

SYLLABUS

This report presents the results of a feasibility study to provide flood protection for the Fisher School Basin, located in the town of Jean Lafitte, Louisiana. The study was conducted as part of the Continuing Authorities Program (CAP), under the authority of Section 205 of the 1948 Flood Control Act, as amended.

Officials of the town of Jean Lafitte, the West Jefferson Levee District, and Jefferson Parish desire a Federal project to provide increased levels of flood protection for the study area. The desire for improvement in the study area stems from the natural growth and development occurring on the west bank of the Mississippi River, particularly within the proximity of the Fisher High School. This growth has resulted in the development of lands more vulnerable to flooding from storm tides and local rainfall. The area has experienced a recent surge in land and property values as a result of the enormous growth occurring and is likely to continue to develop given the lack of available land on the east bank of the Mississippi River in Orleans and Jefferson parishes, the presence of an existing interior drainage system, the close proximity to metropolitan New Orleans, and plans for continued improvement in the sewer and interior drainage systems by the local government.

The New Orleans District completed a reconnaissance study of the Fisher School Basin and submitted that report to higher authority in November 1994, recommending further analysis through a cost-shared feasibility study. Due to funding constraints, the study did not proceed beyond reconnaissance for approximately two years. Then on June 25, 1996 a Feasibility Cost Sharing Agreement (FCSA) was signed with the West Jefferson Levee District and the Fisher Basin feasibility study was initiated.

The study area encompasses approximately 45 acres of urbanized land located in southeastern Louisiana in the vicinity of New Orleans. Jean Lafitte is located on the eastern bank of Bayou Baratavia in Jefferson Parish and is protected from Mississippi River overflow by the mainline Mississippi River and Tributaries levee system. A local levee system was constructed by the West Jefferson Levee District in response to emergency flooding and provides

minimal protection due to its varying height and gaps in the alignment. Land elevations slope gently from an average elevation of about 4 feet NGVD along the natural banks of Bayou Barataria to -1 foot NGVD in portions of the leveed area. Waters emanating in the Gulf of Mexico and nearby Lakes Salvador and Cataouatche travel across the marsh and through the many natural and manmade channels to flood the study area from the south.

The reconnaissance report recommended a structural solution that involves raising the existing earthen levees to elevation +7.0 National Geodetic Vertical Datum (NGVD). In feasibility, the study team identified and analyzed both non-structural and structural alternatives for providing flood protection in addition to the alternative of “no action”. The study team identified two economically justified non-structural alternatives. However, the net benefit provided by both alternatives were significantly less than that provided by the proposed levee.

The existing levee alignment was followed as closely as possible in order to minimize adverse impacts to the natural environment and social well being. During plan formulation it was deemed necessary that we maintain the hurricane evacuation route during construction. Louisiana Highway 45 (LA 45) is the primary transportation and hurricane evacuation route for the area south of and including Jean Lafitte. The plan recommended for construction would require raising LA 45 to tie into the levee alignment. To accomplish this task however, special measures will be taken to ensure that detours are available to provide continuous service along LA 45 throughout construction.

The recommended plan consists of hauling in approximately 130,000 cubic yards of earthen material to raise the existing levee to elevation 7.0 feet NGVD. Approximately 7,600 linear feet of concrete capped, steel sheetpile floodwall will be installed in three segments along Bayou Barataria due to the limited right of way available. The plan also contains eleven (11) floodgates to maintain pedestrian and vehicular access to Bayou Barataria. Any changes in the existing levee alignment were based on social, environmental, or cost related concerns.

The incremental total project first cost is estimated to be \$9,600,000. The plan would provide flood protection to approximately 309 residential and commercial structures. Annual

operation and maintenance costs, which are included in the previous totals, are approximately \$19,000. The costs are based on 1997 price levels at an interest rate of 7-1/8 percent with a project life of 50 years. The benefit-to-cost (B/C) ratio is 1.5 to 1. The annual net benefits, the difference in equivalent annual benefits and annual costs, are \$386,769. The maximum Federal contribution for Section 205 is \$5,000,000. The non-Federal sponsor is required to provide all Lands, Easements, Rights-of-Way, Relocations, and Disposals (LERRD's) for construction. The total project first costs of approximately \$9,600,000 includes an estimated \$3,800,000 in LERRD's. The project costs for the recommended plan would be apportioned \$4,689,000 Federal (maximizes Federal limit) and \$4,911,000 non-Federal.

The primary environmental impact of the recommended plan would be the loss of 10.4 acres of fresh swamp and bottomland hardwood habitat. All direct losses of habitat value would be mitigated through the implementation of a mitigation plan consisting of the acquisition of forested lands located in nearby Terrebonne Parish. The estimated cost of the mitigation plan is \$17,500. Implementing this mitigation feature would compensate in-kind, all direct project-induced habitat losses to the fullest extent possible. Full compliance with a variety of statutes would be achieved after Clean Water Act public notice, review and revision of the environmental assessment are complete, and a finding of no significant impact is issued, if appropriate.

FISHER SCHOOL BASIN FLOOD PROTECTION PROJECT

TABLE OF CONTENTS

<u>Title</u>	<u>Page</u>
INTRODUCTION	
STUDY AUTHORITY	1
SCOPE OF STUDY	1
STUDY PARTICIPANTS AND COORDINATION	2
OTHER STUDIES AND REPORTS	2
THE STUDY PROCESS	7
PROBLEM IDENTIFICATION	
NATIONAL OBJECTIVES	8
PLANNING CONSTRAINTS	8
PLANNING OBJECTIVES	9
PROBLEMS, NEEDS AND OPPORTUNITIES	10
Floods and Storms of Record	11
Existing Protection	12
Socio-Economic Impacts	12
EXISTING CONDITIONS	13
Physical Setting	13
Physiography	13
Geology	13
Subsidence	14
Mineral Resources	14
Soils	14
Climatology	15
Climate	15
Precipitation	15
Temperature	16
Wind	17
Stages, Frequencies and Duration	18
Biological Resources	19
Wetlands	19
Wildlife	20
Fisheries	20
Threatened and Endangered Species	20
Water Quality	20
Water Use Support Classification	20
Existing Water Quality Data	20
Results of Water and Sediment Quality Testing	21

TABLE OF CONTENTS (continued)

Cultural Resources	21
Recreation	23
Hazardous, Toxic, and Radioactive Waste (HTRW)	23
Economic Resources	25
Population and Land Use	25
Business and Employment	26
Structure Inventory and Contents Valuation	26
Damage Evaluation	28
Automobile Damages and Valuation	29
Summary of Expected Flood Damages	29
FUTURE CONDITIONS WITHOUT PROJECT	30
Flood Protection	30
Biological Resources	31
Wetlands	31
Wildlife	32
Fisheries	32
Threatened and Endangered Species	32
Water Quality	33
Cultural Resources	33
Recreation	34
Hazardous Toxic and Radioactive Wastes (HTRW)	34

PLAN FORMULATION

POLICY REGARDING EXISTING LEVEES	35
INITIAL PLAN DEVELOPMENT	36
Economic Benefit	36
Plan Assessment and Evaluation	37
ENVIRONMENTAL EFFECTS	39
DETERMINATION OF RECOMMENDED PLAN	41

RECOMMENDED PLAN DESCRIPTION

CONSTRUCTION COSTS	42
REAL ESTATE REQUIREMENTS	44
RELOCATION OF AFFECTED FACILITIES	46
MITIGATION	46
OPERATION AND MAINTENANCE	46
ENGINEERING AND DESIGN	47
SUPERVISION AND ADMINISTRATION	48

TABLE OF CONTENTS (continued)

PLAN IMPLEMENTATION

DIVISION OF PLAN RESPONSIBILITIES	49
FEDERAL RESPONSIBILITIES	49
NON-FEDERAL RESPONSIBILITIES	49
VIEWS OF LOCAL SPONSOR	52
STATEMENT OF FINANCIAL CAPABILITY	52

SUMMARY OF COORDINATION, PUBLIC VIEWS AND COMMENTS

STUDY MANAGEMENT	53
TECHNICAL REVIEW	53
PUBLIC INVOLVEMENT	53
PUBLIC INFORMATION MEETING	54
COORDINATION WITH INDIVIDUAL LANDOWNERS	55

RECOMMENDATIONS

ENVIRONMENTAL ASSESSMENT	EA-1
--------------------------	------

APPENDICES

APPENDIX A	ENGINEERING INVESTIGATIONS
APPENDIX B	ECONOMIC ANALYSIS
APPENDIX C	REAL ESTATE SUPPLEMENT
APPENDIX D	WATER QUALITY
APPENDIX E	M-CASES
APPENDIX F	TECHNICAL REVIEW DOCUMENTS
APPENDIX G	PROJECT COOPERATION AGREEMENT
APPENDIX H	PROJECT MANAGEMENT PLAN
APPENDIX I	FINANCING PLAN

TABLE OF CONTENTS (continued)

EXHIBITS

EXHIBIT A	LETTER OF INTENT
EXHIBIT B	FLEMING/BERTHOUD SITE MAP
EXHIBIT C	NEWSPAPER ARTICLE

LIST OF TABLES

1	Monthly Precipitation	16
2	Maximum Precipitation Totals	16
3	Mean Monthly and Annual Temperatures	17
4	Temperature Extremes	17
5	Stream Gaging Data	18
6	Civilian Labor Force, Employment, Unemployment and Income	27
7	Structure Inventory	28
8	Total Number of Structures Flooded by Frequency	29
9	Expected Annual Flood Damages	30
10	2040 Hurricane Surge Heights	31
11	2040 Design Elevation of Protective Structures	31
12	Non-Structural Analysis	38
13	Benefit-Cost Summary	40
14	Construction Cost Estimate	43
15	Real Estate Cost Estimate	45
16	Operation and Maintenance Estimate	47

STUDY AUTHORITY

The Fisher School Basin feasibility study was conducted under the authority of Section 205 of the 1948 Flood Control Act, as amended, in response to requests for Federal assistance from officials of the town of Jean Lafitte by letter dated February 2, 1993. The feasibility study is based on recommendations made by the New Orleans District in the Fisher Basin reconnaissance report, submitted to higher authority in November 1994.

SCOPE OF STUDY

A reconnaissance study of the Fisher Basin was initiated in 1993 as the first phase of a two-phase process. The Corps typically conducts a reconnaissance study using existing data wherever possible to determine the nature and extent of the problems and to determine if a feasibility study is appropriate. In the Fisher Basin, the reconnaissance study concentrated on areas that experienced the greatest amount of damage due to flooding. The feasibility study is the second phase of the two-phase study process and is used to identify the National Economic Development (NED) plan. In feasibility, detailed engineering, economic, and environmental investigations are performed to identify economically feasible, environmentally acceptable alternatives. The NED plan is the plan that reasonably maximizes net benefits and minimizes adverse impacts to the environment and social well being.

The Fisher Basin feasibility study was not initiated until June 1996 due to funding constraints in the Continuing Authorities Program. On July 21, 1997, the scope of work was amended to include an area adjacent to the Fisher School Basin, known as the Fleming Curve. As a result, the total study area was enlarged, to encompass approximately 45 acres, and studied as a single hydraulic basin. The Fisher School Basin and Fisher Basin are used interchangeably in this document to refer to the same study area. A vicinity map and description of the study area are enclosed as Plate 1.

Interior drainage for the Fisher Basin was determined to be adequate for a 10-year rainfall event, however, exterior tidal stages frequently overtop the current levee system and

cause widespread flooding. Approximately 232 of the 309 structures (roughly 75%) within the study area are inundated below the 5-year design storm event. In feasibility, both non-structural and structural alternatives were considered in addition to the “no action” alternative.

Engineering, environmental and economic investigations were used to develop a structural alternative similar to the plan recommended in the reconnaissance report.

STUDY PARTICIPANTS AND COORDINATION

The U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District is responsible for the overall study management and report preparation. The West Jefferson Levee District is the non-federal (local) sponsor for the study. The levee district provided input to the feasibility report by completing the Environmental Assessment in coordination with members of the New Orleans District. The study was coordinated with interested Federal, state, and local agencies, and the public.

OTHER STUDIES AND REPORTS

A number of studies and reports on water resources development in the vicinity of the study area have been prepared by the U.S. Army Corps of Engineers, other Federal, state, and local agencies, research institutes, and individuals. Previous Federal and non-Federal studies have established an extensive amount of data for this study. FEMA Flood Insurance studies were conducted in the study area for the unincorporated areas of Jefferson Parish, and Public Works Department drainage plans were provided to the study team for information purposes. The West Jefferson Levee District maintains a comprehensive regional evacuation plan for a wide range of storms. The Corps of Engineers, in conjunction with the Federal Emergency Management Agency (FEMA) and the National Weather Service (NWS), completed a hurricane preparedness study for southeast Louisiana in August 1994 to provide hurricane evacuation plans. The more relevant studies, reports, and projects are described in the following paragraphs.

a. Studies conducted in the vicinity of the Fisher School Basin

- (1) A reconnaissance report entitled Fisher School Basin, Jean Lafitte, Louisiana was published by the U.S. Army Corps of Engineers in November 1994. The report recommended further analysis of a structural alternative that involved raising the existing levee to provide protection from tidal and rainfall events.

- (2) The U.S. Army Corps of Engineers published a feasibility report entitled West Bank of the Mississippi River in the Vicinity of New Orleans, Louisiana, in December 1986. The report investigated the feasibility of providing hurricane surge protection to that portion of the West Bank of the Mississippi River in Jefferson Parish between the Harvey Canal and Westwego and down to the vicinity of Crown Point, Louisiana. The report recommended implementing a plan that would provide hurricane protection to an area on the West Bank between Westwego and the Harvey Canal north of the Fisher Basin. The project was authorized by the Water Resources Development Act of 1986, Public Law 99 - 662. Project construction was initiated in early 1991, with the West Jefferson Levee District as the non-Federal sponsor. Overall construction of the Westbank hurricane protection projects is scheduled for completion in 2011.

- (3) The U.S. Army Corps of Engineers completed a feasibility report entitled West Bank of the Mississippi River in the Vicinity of New Orleans, Louisiana (East of the Harvey Canal), in August 1994. The study investigated the feasibility of providing hurricane surge protection to that portion of the West Bank of metropolitan New Orleans from the Harvey Canal eastward to the Mississippi River. The final report recommended that the existing West Bank Hurricane Protection Project, authorized by the Water Resources Development Act of 1986, Public Law 99-662, approved November 17, 1986, be modified to provide additional hurricane protection east of the Harvey Canal. The report also recommended the level of protection for the area east of the Algiers Canal deviate from the NED level of protection and provides protection for the Standard Project Hurricane (SPH). The Division Engineer's Notice was issued on September 1, 1994. The Chief of Engineer's report was issued on May

1, 1995. The project was authorized by the Water Resources Development Act of 1996. Overall construction of the Westbank hurricane protection projects is scheduled for completion in 2011.

- (4) A Post Authorization Change report entitled Westwego to Harvey Canal, Louisiana Hurricane Protection Project Lake Cataouatche Area was published by the U.S. Army Corps of Engineers in December 1996. The report investigated the feasibility of providing hurricane surge protection to several communities on the west bank of the Mississippi River bounded by Bayou Segnette to the east, Lake Cataouatche to the south, the Mississippi River to the north, and the St. Charles Parish line to the west. The recommended plan would provide for the construction of levees and floodwalls extending from Bayou Segnette State Park to the St. Charles Parish line. The protection would tie into the authorized Westwego to Harvey Canal project that was authorized by the Water Resources Development Act of 1986 and construction of the project began in early 1991. Overall construction of the Westbank hurricane protection projects is scheduled for completion in 2011.
- (5) The U.S. Army Corps of Engineers completed a reconnaissance report, Jefferson and Orleans Parishes Louisiana Urban Flood Control and Water Quality Management in July 1992. The study was authorized by Senate and House resolutions to investigate rainfall flooding and water quality problems associated with storm water runoff in Jefferson and Orleans Parishes. Both Orleans and Jefferson parishes agreed to participate in four-year urban flood control feasibility studies beginning in 1994. Due to a catastrophic rainfall event on May 8-9, 1995, Section 108 of the Energy and Water Development Appropriations Act of 1996, directed the Corps to proceed with engineering, design and construction of economically justified alternatives identified by the reconnaissance study in Orleans, Jefferson and St. Tammany parishes. The individual flood control features in the three parishes are a part of a single project known as the Southeast Louisiana (SELA) Project. Pre-construction engineering and design (PED) and construction are underway for several project features in Orleans and Jefferson parishes.

b. Other studies and reports

(1) The Mississippi River and Tributaries project, the comprehensive flood control project for the lower Mississippi Valley below Cairo, Illinois, has had a significant impact on the water and land resources in the study area. The Flood Control Act of 1928, and subsequent amendments authorized this project. Features of the project pertinent to the study are listed below.

- a) The Mississippi River levees extend from Baton Rouge, Louisiana, to Bohemia, Louisiana, on the west bank. They provide protection from the standard project flood on the Mississippi River and Tributaries system. These levees are essentially complete in the study area.
- b) The Bonnet Carre Spillway is located upstream of New Orleans, Louisiana, on the east bank of the Mississippi River in the vicinity of Norco, Louisiana. The purpose of the spillway is to divert Mississippi River flows into Lake Pontchartrain to lower flood stages on the Mississippi River in the New Orleans area. The spillway was completed in 1932.
- c) Revetments and foreshore protection were constructed along the Mississippi River in the study area. Revetments are constructed where levees or development is threatened by bank caving or where unsatisfactory alignment and channel conditions are developing. Foreshore protection is constructed where the erosion of the batture threatens levees. Construction of these features is continuing as needed.

(2) The Louisiana Department of Natural Resources published a report entitled Louisiana's Eroding Coastline: Recommendations for Protection in June 1982. The report recognizes that future losses of coastal wetlands are unavoidable and will require either retreat of development from the coastal zone or increasingly greater levels of protection. The report recommends development and implementation of a shoreline protection plan and proposes a number of pilot projects using water and sediment diversions, dredged material placement,

and planting vegetation as a means to reduce erosion. A study to determine future coastal conditions, including changes in shoreline configuration and impacts on developed areas, is also recommended.

- (3) The U.S. Army Corps of Engineers prepared a final feasibility report, Louisiana Coastal Area - Freshwater Diversion to Barataria and Breton Sound Basins in September 1984. The report recommends diverting Mississippi River water near Caernarvon into the Breton Sound Basin and near Davis Pond into Barataria Basin to enhance habitat conditions and improve fish and wildlife resources. The report also recommends implementation of the plan under the authorized Mississippi Delta Region Project, which is identical in purpose. The diversions would reduce land loss and save about 99,200 acres of marsh. The construction of the Caernarvon structure was completed in early 1991. Construction is underway for the Davis Pond project.

- (4) The Barataria-Terrebonne National Estuary Program, nominated by Governor Roemer in October 1989, received funding under Section 320 of the 1987 Water Quality Act on April 20, 1990, to enhance, protect and maintain the water quality, habitat integrity and natural resources of the Estuarine Complex. The Act authorized the EPA to develop a Comprehensive Conservation and Management Plan which recommends priority corrective actions and compliance schedules addressing point and non-point sources of pollution to restore and maintain the chemical, physical and biological integrity of the estuary: including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish, and wildlife, and recreational activities, and assuring that the designated uses of the estuary are protected.

- (5) The Louisiana Coastal Wetlands Restoration Plan, a comprehensive plan for restoring and conserving the coastal wetlands of Louisiana, was mandated by the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA). The final report was submitted to higher authority in December 1993 and the Record of Decision on the Programmatic Environmental Impact Statement was signed in March 1994. The report details the process by which wetlands restoration plans were developed for the nine hydrologic basins in the

coastal zone. The projects presented in the report far exceed the CWPPRA's funding capacity (approximately \$40 million per year from 1991 to 1997, including 25 percent cost sharing by the state of Louisiana). The task force established by CWPPRA is initiating feasibility studies with a view toward securing authorization and funding for a number of large-scale projects.

THE STUDY PROCESS

The reconnaissance report concluded that structural improvements to provide flood protection from tidal and rainfall events were economically feasible. The report recommended detailed studies to quantify the magnitude of the costs and benefits associated with several types of improvements.

This feasibility study follows the recommendations of the Fisher School Basin Reconnaissance Report. It includes detailed analyses of a range of improvements and their effectiveness at providing adequate flood protection to the residents of Jean Lafitte. The feasibility study also provides detailed assessments of environmental, social, and local economic effects of those improvements determined to be most viable from a national economic perspective. Results of this study form the basis for a decision on project implementation.

The study process provided for a systematic preparation and evaluation of alternate plans that address study area problems and opportunities. The process involved all of the four functional planning steps:

PROBLEM IDENTIFICATION
FORMULATION OF ALTERNATIVES
IMPACT ASSESSMENT
EVALUATION

The reconnaissance phase emphasized problem identification and formulation of alternatives. Emphasis in this feasibility phase is on evaluation of alternatives, assessment of impacts, and selection of a recommended plan.

PROBLEM IDENTIFICATION

This section of the report shall address the National Objectives; Existing Conditions; Future Conditions without project; Problems, Needs, and Opportunities; and Planning Objectives

NATIONAL OBJECTIVES

The fundamental national objective of Federal participation in water resource development projects is to insure that an optimum contribution is made to the welfare of all people. This requires contributing to the national economic development consistent with protecting the Nation's environment, while at the same time protecting national environmental statutes, applicable executive orders, and other national planning requirements.

The plan that reasonably maximizes net national economic development benefits, consistent with the national objective is to be identified as the national economic development (NED) plan. National objectives are designed to ensure systematic interdisciplinary planning, assessment and evaluation of plans addressing environmental concerns that will be responsive to Federal law and regulations.

PLANNING CONSTRAINTS

This study was conducted within the constraints described by the Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies, and by applicable Department of the Army regulations and other documents which provide guidance pertaining to the implementation of these principles and guidelines. Plans were developed with due regard to the benefits and costs, both tangible and intangible, as well as associated effects on the ecological, social and economic well-being of the region. Federal participation in developments should also ensure that any plan is complete in itself, efficient and safe, economically feasible in terms of current prices, environmentally acceptable, and consistent and acceptable in accordance with local, regional, and state plans and policies. As far as

practical, plans should be formulated to maximize the beneficial effects and minimize the adverse impacts.

PLANNING OBJECTIVES

The following planning objectives were established in response to the identified problems, needs, and opportunities:

- Provide improved flood protection for the Fisher Basin in the town of Jean Lafitte, Louisiana
- Structural alternatives should follow the existing levee alignment to minimize project costs and adverse impacts to residents
- Ensure that Louisiana Highway 45 remains operable throughout construction to maintain the hurricane evacuation route and minimize impacts on the communities south of Jean Lafitte
- Minimize adverse environmental impacts associated with the implementation of flood control measures
- Minimize to the extent possible the destruction of archaeological and historical resources
- Minimize particularly the loss of bottomland hardwood forests or if not possible, mitigate those losses “in-kind” to the extent practicable
- Mitigate for all unavoidable impacts to significant fish and wildlife resources

PROBLEMS, NEEDS, AND OPPORTUNITIES

The problems, needs, and opportunities identified in this study relate to the need for improving flood protection in the Fisher Basin.

General

The study area is located in southeastern Louisiana and is bounded on the north and west by Bayou Barataria and the Gulf Intracoastal Waterway (G.I.W.W.), in the south and east by numerous oil field canals and wetlands (see Plate 1). The Fisher Basin is located approximately 30 miles north of the Gulf of Mexico.

Early developments within the study area occurred primarily along the banks of Bayou Barataria and consist of wood frame and brick structures constructed on slab and pier foundations. As development expanded away from the bayou and into lower, more vulnerable areas, it became necessary to construct interior drainage canals with pumping stations. Over 85 percent of the residential and commercial structures in the study area were constructed before participation in the National Flood Insurance Program was required. The high rates of ground consolidation and subsidence further compound the problem by decreasing efficiency of interior drainage systems and lowering structure elevations below sea level in some areas. As a result, most of the structures located within the study area, experience considerable and repetitive flooding damages.

If no Federal action is taken to provide increased levels of flood protection to the Fisher Basin, the study area will continue to experience flooding because the local governments do not possess the financial resources to construct the recommended plan without Federal assistance. The West Jefferson Levee District constructed several small earthen levee sections along the eastern and southern project limit, in immediate response to hurricane induced flooding. Currently, there are no federally authorized hurricane or tidal flood protection projects for the Fisher Basin study area. Hurricane protection within the study area is not economically feasible at this time given the limited amount of existing development and right-of-way along Bayou

Barataria. The communities along Bayou Barataria, in the vicinity of the study area, could not support a project to provide protection against a 100-year event.

Floods and storms of record

Most of the flooding in the Fisher Basin results from high tides caused by hurricanes and tropical storms tracking in the Gulf of Mexico. The most recent flooding in Jean Lafitte occurred during Tropical Storm Frances from 11-13 September 1998, where Bayou Barataria was 2-to-4 feet above normal for approximately five days. In Jean Lafitte, residents battled tidal flooding under a mandatory evacuation order that was issued Friday, September 11, 1998. Mayor Kerner of Jean Lafitte indicated that during the storm the small levee along the eastern project limit, failed at Tasha Lane and caused flash flooding that damaged several homes and left many residents stranded in those areas. The levee district was able to repair the levee fairly quickly. Federal and State agencies provided portable drainage pumps to relieve some low-lying areas that flooded, but as late as Wednesday, September 16, 1998 several streets had up to one-foot of water still remaining and several homes could not be reached.

Hurricane season extends from June through November with the greatest number of storms expected during the first two weeks of September. Hurricane force winds exceed 74 mph and may extend 100 miles from the center. Extreme gusts may exceed 200 mph at a distance of 20 to 30 miles from the eye. Most hurricanes approach the Louisiana coast from the south or southeast and cross the shoreline at a high angle before moving inland. Occasionally, however, a storm will parallel the shoreline, lingering for days and causing unexpected damages. Such was the case in 1985 when Hurricane Juan looped twice south of Morgan City before paralleling the shoreline and crossing the mouth of the Mississippi River and continuing to the east.

Surveys estimated that 271 of the 275 residential structures and approximately 34 commercial structures in Jean Lafitte, experienced damage during recent hurricane and flooding events, including damage from Tropical Storm Frances in 1998 and Hurricane Juan in 1985. And in 1992, Hurricane Andrew raised water levels at Barataria and Lafitte to 3.5 and 4.2 feet NGVD, respectively, causing widespread flooding of residential and commercial structures. In

addition to these storms, the following hurricanes also affected the study area and caused significant flooding: Carmen (August-September 1974), Babe (September 1977), Bob (July 1979), and Danny (August 1985). Statistical data concerning these hurricanes is presented in Appendix A.

Existing protection

The study area is protected from Mississippi River overflow by the mainline Mississippi River and Tributaries levee system. The West Jefferson Levee District has constructed several earthen segments in response to Hurricanes Juan and Andrew to form segmented local levees. The levees vary in elevation from 2 to 6 feet NGVD along Bayou Barataria and from approximately 2.5 feet to 4 feet NGVD along the eastern and southern alignment. The integrity of this series of levees is questionable in view of failures that occurred during Hurricane Juan and Tropical Storm Frances. Overflow frequently occurs across low spots in the line of protection and interior drainage problems are exacerbated when rainfall is accompanied by high tides.

Socio-economic impacts

Most of the residential structures in Jean Lafitte are single-family units. Surveys of estimated damage to residential property from recent flood and hurricane events indicate that approximately 822 of the 1,500 residents in Jean Lafitte have experienced losses from these events. This estimate is based on the general pattern of single-family dwelling units in the community, the number (275) of residential structures and mobile homes impacted by recent events, and the 1990 census estimate of the size of an average household in the town of Jean Lafitte (275×2.99 persons/ household = 822 persons).

The needs of the study area related to tidal flood protection can be demonstrated by the fact that of the 309 residential and commercial structures located within the study area, 232 are vulnerable to the 5-year design storm event. The equivalent annual damages for the without project conditions are estimated to be \$1,225,407. Flood damage to new development should be

moderated by participation in the National Flood Insurance Program, which requires the construction of new structures above the 100-year base flood elevation.

EXISTING CONDITIONS

Physical setting

(1) Physiography. The dominant physiographic features of the study area typically include abandoned distributaries of the Mississippi River, natural levees, inland lakes and bayous, low lying swamps and marshes, and small interconnected lakes, bayous, and man-made canals. The Fisher Basin is located on the deltaic alluvial plain of the Mississippi River and is generally characterized by low relief and gentle slope. Elevations of natural ground typically range from a maximum of approximately 4.0 feet NGVD along the levee ridges of Bayou Baratavia to a minimum of approximately –1.0 foot NGVD within protected areas along the eastern part of the study area.

At present, the threat of Mississippi River flooding has been alleviated by levees constructed as part of the Mississippi River and Tributaries Flood Control Project. Storm surges, however, are a continuing threat to the study area. The storm surges, usually related to tropical storm systems originating in the Gulf of Mexico, can easily travel across the broken marsh and through Bayou Baratavia and numerous other natural and man-made channels thereby threatening the study area with inundation.

(2) Geology. The geologic history of primary significance to the study area is that which has occurred since the end of the Pleistocene Epoch. A shift of the Mississippi River brought the flow into its present course forming the Plaquemine Delta just south of New Orleans, and the present Balize Delta below the Plaquemine Delta. During the last 1,000 years the Plaquemine-Modern Delta Complex continued to supply minor amounts of sediments into the study area until that supply was interrupted by construction of the artificial levee systems along the Mississippi River resulting in the gradual degradation of the study area through subsidence and shoreline retreat.

(3) Subsidence. Subsidence, which generally refers to the loss of surface elevation, is an ongoing occurrence within the deltaic alluvial plain of the Mississippi River and consequently, within the study area. Subsidence in the study area is estimated to occur at a rate of 0.50 feet per century within a levee system and from 0.6 to 1.2 feet per century in unleveed areas. This rate of subsidence is and will continue to be exacerbated by eustatic/global sea level rise that has been estimated to be 0.5 feet per century. As a result of subsidence and sea level rise, the study area will become increasingly vulnerable to flooding, particularly in unleveed areas.

(4) Mineral Resources. Extensive oil and gas exploration and production has occurred in the vicinity of the study area. While the majority of producing facilities are presently suffering limited production, geophysical exploration activities are reportedly being undertaken by Shell Oil Company. No active exploration or producing wells were identified within the study area, although some facilities related to the production of adjacent wells are known to exist. Continued exploration and production of mineral resources in the vicinity of the study area will not be adversely affected by the project, nor will the project be adversely affected by the oil and gas operations.

(5) Soils. At the project site, the subsurface consists of Holocene deposits approximately 90 feet thick. These deposits consist of natural levee clays and silts approximately 10 feet thick adjacent to Bayou Barataria. Moving east from Bayou Barataria, the flanks of these natural levees have subsided and approximately 5 feet of swamp and marsh clays and peats have been deposited on top of the natural levee. Natural levee, swamp, and marsh deposits overlie interdistributary clays and silts that can be found to elevation -60.0 feet NGVD.

The United State Department of Agriculture - Soil Conservation Service has surveyed and classified the soils within the study area. According to this survey, the study area is comprised of five soil series, which include Barbary Muck; Sharkey Clay; Sharkey Silty Clay Loam; Commerce Silt Loam; and Lafitte-Clovely Association. Most of the soil types in the study area will settle upon loading, will shrink and oxidize upon dewatering, and have low shear strengths. Therefore, settlement sensitive structures should be pile supported.

Climatology

(1) Climate. The study area has a subtropical marine climate. Located in subtropical latitude, its climate is influenced by the many water surfaces of lakes, streams, and the Gulf of Mexico. Throughout the year, these water bodies modify the relative humidity and temperature conditions decreasing the range between the extremes. When southern winds prevail, these effects are increased, imparting the characteristics of a marine climate.

Climatic conditions in the area from April through September are influenced by tropical air masses from the Gulf of Mexico and, from October through March, by cold air masses from the northern continental United States. The result is a humid, subtropical climate with mild winters and long, hot summers. During the summer, prevailing southerly winds produce conditions favorable for afternoon thundershowers. In the colder seasons, the area is subjected to frontal movements that produce squalls and sudden temperature drops. River fogs are prevalent in the winter and spring when the temperature of the Mississippi River is somewhat colder than the air temperature.

(2) Precipitation. Precipitation in Louisiana results from storms commonly associated with polar fronts, squall lines, tropical fronts, tropical weather systems, and showers and thunderstorms. Summer showers last from mid-June to mid-September, and heavy winter rains generally occur from mid-December to mid-March. Extreme monthly rainfalls exceeding 12 inches are not uncommon within the study area, and as much as 20 inches have been recorded in a single month. The heaviest rainfall typically occurs in the summer. Precipitation in the form of snow, sleet, or hail seldom occurs.

Precipitation data pertinent to the study area has been collected from the National Climatic Center for the LSU Citrus Research Station. The station location is situated 20 miles southeast of the study area. The monthly and annual norms for the station are listed on Table 1. The maximum monthly rainfall and the maximum daily rainfall totals recorded between 1984 and 1992 are listed on Table 2.

TABLE 1
MONTHLY PRECIPITATION (Inches)
30 Year Average (1961-1990)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
LSU CITRUS	5.05	5.83	4.99	4.06	5.08	5.59	6.82	6.67	5.89	3.40	4.26	5.21	62.85

Source: National Climatic Center

TABLE 2
MAXIMUM PRECIPITATION TOTALS (Inches)
(1984-1992)

STATION	MONTHLY	MAXIMUM DATE	1 DAY	GREATEST DATE
LSU CITRUS	20.00	APR 91	8.73	2 AUG 84

Source: National Climatic Center

The annual normal precipitation at the LSU Citrus Research Station over the 30-year period from 1961 to 1990 is 62.85 inches. July is the wettest month with an average monthly normal of 6.82 inches. October is the driest month, averaging 3.40 inches. The maximum monthly rainfall at the station between 1984 and 1992 occurred in April 1991 when a total of 20.00 inches was recorded. The maximum daily rainfall at the station during the referenced period occurred on August 2, 1984 when a total of 8.73 inches was recorded.

(3) Temperature. Records of temperatures are available from "Climatological Data" for Louisiana, published by the National Climatic Center. Mean temperatures within the study area can be described using data observations from the LSU Citrus Research Station. The annual normal temperature at this station during the period from 1961 to 1990 is 60.1 degrees Fahrenheit (EF) with monthly mean temperature norms varying from 42.5 EF in January to 73.7 EF in July. Temperature extremes occurring at the station between 1984 and 1992 were

97EF for a high and 12 EF for a low on December 23, 1989. Average temperatures are shown in Table 3 and extremes at this station since 1984 are shown in Table 4.

TABLE 3
MEAN MONTHLY and ANNUAL TEMPERATURES (EF)
30 Year Average (1961-1990)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
LSU CITRUS	42.5	45.1	51.9	60.2	67.0	72.5	73.7	73.6	71.6	62.4	54.1	46.4	60.1

Source: National Climatic Center

TABLE 4
TEMPERATURE EXTREMES (EF)
(1984-1992)

STATION	MAXIMUM	DATE	MINIMUM	GREATEST DATE
LSU CITRUS	97	Occurring on Several Days	12	23 DEC 89

Source: National Climatic Center

(4) Wind. Wind data taken at New Orleans is used to describe the study area. The average wind velocity is 8.0 miles per hour (mph) over the period 1973-1992. Southeast winds predominate in the spring and summer. The prevailing winds of the fall and winter are from the northeast. The strongest winds are associated with the high-pressure systems that penetrate the Gulf of Mexico area in winter and with hurricanes in summer. The winter storms have produced wind speeds up to 47 mph, and hurricanes have generated winds in excess of 190 mph in the area. Since 1893, a total of 75 tropical storms and hurricanes have struck the coast while another 103 passed offshore but affected the area. The maximum wind speed observed (highest one-minute speed) since 1963 was 69 mph at New Orleans and was the result of Hurricane Betsy in September 1965.

(5) Stages, Frequencies and Duration. Stage data is recorded at two gage stations within the vicinity of the study area. One station, identified as "Bayou Barataria at Barataria", is located near the confluence of Bayou Barataria and the Gulf Intracoastal Waterway. The second station, identified as "Bayou Barataria at Lafitte", and is located near the confluence of Bayou Barataria and Bayou Rigolettes. Stream gage data for these stations, including period of record and maximum and minimum stages, is presented in Table 5.

**TABLE 5
STREAM GAGING DATA**

MAP NO.	STATION	PERIOD OF RECORD	MAXIMUM STAGE		MINIMUM STAGE	
			FEET NGVD	DATE	FEET NGVD	DATE
1	Bayou Barataria at Barataria	1950-92	4.25 ¹	October 29, 1985	-0.58 ¹	September 10, 1965
2	Bayou Barataria at Lafitte	1963-92	5.05 ¹	October 29, 1985	-0.95 ²	December 23, 1989

¹ Caused by Hurricane Juan in 1985

² From Incomplete Record

Source: U.S. Army Engineers District, New Orleans

Tides in the study area can be diurnal or semi-diurnal depending on astronomical conditions. The tidal range at Barataria is 0.25 feet NGVD with the mean high water being approximately 1.47 feet NGVD, and the mean low water approximately 1.22 feet NGVD. The average high stage at Barataria is 3.34 feet NGVD, and the average low stage is 0.72 feet NGVD. At Lafitte, the tidal range is 0.35 feet NGVD with the mean high water measuring approximately 1.49 feet NGVD, and the mean low water approximately 1.14 feet NGVD. The average high stage is 2.87 feet NGVD, and the average low stage is -0.13 feet NGVD.

Within the study area, wind effects can mask the daily ebb and flow variations, and during periods of sustained southerly winds, tides rise in direct response to the duration and intensity of the wind stress. Intense hurricanes such as Betsy have caused high stages along the coastal area of Louisiana (10.5 feet NGVD at Grand Isle) and moderately high stages inland

(3.2 feet NGVD at the Harvey Lock). Although a relatively weak storm in terms of maximum sustained windspeed, Hurricane Juan caused higher stages in the study area than the more intense Hurricane Betsy. This is directly attributable to the hurricane's erratic, almost stationary, path across southern Louisiana. Gale force winds over a period of five days caused tides 3 to 6 feet above normal across the entire coastal area of southern Louisiana. Examination of gage records at the gaging stations for the study area reveals that Hurricane Juan caused the highest stage of record on October 29, 1985, along Bayou Barataria at both Barataria (4.25 feet NGVD) and Lafitte (5.05 feet NGVD).

Biological resources

Wetlands. Forested wetlands of the project area are under extreme developmental pressures, primarily being cleared for single family dwellings. Much of the southern half of the project area has been enclosed by a levee constructed by local interests and has been under pump for some time. Although currently unleveed, forested wetlands within the northern half of the project area are experiencing identical developmental pressures.

Along the extreme southern end of the project area, 17.5 acres of fresh swamp are currently enclosed by an existing levee. This habitat is characterized by the occurrence of a few remaining baldcypress and tupelogram trees; however, the area primarily consists of a dense growth of young woody vegetation having an average height of less than 25 feet. Because of the denseness of the canopy, the area is virtually devoid of ground cover.

Within the mid- to northern reach of the project area, 7.96 acres of early successional bottomland hardwood habitat will be enclosed by the proposed levee. The areas that have become reforested had formerly been cleared for the cultivation of sugarcane. The predominant species within this habitat include sugar-berry, Chinese tallow-tree, red maple, black willow, American elder, eastern false-willow, and blackberry. This habitat resembles a scrub-shrub community, having tree species with a diameter breast height (dbh) of generally less than 5 inches.

Wildlife. Because the remaining forested wetlands in the project area are of relatively low quality and have been adversely affected by forced drainage and developmental disturbances, they are considered of low value as wildlife habitat. Wildlife which may be evidenced in the project area include various species of reptiles and amphibians, resident and migratory passerine birds, rabbits, squirrels, various rodents, and the nine-banded armadillo.

Fisheries. Bayou Baratavia supports a variety of fish species including blue and channel catfish, freshwater drum, buffalo, largemouth bass, and spotted, long nose and alligator gar. Saltwater species such as anchovies and striped mullet also inhabit the bayou indicating that a transition of salinity conditions occurs in the general area. Open water in the project area is limited to borrow canals/ditches that are of extremely low value to fishery resources because of their poor water quality and shallow depth. The only fish species that is likely to occur with some regularity within the project area is the mosquitofish.

Threatened and Endangered Species. The only species of concern near the project area is the bald eagle, an endangered species. A nest is located in the vicinity, over a mile from the project area. The U.S. Fish and Wildlife Service does not consider this nest to be within the proposed project area.

Water Quality

Water Use Support Classification. LDEQ classifies water use support based upon either an evaluation of land use, citizen complaints, etc., or upon actual monitored data. Only an evaluated assessment is available for the study area, and the results of this evaluated assessment are summarized below and discussed in more detail in Appendix D.

Existing Water Quality Data. No active water quality monitoring stations were identified in the study area. Prior to 1994, there were three stations located near the study area as part of Jefferson Parish's storm water drainage canal sampling program. The data for these stations are listed in Appendix A.

Results of Water and Sediment Quality Testing. As part of this water quality assessment, water samples were taken at three sites. These sites were the forebay of the Gloria Drive pumping station, the tailbay of the Verret Street pumping station, and on the unprotected side of the existing levee near the Town Auditorium. Sediment samples were taken in the forebay of the Verret Street pumping station, just downstream of the Louisiana Highway 45 bridge. Both the water and the sediment samples were tested for priority pollutants.

The results of the water testing were compared to the water quality standards and criteria of the Louisiana Department of Environmental Quality. Very few contaminants were detected in any of the water samples. Trace amounts of D-BHC were detected at both the Gloria Street and the Verret Street pumping station sites. A trace amount of B-Endosulfan was detected at the site near the Town Auditorium. Arsenic was detected in very small quantities at all three sites tested, as was copper and nickel. Zinc was detected at the Town Auditorium site. None of these parameters exceeded the state water quality criteria. No testing for fecal coliform was performed at these sites.

Cultural Resources

The lower Barataria region was used by humans in both prehistoric and historic times. Archaeological records concerning prehistoric sites in the region indicate that extensive colonization sites are known to exist within the immediate vicinity of the project area. Two cultural resources surveys of the project area have been completed by Earth Search, Inc. through primary source document research, intensive pedestrian survey, and fieldwork consisting of a program of shovel testing and auguring. One of the surveys addresses the originally proposed alignment for the Fisher School Basin. The second addresses the Fleming Curve, which was later included in the proposed alignment. Through these efforts, data detailing the environmental setting, prehistoric occupations, historic occupations, previous investigations, and existing archaeological sites and conditions has been collected. A report of these findings is on file at the New Orleans District.

An examination of the cultural resources survey reports indicate that there are two reported sites: the Oyster Road Site (16JE84) - located within the project area at its' southwest corner; and the Fleming /Berthoud Cemetery (16JE36) - located within the project area near the shoreline of Bayou Barataria at the intersection of Bayou Villars. The Oyster Road Site was recorded in 1977 by Richard Weinstein of Coastal Environments, Inc. and at that time was listed in the Louisiana State Files as a prehistoric (Marksville period) Indian shell midden which occupied 32.5 meters along the bank of Bayou Barataria. A subsequent visit, by archaeologists from R. Christopher Goodwin & Associates, Inc., in 1984 found the site to be severely eroded and completely wave washed. While no subsurface testing was conducted, surface probing did not reveal evidence of cultural remains. Due to the extensive damages, the site was deemed ineligible for nomination to the National Register of Historic Places (NRHP). A recent visual and subsurface examination of the site in July 1995, by archaeologists from Earth Search, Inc., revealed no evidence of shell or cultural materials. It has been concluded that the site is destroyed and no longer eligible or potentially eligible for nomination to the NRHP. Consequently, the proposed project will not impact any significant cultural resources at this site.

The second reported site, the Fleming/Berthoud Cemetery (16JE36), contains the remains of both prehistoric and historic components. The prehistoric component includes a Marksville through Mississippi period shell midden deposit and a large Indian mound. The historic component includes a cemetery dug into the Indian mound and the remains of the Mavis Grove/Fleming Plantation which consists of the main house, the yard area, and ruins of the sugar house. The plantation, which dates to the early 19th Century, was a large sugar plantation with numerous outbuildings including a hospital, storehouses, stables, Negro cabins, and a sugar house. The prehistoric components of (16JE36) were reported as eligible for nomination to the NRHP in 1975 and 1986, however these sites are not currently listed in the NRHP. The Mavis Grove/Fleming Plantation main house is presently listed in the NRHP. Both the prehistoric and historic components of the Fleming/Berthoud site have been archaeologically investigated. No intact cultural deposits associated with either the historic or prehistoric components at 16JE36 were found within the project corridor. Planned construction will therefore have no adverse effect on this significant site. The New Orleans District is currently preparing Plans and Specifications for a bank stabilization project at the Fleming Cemetery site. This work is being

done in connection with maintenance operations on the Gulf Intercoastal Waterway (GIWW). The proposed project would protect the cemetery from erosion with a sheetpile wall by following the existing shoreline and tying into the Fisher Basin flood protection levee. The proposed improvements to the levee system would likely benefit the cemetery by stabilizing the eroding shoreline.

Recreation

Urban type facilities, found both within and north of the study area, include: National and State Parks; local parks, playgrounds, and swimming pools; and ball parks and tennis courts. Natural resource related facilities, found within and surrounding the study area, include: picnic areas, camp sites, and hiking trails; wildlife refuges, management areas, and numerous waterbodies; and private and public fishing piers and boat launches.

Predominant recreational activities are freshwater and saltwater fishing, including finfishing, crawfishing, crabbing, and shrimping. Other recreational activities include big game, small game and migratory bird hunting, boating, swimming, and camping. The three major recreational areas of significance adjacent to the area are the Lake Cataouatche - Lake Salvador complex (which includes the Salvador Wildlife Management Area), the Jean Lafitte National Historical Park and Preserve, and the Bayou Segnette State Park. A listing of the recreation sites located within the vicinity of the project area, as condensed from an outdoor recreation printout provided by the Louisiana Department of Culture, Recreation and Tourism, is presented in Tables 7 and 8 of the attached Environmental Assessment. The tables provide an overall summary of the recreational facilities available in the vicinity of the proposed project.

Hazardous, toxic, and radioactive wastes

A land use history evaluation, regulatory agency coordination, and site inspections have been accomplished to assess the potential for hazardous, toxic, and radioactive wastes (HTRW) within the project area. A full report of the Preliminary HTRW Site Assessment is contained in the Environmental Assessment.

The EPA National Priorities List (NPL - Superfund Sites) of the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) was investigated through personal contacts with Mr. Don Markham of EPA Region 6 on March 7, 1997. No sites from the project area were identified on the NPL at that time. The EPA Resource Conservation and Recovery Information System (RCRIS) list for Jean Lafitte was obtained on March 7, 1997. The list indicated that no hazardous waste treatment, storage, disposal, or transportation facilities are located within the project vicinity; however, the list did reveal that five hazardous waste generators are reporting in the project vicinity. Several generators are no longer active. Of the active generators, none were located within two miles of the project area. The Louisiana Department of Environmental Quality, Louisiana Site Remediation Information System (LASRIS) list, which shows inactive and abandoned sites, lists one location (Watts Construction Company) in Jean Lafitte. The site is located over three miles northeast of the project area.

Inspections of the proposed project alignment and adjacent areas were accomplished on November 11, 1996, April 3, 1997, and July 28, 1997. The inspections were completed on foot and included all accessible portions of the alignment. Based upon these inspections, the risk of encountering an HTRW site during construction is minimal throughout most of the project. Areas identified to be of moderate to high risk include: a small dump site north of the Gloria Drive Pump Station; a boat building or repair business at the southwest corner of the alignment; and an underground storage tank (UST) located at a vacant grocery store along Bayou Barataria. Construction of the proposed levee will not impact these three sites. Areas identified to be of minimal HTRW risk, but likely requiring removal to accommodate construction included: a residential storage area at the LA Highway 45 bend; pipe penetrations in the levee near Tasha Lane; a dump site at the dead end canal; and a dump site south of the Gloria Drive Pump Station. These four areas will likely be removed during construction. Other areas identified were either outside of the alignment, or were not a significant HTRW concern.

Economic resources

(1) Population and Land Use. The town of Jean Lafitte, Louisiana, is located in Jefferson Parish, which is one of eight parishes making up the New Orleans Metropolitan Statistical Area (MSA). Jean Lafitte was incorporated, and portions of it annexed, between 1970 and 1980. The population of Jean Lafitte increased from 936 to 1,496 between 1980 and 1990 while the total population of both Jefferson Parish and the New Orleans metro area slightly declined. The population increase in Jean Lafitte, as in other suburban communities is due in part to the lower cost of single-family housing and other properties such as: the appeal of lower population densities, new construction of or improvements to rapid transportation systems, and increasing crime rates in large metropolitan areas. Construction of an additional Mississippi River bridge near the New Orleans central business district is believed to have a positive impact on residential developments in Jean Lafitte.

In spite of frequent storms making up part of the semi-tropical climate of the area, the mild climate and availability of abundant natural resources have generated economic development and population growth along the Louisiana Gulf Coast, the New Orleans metropolitan area, and the town of Jean Lafitte. Since the population of Jean Lafitte is still relatively small, the availability of published data on land use and other socio-economic conditions is limited. The 1990 census reported that the political boundaries of Jean Lafitte covered approximately 6.3 square miles, including 6.0 square miles of land area.

A 1980 summary of total land use for the parish prepared by the Louisiana Office of State Planning estimated the total land area of the parish at about 319.57 square miles. This preliminary estimate showed that 72 percent of the total land area in Jefferson Parish was wetland and beaches. About 15 percent was residential land (including a significant amount of the urbanized portion of the New Orleans metropolitan area); another 7 percent was commercial and industrial land; 4 percent was used for transportation, communication, and related services; and the remaining 2 percent was either agricultural land, forest land, strip mines and quarries, sandy areas other than beaches, and land in transition.

(2) Businesses and Employment. The businesses and related employment within the incorporated limits of Jean Lafitte include the markets and services traditionally required maintaining a small suburban community in close proximity to a much larger urban center. Businesses include such things as retail stores that sell food, clothing, medical supplies, home furnishings, automobiles, trucks, and boats; and various service establishments providing health care, sanitation, legal services, and automobile and boat maintenance. Other business activities more unique to the local area include the operation and maintenance of the commercial fishing vessels docked along the bayou and activities in support of oil and gas production. Table 6 compares employment, and unemployment rates, and the median family income in Jean Lafitte and Jefferson Parish and has not been adjusted to reflect the unusual pattern of inflation, which occurred nationally between 1979 and 1989.

The 1990 census appears to be the first published information providing employment and median family income data for communities with populations of less than 2,500. The 1980 census indicated that Jefferson Parish ranked first among all Louisiana parishes in median family income. In 1990, it ranked slightly behind three other parishes in the New Orleans MSA, St. Charles Parish with \$35,355 and St. Tammany Parishes with \$35,033 and East Baton Rouge Parish with \$34,198.

(3) Structure Inventory and Contents Valuation. A comprehensive field survey (100% inventory of all of the structures within the alignment) was conducted for the Fisher Basin to identify every structure at risk in the study area. Contained in the survey is an estimate of the number, value, and elevation of all structures. First floor elevations above natural ground were estimated using a hand level to insure accuracy and ground elevations were determined using 1-foot contours from GIS maps provided by Jefferson Parish's contractor, Vernon F. Meyer and Associates.

TABLE 6
Civilian Labor Force, Employment, Unemployment and Income

AREA	1980/a	1990/b	1994/c (April)
Jean Lafitte:			
Civilian Labor Force	*	571	*
Employed	*	531	*
Unemployed	*	40	*
Unemployment Rate	*	7.0	*
Median Family Income	*	\$22,125	*
Jefferson Parish:			
Civilian Labor Force	214,909	222,939	226,700
Employed	205,987	207,556	212,600
Unemployed	8,922	15,383	14,100
Unemployment Rate	4.2	6.9	6.2
Median Family Income	\$21,920	\$32,446	*

* Not available

a/ U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, "General Social and Economic Characteristics, Louisiana". Income data are for the entire previous (1979) year, and unadjusted for changing price levels.

b/ U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population and Housing, "Summary Social, Economic, and Housing Characteristics, Louisiana". Income data are for the entire previous (1989) year and unadjusted for changing price levels.

c/ Louisiana, Department of Labor, unpublished data.

Structure and content values are major elements impacting depth-damage relationships and the magnitude of flood damage to urban structures. For the purposes of estimating urban flood damages, a structure is defined as a building and any attached components, such as built-in appliances, shelves, carpeting, etc. Contents represent furnishings and equipment, or all items

within the structure that are not permanently attached. The value of land is excluded in the determination of urban structure values.

Residential structure values were calculated using the Marshall and Swift Residential Estimator Program. This continually price-adjusted computer program uses cost per square foot, geographically localized by zip code, to calculate a depreciated replacement value for each structure. Mobile homes within the area were assessed using an average value per structure based on size. A summary of the major structure types and structure values, is depicted in Table 7.

TABLE 7
STRUCTURE INVENTORY

CATEGORY	NUMBER	VALUE
Residential (1-sty)	168	\$ 6,762,663
Residential (2-sty)	18	905,434
Mobile Homes	89	612,000
Commercial	34	\$ 3,763,487

(4) Damage evaluation. In determining the number of structures flooded and resulting impact, the Urban Flood Damage Program was utilized to correlate existing structural and hydrologic data. Within the program, nine different types of urban structures were evaluated using hydrologic profile data, structure locations, first floor elevations, depth-damage relationships, and structure and contents values to compute the depth of flooding and resulting damages for each structure for selected frequency flood events. Table 8 displays the number of structures damaged by flood frequency for the study area.

TABLE 8
TOTAL NUMBER OF STRUCTURES FLOODED BY FREQUENCY*

DESIGN STORM FREQUENCY	# OF STRUCTURES FLOODED
1	4
2	91
5	232
10	243
25	279
50	295
100	304
200	305
500	305

* Total numbers are cumulative. Damages begin with yard and slab damage 0.5 foot below first-flood elevation.

(5) Automobile Damages and Valuation. Damage to other property in the flood plain, such as automobiles, are directly related to the structural flood damages. The elevation of each automobile is determined by its corresponding structure elevation. Automobile damage estimates are then calculated by correlating depth of flooding, depth-damage per automobile, and damage per automobile. The 1990 census indicated that there were 1.8 vehicles per household in Jefferson Parish. It was assumed that each residence had one automobile that was susceptible to damage. The current average damage per automobile was estimated to be \$9,400, based on the replacement value of a depreciated used automobile according to the Louisiana Motor Vehicle Division and Census Data.

(6) Expected Flood Damages. The results of the flood damage analysis for existing conditions are presented in Table 9 for structures and automobiles.

TABLE 9
EXPECTED ANNUAL FLOOD DAMAGES

DAMAGE CATEGORY	EXPECTED ANNUAL DAMAGE
Residential	\$527,757
Commercial	260,922
Automobiles	436,728
TOTAL	\$1,225,407

FUTURE CONDITIONS WITHOUT PROJECT

Having explored the past and present condition of Jean Lafitte, the next step is to forecast future conditions if no improvements are made. This forecast of conditions under the no-action scenario will provide the basis for analysis of project improvements.

Flood Protection

Historical evidence of sea level rise and subsidence indicates the need for a projection of storm surge stages and their effect on this project's effectiveness. Sea level rise of 0.5 feet per century along the Gulf Coast is recommended by the latest Corps' guidance. COE geologists from radio carbon dating of buried marsh deposits developed estimates of subsidence in coastal Louisiana. This data was compiled on quadrangle maps for coastal Louisiana. Using the projected sea level rise of 0.2 feet in the next 50 years and the appropriate subsidence rate in the coastal zones bordering the project area, the WIFM model was employed to compute the hurricane surge heights which could be expected in the year 2040. Stages for pertinent locations in the area that would accompany the SPH, 100-year and 10-year hurricanes are shown in Table 10.

TABLE 10
2040 HURRICANE SURGE HEIGHTS

Location	STAGES IN FEET NGVD		
	SPH	100-year	10-year
Bayou Barataria	9.6	7.7	4.2

Levee heights for future conditions were determined by adding runoff from the appropriate wave condition to the design stillwater level. Where protective structures will be sheltered against significant wave runoff, wave runoff from the small locally generated wave climate was used to determine levee height. On the eastern side of the study area wave berms should be added to maintain the same level of protection as the original project due to the loss of the woods and marsh on the flood side of the levee. In these areas where significant hurricane wave action will occur because of an available fetch, levee heights were designed using wave height determined from methodologies described in the Coastal Engineering Center's Shore Protection Manual. Design elevations of protective structures in each reach are given in Table 11.

TABLE 11
2040 DESIGN ELEVATION OF PROTECTIVE STRUCTURES

Location	SWL	WAVE	10-year*
	(ft)	RUNUP	
Bayou Barataria	4.25	2.0	6.5
Eastside Levee (w/berm)	4.25	2.5	7.0

* Ground surface elevation is 0.2 ft lower.

Biological Resources

Wetlands. After a thorough review of color infrared photography beginning at year 1974, through year 1995, combined with a field reconnaissance of the project area (including the

proposed levee alignment), biologists from the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the local sponsor (West Jefferson Levee District) concluded that within the next 15 years (by the year 2012) all of the forested wetlands (94.7 acres) that would be enclosed within the proposed levee alignment would be lost to development in the future without - project condition. In other words, even if the levee were not constructed, those wetlands would be lost to ongoing developments (i.e., primarily single family dwellings). These developments are and will continue to expand via construction on pilings or on hauled-in fill material, to the FEMA - approved elevation.

It is unlikely, however, that forested wetlands (i.e., fresh swamp) on the unprotected side of the existing levee along the southeastern perimeter of the project area will be cleared for development. Levee systems such as that currently being proposed have historically become the line of demarcation precluding future developments on the unprotected side. As such, they serve to protect adjacent, functionally valuable wetlands. The currently existing levee provides such a benefit to adjacent wetlands. Unfortunately, increased saltwater intrusion and subsidence in the future are likely to convert wetlands outside the existing future levee system from swamp to marsh and, to some extent, open water within the next 50 years.

Wildlife. Wildlife habitat within the levee system, albeit very limited and of low value, is expected to be virtually eliminated within the next 15 years. Habitat outside of the levee system would support different species assemblages as it transitions from swamp to marsh to open water.

Fisheries. Fishery conditions in Bayou Baratavia may become more saltwater oriented during the next 50 years unless the anticipated freshwater introduction benefits from diversions at Davis Pond and other areas are realized.

Threatened and Endangered Species. The bald eagle nest would continue to be used for the foreseeable future unless encroaching development stresses cause the eagle to relocate. Unless abated, continued saltwater encroachment could cause the death of the baldcypress-nesting tree.

Water Quality

For the without project condition, projected water quality for the study area is expected to remain similar to current conditions. The study area is partially protected by an existing non-Federal levee, and would continue to be pumped in the absence of the proposed project. Minor industrial point sources, package plants, petroleum activities, channelization, spills, contaminated sediments, siltation, salinity, total dissolved solids, chlorides, and oil and grease are the major factors which currently affect water quality in the study area. These are expected to continue to be the major factors affecting water quality in the study area. Recent increased regulation and legislation as well as an increase in public awareness of environmental issues may result in slight reductions in the amount of pollutants released into the study area, which would result in slight improvements in its water quality.

Cultural Resources

The Oyster Road site (16JE84) mentioned previously has eroded into Bayou Barataria and is totally destroyed. Whatever remnants of the site remain will continue to be eroded by the bayou. A prehistoric shell midden component of the Fleming/Berthoud site (16JE36) has experienced some erosion along Bayou Barataria. Riprap placed along the bankline is protecting the midden at this time; however, without continued intervention, the midden will likely be impacted again in the future. The prehistoric Indian mound component of the Fleming/Berthoud site has been used for interments in historic and modern times. This usage is expected to continue. The historic plantation component of the Fleming/Berthoud site is suffering from neglect. This component will continue to deteriorate without intervention.

It is probable that both the known and unknown cultural resources in the project vicinity will eventually be impacted by urban growth, since residential development is proceeding rapidly in the area. Other adverse impacts resulting from indiscriminate human actions would most likely increase with the corresponding increase in population. In addition to potential vandalism of cultural properties, both recorded and unrecorded sites could be unknowingly destroyed.

Recreation

Future recreational use of the study area should increase due to: the proximity of natural areas such as Lake Cataouatche-Lake Salvador (including the Salvador Wildlife Management Area), Jean Lafitte Natural Historical Park, and Bayou Segnette State park; the availability of numerous access points to the areas natural resources; and the rapid rate of development presently occurring in the vicinity. These anticipated increases in recreational use would not significantly affect any of the Federal and State parks or management areas in the vicinity; however, public facilities at the Parish and local levels could eventually be strained by increasing usage demands. Continued flooding, experienced without the proposed project, would adversely affect existing and future recreation opportunities by limiting accessibility during and immediately following such events. Expenditures related to flood recovery could also limit the feasibility of providing viable recreation opportunities at the local and commercial level.

Hazardous, toxic, and radioactive waste

Hazardous, toxic, and radioactive waste (HTRW) problems are unlikely along most of the proposed alignment with the exception of three (3) sites which were determined to be of moderate to high risk. No change in the likelihood of occurrence or location of toxic materials would be expected without this project.

PLAN FORMULATION

This section describes the process of developing plans to address the flood protection needs of the study area.

POLICY REGARDING EXISTING LEVEES

The U.S. Army Corps of Engineers, Policy Guidance Letter No. 26, Benefit Determination Involving Existing Levees (dated December 23, 1991) provides guidance for determining without-project conditions and with project flood damage reduction benefits for feasibility studies involving existing non-Federal levees that do not meet Army Corps of Engineers criteria. Problems have arisen in the benefit evaluation of flood damage reduction studies when there are existing levees of uncertain reliability. Specifically, the problem is one of engineering judgement on the ability of the levees to contain flows with water surface elevations of given height. Following a careful evaluation of the segmented levees in the Fisher Basin, the New Orleans District has determined the following:

- existing levees do not form a closed system to protect against tidal flooding
- level of protection provided by the levees is estimated to be below the 5-year event

Integrity of the local levee system is questionable in view of failures that occurred during recent hurricanes and tropical storms. The close proximity of many residences to Bayou Barataria prevents construction of a significant earthen levee in many areas, therefore, a true levee does not exist along the bayou, but the high bank elevation varies from +2.0 to +6.0 feet NGVD. Along the eastern and southern project limits, the levee constructed by West Jefferson Levee District stops approximately 300 feet south of Highway 45 providing a fairly large gap that will allow flood waters to inundate the study area.

Based on the minimal level of protection provided by the existing levee and the nature of the flooding experienced in the study area, PGL No. 26 guidelines were not applied to the engineering calculations for this study.

INITIAL PLAN DEVELOPMENT

The Guidance for Conducting Civil Works Planning Studies (ER 1105-2-100) requires the systematic development of alternative plans that contribute to the Federal objective. The objective of this study is the development of an economically feasible and environmentally acceptable flood protection plan that will enable the area to adequately withstand a 10-year design storm event, as a minimum, without substantial residual flooding.

In the development of plans for addressing the problems and needs of the study area both structural and non-structural alternatives were considered. Structural measures considered for the study area included levees, floodwalls, floodgates, and pumping stations and other available means to reduce flooding from storm driven tides and rainfall. Non-structural measures, such as flood-forecasting, combined with evacuation procedures and participation in the national flood insurance program, are currently being employed in the study area and will continue to be employed, with or without further Federal action. Additional non-structural measures were considered during feasibility, and are summarized in the following sections.

Development of a structural alternative was based on the recommendations made in the November 1994 reconnaissance report for the study area. The recommended plan was designed to maximize the use of the high bank along Bayou Barataria and existing levees. The levee alignment described by that report provided protection to the developed areas of Jean Lafitte primarily located south of the Fleming Canal, from Touchard Lane to Canal Street. In feasibility, the non-Federal sponsor requested that the levee alignment be enlarged to provide protection to an adjacent area that includes the developed portions of Jean Lafitte bounded by Canal E1 to the east, Bayou Barataria in the north and west and Canal Street to the south.

Economic Benefit

The National Economic Development Procedures Manual for Urban Flood Damage recognizes four (4) primary categories of benefits for urban flood control plans: inundation reduction, intensification, location and employment benefits. Inundation reduction is the only

category of NED benefits for urban areas considered in this analysis. In addition to the reduction in damages caused by inundation, this category also includes the reduction of emergency costs, evacuation and subsistence costs, reoccupation costs, and Federal Insurance Administration costs saved. The evaluation process involved the formulation and assessment of the flood control improvements, the identification of categories of possible flood control benefits, the determination of without- and with-project damages and costs incurred, and standard benefit-cost comparisons.

The values estimated for benefits and costs at the time of accrual were made comparable by conversion to an equivalent time basis using a designated interest rate. The interest rate used in this analysis is 7-1/8 percent. The period of analysis, or project life, utilized in the analysis is 50 years. The benefits and costs are expressed as the average annual value of the present worth of all expenditures and all plan outputs. These expenditures and outputs are measured at a specific point in time (base year). The base year for this project is 2002, which represents the year in which the project becomes operational or when significant benefits start to accrue.

Plan Assessment and Evaluation

The final phase of the plan formulation process is refinement. A broad range of preliminary plans were formulated, but some key points remain to be determined. Among these are: the level of protection to be provided by improvements, interior drainage capacity, and impacts to residential and commercial structures and occupants. Detailed procedures for cost and benefit evaluations are summarized in Appendix B. A summary of plan assessment and evaluation follows:

No Action. The Corps would not participate in any protective measures to protect the Fisher Basin. As stated earlier in this report under future conditions without project, the study area would continue to be inundated by rainfall events and tidal stages. The West Jefferson Levee District's efforts to implement flood control improvements are restricted due to funding limitations and the magnitude of the flooding problems.

Non-structural Alternatives. Non-structural measures either reduce or avoid flood damages without significantly altering the nature or the extent of flooding. Such measures reduce flood losses by either (1) changing the use of floodplains (e.g., from residential to recreational use), or (2) retaining existing flood plain use with some accommodation of the flood hazard (e.g., elevating a structure). Non-structural measures include, but are not limit to, such actions as floodproofing of structures, regulation of floodplain use, temporary evacuation of hazard areas, relocation of activities to non-floodplain sites, acquisition of land or easements, redevelopment in a manner compatible with the flood hazard, and flood forecasting and warning.

Basically, two types of non-structural measures for flood protection exist – those that reduce existing damages and those that reimburse for existing damages and reduce future damage potential. Only those non-structural measures that reduce damages were investigated to varying degrees in this study and include the following:

- a. Floodproofing by waterproofing of walls and openings in structures.
- b. Raising structures in place.
- c. Constructing small walls or levees around structures.

The analysis of non-structural alternatives shown in Table 12, revealed that flood proofing and small walls are economically justified.

TABLE 12
NON-STRUCTURAL ANALYSIS

Description	First Costs	Avg. Ann. Cost	Avg. Ann. Benefit	B/C Ratio	Net Benefits
Flood Proofing	\$4,474,700	\$329,500	\$430,400	1.3	\$100,900
Small Walls	\$3,286,600	\$242,000	\$240,800	1.0	(\$1,200)
Raise Structures	\$6,039,800	\$444,700	\$203,000	.7	(\$151,700)

Structural Alternatives. The proposed plan consists of earthen levee, floodwalls, and floodgates. The design target of the plan was to protect the Fisher Basin against damage from a 10-year rainfall and tidal event. The basin's interior drainage system consists of several drainage canals, five pump stations, and an extensive pipe network that is adequate for a 10-year rainfall event if the study area were protected from tidal inundation. During reconnaissance, a levee constructed to elevation 7.0 NGVD was determined to be sufficient to provide protection from the 10-year event described. In order to identify the NED plan, the study team evaluated the level of protection provided by constructing levees at various elevations. The results of this analysis using the fully funded cost estimates are shown in Table 13.

ENVIRONMENTAL EFFECTS

The study team assumed that a levee constructed to elevation 8.0 feet NGVD would cause similar adverse environmental impacts as a levee at a lower elevation, but the magnitude of those effects would differ. Extensive analyses were performed to assess the likely environmental effects of the plans. These analyses are described in detail in the Environmental Assessment (EA) and Appendix D. A brief summary of the significant environmental concerns is provided in this section.

Wetlands. Forested wetlands of the project area are under extreme developmental pressure, primarily being cleared for single family dwellings. Within the extreme southern end of the project 17.5 acres of fresh swamp are currently enclosed by an existing levee. Within the mid- to northern reach of the project area are 79.6 acres of early successional bottomland hardwood habitat.

No Action: After a thorough review of color infrared photographs beginning in 1974 through 1995, combined with a field reconnaissance of the project area, biologists representing the Corps, the U.S. Fish and Wildlife Service, and the local sponsor concluded that within the next 15 years (by 2012), all of the forested wetlands (94.7 acres) that would be enclosed by the proposed levee alignment would be lost to development in the future without-project condition.

TABLE 13
BENEFIT-COST SUMMARY

Levee Elevation (NGVD)	+6.0-ft	+7.0-ft	+8.0-ft.
Construction Costs	\$4,534,000	\$4,845,000	\$5,536,500
Real Estate	3,196,000	3,196,000	3,711,000
Relocations	693,000	693,000	767,000
Mitigation	19,000	19,000	22,500
Engineering & Design	412,100	412,100	412,100
Supervision & Administration	803,000	803,000	803,000
Interest During Construction	<u>1,055,769</u>	<u>1,070,019</u>	<u>1,209,719</u>
Total First Costs	\$10,713,069	\$11,038,319	\$12,461,819
Average Annual Costs	\$ 788,589	\$ 812,531	\$ 917,314
Operation and Maintenance	<u>19,000</u>	<u>19,000</u>	<u>19,000</u>
Total Average Annual Costs	\$ 807,589	\$ 831,531	\$ 936,314
Average Annual Benefits			
Inundation Reduction	\$ 712,400	\$ 857,900	\$ 906,100
Emergency Costs Saved	137,300	143,700	145,300
Evacuation & Subsistence Costs Saved	28,000	29,300	29,600
Reoccupation Costs Saved	169,300	177,000	178,900
FIA Costs Saved	<u>9,900</u>	<u>10,400</u>	<u>10,500</u>
Total Average Annual Benefits	\$ 1,056,900	\$1,218,300	\$1,270,400
Benefit-Cost Ratio	1.3	1.5	1.4
Net Benefits	\$ 249,311	\$ 386,769	\$ 334,086

Levee and Floodwall: Within the extreme southern end of the project area, enlargement of the existing levee to elevation 7.0 feet NGVD would result in the direct loss of 2.4 acres of the 17.5 acre fresh swamp. Within the mid to northern reach of the project area, levee construction would cause the direct loss of 8.0 acres of the 79.6 acre early successional BLH habitat.

In August 1997, the previously referenced biologists quantified the loss in habitat values associated with the direct project-induced loss of 2.4 acres of fresh swamp and 8 acres of early successional bottomland hardwood habitat. The value of the 10.4 acres of habitat loss will be mitigated through purchase of the needed acreage. The cost of this purchase is directly attributable to project costs. The project induced effects on wildlife, fisheries, threatened and endangered species, cultural resources, water quality, air quality, recreational resources and hazardous, toxic, and radioactive, wastes (HTRW) are summarized in detail in the EA and Appendix D of this document.

DETERMINATION OF THE RECOMMENDED PLAN

This section evaluates the NED results for each plan developed separately in relation to the no-action plan. It draws on the results obtained for the three benefit types and costs developed in other sections and appendices.

A traditional analysis was performed using annualized benefit and cost estimates, an assessment of environmental acceptability, and impact to local residents and businesses. Therefore, these costs are sufficiently accurate to allow elimination of plans that are infeasible. Upon review of the non-structural alternatives, raising structures is not economically justified and floodproofing is superior to the small walls option. However, the structural alternative provides superior net benefits compared to any of the non-structural alternatives. Therefore, the non-structural alternatives were dropped from further consideration.

With respect to the structural plan, the levee design contains similar floodwall, floodgate, and earthen levee features for each level of protection. While all appear economically justified, a levee constructed to elevation +7.0 feet NGVD maximizes net benefit.

RECOMMENDED PLAN DESCRIPTION

The recommended alternative consists of earthen levee enlargement, levee creation, and floodwall and floodgate construction to enhance flood protection. The plan involves hauling to the site approximately 135,000 cubic yards of earthen fill material from an offsite commercial source for elevating 3.0 miles of an existing earthen levee. The final elevation of the protection levee is 7.0 feet NGVD with 1-on-4 side slopes. The remaining levee alignment, approximately 1.7-miles, will consist of eleven (11) floodgates and three sheetpile floodwall sections that will tie into the earthen levee to form a closed alignment. Earthen fill material will be transported to the construction site via Louisiana Highway 45 (LA 45). From LA 45, the dump trucks would access the levee construction site via Gloria Drive, Canal Street, Radio Tower Road, and Dardar Street located in the town of Jean Lafitte.

CONSTRUCTION COSTS

The proposed levee will be constructed in one lift with a total duration of approximately 2 to 2.5 years, but will be limited to a maximum of six months in any one location based upon prior construction projects of this nature. A five-foot wide temporary construction easement is required for a period of three years to accomplish the described work. Based on the types of construction involved it is recommended that it be accomplished using three separate contracts. Cross-sectional diagrams of the proposed earthen levees, floodwalls, and floodgates are presented in Plates 11 thru 19. A detailed estimate of construction costs is presented in Table 14.

Levee construction will require the use of approximately 60 trucks per day, hauling material during daytime hours. Typical construction of earthen levees is accomplished at the rate of 1200 cubic yards per day. The levee requires approximately 100,000 cubic yards of material, however additional time must be added to account for the special right-of-way circumstances. A number of private residences are within 20 feet of the construction site, thus minimizing impacts to the residents will require implementing techniques to reduce noise and avoid damage to private property.

Table 14
Construction Cost Estimate

Cod e	Item	Qty	Unit	Unit Price	Amount	Contingency	Project Cost
1	Mob/Demob		LS	\$115,000	\$115,000	\$28,750	\$143,750
2	Reinforced Concrete						
	Bulkhead Floodwall: Walls	310	CUYD	\$400	\$124,000	\$31,000	\$155,000
	Landside Floodwall: Walls and Columns	2050	CUYD	\$400	\$820,000	\$246,000	\$1,066,000
	Base Slabs	200	CUYD	\$200	\$40,000	\$12,000	\$52,000
	Stab. Slabs	150	CUYD	\$100	\$15,000	\$4,500	\$19,500
	Stairs	75	CUYD	\$400	\$30,000	\$9,000	\$39,000
3	Steel Sheetpiling						
	CZ-101 (Landside F/W)	69,100	SQFT	\$12.5	\$863,750	\$259,125	\$1,22,875
	CZ-114 (Bulkhead F/W)	40,300	SQFT	\$14.0	\$564,200	\$141,050	\$705,250
4	Piling, Timber (12" dia.)	6,000	LNFT	\$12	\$72,000	\$21,600	\$93,600
5	Excavation (Floodwall)	3,000	CUYD	\$6	\$18,000	\$5,400	\$23,400
6	Backfill (Floodwall)						
	Backfill (Landside F/W)	2,000	CUYD	\$8	\$16,000	\$4,800	\$20,800
	Backfill (Bulkhead F/W)	700	CUYD	\$8	\$5,600	\$1,400	\$7,000
7	Fertilizing, Seeding & Mulching	.7	ACRE	\$2,000	\$1,400	\$420	\$1,820
8	Steel Swing Gates	21,400	LBS	\$2.5	\$53,500	\$16,050	\$69,550
9	Clearing & Grubbing	25	ACRE	\$1,000	\$25,000	\$5,000	\$30,000
10	Embankment Semicompacted Fill	100,000	CUYD	\$8	\$800,000	\$160,000	\$960,000
11	Fertilizing and Seeding Embankment		LS	\$15,000	\$15,000	\$3,000	\$18,000
TOTALS					\$3,578,450	\$949,095	\$4,527,545

Concrete-capped steel sheetpile floodwalls will be constructed primarily along Bayou Barataria, where construction right-of-way is extremely limited. The total length of the floodwalls is approximately 7,600 feet. Included in the floodwall design are eleven (11) swing-type floodgates to maintain vehicular and pedestrian access to Bayou Barataria. At each residence along Bayou Barataria, reinforced concrete stairs will be installed to maintain pedestrian access to the water.

REAL ESTATE REQUIREMENTS

There are no existing Federal interests associated with this project. The estates required for this project include a Perpetual Flood Protection Levee Easement consisting of approximately 17.7 acres and a Temporary Work Area Easement consisting of approximately 3.4 acres for 3 years. Bayou Barataria is an inland water course that is presently used in interstate or foreign commerce. All of the work along Bayou Barataria will be accomplished within an area where the Federal Government can assert its superior right to aid commerce. Therefore, the Government needs no further real estate interests to perform said work. A summary of the Real Estate costs using December 17, 1997 valuation date is shown in Table 15. A detailed description of these requirements is presented in Appendix C.

Approximately 120 individual landowners will be affected by construction and will require 5 residences to be demolished and removed. It is understood at this time that the residences are occupied rental units. The landowner is entitled to compensation for the value of the structures and the renters entitled to relocation benefits as displaced persons under Public Law 91-646, as amended. These costs have been incorporated into the real estate estimates. Along Bayou Barataria construction may require removal of several bulkheads, piers and boathouses affecting approximately 60 landowners. The landowner is entitled to compensation for the value of the structures removed. These costs have also been incorporated into the real estate estimate.

TABLE 15
Real Estate Cost Estimate

(A) LANDS AND DAMAGES (TITLE III)			
Perpetual Flood Protection Levee Easement	Acres	Unit Value	Total Value
Residential (Waterfront West of LA 45)	5.7	\$219,150	\$1,249,155
Residential (East of LA 45)	5.4	\$ 28,227	\$152,424
Recreation	6.6	\$270	1,782
Temporary Work Area Easement (3 years)			
Residential (Waterfront West of LA 45)	.9	\$69,626	\$62,663
Residential (East of LA 45)	1.3	\$ 8,970	\$11,661
Recreational (East of LA 45)	.9	\$ 86	\$ 77
Road Access	.3	N/A	\$1,500
(B) Improvements			\$12,000
(C) Severence Damage (Cost to Cure)			\$165,000
TOTAL LANDS & DAMAGES			\$1,656,000
(D) Contingencies 25%			\$414,000
TOTAL LANDS, EASEMENTS AND RIGHTS-OF-WAY			\$2,070,000
(E) Acquisition Costs			\$1,089,120
(F) PL 91-646 (URA), Title II payments			\$37,500
TOTAL ESTIMATED REAL ESTATE COST			\$3,195,930

RELOCATIONS OF AFFECTED FACILITIES

The total cost for relocation of Louisiana Highway 45, several oil and gas pipelines, power and communication lines, and drainage pump station discharge pipes for the proposed project is currently estimated to be \$693,200.00. This total includes 5% for the owners engineering and design and 10% for the owners contract administration. Twenty-five percent (25%) for contingencies is added to the total for all relocation items except the highway ramps and detours. Contingencies for the ramps and detours are 30% and 35% respectively. Future Government expenditures in the areas of engineering, design, and contract administration have not been included in these estimates. A detailed description of the facilities to be relocated is provided in Appendix A.

MITIGATION

Mitigation as a result of project construction is required for 10.4 acres of direct forested wetland loss, which is approximately equivalent to 3 Average Annual Habitat Units. The habitat value of wetland loss could be fully mitigated via acquisition of an appropriate amount of forested wetland mitigation credits from an approved mitigation area in coastal Louisiana. The West Jefferson Levee District has contacted the Bayou LaCache wetland mitigation area that complies with the Coastal Management Division of the Department of Natural Resources and the U.S. Army Corps of Engineers. This mitigation area is located in Terrebonne Parish and consists of approximately 655 acres of available forested wetland habitat with an estimated habitat unit value per acre equal to .6. Thus, mitigation for construction of the Fisher Basin project would require approximately 5 acres from Bayou LaCache at a cost of approximately \$3,500 per acre. The total mitigation cost for the proposed project is estimated to be \$17,500.

OPERATION AND MAINTENANCE

The estimated annual operation and maintenance (O&M) costs of the recommended plan for the Fisher Basin are as follows.

TABLE 16
OPERATION AND MAINTENANCE ESTIMATE

<u>MAINTENANCE ITEM</u>	<u>COST ESTIMATE</u>
Levee Maintenance	\$ 7,500
Floodwall Maintenance	\$ 2,000
Floodgate Maintenance	<u>\$ 7,000</u>
Subtotal	\$16,500
15% contingencies	<u>2,475</u>
TOTAL	\$18,975

Operation and maintenance of this project involves mowing approximately 56 acres of earthen levee, mowing or spraying grass adjacent to 7,600 linear feet of floodwall, removing graffiti from floodwalls, cleaning floodgate sills, and greasing and spot painting the floodgates periodically.

ENGINEERING AND DESIGN

Engineering and Design (E&D) for this project consists of preparing detailed design plates for construction. Pending approval of this DPR, additional funding will be provided to develop plans and specifications. E&D cost estimates are as follows:

Geotechnical Br.	\$56,000.00
Structures Br.	\$81,250.00
General Engineering Br.	\$3,350.00
Cost Engineering Br.	\$18,000.00
Hydraulics Br.	\$2,500.00
Civil Br.	\$80,000.00
Design Services Branch	\$16,000.00
Surveys	<u>\$90,000.00</u>
Engr Div Total	\$347,100.00

Construction Div.	\$25,000.00
Project Mgmt. Div.	<u>\$40,000.00</u>
E&D TOTAL	\$412,100.00

SUPERVISION AND ADMINISTRATION

Supervision and Administration (S&A) of construction contracts for this project is the responsibility of the U.S. Army Corps of Engineers. S&A cost estimates are as follows:

Construction Div.	\$720,000.00
Project Mgmt. Div.	<u>\$30,000.00</u>
S&A TOTAL	\$750,000.00

PLAN IMPLEMENTATION

The purpose of this section is to present pertinent information concerning the Federal and non-Federal responsibilities regarding cost apportionment and the division of responsibilities for construction and subsequent operation, maintenance, and rehabilitation of the project. Such costs apportionment is based on Federal guidelines.

DIVISION OF PLAN RESPONSIBILITIES

FEDERAL RESPONSIBILITIES

The Federal government will be responsible for planning, engineering, design, and construction of the project in accordance with the applicable provisions of Public Law 99-662 (WRDA of 1986). The Government, subject to the availability of funds and using those funds provided by the Non-Federal Sponsor, shall expeditiously construct the Project, applying those procedures usually applied to Federal projects, pursuant to Federal laws, regulations, and policies.

NON-FEDERAL RESPONSIBILITIES

In accordance with Federal policy, non-Federal interests must, at the appropriate time, assure the Secretary of the Army that they will, without cost to the United States:

- A. Furnish all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas necessary for construction, operation, and maintenance of the Project, and shall perform or ensure performance of all relocations necessary for the construction, operation, and maintenance of the Project.
- B. The Non-Federal Sponsor shall contribute a minimum of 35 percent, but not to exceed 50 percent, of total project costs in accordance with the Federal regulations

- C. The Non-Federal Sponsor shall provide a cash contribution equal to 5 percent of total project costs.
- D. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project, except for damages due to the fault or negligence of the United States or its contractors.
- E. Operate, maintain, repair, replace, and rehabilitate, as necessary, all features of the project, at no cost to the Government, in accordance with regulations prescribed by the Secretary of the Army, including levees, floodwalls, floodgates and approach channels, drainage structures, drainage ditches or canals, and all mitigation features.
- F. Provide for the adjudication of all water right's claims resulting from construction, operation, maintenance, repair, replacement, and rehabilitation of the project, and hold and save the United States free from damages due to such claims.
- G. Publicize flood plain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the Project.
- H. Within one year after the date of signing a project cooperation agreement, prepare a floodplain management plan designed to reduce the impact of future flood events in the project area. This plan shall be prepared in accordance with guidelines developed by the Government. The plan must be implemented no later than one year after completion of construction of the project.
- I. Prescribe and enforce regulations to prevent obstruction of or encroachment on the project that would reduce the level of protection it affords or that would hinder operation and maintenance of the project.

- J. Assure that construction, operation, maintenance, repair, replacement, and rehabilitation of any non-Federally constructed flood features do not diminish the flood protection provided by or jeopardize the structural integrity of the project.
- K. Assure compliance with applicable Federal floodplain management and flood insurance programs.
- L. The Non-Federal Sponsor may request the Government to accomplish betterments. Such requests shall be in writing and shall describe the betterments requested to be accomplished. If the Government elects to accomplish the requested betterments or any portion thereof, it shall so notify the Non-Federal Sponsor in a writing that sets forth any applicable terms and conditions. The Non-Federal Sponsor shall be solely responsible for all costs due to the requested betterments and shall pay all such costs.
- M. Not less than once each year the Non-Federal Sponsor shall inform affected interests of the extent of protection afforded by the Project.
- N. Comply with the applicable provisions of the Uniform Relocations and Real Property Acquisition Policies Act of 1970 (PL 91-646), as amended by Title IV of the Surface Transportation and Uniform Relocations Assistance Act of 1987 (PL 100-17)
- O. Comply with Section 221 of Public Law 91-661, flood Control Act of 1970, approved December 31, 1970, which provides that the construction of any water resources project by the Corps of Engineers shall not be started until each non-federal interest has entered into a written agreement to furnish its required cooperation for the project.
- P. Comply with Section 601 of Title IV of the Civil Rights Act of 1964 (PL 88-352) that no person shall be excluded from participation in, denied the benefits of, or subject to

discrimination in connection with the project on the grounds of race, creed, or national origin.

VIEWS OF LOCAL SPONSOR

The West Jefferson Levee District is the local agency responsible for providing flood protection to residents living on the westbank of the Mississippi River in Jefferson Parish. Mr. Gerald Spohrer, Executive Director of the levee district and his project management team at Coastal Engineers and Environmental Consultants were members of the Interdisciplinary Planning Team (IPT). Approximately twenty-two (22) IPT coordination meetings were conducted throughout the course of this feasibility study. The West Jefferson Levee District has expressed their support of the recommended plan and their intent to provide the non-Federal share of the project costs (see Exhibit 1).

STATEMENT OF FINANCIAL CAPABILITY

The New Orleans District has reviewed the West Jefferson Levee District's financing plan and determined that the local sponsor is financially capable of satisfying the project cost-share requirements. The West Jefferson Levee District received revenue from several sources including, but not limited to, ad valorem taxes on property, state revenue sharing, interest income on fund balances, and other fees. In addition to these revenue sources, funds for the Fisher Basin Project are being requested in the State of Louisiana capital outlay budget and Statewide Flood Control Program.

SUMMARY OF COORDINATION, PUBLIC VIEWS AND COMMENTS

STUDY MANAGEMENT

The U.S. Army Corps of Engineers, New Orleans District, had the responsibility of conducting and coordinating the feasibility study, consolidating information from other agencies and interested parties, preparing the report, and formulating the alternative plans in conjunction with the non-Federal sponsor. During the course of this study, coordination was initiated and maintained with the U.S. Fish and Wildlife Service, Louisiana Department of Wildlife and Fisheries, Louisiana Department of Transportation and Development, Louisiana Office of State Parks, West Jefferson Levee District, Jefferson Parish Department of Drainage, Town of Jean Lafitte, and other Federal, state, and local agencies.

TECHNICAL REVIEW

The Mississippi Valley Division office is concerned with providing Quality Assurance in the preparation, review, and approval of decision and implementation documents. Quality Assurance guidance for technical products developed by both Planning and Engineering division is the focus of this section. An interdisciplinary planning team at the district accomplished the independent technical review. The technical review was completed on November 6, 1998 and the significant issues are summarized in Appendix F.

PUBLIC INVOLVEMENT

Through the combined efforts of the New Orleans District and the West Jefferson Levee District, a public involvement strategy was developed to ensure that agencies, groups, and individuals most likely to be interested in the study are identified and contacted, and that their views and concerns relative to the study process and plan formulation are identified and addressed in the design.

PUBLIC INFORMATION MEETING

On January 20, 1998, the New Orleans District and the West Jefferson Levee District hosted a public information meeting in the Jean Lafitte Town Hall to describe the proposed project to all affected individuals and interested groups and agencies. The participants in this meeting included landowners, representatives from local interest groups, business owners, and many of the local and state officials. Approximately 35 people were in attendance.

Many landowners expressed concern on the topic of: access to Bayou Barataria, adverse impacts to oak trees along the existing alignment, and impacts to existing private bulkheads, boat docks, and boat sheds. The floodwall design provides several public use floodgates for vehicular and pedestrian access. In addition, each residence along Bayou Barataria affected by the floodwall will be provided a set of concrete stairs. In areas along the bayou where an earthen levee is proposed, pedestrian access is not inhibited by the final levee height.

The enclosed Environmental Assessment addresses the issue of oak trees situated along Bayou Barataria, specifically at the Fleming/Berthoud site along the bayou. Most of the live oak trees in the area would continue to survive in a stressed condition provided that no disturbances occur on the ground below or around them. However, the erosion along Bayou Barataria would likely result in the demise of the oaks along its bank in 15 to 20 years. Unfortunately, efforts to stabilize the bank could kill the stressed trees rather than save them. If the floodwall is moved several feet out from the bank, no fill is placed behind the floodwall above the bayou water level, and no activity occurs on the land under or within several feet of the crowns of the trees, they may live the full 15-20 years that we estimate. The earthen levee section on the landside of the trees located at the Fleming/Berthoud site is estimated to cost \$72,000, while a concrete-capped sheetpile floodwall placed in the bayou, outside the tree crown, is estimated to cost \$800,000. A floodwall is not an economically viable alternative since available right-of-way for an earthen levee does exist on the landside of the live oaks (see Exhibit B). The final levee alignment will minimize impacts to the live oak trees and shall be determined in the preconstruction engineering and design (PED) phase.

With respect to the existing bulkheads, docks, boat sheds, etc. along Bayou Baratavia, the method of construction currently involves the use of a barge to drive sheetpile. This method may require the removal of approximately 60 boat docks and boat sheds along the bayou. However, the federal government will make every attempt to minimize the number of private structures affected during construction.

The participants in the public information meeting expressed satisfaction with the attempts being made to accommodate their interest and seemed optimistic about the project. The Times-Picayune summarized the proposed project and the public meeting in an article that appeared in the January 21, 1998 issue. A copy of the newspaper article is provided as Exhibit C.

COORDINATION WITH INDIVIDUAL LANDOWNERS

Following the public meeting, several landowners contacted the New Orleans District to discuss the proposed levee alignment. The owners of the Fleming/Berthoud tract mentioned above, expressed great interest in the live oak trees. As discussed earlier, a floodwall placed several feet out into the bayou would be too cost prohibitive, therefore we recommend relocating the earthen levee away from the bank, where most of the live oaks are situated.

Adjacent to the Fleming/Berthoud site along Bayou Baratavia is the Fleming Canal Store. The business consists of a marina with fuel pumps and a large store. The site was originally excluded due to right-of-way concerns and the impact of construction on their business. However, after a closer look at the site, the number of floodgates required in both cases is identical and the construction costs involved in excluding the business versus including the business are also nearly identical. The owner is willing to allow construction to inconvenience them temporarily in exchange for a revised floodwall alignment that will protect many of the existing structures and maintain their access to the waterfront. They also request that the construction be scheduled during winter months and that every effort be made to affect only half of the property at any one time.

In the northeastern section of the Fisher Basin, several changes to the proposed levee were discussed to accommodate three individual landowners and their future development plans. Cost estimates were prepared for each of the proposed changes, which would result in more land, not structures, being protected. In each case, the landowners' proposed alignment is more expensive than the Corps' proposal. The additional construction costs are estimated to be \$75,000, additional facility relocation costs are estimated to be \$155,000, and additional mitigation is estimated to be \$45,000. The proposed changes are not economically feasible due to the increased cost and adverse impacts to approximately 10-acres of scrub-shrub wetland habitat. Therefore the West Jefferson Levee District would be responsible for funding these changes. The levee district is expected to respond to these requests prior to initiation of PED.

RECOMMENDATIONS