighboring houses. While it would prove impractical to try to eliminate cavities under all pile supported foundations in order to prevent the formation of gas pockets, measures should be taken to stop these gas leaks from occurring.

Earle also examined the added costs of wetlands construction to the developer which are passed on to the consumer in property and construction cost increases. Developers face these added costs in three areas (Earle, 1975: 84):

1. The ground surface, buildings, roads and utilities must be stabilized.
2. Buildings and sometimes roads must be elevated on fill.
3. Excavations for utilities, drainage and foundations must cope with on-site soil problems.

It is estimated by New Orleans contractors that the cost of developing a subdivision (exclusive of homes) in recently reclaimed wetlands is 50 percent greater than in natural dry lands.

The average cost of raising a conventional slab house with fill to meet flood insurance elevation standards in reclaimed wetlands was estimated to cost between $400 for a 1 foot rise to $3000 for an 8 foot rise above the base elevation (Earle, 1975: 85).

Earle's study also pointed out the problems faced by utility companies in the installation and maintenance of lines through fast lands. Soil problems such as high water table and unstable trench walls necessitate the use of pumps and shoring to prevent trench collapse. Trench excavation in organic soils may also require removal of large trees and other buried swamp debris. Special techniques must be used for installation of water and sewerage pipes including excavation, placement of several feet of shell fill, and construction of a board frame or "cradle" which helps to balance out local settling and prevents pipes from sinking or floating to the surface. It is estimated that sewerage installation costs are approximately twice as much in reclaimed wetlands as in other more stable areas (Earle, 1975: 86-87).

The connection of the utility system to the building and its foundation slab presents a critical point since the structure is fairly stable on pilings while the utility line subsides with the soil. This creates the danger of sewer, water and gas line breaks. Maintenance problems create additional costs to utility companies including the repair of cracked and opened joints in pipes along with the need to reset manhole covers at the subsided levels of streets and sidewalks (Earle, 1975: 87-88).

Local as well as state and federal government subsidence related problems and costs are categorized by Earle into four major areas (Earle, 1975: 88):

1. Installation and maintenance of drainage and flood protection facilities comprises a major budget item.
2. Public facilities such as schools and parks require continual maintenance.
3. Services such as street repairs and protection from the fire hazards of underground organic soil combustion must be provided.
4. Property values in neighborhoods must be retained to prevent the creation of tax burdens if serious deterioration is allowed.

These governmental expenditures to remedy subsidence based problems ultimately result in an increased burden on the taxpayers.

Flooding

A major threat to urban development in Louisiana's caostal zone is that of flood inundation caused either by high river water levels or by the high tides and waves associated with tropical storms. Flood damage results when structures are erected in flood-prone areas either at a level below projected flood heights or without regard to the effect of flood flows on structures or vice versa.

Community problems resulting directly from flooding in an urban development built on reclaimed wetlands include (derived from Lafayette Regional Planning Commission, 1973: 14-15):

1. contamination of the water supply by toxic, flammable or bacterial matter creating a community health hazard;
2. reverse flow of sewage effluent into buildings from septic tanks and other sewage disposal systems;
3. structural damage by high velocity flood waters and/or water-borne debris;
4. danger from inundated electric lines, circuits, equipment and appliances;
5. property damage to building contents by flood waters;
6. injury to community residents.

Large-scale public works projects (levees, flood walls, channel dredging, etc.) have been undertaken in the past to prevent or reduce flood damage. However, this approach has proven to be only partially effective as urban development spread rapidly outside the bounds of flood protection systems into flood-prone areas. Emphasis has therefore been shifted towards regulatory controls setting guidelines as to permitted land uses and required construction standards in areas of flood hazard. Regulatory system instruments include flood-control zoning ordinances, subdivision regulations, building and sanitary codes, open space and public land acquisition programs, flood warning systems, and public policy discouraging development extension into wetlands (Kusler and Lee, 1972: 3).

Structural protection under the regulatory approach applies to individual buildings rather than to levees, etc.

A building code may require new structures to meet appropriate flood-proofing and elevation standards thus placing more of the financial burden of flood protection on individual homeowners (Kusler and Lee, 1972: 3). However, the National Flood Insurance program has forced local and regional coastal zone planning agencies to assume responsibility in considering the impact of flood hazards on proposed developments which are supported with funds from federally-insured lending institutions.

Pollution

Water pollution is a continuing problem of developments located on former wetlands. In urban areas, this problem centers mainly on the infiltration of biodegradable and nonbiodegradable effluents into the storm sewer system along with the lack of treatment for storm runoff.

Reclaimed wetlands which have been developed for residential use require that all storm water be collected and pumped over the protective levee system into a nearby water body. This urban runoff normally contains a number of dangerous chemical compounds listed in Table 2.1, along with other street residues and raw sewage that seeps into the system through cracks and leaks in underground sewer lines. When storm runoff containing these materials is pumped untreated into a water body, it can lead to unnatural algal blooms (and resulting fish kills) as well as create a health hazard to recreational users of the water body (Mumphrey et al., 1975: 52-55).

TABLE 2.1

DANGEROUS EFFLUENTS IN URBAN DRAINAGE WATER

NONDEGRADABLES	DEGRADABLES
Glass	Petroleum
All Plastics	Natural Fibers
Mercury	Phosphates
Lead	Steel
Zinc	Nitrogen Oxides
Copper	Paper
Sulfuric Acid	Cellulose
Synthetic Insecticides	Nitrogen
Synthetic Detergents	Fertilizers
Synthetic Fibers	Carbon Monoxide
Some Drugs	
Asbestos	
Aluminum	
All Nonnatural Organic Compunds	

Source: Commoner, 1971.

An additional water pollution problem is posed by the existence of recreational camps located along the edge of water bodies. Such structures do not fall under standard subdivision statutes and may have totally inadequate sewage disposal systems. This can lead to high water pollution levels and present a public health menace (Stocks, 1974: 3).

Improvements are needed in both urban sewerage systems and in the regulations which control sewage collection, treatment and disposal methods.

Developmental Effects of Removal of Wetlands from the Ecosystem

Reclamation of wetlands for urban development creates a number of deleterious effects felt in the community-at-large. These include the loss of such productive activities performed by the estuarine system as (Mumphrey et al., 1975: 80-81):

1. assimilation of pollutants from urban runoff;
2. buffer from storm velocity wind and waves;
3. contribution to the local economy.

A healthy marsh has a high assimilation capacity, and can substantially filter urban-generated as well as industrial pollutants dumped into coastal waters. Wetlands also function as a storm buffer zone for inland urban areas, reducing wind and wave velocity by friction as the tropical storm passes. Because wetlands serve as a prime nursery area

for many marine species their value is extremely significant to the commercial fishing industry as well as to sports fishermen and other recreational participants.

Loss of a tract of wetland by means of leveeing, draining and filling prior to development causes a loss to the total estuarine system. With a reduction of nutrients from the tract entering the system, plant and animal production declines and there is a loss of habitat for migratory marine animals. Thus the reclamation process irreversibly decreases the natural productivity of the wetland ecosystem as a whole (Mumphrey et al., 1975: 79-80).

STAGES IN THE DEVELOPMENT PROCESS

Figure 2.1 illustrates the various stages involved in the conversion of current or former wetlands acreage into a residential subdivision and the problems associated with each stage. The development process for non-fast lands begins at Stage 1. For fast lands which are already protected by a levee system, the development process starts at Stage 3. The chart also illustrates stages in the construction of camps, duck blinds and other minimal types of development in non-fast lands. A description of the process and problems encountered occurs at the end of this chapter.

Development Process for Existing or Proposed Fast Lands

Pre-Development Stage[2]

Prior to the first stage of development the subdivision project is conceived by a developer. A determination is made at that time as to whether or not construction of a levee will be necessary. If the proposed project area is currently non-fast land, then a levee must be constructed in order to meet subsequent flood insurance, subdivision ordinance,etc. requirements. The developer then proceeds to Stage 1 of the process.

Stage 1 -- Apply for Corps of Engineers Permit

The developer applies to the Corps of Engineers for a dredge and fill permit necessary before commencing levee construction. Other means by which the levee building process is initiated include: 1) a federal legislative mandate; 2) a state, local or private request to the Corps of

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[2]This discussion refers only to development in wetlands. Obviously, the problems mentioned could be eliminated by using alternative, if available, dry land locations. Also certain landscape architectural and structural design techniques could be used to minimize the impacts of wetland environments on development. For more information see Georgia Department of Natural Resources (1975) Handbook: Building in the Coastal Environment and Carroll (n.d.) Developer's Handbook.

Engineers; or 3) self-initiation by the Corps of Engineers to build a levee for flood control or other purposes (Swindler, 1976).

If the Corps of Engineers has no objection to the requested levee construction, they submit the proposal through the process of impact assessment, public notice, and outside agency review which is discussed in Chapter 1. The National Environmental Policy Act of 1969 (N.E.P.A.) requires the filing of an environmental impact statement (E.I.S.) on any federally funded project before construction can begin if preliminary investigation indicates a significant impact. If an E.I.S. is required, the developer must usually provide the Corps of Engineers with all necessary environmental data. Granting of the permit allows the developer to proceed to the next stage.

Stage 2 -- Build Levee

In the second stage of development, the Corps of Engineers or a contractor under their direction physically constructs the levee. This process normally involves dredging of a ditch accompanied by a piling up of the dredged material alongside the ditch to create an earth berme. Additional earth material may be brought in to stabilize and solidify the levee. The Corps of Engineers sets standards for the methods and materials to be used in levee construction (Swindler, 1976).

When the Corps of Engineers undertakes a levee-building project in which there is a strong possibility of creating "windfall profits" for a developer, the Corps is required to conduct a land ownership analysis of the affected area. If project benefits are expected to arise from changes in the land type and resulting intensification of land use, Corps' policy requires that a cost-sharing system be used to finance levee construction. Thus the developer must pay a certain portion of the levee cost in order to receive the monetary benefits of wetlands reclamation on his property (Save Our Wetlands, Inc. v. Rush, et al., U.S. District Court, 1975).

Problems resulting from the erection of a levee include disruption of the wetland ecological system. When the wetland is cut off from its natural source of water and nutrient replenishment, the normal food chain and animal habitats are destroyed. This in turn reduces the economic and recreational benefits derived from the wetland by commercial and sport fishermen, hunters, etc. (Mumphrey et al., 1975: Chapters 3 and 4).

Another problem associated with this development stage involves the structural stability of the levee itself. Material dredged from the upper soil layers of a wetland to create a levee is normally very high in organic content (i.e. peat) and low in mineral content soils (i.e. sandy or silty clay). This organic material shrinks and cracks as it dries and oxidizes making the levee more vulnerable to erosion and

breach in the event of high water levels. Only by adding to the levee mineral soils dredged from the deeper layers of the wetland or brought in from outside areas does it become solid and stable (D. Clement, 1976).

Stage 3 -- Obtain Loan and Purchase Land

Once levee construction is assured, the developer may proceed with negotiations for obtaining a loan and purchasing the land for the subdivision.[3] In most cases, the developer will apply for a loan from a federally insured lending institution. By doing so, he falls under the current requirements of the H.U.D. Flood Insurance program detailed in Chapter 1. In accepting a federally subsidized loan for new residential construction, the developer must meet all standards for elevation of structure above the base flood level, flood-proofing of utilities, stability of raised structural supports, etc.

Stage 4 -- Drain Site

Once the land has been sealed off by means of the levee from further surface water interaction with the larger coastal wetland zone, it is ready to be drained. This involves the dredging of drainage canals and installation of pumps to lower the water table. (See subsequent section,

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[3]In some instances, the developer may purchase the land before requesting a permit for levee construction (Swindler, 1976).

Stage 6 -- Fill Site,for discussion of reclamation techniques.) The initial subsidence stage causes the upper layers of organic material to rapidly lose up to 85 percent of their original volume. Very quickly the land protected within the levee subsides to an elevation below sea level. Pumps must be used to continue lowering the water table and to pump the water up and over the levee. The canals are initially dredged to a depth of 4 to 6 feet. However, rapid subsidence of the surrounding land and silting up of the canals with sediments necessitates that they be dredged periodically (D. Clement, 1976). This procedure is often requested by the residents themselves as a means of improving their drainage during periods of heavy rainfall. However, the ultimate result of this periodic lowering of the water table is that another layer of organic material beneath the surface dries out, oxidizes and causes increased homeowner subsidence problems where previously they may not have been as serious (D. Clement, 1976).

Problems associated with the site drainage stage include the rapid oxidation of peat and accompanying land subsidence. When the thick peat beds of former wetlands are rapidly dried, air displaces water in the voids within the organic materials. High oxygen levels can trigger underground combustion of loosely packed organic soils commonly called peat fires. These burn uncontrolled often for many days and sometimes to depths 10 to 12 feet beneath the land surface.

While these fires do quickly oxidize a great amount of organic material that could cause continued subsidence problems to homeowners,they also greatly increase air pollution levels (Earle, 1975: 90).

Stage 5 -- Clear Site

When drainage of the land is sufficiently advanced to allow bulldozers and other heavy equipment onto the site, the clearing stage begins. This may involve only selective clearing of some trees and underbrush, but more frequently is an almost complete removal of all vegetative cover.

Problems associated with this stage include the rapid drying, shrinking and cracking of upper organic soil layers with removal of all vegetation. This leads to increased run-off during periods of heavy rainfall and may initiate erosion problems. Loss of all vegetation may also change the microclimate of the immediate area.

Very costly homeowner problems result from improper clearing practices, such as bulldozing under tree stumps, trunks, roots, etc. rather than removing them from the site. These buried objects can cause differential settlement as the surrounding land subsides, and may lead to cracked or tilted house slabs and yard maintenance problems for homeowners (D. Clement, 1976).

Stage 6 -- Fill Site

This stage involves the addition of fill material to the entire site in order to replace all or a portion of the surface elevation lost by initial and continued subsidence. Two very different methods of wetland reclamation are available to the developer along with several variations of each method. They differ greatly in terms of the amount of subsidence each induces, the overall cost based on the amount of fill added to the site, and the flood hazard potential of the filled site.

The "Wet Method" or "Water Drawdown Method" is now the most commonly used technique by developers. It involves lowering of the water table by means of drainage canals and pumps which work to maintain the depressed water table level. Water removed from the site is pumped from the canals into some large water body (e.g., a lake). Some fill is placed on the site to offset subsidence (Kaiser Engineers, 1974: 6).

The "Fill Method" or "Dry Method" dictates that the water table be maintained at mean sea level and several feet of fill be placed upon the site. With this method,land is drained through a system of artificially created swales and surface runoff into a canal system (Kaiser Engineers, 1974: 6-7 and Villavaso, 1975).

The "Fill Method" is not used by developers mainly because of its high initial cost. Although it does provide the highest degree of safety from flooding, it also causes

the highest initial and ultimate subsidence rates due to consolidation and settlement of the fill material. Developers currently use the "Wet Method" of reclamation because much less fill material is required and subsidence rates are lower. However, the most promising reclamation methods for future use would seem to be the "Modified Wet Method" which depresses the water table more than the "Wet Method"; and the "Modified Fill Method" which lowers the water table more and reduces the amount of fill material required as compared to the "Fill Method". Both systems reduce the amount of initial and continued subsidence substantially (Kaiser Engineers, 1974: Figure 3 and Villavaso, 1975).

All reclamation methods which add fill to a wetland are regulated by the Corps of Engineers under Section 404 of the Federal Water Pollution Control Act of 1972 (see Chapter 1).

Stage 7 -- Submit Plan for Approval

Before any further site improvements can be made, the developer must submit a plan of the proposed subdivision to the parish planning commission or police jury for their approval. This approval process normally involves several steps. First, a conceptual plan is prepared for the site which includes proof of utility agreements made by the developer with various private utility companies to service the new development. Next a preliminary plan is completed which shows more specific street and lot arrangements for the subdivision. Finally, an engineering plan for the site

must be submitted and approved. This shows exact dimensions for streets and lots, placement of underground utilities, etc. in accordance with current applicable zoning ordinances and subdivision regulations (Terrebonne Parish Police Jury, 1973).

Problems may be encountered throughout this development stage due to conflicting and confusing regulations. Later homeowner problems may result if the regulations are not adequately enforced and the plan is approved with major deficiencies.

Stage 8 -- Layout of Site

This involves the actual staking out of streets, lots and utility rights-of-way by surveyors on the site prior to commencing improvements. The site layout must carefully follow plans approved by the parish planning agency.

Stage 9 -- Lay Utilities

Trenches for electric, natural gas, telephone, water and sewerage utility lines are prepared within utility rights-of-way in this development stage. Lines are laid within these corridors along with spur lines to connect with future house sites. Special underground cradle structures are built to support manholes, etc.

Problems encountered in this stage are due both to the high water table usually found on the site and the high

subsidence potential. Utility lines may be damaged by water during flood periods. If flood-proofing of utilities is required, this adds to the expense of installation which is passed on to consumers. Subsidence adds to the utility problems by increasing the need for maintenance of cracking feeder pipes by homeowners. There is also the danger of natural gas, sewage and water leaks developing as the subsiding land places a stress on utility lines. Local excavation for sewers, water lines, etc. can of itself contribute to on-site subsidence (Earle, 1975: 81).

Standards for utility installation are set in parish and local building codes along with more specific product design codes.

Stage 10 -- Fill and Grade Roadbeds and Build Streets

The developer is responsible for the construction of roads to parish specifications. This stage usually involves "mucking" or removal of the top several inches of organic material and placement of a sand and shell base course, but not pilings. The asphalt or concrete street is then constructed according to product design code specifications. For larger streets and highways the base preparation may be more extensive, including removal of the top several feet of organic material and laying of a much thicker base course. Roads next to canals may require sheet piling alongside to prevent them from sliding into the canals (Earle, 1975: 89).

The need for extensive excavation of organic soils and the subsequent build-up of the roadbed with sand and shell increases both the time needed to construct streets and their cost.

It is the parish or city which takes over street maintenance from the developer after construction and approval. Thus the extra initial cost along with the maintenance charges over the years on warping and cracking problems caused by high subsidence are ultimately borne by the public-at-large.

Stage 11 -- Fill and Grade Lots

The parish or local building code normally specifies the minimum lot grade which must be established before piles can be driven and a structure erected. This should take into account the elevation required under federally insured flood insurance programs (see Chapter 1).

A problem which may be encountered in this stage is the quality of fill material used on the lot. This should be a good quality "spillway" sand or other comparable mineral soil rather than a "pump" sand which may make surface consolidation difficult and is also very infertile (D. Clement, 1976).

Stage 12 -- Obtain Building Permit

A permit must be obtained from the proper parish and/or local authorities before actual improvements on each house lot can begin. This permit is intended to insure that the

developer will construct each house in accordance with the general building code and all special codes pertaining to gas, electrical and plumbing lines; fire prevention measures; health and sanitation precautions; etc. which may have been adopted.

Stage 13 -- Drive Piles

This stage involves the driving of pile supports for the structures to be built. Most commonly treated wood piles are used at an even spacing around the house site. However, points of greater load in the structure may require closer spacing of piles. The piles are driven to a specified depth or until they reach "refusal" and cannot be driven any deeper. "Skin friction" or the cohesion between the pilings and the soil particles actually creates the supporting capability. Reinforced concrete piles may also be used for larger structures. However, the technology for pouring and joining lengths of these piles is limited.

Vibration of the land surface by the driving of piles on a house site may cause some subsidence problems in nearby structrues already completed.

Stage 14 -- Lay Foundation

When the piles are in place, then a foundation can be evenly supported.[4] Several types of foundations are possible

[4]If the house site was located on a stable topographic feature such as a natural levee or if the "Fill Method" of reclamation was used, it might be conceivable to build structures on grade without piles. It is known that a pile foundation costs about twice as much as a non-pile supported slab on sand foundation (Mumphrey et al., 1975: 145).

for the structure. These include: 1) slab on grade secured to the piles, or 2) structure on short piers with concrete casings enclosing the protruding piles. A masonry wall may also be used to conceal the piers on a raised house.

Severe subsidence problems may cause differential settlement of the land surface leading to cracked or tilted slabs. This in turn can create the danger of breaks in gas lines leading from the gas meter to the house. Subsequent gas leaks may form and therefore the explosion potential is increased.

More common homeowner problems stem from the shrinking away of the yard and landscape features from the pile supported house because of drying, shrinking, and oxidation of the soil. This causes unsightly gaps between the land surface and the base of the slab foundation. The homeowner must then either assume the costs of periodically shoring up around his house with fill material or face a loss in property value (Earle, 1975: 83-84).

Houses raised on short piers experience the same problems as the land surface subsides. There may be the additional problem of termites and dampness attacking exposed joists beneath the house.

Stage 15 -- Build Structure

Each house must be constructed in accordance with the building code and specific utility codes. Subsidence problems may result in cracking of interior floors, walls,

ceilings and exterior masonry walls. The homeowner must assume all costs for repairs or suffer decreasing property values (Earle, 1975: 83-84).

Stage 16 -- Lay Sidewalks, Driveways, Etc.

Subdivision regulations normally provide the specifications for size and placement of sidewalks and driveway aprons. A shallow sand bed is normally the only base preparation provided, with reinforced concrete as a surface treatment.

With continued subsidence of the land surface, these landscape elements pull away from the more solidly supported house foundation. Warped and cracked driveways, walkways, sidewalks, fences, etc. are common in high subsidence areas.

In some communities the parish or local government assumes the maintenance of sidewalks and driveway aprons, replacing them periodically with no direct charge to the homeowner. In other areas, the homeowner may be required to pay half the replacement charge. However, the expense for repair of walkways, driveways, and fences falls directly on the homeowner along with the increased taxes to support other public maintenance work (D. Clement, 1976).

Stage 17 -- Collect and Dispose of Sewage, Waste Water and Solid Waste

Completion of the development, sale of the houses, and assumption of responsibility for roads and utilities by the parish and private utility companies usually terminates the

involvement of the developer in the project. However, the regulatory process continues in effect during all stages of occupancy including the generation and disposal of waste materials.

Special problems are encountered in a community developed on a former wetland with regard to waste disposal. Waste water collected as street runoff during periods of heavy rainfall must be pumped from the numerous collection canals into a larger body of water which is usually at a higher elevation. This falls under the current jurisdiction of Section 404 of the Federal Water Pollution Control Act (1972). Treatment of this waste water may be required before it is pumped. If not treated,receiving water bodies are likely to be highly polluted by this effluent.

Because of the extremely poor soils of former wetlands with the accompanying high water table, use of septic tanks for sewage disposal is not allowed in most urban developments. The soils cannot perform an adequate job of filtering sewage effluent, and bacterial contamination of ground water is the inevitable result. Even in low density developments where septic tanks are marginally allowable, there is a constant problem of system back-ups and actual floating to the surface of waste materials during periods when the water table is particularly high. A sanitary sewerage system with primary and possibly secondary treatment of effluent is usually necessary with any type of urban development in former

wetlands. Problems still occur as the land subsides and pipe connections to individual houses crack and leak. The public cost for maintaining an extensive sewerage system is also high (Stocks, 1974).

Solid waste disposal poses another problem for communities built on former wetlands. Again the poor soils and high water table make the use of sanitary landfills undesirable. Unless greater expense is outlaid for sealing the landfill site with an impermeable material such as clay, there is always the danger that leachate will escape and contaminate the groundwater (Figure 2.3) (Brunner and Keller, 1972: 19). The most commonly used method of solid waste disposal in coastal communities is incineration. This not only adds to the public tax burden because it is an expensive disposal method but also contributes to air pollution and resulting health hazards.

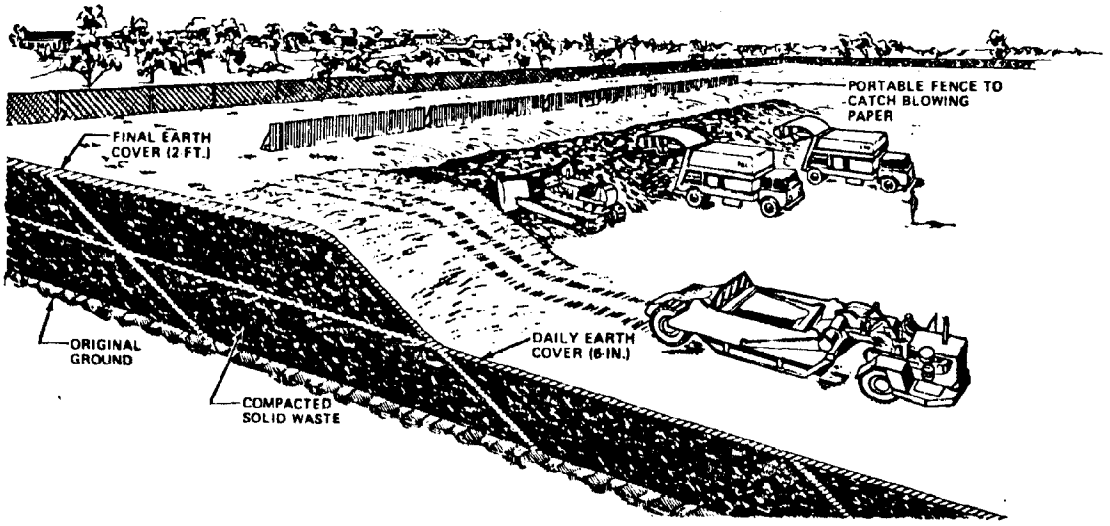
Development Process for Non-Fast Lands

The development process in non-fast lands is greatly limited by the constraints of flood hazard and standing water. Therefore, development is minimal, being limited to the construction of recreation-oriented camps and duck blinds.

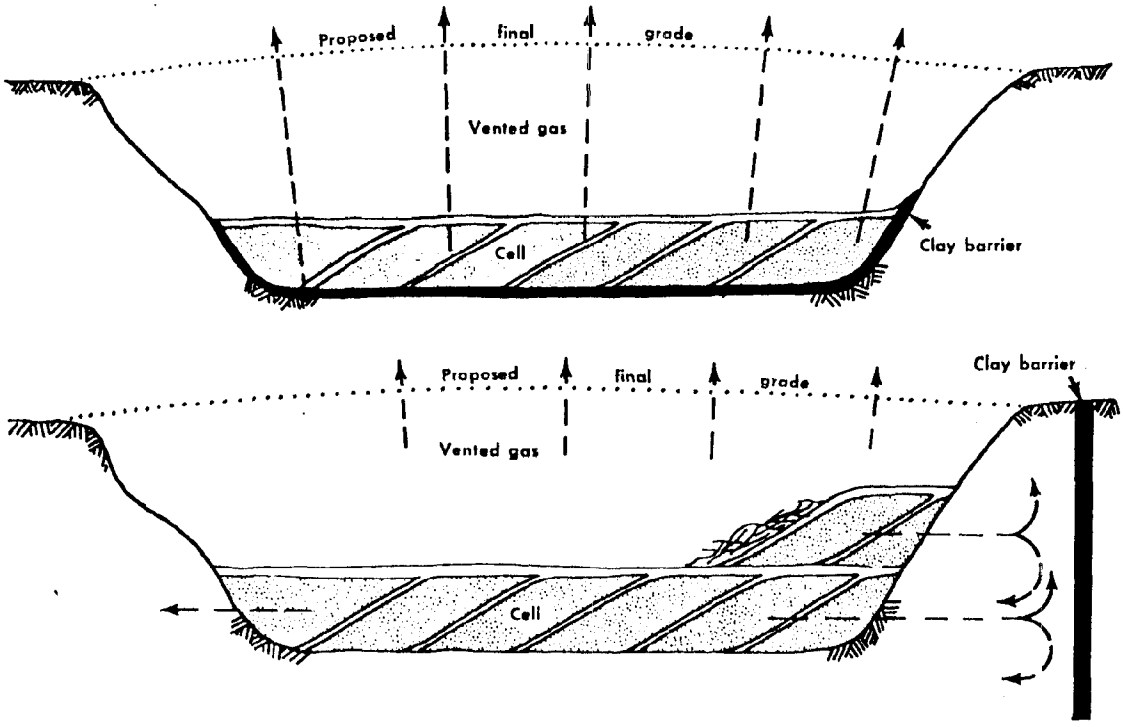
Permits are currently unnecessary from either the Corps of Engineers or local government for erection of a duck blind on non-fast land. Technically the Corps could require a

FIGURE 2.3

DESIGN AND OPERATION METHODS FOR A SANITARY LANDFILL



In the area method of sanitary landfilling, a bulldozer spreads and compacts the waste on the natural surface of the ground, and a scraper is used to haul the cover material at the end of the day's operations.



Clay can be placed as a liner in an excavation or installed as a curtain wall to block underground gas flow.

Source: Brunner and Keller, 1972: 26,28.

permit for such construction, however this prerogative is not currently exercised (R. Clement, 1976).

In the case of recreational camps, the local government in conjunction with the Corps of Engineers may require permits prior to construction. Local government definitely maintains control over construction standards for all habitable structures through the permit system. The Corps of Engineers may require the granting of a permit for any significant structure built on non-fast land under the terms of Section 404 of the Federal Water Pollution Control Act (R. Clement, 1976).

For duck blinds and camps the stages of development subsequent to the building permit stage are illustrated on Figure 2.1. These include driving piles, building the structure on raised pile supports, and disposal of wastes following completion and use of the structure. The last step creates perhaps the greatest problem in non-fast lands because the commonly used system of septic tanks for waste disposal is totally unsuitable. Percolation and detoxification of waste effluent through the soil layers cannot take place on lands where there is a high water table or standing water. Instead pollutants are released untreated into the surrounding waters creating a health hazard. New systems for waste disposal should be developed and required for use prior to the granting of any building permit in non-fast lands.

REFERENCES

Brunner, Dirk R. and Daniel J. Keller (1972) Sanitary Landfill Design and Operation. Washington, D.C.: U.S. Government Printing Office.

Carroll, Allen (n.d.) Developer's Handbook. Hartford, Connecticut: The Connecticut Department of Environmental Protection.

Clement, Daniel W. (1976) District Conservationist, U.S. Soil Conservation Service, Metairie, Louisiana, personal interview, November 4.

Clement, Randolph (1976) Planner, City Planning Commission of New Orleans, New Orleans, Louisiana, telephone interview, November 15.

Commoner, B. (1971) The Closing Circle: Nature, Man, and Technology. New York: Alfred A. Knopf, Inc.

Earle, Daniel W., Jr. (1975) Land Subsidence Problems and Maintenance Costs to Homeowners in East New Orleans, Louisiana. Unpublished doctoral dissertation. Baton Rouge, Louisiana: Louisiana State University.

Frazer, Tom (1976) "The Gas Mystery," The States-Item, October 30.

_____ (1976) "Gas Hazard: A Truck on a Lawn," The States-Item, November 20.

_____ (1976) "East Jefferson Map Shows Potential Explosion Areas," The States-Item, November 23.

_____ (1976) "Louisiana Gas Request Blasted in Jefferson," The States-Item, December 10.

Georgia Department of Natural Resources (1975) Handbook: Building in the Coastal Environment. Atlanta, Georgia: Georgia Department of Natural Resources.

Kaiser Engineers and Burk and Associates, Inc. (1974) Engineering: Pontchartrain New Town in Town; Supplemental Report. New Orleans, Louisiana: Kaiser Engineers.

Kusler, Jan A. and Thomas M. Lee (1972) Regulations for Flood Plains, Planning Advisory Service Report No. 277. Chicago, Illinois: American Society of Planning Officials.

Lafayette Regional Planning Commission (1973) Flood Prone Area Regulations. Lafayette, Louisiana: Lafayette Regional Planning Commission.

Mumphrey, Anthony J. et al. (1975) Louisiana Metropolitan Wetlands: A Planning Perspective; a report to the Louisiana State Planning Office. New Orleans, Louisiana: Urban Studies Institute, University of New Orleans.

Save Our Wetlands, Inc. v. Rush et al. (1975) United States District Court, Eastern District of Louisiana, New Orleans Division.

Stocks, Clare Hilliker (1974) Report on Water Quality in Jefferson, Orleans, St. Bernard and St. Tammany Parishes, unpublished paper prepared for the Implementation Committee of the New Orleans Area Health Planning Council, New Orleans, Louisiana. March 21.

Swindler, Roger D. (1976) U.S. Army Corps of Engineers, New Orleans, Louisiana, personal interview, September 22.

Terrebonne Parish Police Jury (1975) Subdivision Regulations, Terrebonne Parish, Louisiana. Houma, Louisiana: Terrebonne Parish Police Jury.

U.S. Congress (1969) Public Law 91-190, National Environmental Policy Act of 1969. Washington, D.C.: U.S. Government Printing Office.

_____ (1972) Public Law 92-500, Federal Water Pollution Control Act Amendments of 1972. Washington, D.C.: U.S. Government Printing Office.

U.S. Soil Conservation Service (1976) Gulf Coast Wetlands Handbook. Alexandria, Louisiana: Soil Conservation Service, U.S. Department of Agriculture.

Villavaso, Stephen D. (1975) Methods of Wetland Reclamation: A Decision Framework; unpublished manuscript. New Orleans, Louisiana: Urban Studies Institute, University of New Orleans.

CHAPTER 3

RECOMMENDED URBAN DEVELOPMENT GUIDELINES

INTRODUCTION

This chapter carries the problem identification methodology developed in the previous chapter one step further. For those development practices deemed to be non or inadequately regulated, guidelines are recommended. The discussion is divided into two major categories. First, proposed statewide policy guidelines are outlined along with a discussion of examples of coastal zone regulatory schemes from other states. The second section details proposed parish-wide ordinance amendments and other restrictive measures which apply to specific stages in the development process.

STATEWIDE POLICY GUIDELINES

The Coastal Zone Management Act of 1972 in Section 306 suggests any one or a combination of three different techniques for control of land and water uses within the coastal zone. They are as follows:

(A) State establishment of criteria and standards for local implementation, subject to state administrative review and enforcement of compliance;

(B) Direct state land and water use planning and regulation;

(C) State administrative review for consistency with the state management program of all development

> plans, projects, or land and water use regulations, including exceptions and variances thereto, proposed by any state or local authority or private developer, with power to approve or disapprove after public notice and an opportunity for hearings.

Under (A), local implementation of standards and criteria as set forth by the state is achieved by the adoption of suitable local zoning ordinances or regulations. Enforcement by both state and local governments would be on a continuing basis and determined by local conditions. Administrative review at the state level of local regulations would provide consistency with the state criteria and standards but the state would not review the merits of specific cases. If the local government fails to adopt the necessary ordinances and regulations or fails to enforce existing statutes, then the state would have the authority to assume regulatory control (National Oceanic and Atmospheric Administration (NOAA), 1975: II-10). The State of Washington uses this technique.

Under subsection (B), the state would have all control and be responsible for land and water use planning and regulation. The traditional role of local control would be abolished and the state would assume all decision-making responsibilities. Maine is an example of a state which utilizes this particular technique (NOAA, 1975: II-10).

The third technique used by Florida, subsection (C), would allow the local level of government to adopt its own

zoning ordinances or regulations without the restrictions of state criteria and standards. State control would intervene when certain predetermined circumstances come under consideration (NOAA, 1975: II-10). The primary difference between the first and third techniques is that the first one sets up criteria to establish ordinances and regulations, while the third allows existing regulations and ordinances to remain but reviews special cases.

To point out a general inclination of other coastal states towards one of the regulatory techniques, Table 3.1 shows those states which have enacted some specific coastal zone legislation (not CZM Program) as of May 1975. Table 3.2 indicates the technique which each state is considering using to implement its coastal zone management program.

Control Techniques Used by Other States

The state of Washington has enacted its Shoreline Management Act of 1971 which utilizes the first technique. State and local units work together to compose a final set of guidelines. Planning and regulation of the state's shorelines is essentially done by the local levels of government (Berger, 1975: 23).

A summary of Washington's program involves the following steps (Berger, 1975: 24):

1. State Department of Ecology issues proposed guidelines;
2. Local governments comment and negotiate with the Department of Ecology;

TABLE 3.1

LAND/WATER USE CONTROL TECHNIQUES NOW

BEING EMPLOYED BY COASTAL STATES

STATE	STATE CRITERIA/ LOCAL REGULATION (A)	STATE REGULATION (B)	STATE ADMINISTRATIVE REVIEW (C)
Alabama		X	
Alaska		X	
California		X	
Connecticut		X	
Delaware		X	
Florida			
Georgia		X	
Hawaii			
Illinois			
Indiana			
Louisiana			
Maine	X		
Maryland		X	
Massachusetts		X	
Michigan	X		
Minnesota	X		
Mississippi		X	
New Hampshire		X	
New Jersey		X	
New York		X	
North Carolina	X	X	
Ohio			
Oregon			
Pennsylvania			
Rhode Island		X	
South Carolina			
Texas			
Virginia	X		
Washington	X		
Wisconsin	X		
American Samoa			
Guam			
Puerto Rico			
Virgin Islands		X	

Source: Berger, 1975: 20.

TABLE 3.2

LAND/WATER USE CONTROL TECHNIQUES

UNDER CONSIDERATION

STATE	STATE CRITERIA/ LOCAL REGULATION (A)	STATE REGULATION (B)	STATE ADMINISTRATIVE REVIEW (C)
Alabama		X	
Alaska			
California	X	X	
Connecticut	X		
Delaware		X	
Florida	X	X	X
Georgia			
Hawaii			
Illinois		X	X
Indiana	X		
Louisiana	X		
Maine	X		
Maryland			
Massachusetts			
Michigan	X		X
Minnesota	X		
Mississippi			
New Hampshire	X		
New Jersey		X	
New York			
North Carolina	X		
Ohio		X	X
Oregon	X		
Pennsylvania			
Rhode Island	X		
South Carolina	X	X	
Texas	X		X
Virginia			
Washington	X		
Wisconsin			

Source: Berger, 1975: 22.

3. Public hearings;
4. Final guidelines;
5. Comprehensive inventory of shorelines by local governments;
6. Development of master programs by local governments based on state guidelines;
7. Public hearings;
8. Approval/revision of local master programs by the Department of Ecology;
9. State plan from combined individual master plans; and
10. Local administration of a permit program based on the master plans by local governments.

The State of Florida's Environmental Land Water Management Act uses the third technique of administrative review for consistency with the state management program. Basically, it strives to determine the type and degree of use that special areas of the coastal zone can withstand without further deterioration of their basic resources. It does so by dividing the coastal zone into three major categories: Preservation, Conservation, and Development (Florida Coastal Coordinating Council, 1973: 2).

The Preservation category specifies no further modification to those areas which fall under its classification. These areas have overriding ecological, hydrological, physiographic, historical, or socio-economic importance to the public-at-large. The Conservation category allows for

some controlled modification, while the Development category places few controlling restrictions on potential developers (Florida Coastal Coordinating Council, 1973: 2).

Table 3.3 provides a summary and comparison of the three controlling techniques used by Washington, Florida, and Maine.

Suggested Control Technique for Louisiana

The primary concern of the people of Louisiana towards the establishment of a coastal zone management program is who will actually have control -- federal, state, or local authorities -- of the decision-making process once the program is in effect. While they are somewhat divided about giving responsibility to local or state levels, there is a very strong concensus that the federal government should play a minor role in the regulatory process (Lindsey et al., 1976: 1).[1]

In a continuation of this theme for reduced federal control in the coastal zone, it is suggested that the state of Louisiana adopt a controlling technique similar to the first type described in this chapter -- "State establishment of criteria and standards for local implementation, subject to state administrative review of local regulations and state enforcement of compliance". This is recommended

[1]Environmentalists, skeptical of state and local resolves to manage the coastal zone wisely, prefer the alternative of existing and expanded federal control.

TABLE 3.3

SUMMARY OF STATE PROGRAMS

	WASHINGTON	MAINE	FLORIDA
WHO	State guidelines; local regulation	State regulation	Local regulation (or state when appropriate)
WHAT	1. Ocean shorelines of state; 2. Other shorelines of statewide significance	All developments occupying 20 or more acres	All developments of regional impact
HOW	Guidelines; establishment of master programs; permit systems; default clause; appeals to state	Permit system; appeals to Supreme Court of state	Administrative review of all plans, projects, and regulations; appeals through state review process
ENFORCEMENT	By Attorney General with civil and criminal penalties	By Attorney General with no penalties	By state or local level with injunctive relief; no other penalties

Source: Berger, 1975: 28.

because local control is maintained as traditional in Louisiana and the state role is to establish criteria and enforce regulations. State criteria would ensure uniformity over parishes and state enforcement would allow economies of scale to be gained. Also, the federal role would be greatly diminished in line with the desires of Louisiana citizens. The states of Washington and Oregon utilize this particular technique. It reduces federal control by assuming many of the responsibilities such as the permit program and enforcement of air and water quality standards which were previously held by federal agencies.

Section 303 of the Coastal Zone Management Act in part requires:

> (c) for all Federal agencies engaged in programs affecting the coastal zone to cooperate and participate with state and local governments and regional agencies in effectuating the purposes of this title, and (d) to encourage the participation of the public, of Federal, state, and local governments and of regional agencies in the development of coastal zone management programs ....

and Section 307 states:

> (e) Nothing in this title shall be construed -- (1) to diminish either Federal or state jurisdiction, responsibility, or rights in the field of planning, development, or control of water resources, submerged lands, or navigable waters....

There is, however, an indication that the State of Washington's program broadly interprets these guidelines since it provides that "Federal agencies issuing licenses or permits

for any activity affecting the coastal zone are generally constrained from doing so until the state certifies that the proposed activity is in fact consistent with its management program" and the "Federal agencies are in most cases restricted from assisting proposals affecting the coastal zone unless they are consistent with the coastal management program" (Office of Coastal Zone Management, 1976: 98). A lack of Federal control can be seen in Figure 3.1, which shows Washington's Shoreline Permit Procedure and its emphasis upon local regulation (Office of Coastal Zone Management, 1976: 23).

Also, Oregon's Draft Coastal Zone Management Program has attempted to curtail Federal control by requiring that federal agency licenses and permits be certified by the state's lead agency in the program, The Land Conservation and Development Commission. The following is a list of federal agencies and their respective licenses and permits which would have been designated by Oregon to have a significant effect on its coastal zone (Oregon Land Conservation and Development Commission, 1976: 90-91):

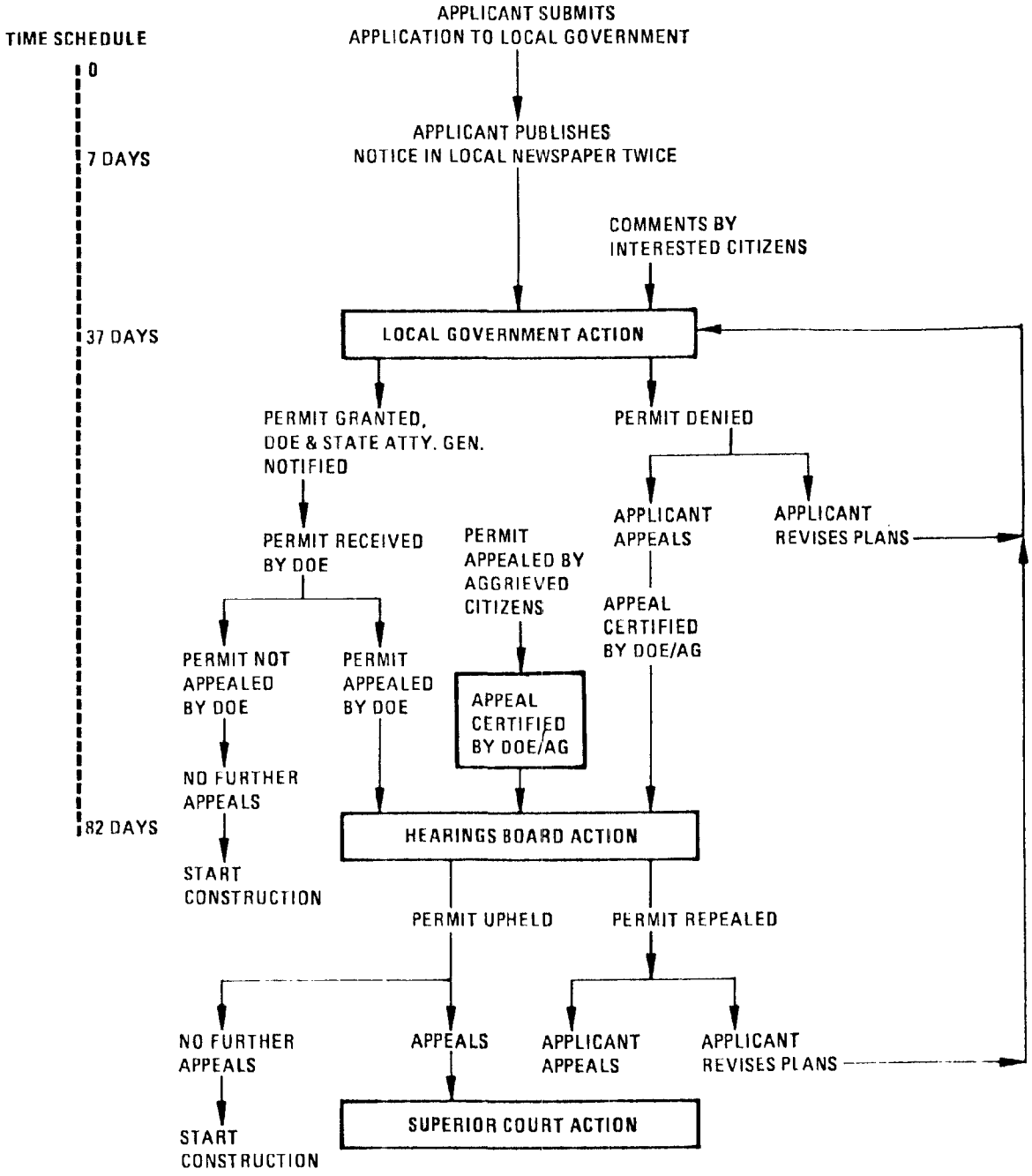
Environmental Protection Agency

1. Permits and licenses required under Sections 402 and 405 of the Federal Water Pollution Control Act of 1972 and amendments.
2. Permits and applications for reclassification of land areas under regulations for the prevention of significant deterioration (PSD) of air quality, unless EPA has delegated all such PSD review authority to the State of Oregon.

FIGURE 3.1

STATE OF WASHINGTON

SHORELINE PERMIT PROCEDURE



Source: Office of Coastal Zone Management, 1976: 23.

Department of Defense - U.S. Army Corps of Engineers

1. Permits and licenses required under Sections 10 and 11 of the River and Harbor Act of 1899.
2. Permits and licenses required under Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972.
3. Permits and licenses required under Section 404 of the Federal Water Pollution Control Act of 1972 and amendments.

Nuclear Regulatory Commission

Permits and licenses required for siting and operation of nuclear power plants.

Department of Interior - Bureau of Land Management

Permits and licenses required for off-shore drilling and mining on public lands.

Department of Transportation - U.S. Coast Guard

Permits for construction of bridges under 33 U.S.C. 401, 491-507, and 525-534.

Department of Transportation - Federal Aviation Administration

Permits for operation of airports.

Federal Power Commission

1. Permits and licenses required for power plant siting and transmission lines.
2. Permits and licenses required for interstate pipelines.
3. Licenses for construction and operation of facilities needed to import or export natural gas.

Since Washington's program has been approved by NOAA for compliance with the Coastal Zone Management Act of 1972,

and yet provides for the greatly diminished federal role, it seems likely that Louisiana could achieve a similar status by adopting the recommended technique of land/water use control.

LOCAL URBAN DEVELOPMENT REGULATORY GUIDELINES

In keeping with the expressed desires among Louisiana citizens of emphasizing local government control of coastal zone issues, the following discussion suggests various local regulatory measures which could be adopted. These suggestions or guidelines are organized around the major problem areas encountered in urban development of wetlands with specific references to the stages of development where they should be applied (Figure 2.1). In addition, the regulatory mechanisms available for incorporating and implementing these guidelines are presented.

It is recognized that the adoption of these local regulations would increase lot and house costs to consumers. However, since these increased costs are spread out over the life of the mortgage, their impact on the consumer would be mitigated. The homeowner would have fewer subsidence, flooding and pollution related problems with less annual maintenance work involved. This would tend to balance the increased mortgage payments.

Hierarchy of Local Land Use Control Ordinances

As a preparatory step in the creation of coastal zone management guidelines, each parish should adopt and implement a comprehensive zoning ordinance, subdivision regulations and a building code. (See Chapter 1.) Each of these three documents must be authorized and duly passed by the local governing body (police jury). These three ordinances each have a separate role to perform in the total regulatory scheme.

The comprehensive zoning ordinance is the most all-encompassing local land use control. It serves as a governmental tool for controlling the use of land in such a way as to make it compatible with contiguous land uses. Thus orderly growth is maintained and private property values are preserved. In the case of wetlands, it is the zoning which generally determines whether or not development will be allowed in a sensitive area.

Subdivision regulations are a second level of land use control generally governing the partitioning of land into lots for eventual sale. These controls come into effect once the decision to build in an area has been made though the zoning ordinance. Subdivision regulations normally include requirements as to maximum development densities, lot sizes and configurations, road design and construction standards, minimum drainage requirements, etc. They may also include minimum floor elevations for structures. These regulations are imposed to insure orderly community growth.

Building codes mark the third layer of local land ordinances and apply at a more detailed level than either the zoning ordinance or subdivision regulations. Building codes regulate all aspects of actual on-site construction including lot grade, piling and foundation preparation, utility installation and structural specifications. Product design and performance standards also work at the same level as the building code. This type of ordinance is most useful for insuring structural safety, uniformity and stability within the community.

Regulatory Guidelines Addressing Specific Problem Areas

The three levels of land use regulatory ordinances should consider the problem areas of flooding, subsidence and pollution associated with urban development in the wetlands. Each of these problems is discussed with regard to the types of development practices which should be regulated.

Flood Protection Guidelines

Permitted Uses in Flood Prone Areas (Imperial Calcasieu Regional Planning and Development Commission, 1974: 48-51)

- Agriculture (all forms)
- Industrial and commercial (e.g. loading and parking areas)
- Public uses of an essentially open space nature not requiring a substantial amount of permanent structures (e.g. airport landing strips, maintenance yards)

- Private recreational uses of an essentially open space nature not requiring large, permanent structures or extensive storage of floatable or potentially hazardous materials
- Uses associated with residences such as lawns, gardens, parking and play areas, but not including permanent habitations

Permitted Uses Under Special Exceptions

Uses which involve low damageable values, temporary use; or safely, easily, and quickly evacuated uses which will not increase flood heights or velocities (e.g. circuses, carnivals, drive-in theaters, car lots, extractive operations, marinas, storage yards for equipment, kennels and stables).

Permitted Uses Under General Exceptions

All uses which meet the following provisions:

- Structures elevated to a minimum specified height above the 100 year flood level
- Structures constructed to minimize flood damage potential -- see below.

1. Construction practices minimizing flood damage (N-Y Associates, Inc., 1973: 3-14 and Lafayette Regional Planning Commission,1973: 14-15).
   - Structures anchored to resist flotation and lateral movement, or additional mass or weight incorporated into structure (Stage 14).
   - Watertight doors, bulkheads, and shutters installed (Stage 15).
   - Walls reinforced to resist damage due to water pressures or floating debris,or first floor washout walls installed (Stage 15).

- Paints, membranes or mortars used to reduce seepage of water through walls (Stage 15).
- Pumps installed to lower water levels in structures (Stage 15).
- Water supply and waste treatment systems constructed to prevent the entrance of flood waters, flammable liquids or other toxic materials that could be hazardous to public health, safety and welfare. Construction of these systems should be in a manner which will assure that the facilities are situated at protected elevations or are adequately flood-proofed to prevent flotation or damage of storage containers releasing toxic materials into flood waters (Stage 17).
- All electric lines, circuits, equipment and appliances installed where they will not be in danger of flooding by the 100-year storm (Stage 15).
- Valves installed in sewerage and drainage systems to prevent the reverse flow of liquids and other materials into buildings (Stage 15).

2. Suggested practices for particular site improvements (Lafayette Regional Planning Commission, 1973: 12).

A. Building site

- Building sites or slabs elevated to a specified elevation (Stage 11 or 14).
- Fill area extended beyond the limits of the intended structure (15 feet or more). If the subdivision is not to be sewered, this fill extension must include areas for on-site waste disposal (Stage 11).
- Commercial or industrial land uses allowed at lower elevations (see above) with the use of such protective measures as flood-proofing (Stage 15).

B. Drainage system

- Drainage structures designed to minimize the water runoff onto other lands located adjacent to the proposed development (Stage 9).
- Surface water flow controlled in a manner which will protect persons and property from damage (Stages 9 and 10).
- Ample drainage provided along streets and away from sewerage disposal facilities and buildings. Drainage openings large enough to remove flood waters without substantially increasing flood heights (Stages 9 and 10).
- Underground system provided to accommodate frequent floods along with a secondary surface drainage system to accommodate larger, less frequent floods. These systems should comply with requirements of the city and/or parish engineer (Stage 9).
- Drainage plans of development made consistent with local and regional drainage plans (Stage 7).

C. Sewerage system (Diversified Economic and Planning Associates, Inc., 1973: 19-20).

- Installation of sewage disposal facilities requiring soil absorption systems prohibited where such systems will not function due to high ground water, flooding, or unsuitable soil characteristics (Stage 7).
- Subdivider must provide, specifically in writing both before and at the time of closing the sales transaction, a statement of the fact that soil absorption fields are prohibited in designated areas (Stages 3 and 7).

- Subdivider required to follow prescribed methods for waste disposal such as connecting with a nearby sanitary sewer system where practical (Stage 7).

D. Streets (D, E, and F from N-Y Associates, Inc., 1973: 3-11 to 3-13).

- Finished elevations of all streets must conform to specified minimum elevation requirements (Stage 10).
- Drainage openings must be sufficient to insure drainage at all points along streets (Stage 10).

E. Water system

- All public and private water systems shall be flood-proofed to above the flood protected elevation (Stage 9).
- If there is an existing public water system on or near the subdivision, the subdivider may be required to connect to this system (Stage 9).

F. Gas system

- All public and private natural gas systems shall be flood-proofed to above the flood protected elevation (Stage 9).

Subsidence Protection Guidelines (Florida Coastal Coordinating Council, 1973: 14-15).

- Where subsidence of structures or the land surrounding the structures is anticipated, the degree of subsidence expected (as indicated on parish-wide Soil Subsidence Potential Maps prepared for the Louisiana State Planning Office, 1976) should be included in writing as a consumer warning to any prospective land or structure purchaser both before and specifically at the time of closing the transaction (Stages 3 and 12).

- Residential subdivisions should not be permitted in areas where local government will inherit unnecessary subsidence maintenance problems from the developer (Stages 7 and 12).
- Roads, sidewalks, water and sewer lines, and storm drainage systems within residential subdivisions permitted on former wetlands must meet rigid subsidence abatement construction standards before projects are accepted for maintenance by local government (Stage 7).
- Subdivision regulations should be performance-oriented rather than means-oriented if possible to allow for flexibility in the techniques used to achieve desired subsidence abatement goals of local government (Stage 7).

Construction Practices Minimizing Subsidence Damage

- Natural gas feeder lines to residences should be designed and installed to minimize the possibility of breaks. All "curb cock" usage (Chapter 2) should be eliminated (Stage 9) (Frazer, The States-Item, November 23, 1976).
- Homeowners should be made aware of the danger of ruptured natural gas and other utility lines caused by heavy trucks rolling over lawns when delivering additional landscape fill material (Chapter 2) and should discourage this practice (after construction) (Frazer, The States-Item, November 20, 1976).
- Utility feeder lines should be adequately supported at the point where they enter the house as well as along the entire distance from the main line (Stages 9 and 14).

- Utility feeder line connections should be flexible at the point of entrance to the residence to allow for some subsidence-caused movement without breakage (Stage 14).

-Foundation slabs should be ventilated to reduce the explosion potential from natural gas leaks (Chapter 2) or from the build-up of gases released by decomposing organic material under house.

- Pilings should provide adequate support for structure (Stage 13).

- Pilings should be properly tied in with the slab foundation (Stage 14).

- Walkways and driveways connecting with the house should have adequate support to minimize their sinking away from the house foundation (Stage 16).

- Initial drainage of a wetland prior to development should be as deep as will ever be desired to eliminate the necessity for post-development lowering of the water table causing further oxidation of organic materials, drying of clays, and subsequent subsidence (Chapter 2). After oxidation and land subsidence have occurred for a period long enough to allow most of the subsidence to take place (following initial drainage), and the land has been filled to the required elevation, then the water table should be maintained at as high a level as feasible without creating the danger of flash flooding. Construction may then proceed (Stage 4) (D. Clement, 1976).

  This means that in anticipation of future development with Outer Continental Shelf (OCS) or other growth, certain areas should be drained and set aside for some time period to allow a large percentage of land subsidence to take place before development occurs.

- New reclamation methods should be developed for wetlands to reduce subsidence damage to residential property (Chapter 2) (Stage 6).

Pollution Protection Guidelines (Florida Coastal Coordinating Council, 1973: 15).

- Storm water systems carrying street runoff and waste water systems carrying untreated sewage should be separate with treatment facilities for both (Stages 9 and 17).
- Catchment basins should be constructed at storm sewer outfalls to prevent silt and other pollutants from entering water bodies (Stage 9).
- Septic tanks should not be allowed in residential subdivisions built on soils having low permeability (i.e. clay) because the sewage effluent cannot adequately percolate down through the soil layers for aeration and treatment. Conditions of high water table or high organic matter soil content also make septic tanks infeasible because of the ineffective filtering of effluent in both cases (Stages 7 and 12).
- Permanent use of septic tanks should be confined to rural areas. For urban subdivisions and high density use areas, septic tanks should not be considered as a permanent answer to sewage disposal, regardless of soil conditions, because the capacity of the land to handle the sewage effluent will be exceeded (Stage 7).
- Septic tank drainfields should be located at distances far enough away from water bodies to preclude drainfield seepage from entering the water bodies (Stage 12).

- Fishing camps and other developments in non-fast lands should be required to tie into adequate sewerage systems. Septic tanks in non-fast lands should be prohibited because of high water table (Stage 12).
- Sanitary landfill operations should be planned for by local government and monitored to prevent contamination of groundwater and nearby water bodies with inadequately filtered leachate (Chapter 2) (Stage 17).
- Solid waste management programs should be coordinated between municipalities, parishes and multi-parish planning districts and should be in accordance with a well thought out long term plan (Stage 17).

Conclusions

Zoning ordinances, subdivision regulations and building codes should be developed as legal controls for all coastal parishes to address the problem areas identified in wetlands development. The concerns previously discussed and guidelines suggested should be considered when drafting these three ordinance levels. The topics contained in each of these guideline sections may be incorporated, as appropriate, directly in the zoning ordinance, subdivision regulations and building code. In any case, coordination among the various pieces of legislation is necessary.

REFERENCES

Berger, Ann H. (1975) Method of Control of Land and Water Uses In the Coastal Zone. Washington, D.C.: U.S. Government Printing Office.

Clement, Daniel W. (1976) District Conservationist, U.S. Soil Conservation Service, Metairie, Louisiana, personal interview, November 4.

Diversified Economic and Planning Associates, Inc. (1973) Modifications of Existing Work Elements, Calcasieu Parish, Louisiana; a report prepared for the Calcasieu Regional Planning Commission. New Orleans, Louisiana.

Florida Coastal Coordinating Council, Department of Natural Resources (1973) Recommendations for Development Activities in Florida's Coastal Zone. Tallahassee, Florida: Florida Department of Natural Resources.

Frazer, Tom (1976) "Gas Hazard: A Truck on a Lawn," The States-Item, November 20.

_____ (1976) "East Jefferson Map Shows Potential Explosion Areas," The States-Item, November 23.

Imperial Calcasieu Regional Planning and Development Commission (1974) Pre-Disaster Plan, Volume II. Lake Charles, Louisiana: Imperial Calcasieu Regional Planning and Development Commission.

Lafayette Regional Planning Commission (1973) Flood Prone Area Regulations. Lafayette, Louisiana: Lafayette Regional Planning Commission.

Lindsey, Joel L., Karen W. Patterson, and Alvin L. Bertrand (1976) Citizen Perception of Coastal Area Planning and Development: A Study of the Attitudes and Knowledge of Louisianians. Baton Rouge, Louisiana: Center for Wetland Resources, Louisiana State University.

Louisiana State Planning Office (1976) Soil Subsidence Potential Maps; prepared by Burk and Associates, Inc. New Orleans, Louisiana.

N-Y Associates, Inc. (1973) Initial Housing Study, Review of Codes, Subdivision Regulations, Zoning Ordinance for St. Charles Parish, Louisiana; reports prepared for the St. Charles Parish Planning Commission and Police Jury. Metairie, Louisiana: N-Y Associates, Inc.

National Oceanic and Atmospheric Administration, U.S. Department of Commerce (1975) "Coastal Zone Management Program Administrative Grants," Federal Register, Vol. 40, No. 6, Part I. January 9. Washington, D.C.: U.S. Government Printing Office.

Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (1976) State of Washington Coastal Zone Management Program: Final Environmental Impact Statement. Washington, D.C.: U.S. Government Printing Office.

Oregon Land Conservation and Development Commission (1976) Oregon Coastal Zone Management Program, Draft. Salem, Oregon: Oregon Land Conservation and Development Commission.

U.S. Congress (1972) Public Law 92-583. "Coastal Zone Management Act of 1972." Washington, D.C.: U.S. Government Printing Office.

CHAPTER 4

PROCESS FOR DEVELOPING FUTURE REGULATIONS

Some practices associated with urban development in wetlands that should be regulated may have been omitted from the problem-recognition methodology and guidelines previously developed in Chapters 2 and 3. Also the regulation of practices along the lines suggested in Chapter 3 may result in a synergistically negative effect. As an example of synergism, it was suggested to the Jefferson Parish Council by the local gas company that an ordinance be adopted which would prevent heavy trucks and equipment from rolling over residential lawns with underground natural gas lines. While such an ordinance might help to abate the natural gas explosion problem, it might essentially relieve the gas company of any liability in the event of an explosion, and place the burden of proof upon the homeowner (Frazer, The States-Item, December 10, 1976). As a consequence, the wisdom of enacting such an ordinance is questionable. Therefore new and revised guidelines may have to be instituted from time to time.

Developers of tracts in former wetlands cannot be expected to expose to local government and the public-at-large problems that they encounter which would be appropriate for regulation. This might be financially detrimental to their interests. Therefore, local authorities should be constantly vigilant in spotting new problems which may

develop as well as in noting any which may arise as a result of regulation of wetlands development.

If a new problem occurs, the development stage at which it occurs should be examined to determine why the problem exists. Also other stages should be examined to locate possible cause-and-effect relationships with the new problem.

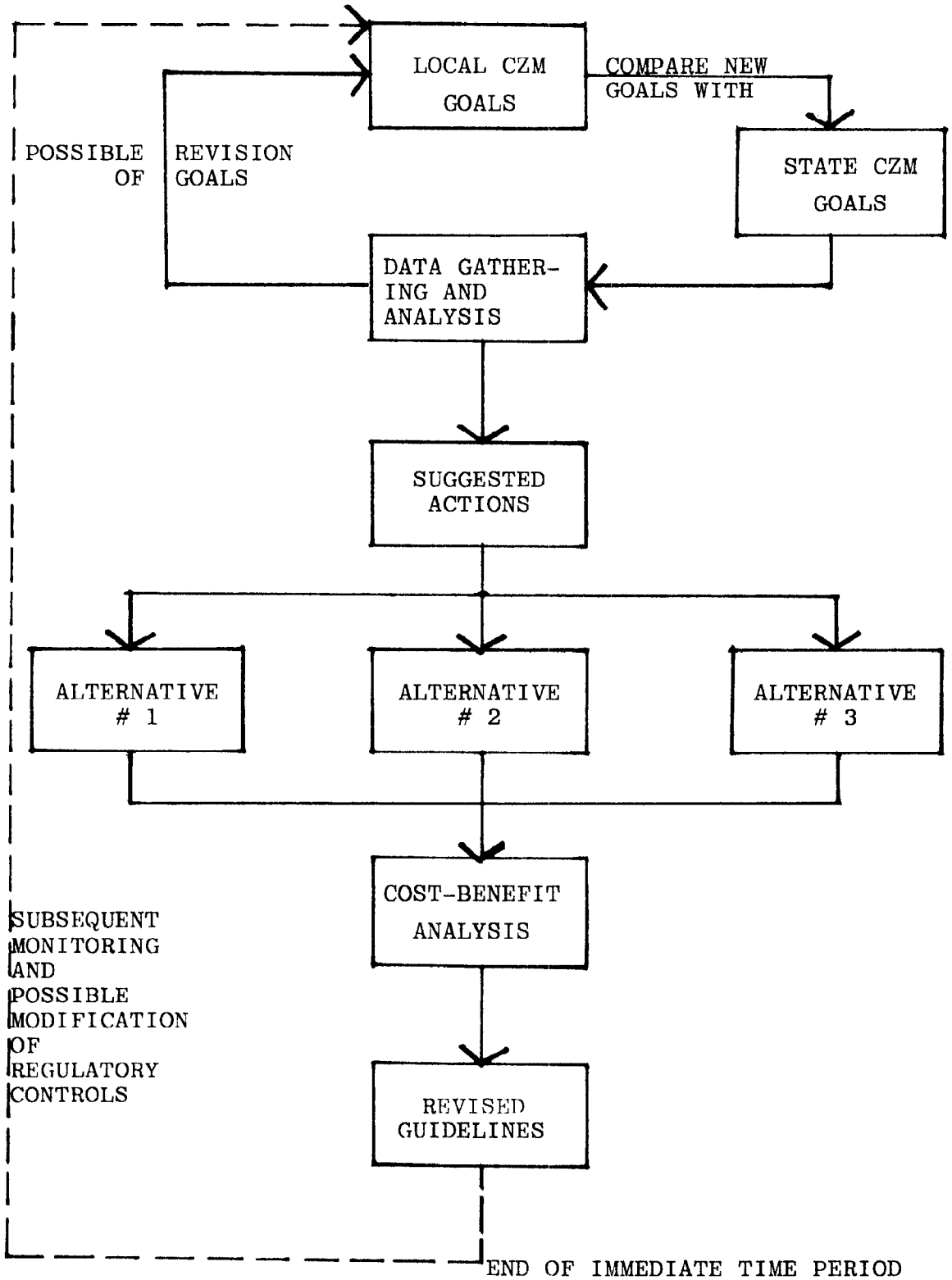
Related existing guidelines should be examined for possible modification to handle this new problem. If none of the available guidelines are appropriate, then new ones specifically dealing with the problem in question have to be developed. Such guidelines could be incorporated into local zoning ordinances, subdivision regulations, or building codes.

Under certain circumstances, a new problem may be encountered which would be so rare that the subsequent development of guidelines to handle it would not be appropriate. In such an instance, the local coastal zone commission or other appropriate parish body may be required to mediate such situations on a case by case basis.

In writing new regulations or mediating one-time situations, appropriate qualitative and quantitative data have to be collected. These include pollution, flood, and subsidence information. Knowing the goals of local coastal zone management and having gathered the necessary information, then alternative guidelines and practices for regulating the situation can be generated. Obviously, the alternative best meeting the goals should be the one selected. Figure 4.1 shows a planning process which could be utilized to develop new local guidelines and regulations.

FIGURE 4.1

PLANNING PROCESS FOR THE DEVELOPMENT OF NEW REGULATIONS



Source: The Authors.

In some instances, it is conceivable that new problems may be of such scope and magnitude that local officials may be forced to re-evaluate the goals of their respective coastal zone management programs. Bobo, Mumphrey, and VanLandingham (1976: 42 and Mumphrey et al., 1975: 217-227) present a goals program model which can be utilized by local officials to guide them in either the formulation or evaluation of their programs. The model attempts to formalize a set of attributes which goals programs should possess and which can be used to evaluate these programs.

When officials are faced with the decision of choosing the best alternative in the process of developing new goals and guidelines, a particularly helpful tool is benefit-cost analysis. Mumphrey et al., (1975: 190-217) discuss extensively the use of cost-benefit analysis in decision making. They present various types of models and recommend one which includes goals; distributional effects; and monetary, nonmonetary, and intangible costs and benefits.

Regulations controlling coastal wetlands development for urban uses in general have to be constantly monitored and modified to insure achievement of the goals of local coastal zone management. Data resulting from monitoring aids in exposing the significant problem areas which might require further regulation in order to meet local goals. As an example, monitoring systems could be installed to indicate total land subsidence over a specified time period resulting from a reclamation practice in a developed tract of former

wetland. Monitoring could also be used to gather information related to pollution and flood-hazard abatement measures. Through analysis of the collected data, already implemented regulatory controls could be upgraded to better deal with problem areas of urban development in the wetlands.

In summary, the process for developing new guidelines as shown in Figure 4.1 requires a) the articulation of goals by local CZM governing bodies; b) comparison of the new local goals with those of the state CZM regulatory body (revision of local goals may be necessary); c) data gathering and analysis (derived from carefully monitoring problem areas); d) suggestions for alternative actions; e) cost-benefit analysis to pick the best of these alternative actions; f) development of revised regulatory guidelines to meet the desired goals; and g) subsequent monitoring and possible modification of regulatory controls to meet new and changing problems.

REFERENCES

Bobo, James R., Anthony J. Mumphrey, Jr. and H. Wade VanLandingham (1976) "Metropolitan Goals Programs -- A Model and Evaluation of the Dallas and New Orleans Programs," Town Planning Review, Vol. 47, No. I, January.

Frazer, Tom (1976) "Louisiana Gas Request Blasted in Jefferson," The States-Item, December 10.

Mumphrey, Anthony J. et al. (1975) Louisiana Metropolitan Wetlands: A Planning Perspective; a report to the Louisiana State Planning Office. New Orleans, Louisiana: Urban Studies Institute, University of New Orleans.