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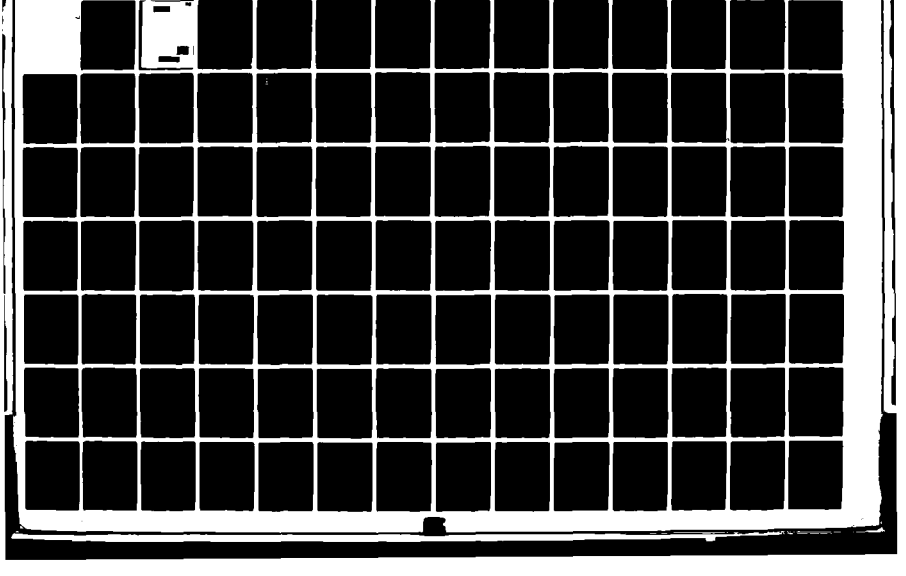

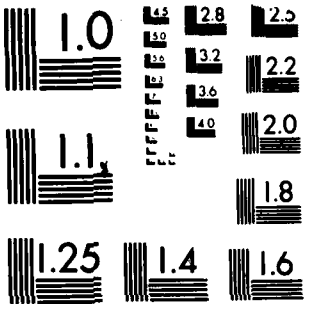

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Studies of a 210-square mile area including the Cape Girardeau-Jackson, Missouri metropolitan areas are addressed in this report. The problem of flooding along Cape La Croix Creek and Walker Branch in the City of Cape Girardeau (drainage area of 21.4 square miles) is addressed by the Recommended Plan. Environmental, outdoor recreation, and social well-being concerns have also been addressed. Flood control improvements for the remainder of the study area, including the city of Jackson and the rural area along the Little River Diversion Channel, are not economically justified at this time.

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The Recommended Plan has widespread public support; it reduces the total average annual flood damages by about 85%; and addresses the environmental and outdoor recreational needs. With implementation of the Recommended Plan of improvements, the flood damages normally expected to result from a 500-year flood (this is a flood having a 0.2 percent chance of occurring in any one particular year) would be reduced by about 61 percent. Some 263 existing structures subject to flooding will have full 100-year flood protection with 44 additional structures receiving partial protection. Average annual tangible benefits divided by average annual costs yield a benefit-to-cost ratio of 1.7 to 1, based on 8-1/8 percent interest and October 1983 price levels.

The Recommended Plan of improvements is estimated to cost $25,900,000 based on October 1983 price levels. Under existing laws and cost sharing procedures these costs would be shared $20,700,000 Federal and $5,200,000 non-Federal sponsor. In addition, the local sponsor would be responsible for all operation and maintenance costs currently estimated to be about $58,100 annually, plus $45,700 annual major replacement costs, totalling $103,800 annually. The Cape La Croix Creek and Walker Branch Levee and Drainage District is the local sponsor. No mitigation would be required by the implementation of the Recommended Plan and no unresolved environmental or other issues are known to exist.

WATER RESOURCES INVESTIGATION

CAPE GIRARDEAU-JACKSON

METROPOLITAN AREA, MISSOURI

SURVEY REPORT

VOLUME ONE

MAIN REPORT

WITH

(ENVIRONMENTAL ASSESSMENT)

DECEMBER 1983

A1

CAPE GIRARDEAU-JACKSON METROPOLITAN AREA, MISSOURI

CAPE LA CROIX CREEK AND WALKER BRANCH

SYLLABUS

Studies of a 210-square mile area including the Cape Girardeau-Jackson, Missouri metropolitan areas are addressed in this report. The problem of flooding along Cape La Croix Creek and Walker Branch in the city of Cape Girardeau (drainage area of 21.4 square miles) is addressed by the Recommended Plan. Environmental, outdoor recreation, and social well-being concerns have also been addressed. Flood control improvements for the remainder of the study area, including the city of Jackson and the rural area along the Little River Diversion Channel, are not economically justified at this time.

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO
ATTENTION OF

CAPE GIRARDEAU-JACKSON

METROPOLITAN AREA, MISSOURI

INTRODUCTION

This report presents the results of the studies conducted by the Corps of Engineers regarding flooding and related land resource problems, needs, and opportunities in the Cape Girardeau-Jackson area. This is the final report prepared during the course of this study.

This Main Report (Volume One) has been prepared for general distribution as a public information document. Volume Two presents a description of the technical analyses and other detailed data. Volume Three includes a complete set of detailed plates, maps and charts. Volume Four, deals exclusively with public views and responses. More specialized and detailed study documentation such as computer output and technical economic, engineering, and environmental results are available for

inspection at the office of the St. Louis District, Corps of Engineers, Urban Studies Branch, 210 Tucker Boulevard, North, St. Louis, Missouri, 63101.

STUDY AUTHORITY

The Cape Girardeau-Jackson water resources study was authorized by a resolution adopted on 11 April 1974 by the Committee on Public Works of the House of Representatives. The resolution was introduced and adopted at the request of the Honorable Bill D. Burlison. In compliance with the resolution the studies include "consideration of the needs for flood control, wise use of floodplain lands, wastewater management facilities, including stormwater runoff, regional water supply, water quality control, recreation, fish and wildlife conservation, protection and enhancement of aesthetic qualities, and other measures for enhancement and protection of the environment in the metropolitan area." The 11 April 1974 resolution is the most recent of three Congressional resolutions that relate to this study. In 1966, a Corps of Engineers flood control study was authorized for an agricultural area north of the Little River Diversion Channel between Hubble Creek and Ramsey Branch. In 1972, the Corps of Engineers was authorized to make a flood control study for the Cape La Croix Creek watershed. These two investigations were combined with the larger and more comprehensive Cape Girardeau-Jackson water resources study. The three resolutions are included in APPENDIX A.

SCOPE OF STUDY

The study authorized by Congress is a comprehensive water resources study that encompasses a 210 square mile area in Cape Girardeau County in southeast Missouri as shown on Plate 1. Substantial population growth is occurring in this part of Missouri. The authorized study purposes of wastewater management facilities and regional water supply were addressed in the first stage of the study. It was found that other agencies are addressing the water supply and water quality problems. The wise use of floodplain lands is being addressed by such programs as the Corps of Engineers Flood Plain Management Services program and by the Federal Flood Insurance program.

This study dealt with the need for flood control in several parts of the study area, including the Mississippi River floodplain, the Little River Diversion Channel floodplain, the community of Jackson and the Cape La Croix Creek watershed. Flood control projects were found to be feasible only in the Cape La Croix Creek area. A detailed study of the feasibility of flood protection and related measures in the 21.4 square mile Cape La Croix Creek watershed is presented in this report.

STUDY PARTICIPANTS AND COORDINATION

Although there have been many participants, the Corps of Engineers has the final responsibility for accomplishing this study. Active participants at

the local level include the city of Cape Girardeau, the city of Jackson, Cape Girardeau County, the Cape La Croix Creek-Walker Creek Levee and Drainage District (project sponsor), and the Southeast Missouri Regional Planning Commission (SEMORPC). State level participants are the Missouri Department of Natural Resources (MDNR) and the Missouri Department of Conservation (DOC). The Federal agencies most actively participating in this study are the National Park Service (formerly the Heritage Conservation and Recreation Service), the Fish and Wildlife Service (USFWS), the Soil Conservation Service (SCS), the Environmental Protection Agency (EPA), and the United States Geological Survey (USGS).

Public involvement, especially informal discussions and coordination, was emphasized throughout this investigation. The initial formal public meeting was held in Cape Girardeau on 3 April 1975, approximately 100 persons attended. Many additional formal and informal meetings, field inspections, and citizen contacts occurred. Another formal meeting covering the status of the project was held on 9 October 1980 including Representative Burlison, members of the city council, and the levee board. On 24 February 1981, a final meeting involving the general public was held. Congressman Burlison's representative, members of state, county, city, levee board, and the general public were present. Active local newspaper and television coverage, plus notices to the known residents of the drainage District were methods, used to inform the public and involve their participations in the planning and review process.

RELATED STUDIES

The Corps of Engineers has prepared several reports which cover various aspects and parts of the study area. A Flood Plain Information Report for the Mississippi River and Cape La Croix Creek was published in December 1969. A Corps of Engineers study of the feasibility of protecting a floodplain area adjacent to the Little River Diversion Channel has been incorporated into the Cape Girardeau-Jackson water resource study. The Little River Diversion Study found that flood protection for that area was economically unjustified at that time, and remains unjustified at this time. In addition, a Corps of Engineers report containing a description of a flood protection project for the city of Cape Girardeau was published by the United States House of Representatives in June 1949. This report, the Mississippi River at Cape Girardeau, Missouri, is especially significant, because the Chief of Engineers and the Board of Engineers for Rivers and Harbors recommend Congressional authorization of a four-reach flood protection project for the city. Congress subsequently authorized construction of the project in the Flood Control Act of 1950. "Reach 2" of that project protects an area in the downtown business district and was constructed in the 1950's. Reaches 1, 3, and 4 were deauthorized on 3 October 1978.

SEMORPC functions as the regional planning agency for the study area. This agency has published a series of reports, including an inventory and evaluation of economic resources in its seven-county region; a survey of housing; a study of assessed valuation, land indebtedness and tax rates; an analysis of industrial developments; a regional economic development plan; a directory of manufacturing and basic industries; an outdoor recreation and open space plan; a report on the 1973 Mississippi River flood; and a report on the geology of the Cape Girardeau-Jackson urbanizing area. SEMORPC has completed studies of present and projected land use for the city of Cape Girardeau and its immediate vicinity. Under contract with the Corps of Engineers, SEMORPC completed an institutional study which presents information on the existing institutional system related to water resources in the Cape Girardeau-Jackson area.

In 1978, Atlantic Aerial Surveys, Inc., Huntsville, Alabama, prepared 2-foot contour maps for floodplain areas in the urban and urbanizing parts of the study area under a contract with the Corps of Engineers. The contours are displayed on an aerial photo base at a scale of 1 inch equals 200 feet. This survey information has been very valuable for the hydrologic and hydraulic studies needed to define and display various frequency floods and to examine alternative solutions to the flood problems. The survey information has also been used in economic, environmental, and other evaluations of proposed alternative solutions.

Flood Insurance Studies have been completed for the cities of Jackson and Cape Girardeau. The USGS made the technical studies for the Jackson study area. The Corps of Engineers was retained by the Federal Insurance Administration (FIA) to do the technical studies for the Cape Girardeau Flood Insurance Study. The survey and hydrologic studies for the Cape Girardeau Flood Insurance Study have been coordinated and combined with similar more recent studies executed for this Cape Girardeau-Jackson study.

The Missouri Geological Survey and the USGS selected the Cape Girardeau area as a test region for the development and evaluation of various resources inventory techniques termed RALI (Resources and Land Inventory). The test region is the area covered by the Cape Girardeau USGS 7-1/2' Quadrangle. It includes the city of Cape Girardeau and its immediate environs. The remote sensing and field data assembled during the RALI study deal primarily with engineering and geologic properties, these characteristics have been useful in this investigation. Department of Agriculture aerial photographs of the study area and a SCS soil survey of Cape Girardeau County also provided useful land resource information.

Southeast Missouri State University, Cape Girardeau, completed baseline water quality studies for eight streams under contract with the Corps of Engineers. Numerous wastewater management studies have been completed for the Cape Girardeau-Jackson area. Most of these studies were made in compliance with the Federal Water Pollution Control Act Amendment of 1972 (Public Law 92-500).

Midwest Aquatic Enterprises, Mahomet, Illinois, surveyed the biological elements of the Cape La Croix Creek watershed for the Corps of Engineers. The results were reported in: Biological Inventory - Cape La Croix Creek Watershed, Cape Girardeau County, Missouri. This study provides data necessary to analyze and understand local and regional impacts which may result from water resource developments in the near and distant future.

In accordance with the Fish and Wildlife Act, the USFWS prepared for the Corps of Engineers a 9 March 1982 Draft Fish and Wildlife Coordination Act Report for the Cape Girardeau-Jackson area. Any additional correspondence will be published in Volume Four - Public Views and Responses of this report.

THE REPORT AND STUDY PROCESS

This Survey Report provides the results of a general investigation that responds to the previously described Congressional resolutions. Recommendations are included that Congress authorize the construction of improvements for that portion of the study area for which feasible improvements have been identified. Preconstruction planning documents to be prepared after Congressional authorization are to include detailed design data for construction and a firm legal and binding commitment from the local sponsor.

The information and data in this final Survey Report accomplish these goals: (1) it defines present and future water and related land resource problems, needs, and opportunities in the study area; (2) it identifies alternative comprehensive plans that address the problems and needs and capitalizes on the available opportunities; and (3) it provides a sound water resources plan consistent with local, state, and Federal objectives and authorities. The Cape La Croix Creek and Walker Branch Levee and Drainage District (local sponsor) consider the plan to be realistic and practical and having strong public support.

The study process used to arrive at the Recommended Plan of improvements consisted of addressing four planning tasks (problem identification, formulation of alternatives, impact assessment and evaluation) at increasing levels of detail in three stages as follows:

a. Stage 1. The primary emphasis in Stage 1 was on the first planning task, identification of problems and opportunities, and on developing sound planning objectives. The remaining three tasks (formulation of alternatives, assessment and evaluation) were done conceptually. The Stage 1 report, published in July 1975, primarily defined the magnitude of the study and served as a guide for the subsequent stages of planning.

b. Stage 2. The second stage (October 1980) of the study process emphasized the analysis of alternative solutions. The basic output of

this stage was a comprehensive array of alternative solutions that addressed the planning objectives, provided choices between resource management options, and identified the most reasonable alternatives to be considered during the final planning stage.

c. Stage 3. During this final stage, the alternatives were further detailed and evaluated to arrive at the Recommended Plan. The design, assessment, and evaluation of the final alternatives were accomplished on an equal basis. The responsibility for selecting the Recommended Plan rests with the District Engineer, St. Louis District, Corps of Engineers and his staff.

The final survey report will be furnished to the Congress for its consideration and action. If Congressional authorization is granted, then post-authorization studies and the preparation of construction plans and specifications will follow, and ultimately, project implementation will be accomplished. The study results through Stage 2, as well as more detailed information and technical data on Stage 3 studies, are summarized in APPENDIX B under Plan Formulation.

PROBLEMS, NEEDS, AND OPPORTUNITIES

The study area problems, needs, and opportunities are the topics of this section. First, the national objectives are identified; followed by the study area profile to provide specifics about local problems, needs, and opportunities.

NATIONAL OBJECTIVES

A brief discussion of "national objectives" and the dynamic nature of Federal policy is provided as the general background into which this study must fit.

Current national objectives regarding water resource developments are described within the Water Resource Council's (WRC) Principles and Guidelines for Planning Water and Related Land Resources. Federal policy in cost sharing is dynamic and will be specifically defined when the Congress and Administration take action on this report.

The national goal is sound floodplain management that embodies the wise use, conservation, development, and utilization of interrelated land and water resources to attain the objectives of economic efficiency, environmental quality, and social well-being. It is the policy of the Corps of Engineers to formulate projects which, to the extent possible,

avoid or minimize adverse impacts associated with use of the base floodplain and prevent inducing development in the base floodplain unless there is no practicable alternative.

STUDY AREA PROFILE

A brief profile of the study area is presented in the following. A more detailed technical discussion is presented in APPENDIX A as well as other applicable technical appendices.

The overall study area contains about 210 square miles of rural, suburban and urban land within Cape Girardeau County, Missouri. The trend of urbanization for Cape Girardeau and Jackson is toward Interstate 55, and toward each other.

Most of the land in the study area is drained by small independent streams. These include Cape La Croix Creek, Ramsey Branch, Ranney Creek, Hubble Creek, Indian Creek, Flora Creek, Scism Creek, Juden Creek, and Sloan Creek. Cape La Croix Creek is the major urban stream in the study area. It has become the primary focus of this study based on economic and hydraulic findings. The three-square mile Sloan Creek watershed is located within the city of Cape Girardeau. Juden Creek and Ramsey Branch are partially urbanized as a result of the expansion of Cape Girardeau. The only other watershed with significant urban development at this time is Hubble Creek. The town of Jackson lies in the upper reaches of this stream.

In contrast to its surrounding region, the Cape Girardeau-Jackson area has experienced considerable economic growth in the past two decades. Cape Girardeau has the reputation of being one of the most progressive counties in southeast Missouri, as evidenced in having planning and zoning authorities, and subdivision regulations which are lacking in most other counties in this region.

According to data prepared by SEMORPC, the Cape Girardeau-Jackson Urban Complex had an estimated 1972 population of 42,000 people. The population of the complex increased 25 percent from 1960 to 1970. The 1980 census reports a combined population of 42,188 for Cape Girardeau and Jackson, an increase of 13 percent over the figures reported in 1970. Population growth has been steadily increasing over the forty-year period of examination. From 1940 to 1970 the trend has been accelerating, with the city of Cape Girardeau leading the observed patterns. The average annual population increase for Cape Girardeau has been 1.78 percent, as compared to the St. Louis 1.37 percent rate of growth.

A 1977 cultural resource reconnaissance of 680 acres along Cape La Croix and Hubble Creeks resulted in the discovery of 20 locations of archaeological and historical interest. These sites ranged from 10,000 B.C. through early pioneer cabin sites, and standing structures of the 19th century. The 360 acre survey of Cape La Croix Creek yielded

nine prehistoric and two historic sites. In 1982, Southern Illinois University, Edwardsville, surveyed an additional 120 acres and found four additional prehistoric sites and one historic site.

The biological setting includes three important land holdings under the jurisdiction of the State of Missouri. The Maintz Wildlife Preserve is a 594-acre wildlife management area located northwest of the study area. Lake Girardeau, located west of the area, contains 350 acres of land managed for fish and wildlife. The 3,268-acre Trail of Tears State Park is located in the northeast corner of the study area.

Cape La Croix Creek and its tributaries represent the resource that would be affected by proposed water developments. The aquatic and terrestrial habitats of the upland portions of the creek systems have been little altered by the activities of man. (see APPENDIX F for details.) Water quality in the uplands is good. The riparian tree corridor provides avenues for the dispersal and movement of wildlife. The principal threat to the upland habitat appears to be urbanization that is occuring north and northwest of the city of Cape Girardeau. The removal of streamside cover, clearing in adjacent areas, diversion of stormwater, and the establishment of septic fields could adversely impact this upland habitat.

Although the present water quality is generally good, neither the transitional nor the southeasterly lowlands portion of Cape La Croix Creek are presently valuable aquatic resources. In some locations,

extensive development of urban habitats along the creek has severely affected the riparian vegetation, the bank, and bed materials. Past channel modifications have been directed toward removal of flood water. Activities have included channel straightening, removal of streamside vegetation, and the cutting and removal of fallen trees. In terms of implementation of feasible water resource development projects, it is doubtful if further physical damage could be done to the southeastern lowlands portion of Cape La Croix Creek. Presently, this portion of the stream has a limited value for fish and wildlife.

A forested wetland area, totaling 25 acres, is located near the junction of U.S. Highway 61 and Missouri Highway 74. This tract is the most significant wetland of the watershed, representing a relic natural area and a refuge for many species which do not exist elsewhere in the watershed. This forested wetland is susceptible to destruction from two sources: clearing and drainage for agricultural uses; and filling for urban development.

Seventy-four species of fishes appear to occur in the Cape La Croix Creek watershed. The terrestrial habitat contains 199 species. These species include 25 amphibians, 41 reptiles, 98 birds, and 35 mammals.

The USFWS has listed two endangered species, the bald eagle and the peregrine falcon, which might be found in the region.

PROBLEMS, NEEDS AND OPPORTUNITIES

The problems, needs and opportunities related to flooding, outdoor recreation and environmental quality are summarized in the following paragraphs (see APPENDIX A for details).

Flood Control. Two essentially independent types of flood problems were identified: (1) flash flooding on the interior streams and tributaries; and (2) flooding due to high water on the Mississippi River and on the Little River Diversion Channel.

Most urban flood damages along Cape La Croix Creek and Walker Branch would result from rainfall within its watershed and not from high water on the Mississippi River. Under a future without project condition the occurrence of a 100-year flood event would cause flood damages to 246 residential units and 176 commercial/ industrial structures. Total damages for the 100-year flood and the SPF would be $22,093,500 and $44,008,800, respectively. On an average annual basis, the flood damages for Cape La Croix Creek and its tributary, Walker Branch are estimated to be approximately $4,126,100 annually. (It should be noted that numerical values presented herein are based on October 1983 price levels and 8-1/8 percent interest). Flood damages in Cape Girardeau due to the 1973 Mississippi River flood were estimated by the Corps of Engineers to be $3,161,000. The existing Corps of Engineers levee and floodwall system protecting the downtown area of the city of Cape Girardeau was credited

with preventing $17,484,000 of urban flood damages from this flood. These estimates are based on conditions existing at that time. PLATES 8 through 17 of this report indicate additional information on flood damages.

Outdoor Recreation. Outdoor recreation needs exist. Though parks are providing reasonable distribution of facilities, the level of recreational opportunities could be enhanced by providing specific types of facilities. During coordination with the Parks and Recreation Department of the city of Cape Girardeau, recreation facilities selected for the final array of plans included hiking and bicycle trails, horse trails, picnicking, open play areas, nature trails, group camping, and exercise trails.

The National Park Service (NPS) identified and recommended recreation features needed by the year 2020. Many of these recreation facilities have been incorporated through the development of a network of parks, open space, and connecting corridors. Recreation activities requiring additional facilities by the year 2020 include 188 acres for outdoor games and sports, 3 acres for group camping, 33 football and soccer fields, 9 baseball and softball fields, 17 basketball courts, 16 swimming pools, 328 miles of stream fishing, 9 tennis courts, 3 golf courses, 351 miles of bike trails, 43 miles of hiking trails, 99 miles of horse trails, and 539 picnic tables.

Environmental Quality. The water supply needs of the city of Cape Girardeau are provided by the Missouri Utilities Company. The system is adequate for existing needs, but will need expansion to meet Cape Girardeau's future water supply demand. Three city-owned wells provide potable water for the city of Jackson. No water supply problems presently exist nor are any expected to exist within the foreseeable future. Public water supply districts or individual wells/cisterns serve the remainder of the county. The principal potential water supply problem in these rural areas is supply contamination from surface pollutants and septic tank leakage.

Point source pollution problems are being adequately addressed by the ongoing EPA planning and construction program. Areawide and non-point pollution problems have therefore not been specifically addressed. Because of the EPA program(s), and in view of the relatively minor areawide and non-point pollution problems, the Corps of Engineers did not propose additional areawide wastewater studies.

Extensive urbanization within the watershed has reduced the amount of undeveloped areas that are the primary habitats for terrestrial wildlife. Particularly significant has been the loss of bottomland forest. This habitat type is of fairly limited distribution, occurring only in the floodplains of rivers and creeks. Riparian bottomland forest has been eliminated from much of the creek within and below the city of Cape Girardeau. The net result has been a loss of food, cover,

travel lanes for wildlife, and the opportunity for the public to observe wildlife in an urban setting. Measures designed to provide access to publicly owned and managed habitat areas, or that improve backyard habitat areas, would greatly enhance conditions for wildlife and also provide opportunities for nonconsumptive wildlife observation and study.

Aquatic habitat in the streams has been degraded due to the impacts of urbanization. Few pools remain which provide water, food, and shelter for fish and other organisms in the southeastern low lying parts of Cape La Croix Creek. The removal of trees has allowed the creek water temperature to increase during the summer, resulting in an adverse impact on the aquatic ecosystem. With the removal of trees, the availability of aquatic and riparian habitats has decreased, food organisms have diminished, banks have become unstable, and the number of fish species and their populations has dropped. More channelization and removal of fallen trees have increased runoff and erosion.

Environmental needs include the improvement of habitat supportive of wildlife, birds, fish, and other aquatic types. Additional needs include the establishment of vegetation on creek banks, creek bends, and areas with high runoff and preservation of wetlands. The most visual need is to control litter and debris which impact aesthetic, environmental, and hydraulic aspects of the stream corridors.

PLANNING APPROACH

Water resources problems and opportunities were identified and described in each of the three stages of the study. General planning objectives were developed in Stage 1. These were refined and made more specific in Stages 2 and 3. Alternative measures and plans that address the planning objectives were only conceptualized in Stage 1. In Stage 2 specific plans were formulated, designed, evaluated and presented to the public. The Stage 3 alternatives are refinements of the Stage 2 plans. Additional plan formulation was done to further address the planning objectives and planning constraints which are summarized in the following paragraphs.

PLANNING OBJECTIVES

The Stage 3 analysis of problems and opportunities led to a refinement of the planning objectives. It was found that a significant flooding problem exists along Cape La Croix Creek and Walker Branch. Flood control improvements for the remainder of the study area, including the town of Jackson and the rural area along the Little River Diversion channel, are presently not economically justified. The specific planning objectives, which focus on Cape La Croix Creek and Walker Branch are:

a. To reduce the incidence and amount of damage from flooding in the urban and urbanizing areas of the Cape La Croix Creek watershed;

b. To reduce or retard streambank erosion on Cape La Croix Creek and Walker Branch;

c. To safeguard and enhance the quality of the natural environment in the Cape La Croix Creek watershed;

d. To improve the quantity and quality of outdoor recreation opportunities in the Cape La Croix Creek watershed.

PLANNING CONSTRAINTS AND GUIDELINES

A number of specific criteria were established in regard to technical, economic, environmental, and evaluation aspects to aid in practical plan formulation. These criteria have been, in essence, constraints placed upon the plan formulation process. Critical to plan selection for this study were the new Principles and Guidelines which were signed by the President on February 3, 1983. These Principles and Guidelines placed added emphasis on the selection of the NED plan for any recommendation involving Federal action. The Principles and Guidelines state that any exceptions to the selection of the NED plan may only be made when there are overriding reasons based on the Federal, state, or local concerns. Other planning constraints were:

Technical Criteria. Technical criteria are the practical guidelines that directly affect physical design features. The technical criteria relate primarily to sound engineering practice. The technical criteria established for this study are as follows:

a. Equal consideration must be given to nonstructural and structural approaches; and,

b. All nonstructural and/or structural measures recommended must be practical from an engineering standpoint and implementable under the specific site conditions; and,

c. Nonstructural and structural measures must not impede any potential future flood fight efforts.

Economic Criteria. Specific economic criteria were used to analyze alternative. The economic criteria were:

a. The sum of tangible and intangible benefits must exceed project costs; and

b. Each separable unit of improvement must provide tangible and intangible benefits, at least equal to their costs; and

c. All analyses be based on uniform price levels (October 1983); and,

d. Annual costs and benefits be based on the 100-year period of analysis; and,

e. All average annual calculations be based on the prevailing annual interest rate (8-1/8 percent).

Environmental Guidelines. Environmental guidelines were established to insure that environmental quality considerations were used in formulating the alternative solutions. The following criteria were used as guides:

a. Plans to reduce flooding will protect and enhance the natural environment whenever possible; and,

b. Should the imposition of detrimental environmental impacts be unavoidable, appropriate mitigation measures will be included; and,

c. The protection and enhancement of public health, safety, and social well-being will through flood control plans be maximized wherever and whenever possible.

Evaluation Measures. To provide a means for testing and evaluating relative plan performance, specific evaluation measures were applied. These measures were:

a. Assess the workability and viability of each plan regarding its acceptance by the affected publics and its accommodation of known institutional constraints (acceptability test); and

b. Appraise the technical performance of each plan and the level of contribution to the planning objectives (effectiveness test); and

c. Assess whether all necessary investments or other actions necessary to assure full attainment of the plan are included (completeness test); and

d. Assess the plan's ability to achieve the planning objectives in the least costly way (efficiency test).

PLAN FORMULATION STUDIES STAGE 1

In Stage 1, the studies were concentrated on problem identification for each of the water resources study purposes authorized by Congress. The logic was to identify first the problems and opportunities in the 210 square mile study area and then to determine if it was necessary to develop specific plans.

The Stage 1 studies disclosed that wastewater management problems were being adequately addressed by other agencies, and that additional wastewater management studies would not be needed unless a serious need for such studies was subsequently demonstrated. Local interests have adequately dealt with water supply needs. It was also determined that water supply should only be examined in conjunction with plans developed for other purposes. For example, if reservoirs were considered for flood control, their potentials for water supply should be examined.

The Stage 1 studies revealed that flooding problems were being experienced along Cape La Croix Creek, Sloan Creek, Hubble Creek, Ramsey Branch, Juden Creek, and Indian Creek, and in floodplain areas adjacent to the Little River Diversion Channel and the Mississippi River. Plans addressing these flooding problems were conceptually developed in Stage 1. Costs and benefits for the conceptual plans were not actually developed. However, based on the apparent damages and possibilities for alleviating these damages, it was recommended that more detailed studies be made (see APPENDIX B).

PLAN FORMULATION STUDIES STAGE 2

In Stage 2, it was determined that existing wastewater management studies were adequate. Flood damages were examined along Cape La Croix Creek, Sloan Creek, Hubble Creek, Ramsey Branch, Juden Creek, and Indian Creek, and in the floodplain areas adjacent to the Little River

Diversion Channel and the Mississippi River. Serious flood damages were found along Cape La Croix Creek and its tributary, Walker Branch. Damage levels along Ramsey Branch, and Sloan and Juden Creeks were found to be minimal. The city of Jackson and Indian and Hubble Creeks showed flood damages of less than $10,000. Previous Corps of Engineers studies of the flood problems in the Little River Diversion Channel floodplain area had found no economically feasible solutions, and a reexamination of that area concluded that solutions were still infeasible. Additional reaches of the Cape Girardeau local protection project along the Mississippi River were found to lack local interest and to have a low potential for economic feasibility.

In Stage 2, flood damage reduction plans were developed only for Cape La Croix Creek and its tributary, Walker Branch. Initially various channel lengths, sizes and linings; wet reservoirs and dry detention sites; levees; and diversion channels were examined. Those plans showing economic potential were refined as a result of more detailed hydraulic, economic and cost studies. Recreation and environmental measures were developed and combined with various flood damage reduction features to produce multipurpose plans. The economic analysis for the 16 plans considered for the Cape La Croix Creek watershed are shown in TABLE 1 (see APPENDIX B). Plans 10, 13, 14, 15, and 16 were carried forward into Stage 3 and served as the foundation for solutions that emphasized national economic development (NED); environmental quality (EQ); standard project flood protection (SPF); and, nonstructural (NS) approaches. The 16 plans developed in Stage 2 are described below.

Plan 1 consists of a concrete lined rectangular channel passing through the highly developed portions of Cape La Croix Creek and Walker Branch and trapezoidal grass-lined channels in the other reaches. Due to the physical constraints placed upon the streams by the existing development, a bottom width of 75-feet was selected for the Cape La Croix Creek rectangular concrete channel, and bottom widths of 25 and 30 feet were selected for the Walker Branch rectangular concrete channel. The concrete channel on Walker Branch above Independence Street is 25 feet wide. These widths represented the widest channel that could be constructed while minimizing relocations and replacements. Some bridges having a width of less than 75-feet required transition through existing openings. The trapezoidal grass-lined channels were designed to convey water equal to that of a concrete channel bottom with bottom widths of 110 feet on Cape La Croix and 25 feet on Walker Branch having side slopes of 3 horizontal to 1 vertical. No channel improvements were proposed upstream of mile 5.1 on Cape La Croix Creek and mile 1.7 on Walker Branch. Essentially all channel improvements followed the existing channel alignment with some minor smoothing of sharp bends, such as the bend just upstream of the Wilson Road bridge over Cape La Croix Creek. Also, the irregularities of the invert slope were smoothed between miles 1.2 and 4.5 on Cape La Croix Creek resulting in maximum depth increases of about 3 feet.

TABLE 1
CAPE LA CROIX CREEK AND WALKER BRANCH
STAGE 2 ECONOMIC ANALYSIS OF PRELIMINARY PLANS
OCTOBER 1980 PRICE LEVEL, 7 1/8% INTEREST

Plan	1	2	3	4	5	6	7	8
Annual Cost								
First Costs	$1,533,000	$2,282,000	$1,548,000	$1,533,000	$2,860,000	$1,826,000	$2,011,000	$183,000
Real Estate	72,000	130,000	72,000	72,000	465,000	121,000	132,000	11,000
O&M	41,000	71,000	42,000	41,000	104,000	49,000	161,000	12,000
Replacement								
Channels @ 25 years	36,000	49,000	36,000	36,000	61,000	49,000	49,000	-0-
Bridges @ 50 years	-0-	2,000	-0-	-0-	6,000	2,000	2,000	-0-
Detention Reservoir @ 25 years	-0-	-0-	-0-	-0-	-0-	2,000	2,000	-0-
TOTAL	$1,682,000	$2,534,000	$1,690,000	$1,682,000	$3,496,000	$2,047,000	$2,257,000	$208,000
Annual Benefits	808,000	2,901,000	812,000	1,049,000	3,204,000	2,889,000	2,959,000	668,000
Net Benefits	-874,000	367,000	-886,000	-633,000	-292,000	842,000	702,000	460,000
Benefit to Cost Ratio	.48	1.14	.48	.62	.92	1.41	1.31	3.21
Percent Damage Reduction	24.4	87.6	24.50	31.7	96.8	87.3	89.4	20.2

TABLE 1
(Continued)

Plan	9	10	11	12	13	14	15	16
Annual Cost								
First Costs	$3,202,000	$ 345,000	$ 88,000	$ 145,000	$2,059,000	$2,244,000	$3,435,000	$ 578,000
Real Estate	479,000	3,667,000	643,000	414,000	1,178,000	1,209,000	1,567,000	4,724,000
O&M	122,000	6,000	2,000	19,000	70,000	82,000	143,000	27,000
Replacement								
Channels @ 25 years	61,000	-0-	-0-	2,000	51,000	51,000	62,000	2,000
Bridges @ 50 years	6,000	-0-	-0-	-0-	2,000	2,000	6,000	-0-
Detention Reservoir @ 25 years	3,000	-0-	-0-	-0-	-0-	2,000	3,000	-0-
TOTAL	$3,873,000	$4,018,000	$ 733,000	$ 580,000	$3,360,000	$3,590,000	$5,216,000	$5,331,000
Annual Benefits	3,219,000	1,691,000	36,000	512,000	3,437,000	3,507,000	3,767,000	2,239,000
Net Benefits	-654,000	(2,327,000)	(697,000)	(68,000)	77,000	-83,000	-1,449,000	(3,092,000)
Benefit to Cost Ratio	.83	.42	.05	.88	1.02	.98	.72	.42
Percent Damage Reduction	97.2	73.4	-	-	81.3	89.4	97.2	73.4

Plan 2 is similar to Plan 1 except concrete channel bottoms were enlarged to 100 feet on Cape La Croix Creek, and to 60 feet on Walker Branch. The concrete channel above Independence Street on Walker Branch was reduced to 50 feet width. The bottom widths of the trapezoidal grass-lined channels were 160 feet on Cape La Croix Creek and 75 feet on Walker Branch, with a 35-foot wide trapezoidal channel above mile 1.7 of Walker Branch. Bridges at Sprigg Street, Wilson Road and Independence Street over Cape La Croix Creek and bridges at Good Hope, William, Town Plaza, Independence, Themis, Private Drive, Bessie and Marietta Streets over Walker Branch would be removed and replaced with spans equal to the channel width. Several existing buildings would also need to be removed.

Plan 3 is essentially the same as Plan 1, except that the existing bridges at Sprigg Street and Wilson were removed and replaced with a new clear span over a 75-foot concrete lined rectangular channel.

Plan 4 is the same as Plan 1, except that the existing bridge at Independence Street was removed and replaced with a new clear span over a 75-foot concrete lined rectangular channel.

In Plan 5 a larger channel was selected for analysis. The bottom widths of the rectangular concrete channels were proposed to be 125 feet on Cape La Croix Creek and 100 feet on Walker Branch. The grass-lined trapezoidal channels had bottom widths of 160 feet and 150 feet, respectively. Above mile 1.7 of Walker Branch, the bottom width was

reduced to 50 feet. The alignment of the channels was approximately the same as the previously proposed channels. Lowering of the Walker Branch invert between Broadway and Kingsway Streets was proposed in order to give a deeper channel with a smoother invert slope. Because this plan included substantially larger channels, it was necessary to remove and replace the bridges at Sprigg Street, Wilson and Bloomfield Roads, and Kingshighway, Independence and East Rodney Streets over Cape La Croix Creek with larger spans. Similar conditions exist at Good Hope, William, Town Plaza, Independence, Themis, Bessie, Broadway, Kingsway and Marietta Streets, and the Railroad bridge over Walker Branch. In addition, it was proposed that the private driveway bridge between Themis and Bessie Streets be replaced. A total of 17 buildings (including 8 commercial and 9 residential), would be required to be relocated to make room for the proposed channels.

Plan 6 is the same as Plan 2, except there are no channel improvements downstream of mile 2.76 of Cape La Croix Creek. This plan had a favorable B/C ratio for flood control.

Plan 7 consists of the same channel improvements proposed for Plan 6 with the added feature of a dry detention reservoir located on an unnamed tributary. The dry detention reservoir was designed to store the volume of runoff from a storm with a 10 percent chance of occurrence. The dam was designed to be capable of passing the Probable Maximum Flood (PMF) through the reservoir without overtopping. The 54-inch Corrigated Metal

Pipe (CMP) low level outlet was selected since the maximum flow from the outlet is approximately one-half of the downstream channel capacity. Reservoirs capable of storing larger storms such as the one percent chance storm and the Standard Project Storm (SPS) were also designed in the same manner. Costs of the larger reservoirs increased considerably over that of the 10-year reservoir, with no appreciable additional flood control benefits in the high damage reaches of Cape La Croix Creek.

Plan 8 consists of the same 10-year dry detention storage reservoir as in Plan 7 without any channel modification.

Plan 9 consists of a dry detention reservoir at the same location capable of storing the "Standard Project Storm" plus the same channel improvements as described in Plan 5. This plan combined a large dry detention reservoir with the largest practical channel improvements. The plan has a B/C ratio of less than 1.0 but represents an attempt to provide protection from a catastrophic flood such as the SPF.

Plan 10 is a nonstructural plan in which all structures damaged by the 10-year flood are removed from the floodplain.

Plan 11 is an environmental plan. The features applied to this plan are essentially the same as those measures applied to all of the multipurpose plans.

Plan 12 is a recreation plan and is described in the recreation appendix.

Plan 13 is a multipurpose plan which combines the channelization and bridge construction in Plan 6 with the purchase of selected environmental and recreational land areas.

Plan 14 is a multipurpose plan which combines the channelization, bridge reconstruction, and dry detention reservoir in Plan 7 with the purchase of selected environmental and recreational land area.

Plan 15 is a multipurpose plan which combines the larger channel widths, increased number of bridge replacements, building relocations, and "Standard Project Storm" dry detention reservoir in Plan 9 with the purchase of selected environmental and recreational land areas.

Plan 16 is a nonstructural plan with recreation added. It requires the removal of all structures damaged by a flood with a 10 percent chance of occurrence. This included 123 commercial structures and 131 residences.

PLAN FORMULATION STUDIES - STAGE 3

Based on the results of the Stage 2 studies, several alternatives were pursued to refine the economically feasible plans which reduced the flooding in the Cape La Croix Creek and Walker Branch floodplains. The impacts of various channel sizes and linings, use of dry detention reservoir sites, levees, and diversion channels on water surface profiles were studied. Plans were analyzed to determine highest economic return, highest flood protection, most environmental benefits, and combinations offering good flood protection, while providing some environmental benefits.

All of those plans analyzed during Stage II were based on the assumption that the channels of Cape La Croix Creek and Walker Branch below Independence Street down to their confluence were one reach. The assumption was based on the hydrologic fact that the floodplain in this area was common to both creeks and the flooding, was not separable.

During review, additional analysis were required to demonstrate incremental feasibility. Twelve additional flood control alternatives were analyzed to determine the NED flood control plan.

The formulation of these additional 12 flood control alternatives treated the junction of Cape La Croix Creek and Walker Branch below Independence Street as several reaches. These 12 plans are described below:

Plan 1 tested the justification of the detention site on Cape La Croix Creek as a first added increment. This provided net benefits, making this the first added increment.

Plan 2 tested the incremental justification of adding to the detention feature a small channel on both Walker Branch (Mile 0.00-2.00) and downstream from the junction on Cape La Croix Creek (Mile 2.70-3.143) with a small transition going upstream from the junction. This plan provided a decrease in net benefits from Plan 1 and, is not justified in isolation with the detention reservoir.

Plan 3 tested the incremental justification of adding to the detention feature a small channel on Cape La Croix Creek (Mile 2.7-3.76) only (included small transition upstream on Walker Branch from junction). This provided a decrease of net benefits from Plan 1 and is not justified.

Plan 4 tested the incremental justification of adding to the detention feature a medium-sized channel on Walker Branch (Mile 0.00-2.00) and a small channel downstream from junction on Cape La Croix Creek (Mile 2.70-3.343). This plan provided an increase in net benefits over Plan 1 and is justified.

Plan 5 tested the justification of adding to the detention feature a medium-sized channel on Cape La Croix Creek, (Mile 2.7-3.76), including a small transition upstream from the junction on Walker Branch to the detention feature. This plan provided a decrease in net benefits from Plan 1 and is not justified.

Plan 6 tested the incremental justification of adding to Plan 4 a small channel on Cape La Croix Creek (Mile 2.7-3.76). This plan provided a decrease in net benefits from Plan 4 and is not justified.

Plan 7 tested the incremental justification of adding to Plan 4 an additional section of channel on Cape La Croix Creek (Mile 3.143-5.11). This plan provided a decrease in net benefits from Plan 4 and is not justified.

Plan 8 tested the incremental justification of increasing the size of the channel for Plan 4. This plan provided a decrease in net benefits from Plan 4 and is not justified.

Plan 9 tested the incremental justification to Plan 4 of increasing the size of the channel and of extending the channel on Cape La Croix Creek (up to Mile 5.11). This plan provided a decrease in net benefits from Plan 4 and is not justified.

Plan 10 tested the incremental justification of adding to Plan 4 a small channel section on Cape La Croix Creek (up to Mile 3.76). This plan provided an increase in net benefits over Plan 4 and is justified.

Plan 11 tested the incremental justification of changing a channel section in Plan 10 on Walker Branch from concrete to grass. This change provided an increase in net benefits and is justified.

Plan 12 tested the incremental justification of the section of channel on Walker Branch (Mile 1.11-2.00) by deleting this section of channel from Plan 11. This change provided a decrease in net benefits and is justified.

From the formulation of these 12 plans, Plan 11 becomes the NED flood control plan. From all studies accomplished, six plans were identified as a final array of alternative solutions to serve as the basis for selecting the Recommended Plan. These six final alternatives were named as follows:

No Action Plan

NED Plan

Plan "A"

EQ Plan

SPF Plan

Non-Structural Plan

These six final plans provided a range of alternative solutions, and the impacts thereof, to allow formulation of the Recommended Plan. The final six alternatives are discussed in the following paragraphs.

NO ACTION PLAN

Future conditions without implementation of a Corps of Engineers action plan are projected to be a continuation and increase in flooding. Economic and environmental future conditions will be significantly worse without a Corps of Engineers action plan. No further reference to the "No Action" plan is pursued herein.

NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN

The NED Plan is the alternative that reasonably maximizes net national economic benefits consistent with the Federal objectives. Features of the NED plan are described in the following paragraphs.

a. Cape La Croix Creek Channel. The channel improvement on Cape La Croix Creek would consist of a rectangular concrete channel, 75 feet wide extending from mile 2.72 to 3.23 and transitioning into a trapezoidal riprap lined earth channel from mile 3.23 to 3.76. The trapezoidal channel has a bottom width of 40 feet and side slopes of 1 vertical to 2.5 horizontal. No channel improvements are justified for the reach below mile 2.72 or above mile 3.80.

b. Cape La Croix Creek Detention. A 157-acre dry detention reservoir would be located on a tributary to upper Cape La Croix Creek with storage to hold runoff from a storm having a 10 percent chance of occurrence.

c. Walker Branch Channel. Improvement on Walker Branch would consist of a 60-foot wide concrete channel improvement from the mouth of Walker up to Independence Street at mile 0.40. A 50-foot width concrete channel would exist between Independence Street and mile 0.89 at the Kingsway Bridge. A concrete lined transition would extend from Kingsway to mile 0.96. A 75-foot bottom width grass-lined channel with 1 vertical to 3 horizontal side slopes would extend from mile 0.96 to mile 1.68. A rip-rap lined transition would extend from mile 1.68 to mile 1.74. From mile 1.74 to Cape Rock Drive at mile 2.00, a 35-foot bottom width

grass-lined channel would be provided. Bridges to be replaced are located at Good Hope Street, Williams Street, Town Plaza Driveway, Independence Avenue, Themis Street, Private Drive, Bessie Street, and Marietta Avenue. Riprap lined transitions are required at the Missouri Pacific Railroad, Broadway, Kingsway, and Lombardo Streets, and Perryville Road.

d. Relocations. Eight mobile homes upstream of Bessie Street, 10 homes in the Golliday Addition and 2 commercial structures would be removed to provide ROW for channel improvements.

e. Recreation Features. A 85 acre park would be developed at the detention site. Of this 85 acres, 61 acres would be located within the boundary required for flood control purposes. Of the additional 24 acres located outside the flowage easement boundary, 6 acres would be required for access, parking, potable water, and sanitary facilities and the remaining 18 acres are for uneconomical remainders and rounding. Recreational facilities at the detention site would include: 0.6 miles of hiking and biking trail, 25 picnic tables, a group camping area, open play areas, nature trail, exercise trail, and a disc course. Biking/hiking trails of 6.61 miles would be provided along Cape La Croix Creek and Walker Branch. Of this, 3.3 miles would be provided by local interests as a connecting trail between the downstream channel improvements and the access road to the upstream detention site. Small

picnic areas would be developed at Bessie Street (3 tables) and Golliday Addition (5 tables) where relocation of residence would be required for channel improvements.

PLAN "A"

This plan was developed to meet the planning objective of high urban flood protection while maintaining reasonable net benefits and also providing realistic recreation and environmental needs. (See PLATE 4 for Plan "A".) This plan provides channel improvements on Cape La Croix Creek which would consist of a rectangular concrete channel, 75 feet wide extending from mile 2.76 to 3.76 and a trapezoidal grass-lined earth channel from mile 3.76 to 5.11. The trapezoidal channel has a bottom width of 110 feet and side slopes of 1 vertical to 3 horizontal. No channel improvements are planned for the reach below mile 2.76 or above mile 5.11. Bridge approaches would be provided with riprap transitions where grass channels are recommended. A dry detention reservoir would be located on a tributary to upper Cape La Croix Creek with storage to hold runoff from a storm having a 10 percent chance of occurrence.

Improvement on Walker Branch would consist of a 60-foot wide concrete channel improvement from the mouth up to Independence Street at mile 0.40. A 50-foot bottom width concrete channel would exist between Independence Street and mile 0.89 at the Kingsway Bridge. A 75-foot

bottom width grass-lined channel with 1 vertical to 3 horizontal side slopes would extend from Kingsway to mile 1.68. From mile 1.74 to Cape Rock Drive at mile 2.00 a 35-foot bottom width grass-lined channel would be provided. Bridges to be replaced include Good Hope Street, Williams Street, Town Plaza Driveway, Independence Street, Themis Street, Private Drive, Bessie Street, and Marietta Avenue. Riprap lined transitions are required at the Missouri Pacific Railroad, Broadway, Kingsway and Lombardo Streets, and Perryville Road.

Plan "A"'s nonstructural measures include the removal of 37 low cost houses near Sprigg Street along Cape La Croix Creek and the removal of 18 residences in the Golliday addition. Both areas would be converted to parks. Also, eight mobile homes on Walker Branch upstream of Bessie Street would be relocated as a result of the channel construction. A small strip park would be developed on this Bessie Street site.

This plan includes hiking trails, horse trails, major recreational features at the Golliday Addition, Sprigg Street, and Bessie Street sites and the dry detention reservoir site. The environmental features of this plan are similar to that of the EQ Plan except that the Hopper Road Park and Meander Site Park have been deleted. One in-channel pool area has been included on the upper Cape La Croix Creek at channel mile 3.7. The plan has a benefit-to-cost ratio of 1.4 to 1.0 and provides a 92 percent damage reduction. A comparison of the features and performance of the final array of alternatives and the Recommended Plan is shown in TABLE 2.

ENVIRONMENTAL QUALITY (EQ) PLAN

The environmental plan contains the following features which have been added to the Plan "A" flood control base (See PLATE 3 for plan layout).

a. An additional 8 acres near Sprigg Street from which structures will be relocated.

TABLE 2
CAPE LA CROIX CREEK AND WALKER BRANCH
PERFORMANCE COMPARISON OF STAGE III PLANS

FEATURE		RECOMMENDED PLAN			NED PLAN			PLAN "A"		
1. CHANNEL IMPROVEMENTS		Bottom Width	Channel Lining	Side Slopes	Bottom Width	Channel Lining	Side Slopes	Bottom Width	Channel Lining	Side Slopes
A. Cape La Croix Creek										
Mile	0.36 - 2.72	-	-	-	-	-	-	-	-	-
	2.72 - 2.76	T	Conc	-	T	Conc	-	T	Conc	-
	2.76 - 3.14	75	Conc	0	75	Conc	0	75	Conc	0
	3.14 - 3.23	T	Conc	-	T	Conc	-	75	Conc	0
	3.23 - 3.76	40	Rip-Rap	2.5:1	40	Rip-Rap	2.5:1	75	Conc	0
	3.76 - 3.80	T	Rip-Rap	-	T	Rip-Rap	-	T	Conc	-
	3,80 - 5.11	-	-	-	-	-	-	110	Grass	3:1
B. Walker Branch										
Mile	0.00 - 0.40	60	Conc.	0	60	Conc.	0	60	Conc.	0
	0.40 - 0.89	50	Conc.	0	50	Conc.	0	50	Conc.	0
	0.89 - 0.96	T	Conc	-	T	Conc	-	T	Conc	-
	0.96 - 1.10	75	Grass	3:1	75	Grass	3:1	75	Grass	3:1
	1.10 - 1.68	75	Grass	3:1	75	Grass	3:1	75	Grass	3:1
	1.68 - 1.74	T	Rip-Rap	-	T	Rip-Rap	-	T	Rip-Rap	-
	1.74 - 2.00	35	Grass	3:1	35	Grass	3:1	35	Grass	3:1
2. BRIDGE IMPROVEMENTS										
A. Cape La Croix Creek										
Bloomfield Road			-			-			-	
Hwy 61 (Kingshighway)			-			-			-	
Independence Street			-			-			-	
East Rodney Street			-			-			-	
B. Walker Branch										
Good Hope Street			Replace			Replace			Replace	
William Street			Replace			Replace			Replace	
Town Plaza Driveway			Replace			Replace			Replace	
Independence Street			Replace			Replace			Replace	
Mo Pac Railroad			-			-			-	
Themis Street			Replace			Replace			Replace	
Private Drive			Replace			Replace			Replace	
Bessie Street			Replace			Replace			Replace	
Broadway Street			-			-			-	
Kingsway Street			-			-			-	
Marietta Street			Replace			Replace			Replace	

TABLE 2(CONT'D)
CAPE LA CROIX CREEK AND WALKER BRANCH
PERFORMANCE COMPARISON OF STAGE III PLANS

FEATURE	RECOMMENDED PLAN	NED PLAN	PLAN "A"
3. DRY DETENTION RESERVOIRS			
Site 1	Yes	Yes	Yes
Site 2	No	No	No
4. NONSTRUCTURAL FEATURES			
Sprigg St. Evacuation	Yes	No	Yes
Golliday Subdivision Evacuation	Yes	No	Yes
5. ECONOMIC DATA (2)			
A. Total Project Costs	$25,900,000	$24,100,000	$34,100,000
B. Annual Cost:			
(1) First Costs	$2,105,200	$1,958,900	$2,771,700
(2) O and M Costs	58,000	57,100	79,000
(3) Replacement Costs	45,700	45,700	65,700
(4) Total Annual Costs	$2,209,000	$2,061,700	$2,916,400
Annual Benefits	$3,710,400	$3,634,900	$3,989,000
Net Benefits	$1,501,400	$1,573,200	$1,072,600
Benefit-to-Cost Ratio	1.7	1.8	1.4
Percent Damage Reduction	85%	84%	92%

Footnote:
(1) Analysis for SPF and Non-Structural plans not extended to include recreational and fish/wildlife aspects because basic flood control was not justified.
(2) Based on October 1983 price levels and 8-1/8% interest.

TABLE 2(CONT'D)
CAPE LA CROIX CREEK AND WALKER BRANCH
PERFORMANCE COMPARISON OF STAGE III PLANS

FEATURE	EQ PLAN			SPF PLAN			NON STRUCTURAL PLAN
1. CHANNEL IMPROVEMENTS	Bottom Width	Channel Lining	Side Slopes	Bottom Width	Channel Lining	Side Slopes	-
							-
A. Cape La Croix Creek							
Mile 0.36 - 2.72	-	-	-	-	-	-	-
2.72 - 2.76	T	Conc	-	T	Conc	-	-
2.76 - 3.14	75	Conc	0	125	Conc	0	-
3.14 - 3.23	75	Conc	0	125	Conc	0	-
3.23 - 3.76	75	Conc	0	125	Conc	0	-
3.76 - 3.80	T	Conc	-	T	Conc	-	-
3.80 - 5.11	110	Grass	3:1	160	Grass	3:1	-
B. Walker Branch							
Mile 0.00 - 0.40	60	Conc.	0	100	Conc.	0	-
0.40 - 0.89	50	Conc.	0	100	Conc.	0	-
0.89 - 0.96	T	Conc.	-	100	Conc.	0	-
0.96 - 1.10	75	Grass	3:1	T	Conc.	-	-
1.10 - 1.68	75	Grass	3:1	150	Grass	3:1	-
1.68 - 1.74	T	Rip-Rap	-	T	Rip-Rap	3:1	-
1.74 - 2.00	35	Grass	3:1	50	Grass	3:1	-
2. BRIDGE IMPROVEMENTS							
A. Cape La Croix Creek					Replace		
Bloomfield Road		-			Replace		-
Hwy 61 (Kingshighway)		-			Replace		-
Independence Street		-			Replace		-
East Rodney Street		-			Replace		-
B. Walker Branch							
Good Hope Street		Replace			Replace		-
William Street		Replace			Replace		-
Town Plaza Driveway		Replace			Replace		-
Independence Street		Replace			Replace		-
Mo Pac Railroad							-
Themis Street		Replace			Replace		-
Private Drive		Replace			Replace		-
Bessie Street		Replace			Replace		-
Broadway Street		-			Replace		-
Kingsway Street		-			Replace		-
Marietta Street		Replace			Replace		-

TABLE 2(CONT'D)
CAPE LA CROIX CREEK AND WALKER BRANCH
PERFORMANCE COMPARISON OF STAGE III PLANS

FEATURE	EQ PLAN	SPF PLAN	NONSTRUCTURAL PLAN
3. DRY DETENTION RESERVOIRS			
Site 1	Yes	Yes	No
Site 2	No	Yes	No
4. NONSTRUCTURAL FEATURES			Remove Structures
Sprigg St. Relocation	Yes	No	in "10 year" Flood
Golliday Subdivision	Yes	No	Plain
5. ECONOMIC DATA (2)			
A. Total Project Costs (1)	$38,300,000	$59,900,000	$57,300,000
B. Annual Cost:			
(1) First Costs	$3,113,100	$4,868,800	$4,657,500
(2) O and M Costs	82,000	159,000	8,000
(3) Replacement Costs	65,700	99,800	0
(4) Total Annual Costs	$3,260,800	$5,127,600	$4,665,500
Annual Benefits (1)	$4,117,200	$4,079,500	$2,126,000
Net Benefits	$856,400	(-$1,048,100)	(-$2,539,500)
Benefit-to-Cost Ratio	1.3	0.8	0.5
Percent Damage Reduction	92%	99%	52%

Footnote:
(1) Analysis for SPF and Non-Structural plans not extended to include recreational and fish/wildlife aspects because basic flood control was not justified.
(2) Based on October 1983 price levels and 8-1/8% interest.

b. About 9.8 miles of hike/bike trails and 4.3 miles of horse trails.

c. Parkland uses 200 acres of the flood control detention site; the 86 acres at the Hopper Road site; and, just downstream of Bloomfield Road, the 27 acre meander site.

d. Recreation facilities would be provided at the sites of structure relocations. These sites are: the Golliday addition on Walker Branch; another site on Walker Branch just upstream of Bessie Street; and, a third site at Sprigg Street along Cape La Croix Creek.

e. A 20-foot wide EQ corridor along selected reaches of Cape La Croix Creek.

f. Whenever possible along Walker Branch, channel construction would be limited to only one stream bank.

g. Landscaping associated with recreational improvements on project lands.

h. An urban wildlife program to be implemented by local authorities would enhance the project.

i. Fish pond improvements would be made on two existing small farm ponds located near the park proposed for the detention site.

j. The plan has a benefit-to-cost ratio of 1.3 to 1.0 and provides a 92 percent damage reduction.

STANDARD PROJECT FLOOD (SPF) PLAN

The standard project flood (SPF) plan was developed to provide for the highest practicable level of flood protection. The SPF plan consists of the largest channel reasonably attainable on Cape La Croix Creek and Walker Branch and dry detention reservoirs at Sites 1 and 2 capable of storing floods with a 0.2 percent chance of occurrence. Fifteen bridges would need to be replaced. This plan resulted in the best overall degree of protection with a high level of reduction in total damages (about 99 percent), but fell short of SPF protection. The plan was neither economically justified nor practical because it required the removal of too many buildings and the replacement of additional bridges. No specific environmental and/or recreational features were added to comply with the planning constraints, because only a further lowering of the already unacceptable net benefits ratio would result. No significant additional effort was expanded on this economically infeasible plan. This plan's focus on high level of flood protection was again considered in the Stage 3 formulation in order that the final array of alternatives include a full range of choices. This plan has a benefit-to-cost ratio of 0.8 to 1.0 and provides a 99 percent reduction in damages.

NON-STRUCTURAL PLAN

The nonstructural plan requires the removal of all structures damaged by the flood with a 10 percent chance of occurrence. This flood was selected because it had the best chance of demonstrating economic feasibility while still providing a reasonable degree of protection. Other nonstructural measures such as flood proofing, raising of structures, low level floodwalls or levees and zoning were considered and found to be economically unjustified. Due to the depth and rapidity of flooding, the type of existing structures, and access required for the many commercial establishments, the most feasible alternative appeared to be the removal of 123 commercial structures and 131 residences. However, the nonstructural plan was not economically justified. It was also unacceptable due to the large number of businesses and residences that would be affected. Plans with a greater degree of protection would, of course, force the evacuation of even more structures and lower the net benefits further. No specific environmental and/or recreational features were added to comply with the planning constraints because only a further lowering of the already unacceptable net benefit-to-cost ratio would result. This plan has a benefit-to-cost ratio of 0.5 to 1.0 and provides a 52 percent reduction in damages.

SELECTING THE RECOMMENDED PLAN

The new Principles and Guidelines, implemented on February 3, 1983, require that a plan recommending Federal action is to be that alternative

with the greatest net NED benefits. Exceptions may only be made when there are overriding reasons for recommending another plan.

The Recommended Plan contains all flood control and recreation features of the NED Plan. In addition, the Recommended Plan includes relocations of 55 residence at the Golliday Addition and Sprigg Street areas with associated recreation development. At Sprigg Street, 37 residences would be removed and the area developed for recreation (5 picnic tables and open play areas). At the Golliday Addition, 18 residences would be removed and the area developed for recreation (10 picnic tables, and 1 mile of exercise trails.)

The justification for adding the nonstructural relocations to the NED plan is based in part to intangible social well being benefits. The relocation structures are located in a low income, blighted area with typical house values of approximately $7,500. Low values like this make it very difficult to justify any kind of flood protection based on tangible NED benefits alone. But, even though these homes are substandard, they do constitute the only home that the residents have. The human suffering experienced by many of these people on a frequent basis is tragic. Each time they are flooded their ability to recover is reduced. But as their suffering is undoubtedly increased with each flood event, their dollar damages in most cases are reduced as the material

worth of their possessions is decreased from previous floods. Unfortunately, the justification process under the NED account cannot measure or recognize this in terms of dollars. The dollar differential between the NED Plan and the Recommended Plan is $1,800,000 for this feature which includes the relocation of 55 additional homes.

In summary, nonstructural relocation features are included because the total beneficial impacts on the environment are deemed to be greater than the total adverse impacts.

ASSESSMENT AND EVALUATION

The six final plans developed for Cape La Croix Creek and Walker Branch resulted from a screening process based primarily on economic and hydrologic performance, coupled with consideration being given to environmental and social well-being impacts. The details of these work efforts are presented in the appropriate technical appendix.

HYDROLOGIC PERFORMANCE

The Recommended Plan provides a reasonably high degree of protection from flooding utilizing structural and nonstructural measures. The flood control structural features for the Recommended Plan and NED Plan are similar. The discussion of flood control performance is equally applicable to either plan. Combinations of flood management measures were considered in arriving at the base flood control plan. The peak flows on Cape La Croix Creek are substantially reduced due to the rainfall runoff storage provided by the proposed dry detention reservoir. The flood elevations are also reduced due to the impact of the proposed channel improvements. To better relate the impact on flood flows, the proposed improvements would considerably lower the water surface elevations through the commercial and residential reaches of Cape La Croix Creek and Walker Branch were the May 1973 or March 1977 floods to recur.

EVALUATION OF ECONOMIC EFFECTS

The flood control benefits of the plans were determined by finding the average annual damages along Cape La Croix Creek and Walker Branch for future conditions with no project and then computing the reduction in average annual flood damages resulting from each plan. The basic procedure used to compute average annual damages involved: (1) locating all flood damageable property; (2) estimating property structural and content values and associated miscellaneous damages; (3) computing total damages for a specific event; and (4) computing average annual damages. A computer modeling analysis tool was used to evaluate annual flood damages for future conditions with various alternatives. Hydrologic flood control performance of the Recommended Plan and the NED Plan are the same. This results from the selection of the economically optimum flood control features as the fundamental base for each of these alternatives. The Standard Project Flood (SPF) and Nonstructural (NS) Plans, however, display a significantly different hydrologic impact. The SPF Plan reduces damages by 99 percent. The SPF alternative utilizes primarily structural flood control management measures. The NS plan calls for the removal of structures from the "10 year" floodplain. Its cost is significantly higher than the Recommended Plan and the benefit to cost ratio is 0.5 to one. Plan "A" provides for high flood protection with damages reduced by 93 percent; worthwhile environmental quality features; and the provision for low income families to leave two flood vulnerable locations at Sprigg Street and in the Golliday addition.

A summary of the economic performance is provided in TABLE 3.

TABLE 3
CAPE LA CROIX CREEK AND WALKER BRANCH
FINAL ALTERNATIVES AND RECOMMENDED PLAN COMPARISON
BASED ON OCTOBER 1983 PRICE LEVELS AND 8-1/8 PERCENT INTEREST

ITEM	RECOMMENDED PLAN	NO ACTION	NED PLAN	EQ PLAN
1. CONSTRUCTION COSTS				
a. Flood Control	$25,166,000	0	$23,486,000	$32,620,000
b. Fish/Wildlife	0	0	0	4,020,000
c. Recreation	734,000	0	614,000	1,660,000
d. Total	$25,900,000	$0	$24,100,000	$38,300,000
2. O/M AND REPLACEMENT COSTS				
a. Flood Control	$ 89,800	(2)	$89,800	$133,700
b. Fish/Wildlife	0	(2)	0	0
c. Recreation	14,000	(2)	13,000	14,000
d. Total	$103,800	$ (2)	$102,800	$147,700
3. AVERAGE ANNUAL COSTS				
a. Flood Control	$2,135,400	(2)	$1,998,800	$2,785,100
b. Fish/Wildlife	0	(2)	0	326,800
c. Recreation	73,600	(2)	62,900	148,900
d. Total	$2,209,000	$ (2)	$2,061,700	$3,260,800
4. FLOOD DAMAGES REMAINING	$642,600	$4,126,100	$ 675,000	$ 370,600
5. AVERAGE ANNUAL BENEFITS				
a. Flood Control	$3,484,300	$ 0	$3,451,100	$3,755,500
b. Fish/Wildlife	300	0	300	2,600
c. Recreation	225,800	0	183,500	359,100
d. Total	$3,710,400	$ 0	$3,634,900	$4,117,200
6. PERCENT FLOOD DAMAGE REDUCTION	85%	0%	84%	92%
7. NET BENEFITS	$1,501,400	$ 0	$1,573,200	$ 856,400

FOOTNOTES: (1) No recreation or fish/wildlife costs or benefits were calculated for the SPF and NS Plans because flood control was unjustified.
(2) The "No Action" alternative will suffer the continuing costs of flood damages and individual protection and clean up efforts.

TABLE 3 (CONT'D)
CAPE LA CROIX CREEK AND WALKER BRANCH
FINAL ALTERNATIVES AND RECOMMENDED PLAN COMPARISON
BASED ON OCTOBER 1983 PRICE LEVELS AND 8-1/8 PERCENT INTEREST

ITEM	SPF PLAN	NS PLAN	PLAN "A"
1. CONSTRUCTION COSTS			
a. Flood Control	$59,900,000	$57,300,000	$32,620,000
b. Fish/Wildlife	(1)	(1)	480,000
c. Recreation	(1)	(1)	1,000,000
d. Total	$59,900,000	$57,300,000	$34,100,000
2. O/M AND REPLACEMENT COSTS			
a. Flood Control	$258,800	$8,000	$133,700
b. Fish/Wildlife	(1)	(1)	0
c. Recreation	(1)	(1)	11,000
d. Total	$258,800	$8,000	$144,700
3. AVERAGE ANNUAL COSTS			
a. Flood Control	$5,127,600	$4,665,500	$2,785,100
b. Fish/Wildlife	(1)	(1)	39,000
c. Recreation	(1)	(1)	92,300
d. Total	$5,127,600	$4,665,500	$2,916,400
4. FLOOD DAMAGES REMAINING	$46,600	$2,000,100	$ 370,600
5. AVERAGE ANNUAL BENEFITS			
a. Flood Control	$4,079,500	$2,126,000	$3,755,500
b. Fish/Wildlife	(1)	(1)	1,600
c. Recreation	(1)	(1)	231,900
d. Total	$4,079,500	$2,126,000	$3,989,000
6. PERCENT FLOOD DAMAGE REDUCTION	99%	52%	92%
7. NET BENEFITS	(-$1,048,100)	(-$2,539,500)	$1,072,600

FOOTNOTES: (1) No recreation or fish/wildlife costs or benefits were calculated for the SPF and NS Plans because flood control was unjustified.
(2) The "No Action" alternative will suffer the continuing costs of flood damages and individual protection and clean up efforts.

EVALUATION OF ENVIRONMENTAL EFFECTS

The Recommended Plan has no significant adverse environmental impacts and mitigation measures are not required. The NED Plan also has no significant adverse environmental impacts. The EQ plan basically added environmental improvements to the basic flood control base of Plan"A". Plan "A" also contained many of the environmental features included in the EQ plan. The SPF plan exhibited many adverse environmental impacts, whereas the nonstructural solution enhanced the environment; however, both these plans lacked economic justification. The environmental effects of the NED, EQ, Recommended Plans and Plan "A" are summarized in the Environmental Assessment (See APPENDIX F for the detailed environmental analysis).

EVALUATION OF SOCIAL WELL-BEING EFFECTS

The evaluation of the various alternative solutions from a social well-being viewpoint was based on estimating relative impact on 14 different factors. The factors evaluated were: (1) noise; (2) homes displaced; (3) aesthetic values; (4) housing quality; (5) archaeological sites; (6) historic sites; (7) transportation; (8) education; (9) leisure; (10) cultural values; (11) community cohesion; (12) regional growth; (13) institutions; and, (14) health, safety and welfare.

These evaluations are included in TABLE 4 of the System of Accounts. In summary, the primary adverse social well-being impact was exhibited in the extensive relocation required by the nonstructural solution. The EQ plan

was generally a plan responding to social well-being concerns as well as the need for flood control. Plan "A" and to a lesser degree the Recommended Plan made reasonable contributions to the social well-being category.

The Recommended Plan was modified to include intangible social well being benefits.

SYSTEM OF ACCOUNTS

The Water Resources Council's Principals and Guidelines for Water Resources Planning requires that plans being developed by Federal agencies be compared and assessed through the use of a System of Accounts. Each plan's short-term and long-term performance is assessed in various accounts that measure National Economic Development, Environmental Quality, Social Well-being, and Regional Development. A summary system of accounts display for the no project plan, NED, EQ, PLAN "A", and Recommended Plans is presented in TABLE 4. The SPF and nonstructural plans are not presented because of their unacceptable level of economic performance.

TABLE 4 - CAPE LA CROIX CREEK AND WALKER BRANCH SYSTEM OF ACCOUNTS FOR ALTERNATIVE PLANS

ENVIRONMENTAL RESOURCE	NO ACTION	RECOMMENDED PLAN	NED PLAN	EQ PLAN	PLAN "A"
Physical Elements					
Air	Slight Improvement	Same as NED Plan	Slight localized degradation due to construction.	Same as Recommended Plan except that EQ corridors purchase assures a long-term reduction in dust.	Same as EQ Plan
Noise	Slight Increase to about 65 dBA's for newly urbanizing areas.	80 dBA's - during construction period.	80 dBA's - during construction period.	Same as Recommended Plan, except that EQ Corridor assures long-term reduction in noise.	Same as EQ Plan
Wetlands	Same as NED Plan	Same as NED Plan	Continued Loss	If local sector implements recommended wetlands preservation measure - loss of the relict Forested-Wetland and other wetland sites would be reduced. These areas would remain available for nature study and wildlife use.	Same as NED Plan
Soils	Continued Erosion	Same as NED Plan	Reduced erosion due to channelization, detention.	Same as Recommended Plan except that EQ corridor purchase assures along term reduction in bank erosion.	Same as EQ Plan

TABLE 4 (cont'd) - CAPE LA CROIX CREEK AND WALKER BRANCH SYSTEM OF ACCOUNTS FOR ALTERNATIVE PLANS

ENVIRONMENTAL RESOURCE	NO ACTION	RECOMMENDED PLAN	NED PLAN	EQ PLAN	PLAN "A"
Physical Elements (Continued)					
Prime Farm Land	Continued loss due to floodplain development.	Same as NED Plan	Net Preservation Slight degradation during construction.	Same as NED Plan	Same as NED Plan
Water Quality	Slight Improvement	Same as NED Plan	Erosion control due to new channel and detention measures. Slight Degradation during construction.	Same as NED Plan but also includes the water quality improvement benefits of 2 more preserved bottomland areas, and increased bank vegetation.	Same as EQ Plan

TABLE 4 (cont'd) - CAPE LA CROIX AND WALKER BRANCH SYSTEM OF ACCOUNTS FOR ALTERNATIVE PLANS

ENVIRONMENTAL RESOURCE	NO ACTION	RECOMMENDED PLAN	NED PLAN	EQ PLAN	PLAN "A"
Biological Elements					
Terrestrial Ecosystem	Moderate loss of undeveloped habitat.	Same as NED Plan	Construction associated loss of some woody vegetation.	Temporary construction associated loss of woody vegetation.	Temporary construction associated loss of woody vegetation.
		A net annualized monetary gain of $235.	Provides a net annualized monetary gain of $265.	Provides a net annualized monetary gain of $2,560.	Provides a net annualized monetary gain of $1,633.
Aquatic Ecosystem	Moderate loss of creek habitat. Continued loss of pond habitat due to siltation.	Same as NED Plan.	3.3 miles of creek habitat destroyed or degraded. Minor loss of aquatic habitat along Cape Le Croix Creek. Net project effect is $491 loss.	3.3 miles of creek habitat destroyed or degraded. However, with fish pond, and EQ (tree) corridor improvements, there is a net annualized impact of $401 loss.	4.3 miles of creek habitat destroyed or degraded. Moderate loss of aquatic habitat along Cape La Croix Creek. Aquatic habitat structure would help offset this loss. Net project is $491 loss.

TABLE 4 (cont'd) - CAPE LA CROIX WALKER BRANCH SYSTEM OF ACCOUNTS FOR ALTERNATIVE PLANS

ENVIRONMENTAL RESOURCE	NO ACTION	RECOMMENDED PLAN	NED PLAN	EQ PLAN	PLAN "A"
Biological Elements (Continued)					
Endangered Species	Same as NED Plan	Same as NED Plan	No significant Impact	Enhancement of non critical habitat.	Enhancement of non critical habitat.
Cultural Elements					
Historic/ Prehistoric Sites	Continued losses related to urbanization and agriculture.	Potential impacts to at least 1 historic and 5 prehistoric sites offset by maintenance of certain project lands in an undeveloped state (e.g. dry detention area) or resource recovery methods.	One prehistoric site destroyed.	Same as Recommended Plan	Same as Recommended Plan
Aesthetics	Less natural setting as urban development proliferates.	Slight degradation partially offset by one-bank channel construction, detention site and parks.	Slight degradation partially offset by one bank channel construction and detention site.	Slight degradation partially offset by one-bank channel construction, preservation of undeveloped land, EQ (tree) corridor.	Same as EQ Plan
Leisure	No Significant Impact	Improved recreation opportunities including hiking, biking, horseback riding, camping, picnicking and open play.	Some improvement in opportunities with addition of detention park and adjacent parkland.	Improved recreation opportunities including hiking, biking, horseback riding, camping, picnicking and open play.	Improved recreation opportunities including hiking, biking, horseback riding, camping, picnicking and open play.

TABLE 4 (cont'd) - CAPE LA CROIX AND WALKER BRANCH SYSTEM OF ACCOUNTS FOR ALTERNATIVE PLANS

ENVIRONMENTAL RESOURCE	NO ACTION	RECOMMENDED PLAN	NED PLAN	EQ PLAN	PLAN "A"
Cultural Elements (Continued)					
Population	No Significant Impact	Same as NED Plan	No Significant Impact	No Significant Impact	No Significant Impact
Land Use	No Significant Impact	Same as NED Plan	No Significant Impact	No Significant Impact	No Significant Impact
Community Cohesion	Disrupted due to flooding.	Same as NED Plan	Improved (92.5% damage reduction)	Improved (92.6% damage reduction)	Improved (92.6% damage reduction)
Health, Safety, and Welfare	Continued flooding will cause further deterioration in existing development, and occupants will continue to be exposed to flood dangers until structures relocated.	Same as NED Plan but somewhat less risk.	Damage and danger from flooding is less.	Same as NED Plan but somewhat more risk.	Same as NED Plan but somewhat more risk.
Displacements	None	67 Structures	12 Structures	67 Structures	67 Structures
Housing	Continued flood damages.	Average annual residential damage reduction of 76%.	Average annual residential damage reduction of 65%.	Average annual residential reduction of 80.2%.	Average annual residential reduction of 80.2%.

TABLE 4 (cont'd) - CAPE LA CROIX AND WALKER BRANCH SYSTEM OF ACCOUNTS FOR ALTERNATIVE PLANS

ENVIRONMENTAL RESOURCE	NO ACTION	RECOMMENDED PLAN	NED PLAN	EQ PLAN	PLAN "A"
Cultural Elements (Continued)					
Growth	Hampered by flooding both within the community and regionally.	Same as NED Plan	More Stable	More Stable	More Stable
Tax Revenue	No Significant Impact	Same as NED Plan	Short-term increase as a result of construction.	Same as NED Plan	Same as NED Plan
Property Value	Property value will remain depressed within the flood plain.	Same as NED Plan	Probable increase of property value of structures in flood plain.	Same as NED Plan	Same as NED Plan

TABLE 4 (cont'd) - CAPE LA CROIX AND WALKER BRANCH SYSTEM OF ACCOUNTS FOR ALTERNATIVE PLANS

ENVIRONMENTAL RESOURCE	NO ACTION	RECOMMENDED PLAN	NED PLAN	EQ PLAN	PLAN "A"
Economic Elements (1)					
Annual Damages	$ 4,126,100	641,800	675,000	370,600	370,600
Annual Flood Control Benefit	0	3,484,300	3,451,100	3,755,500	3,755,500
Annual Redevelopment Benefit	0	0	0	0	0
Annual Recreation/ Environmental Benefit	0	226,100	183,800	361,700	233,500
Total Annual Benefits	0	3,710,400	3,634,900	4,117,200	3,989,000
Total Annual Costs	0	2,209,000	2,061,700	3,260,800	2,916,400
Annual Net Benefits	0	1,501,400	1,573,200	856,400	1,072,600
BCR	N/A	1.7	1.8	1.3	1.4

FOOTNOTE:
(1) Data is based on October 1983 price levels and 8-1/8 percent interest.

CONCLUSIONS

All documents and information pertaining to the proposed Cape Girardeau-Jackson project, along with documented views of interested agencies and public views, have been reviewed and evaluated. This has resulted in the development of several practical alternatives for meeting the water and related land resource problems, needs, and opportunities of the Cape La Croix Creek watershed.

The possible consequences of the proposed action have been studied in accordance with environmental, social well-being, and economic effects as well as engineering feasibility. Pertinent points considered in evaluation were:

1. Economic Considerations. The Recommended Plan contains all features of the NED Plan, plus the relocation of 55 residences based on intangible social well being considerations and conversion of those lands to parks. The Recommended Plan has a benefit-to-cost ratio of 1.7 as compared to 1.8 for the NED Plan based on October 1983 price levels and 8-1/8 percent interest. A comparison of the final array of plans is shown on TABLE 4.

2. Environmental Considerations. Reasonable steps have been taken to assemble and present the known environmental consequences of the proposed action. The present environmental character of Cape La Croix Creek and

Walker Branch varies from semi-natural to heavily urbanized. Future conditions are expected to result in additional alterations due to increased urbanization. Therefore, the recognized disruption of terrestrial plant and animal communities and the reduced aquatic biological productivity that would be unavoidable during project construction appear to be more than offset by the improved aesthetic and amenity values generated by adopting the Recommended Plan.

3. Social Well-Being Considerations. Flood protection provided by the Recommended Plan would directly enhance the general economic welfare and security of the people by reducing property and structural damages and the threat to health and loss of life. Also improved would be some of the intangible human suffering caused by flood events and attendant loss of employment, post-flood cleanup work, and the concern expressed in anticipation of flood events.

4. Engineering Feasibility. The Recommended Plan provides a reduction in average annual flood damages of $1,501,400 (about 85 percent). The flood protection provided when measured in terms of flood frequency performance is quite variable due to the mixed developments in the urban and rural parts of the floodplain. The impacts of the flood control improvements will be most noticeable primarily in the highly urbanized areas which are prone to severe flood damages. Flood control improvements were not specifically justified for the rural segments of the study area because of:

a. About 94 percent of the flood damages caused by the 50 percent chance of occurrence flood (2-year) are eliminated with the Recommended Plan.

b. The Recommended Plan eliminates 61 percent of all flood damages from a flood event with a 0.2 percent probability (500 years).

c. There are 848 structures in the standard project flood (SPF) floodplain of which 558 would be damaged by the SPF flood; 422 structures would be damaged by the 100 year event. With the project in place, 263 structures would be fully protected from the 100-year event.

d. During post authorization studies, Cape La Croix Creek miles 2.72 to 2.2 will be evaluated to determine whether recently placed earth fill and levee cause additional channel improvements to be recommended.

IMPLEMENTATION RESPONSIBILITIES FOR SELECTED PLAN

Federal statutes and regulatory precedents have established the traditional basis for Federal and non-Federal responsibilities in the construction and operation and maintenance of Federal water projects. The traditional first cost of construction cost-sharing requirements for the Recommended Plan are shown in TABLE 5. The annual operation and maintenance costs are shown in TABLE 6 and the major replacement annual costs are shown in TABLE 7, both of which are entirely a non-Federal responsibility. TABLE 8 is a summary of the anticipated annual operation, maintenance, and major replacement costs which are entirely a non-federal responsibility.

TABLE 5
CAPE GIRARDEAU-JACKSON
FEDERAL AND NON-FEDERAL CONSTRUCTION COSTS
BASED ON OCTOBER 1983 PRICE LEVELS
RECOMMENDED PLAN

ITEM	LANDS	RELOCATIONS	IMPROVEMENTS	TOTALS
1. FEDERAL COSTS				
a. Flood control	$ 980,000	$ 370,000	$19,119,000	$20,469,000
b. Recreation	11,000	0	220,000	231,000
c. Subtotal	$ 991,000	$ 370,000	$19,339,000	$20,700,000
2. NON-FEDERAL COSTS				
a. Flood control	$2,691,000	$2,006,000	$ 0	$ 4,697,000
b. Recreation	189,000	0	314,000	503,000
c. Subtotal	$2,880,000	$2,006,000	$ 314,000	$ 5,200,000
3. Summary of First Costs, Federal Plus Non-Federal, by Project Purpose				
a. Flood control	$3,671,000	$2,376,000	$19,119,000	$25,166,000
b. Recreation	200,000	0	534,000	734,000
d. Total Costs	$3,871,000	$2,376,000	$19,653,000	$25,900,000

TABLE 6
CAPE LA CROIX CREEK AND WALKER BRANCH
ANNUAL OPERATION AND MAINTENANCE COSTS
OCTOBER 1983 PRICE LEVELS

Item	Recommended	NED	Plan "A"
Detention Reservoir	$15,300	$15,300	$15,300
Channel Improvements	20,100	20,100	44,000
Bridges	8,700	8,700	8,700
Recreation	14,000	13,000	11,000
TOTAL O&M COSTS	$58,100	$57,100	$79,000

Item	EQ	SPF	Non-Structural
Detention Reservoir	$15,300	$ 43,000	$ 0
Channel Improvements	44,000	85,000	0
Bridges	8,700	31,000	8,000
Recreation	14,000	0	0
TOTAL O&M COSTS	$82,000	$159,000	$ 8,000

FOOTNOTE: - These annual estimated costs are entirely a non-Federal responsibility subsequent to project construction.

TABLE 7
CAPE LA CROIX CREEK AND WALKER BRANCH
ANNUAL EQUIVALENT MAJOR REPLACEMENT COSTS
OCTOBER 1983 PRICE LEVELS

Item	Recommended	NED	EQ	SPF	Nonstructural	Plan "A"
Channels (25-year intervals)	$43,500	$43,500	$63,200	$92,400	$0	$63,200
Bridges and Detention Reservoir (50-year intervals)	$ 2,200	$ 2,200	$ 2,500	$ 7,400	$0	$ 2,500
TOTAL ANNUAL MAJOR REPLACEMENTS COSTS	$45,700	$45,700	$65,700	$99,800	$0	$65,700

FOOTNOTE: - These annual equivalent estimated costs are entirely a non-Federal responsibility subsequent to project construction.

TABLE 8
CAPE LA CROIX CREEK AND WALKER BRANCH
ANNUAL COMBINED O&M AND REPLACEMENT COSTS - NON-FEDERAL
OCTOBER 1983 PRICE LEVELS

Item	Recommended	NED	EQ	SPF	Non-structural	Plan "A"
TOTAL ANNUAL O&M AND REPLACEMENT COSTS	$103,800	$102,800	$147,700	$258,800	$8,000	$144,700

Total average annual equivalent costs for the final array of alternative plans and the Recommended Plan are shown on TABLE 9.

TABLE 9
CAPE LA CROIX CREEK AND WALKER BRANCH
TOTAL AVERAGE ANNUAL COSTS
BASED ON 8-1/8 PERCENT INTEREST AND OCTOBER 1983 PRICE LEVELS

Item	Recommended	NED	EQ	SPF	Non-structural	Plan "A"
First Cost	$2,105,200	$1,958,900	$3,113,100	$4,868,800	$4,657,500	$2,771,700
O&M	58,100	57,100	82,000	159,000	$ 8,000	79,000
Replacements	45,700	45,700	65,700	99,800	0	65,700
TOTAL ANNUAL COSTS	$2,209,000	$2,061,700	$3,260,800	$5,127,600	$4,665,500	$2,916,400

REMAINING WORK AND TIME SCHEDULE

The following actions are necessary to begin construction of the proposed Cape La Croix and Walker Branch project:

a. Review and approval of this report by the Corps of Engineers, Lower Mississippi Valley Division; the Board of Engineers for Rivers and Harbors; and the Office, Chief of Engineers. The Chief of Engineers may then seek formal review and comment by the Governor of Missouri and interested Federal agencies.

b. Following the formal state and interagency review, the final report of the Office, Chief of Engineers can be forwarded by the Secretary of the Army to the Congress, subsequent to the Secretary of the Army seeking the comments of the Office of Management and Budget regarding the relationship of this project to the program of the President.

c. Congressional authorization of the proposed project would then be required. This would include all appropriate review and hearings by the Congressional Public Works Committees. If the project were to be authorized by the Congress for construction, the Chief of Engineers would then include funds, when deemed appropriate, in his budget request for the design and construction of the project.

d. Advanced engineering and design studies would be initiated upon receipt of appropriate authority and funding. The Cape La Croix and Walker Branch project formulation would be carefully reviewed and refined at that time, and the plan of improvements reaffirmed or modified as necessary to meet conditions prevailing at that time. The local sponsor and the state of Missouri would then be required to furnish a letter of intent to the Corps of Engineers reaffirming their intent to comply with the requirements of local cooperation.

e. Surveys, materials investigation, and preparation of design criteria, detailed plans, specifications, and an engineering estimate of costs would then be accomplished by the Corps of Engineers. After the completion of advance design, the plans and specifications could then be prepared, bids would be invited, and a contract awarded. PRIOR TO ACTUAL CONSTRUCTION, FORMAL LEGAL AND BINDING ASSURANCES WOULD BE REQUIRED FROM THE NON-FEDERAL SPONSOR.

f. Following completion of project construction, or any separable units thereof, local interests would be responsible for continuing appropriate operation and maintenance.

It is very difficult to accurately estimate a time schedule for all the steps listed above because of the many variables in the reviewing and funding processes.

ENVIRONMENTAL ASSESSMENT

Basic environmental considerations have been an integral part of the plan formulation process from the outset. The Environmental Assessment that follows the main report will better inform the reviewer as to what environmental concerns exist.

SUMMARY

This study was undertaken to determine the advisability of Federal participation in the design and construction of improvements in the interest of water and water-related land resource problems and opportunities in the Cape Girardeau-Jackson area and, more specifically, the Cape La Croix Creek watershed located in Cape Girardeau County, Missouri. Serious flood and flood-related problems do exist in this watershed and its floodplain area. The opportunity to satisfy unmet outdoor recreational needs and significantly improve the future fish and wildlife habitat all combine favorably with the flood control solution to provide a naturally oriented and aesthetically appealing urban, suburban and rural improvement.

In formulating plans to address the flood control, outdoor recreation, and environmental quality objectives, all alternatives showing any potential for satisfying the needs were examined. Screening of unfavorable alternatives was accomplished through progressive comparisons of the alternatives, with full consideration given to the economic, social, and environmental performance of each alternative. The relative merits and shortcomings of each alternative were explored. Entirely nonstructural alternative solution were considered and found to be not only economically very poor performing alternatives, but to be socially disruptive.

The Recommended Plan of improvements for Cape Girardeau-Jackson consists of improvements on the Cape La Croix Creek watershed. These improvements consist of a combination of channel modifications, a dry detention reservoir, relocation of residential areas, bridge modifications and replacements, and recreation. The flood control improvements provide partial flood protection to the property and structures in the Cape La Croix Creek floodplain. Some average annual flood damages remain even after installation of the Recommended Plan. To maintain and possibly expand the effectiveness of this project, local interests are encouraged to enforce floodplain regulations for all areas below the modified 100-year flood elevation, in accordance with the National Flood Insurance Program.

The estimated capital cost for the recommended project is $25,900,000 (October 1983 price level), of which $20,700,000 would be Federal cost and $5,200,000 non-Federal cost. Average annual charges (including $103,800 major replacements and operation and maintenance) amount to $2,209,000 in average annual costs. Total average annual benefits are estimated to be $3,710,400 yielding a benefit-to-cost ratio of 1.7 to 1.

The proposed Cape La Croix Creek improvements are needed immediately to serve the existing and foreseeable water and related land resources needs of this urban area. Economic considerations were of primary concern but full consideration was also given to the environmental, social well-being, and of course the engineering feasibility of all apparent alternatives. This well balanced project was selected as the best means to serve the flood control, outdoor recreation, and environmental quality needs in a well balanced manner.

DISCUSSION ON COST SHARING

General legislation authorizing implementation of water resources projects, of which the Water Resources Development Act of 1976 is the most recent, generally contained local cooperation requirements established by enacting of various laws. The Administration is reviewing project cost sharing and financing across the entire spectrum of water resource development functions and has submitted proposed legislation to Congress for navigation projects. The basic principle governing the development of specific cost-sharing policies is that whenever possible

the cost of services produced by water projects should be paid for by their direct beneficiaries. It also is recognized that the Federal Government can no longer bear the major portion of the financing of water projects. New sources of project financing, both public and private, will have to be found.

RECOMMENDATIONS

I recommended that the National Economic Development (NED) plan for Cape La Croix Creek and Walker Branch, Missouri, selected herein for flood control, wise use of floodplain lands, recreation, and protection of the environment be modified slightly to include evacuation of an additional 55 low income homes and that this plan be authorized for implementation as a Federal project, with such modifications thereto as in the discretion of the Chief of Engineers may be advisable, with cost sharing and financing arrangements which are satisfactory to the President and Congress. The total first cost of the project, based on October 1983 price levels, is estimated at $25,900,000. This recommendation is made with the provision that prior to implementation, non-Federal interests will agree to comply with the following requirements:

a. Provide without cost to the United States all lands, easements, rights-of-way, relocations, and bridge replacements, including borrow area and disposal areas for excavated material determined suitable by the Chief of Engineers and necessary for implementation of the project;

b. Hold and save the United States free from damages due to the construction works, operation, or maintenance of the project, excluding damages due to the fault or negligence of the United States or its contractors;

AD-A141 578 WATER RESOURCES INVESTIGATION CAPE GIRARDEAU - JACKSON METROPOLITAN AREA..(U) ARMY ENGINEER DISTRICT ST LOUIS MO DEC 83 2/2

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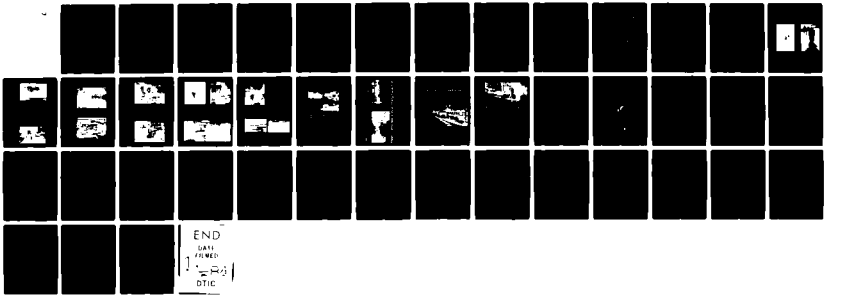

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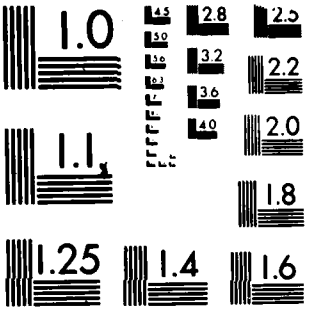


c. Accept title to project lands and maintain and operate all flood control, recreational and environmental works, open to all on an equal basis and in accordance with regulations prescribed by the Secretary of the Army;

d. Provide a cash or in-kind contribution equal to 50 percent of the first costs allocated to separable recreation facilities on lands required for the basic flood control project. Provide other recreation lands and facilities included in the Recommended Plan.

e. Publicize floodplain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the floodplain and in adopting such regulations as may be necessary to insure compatibility between future development and protection levels provided by the project;

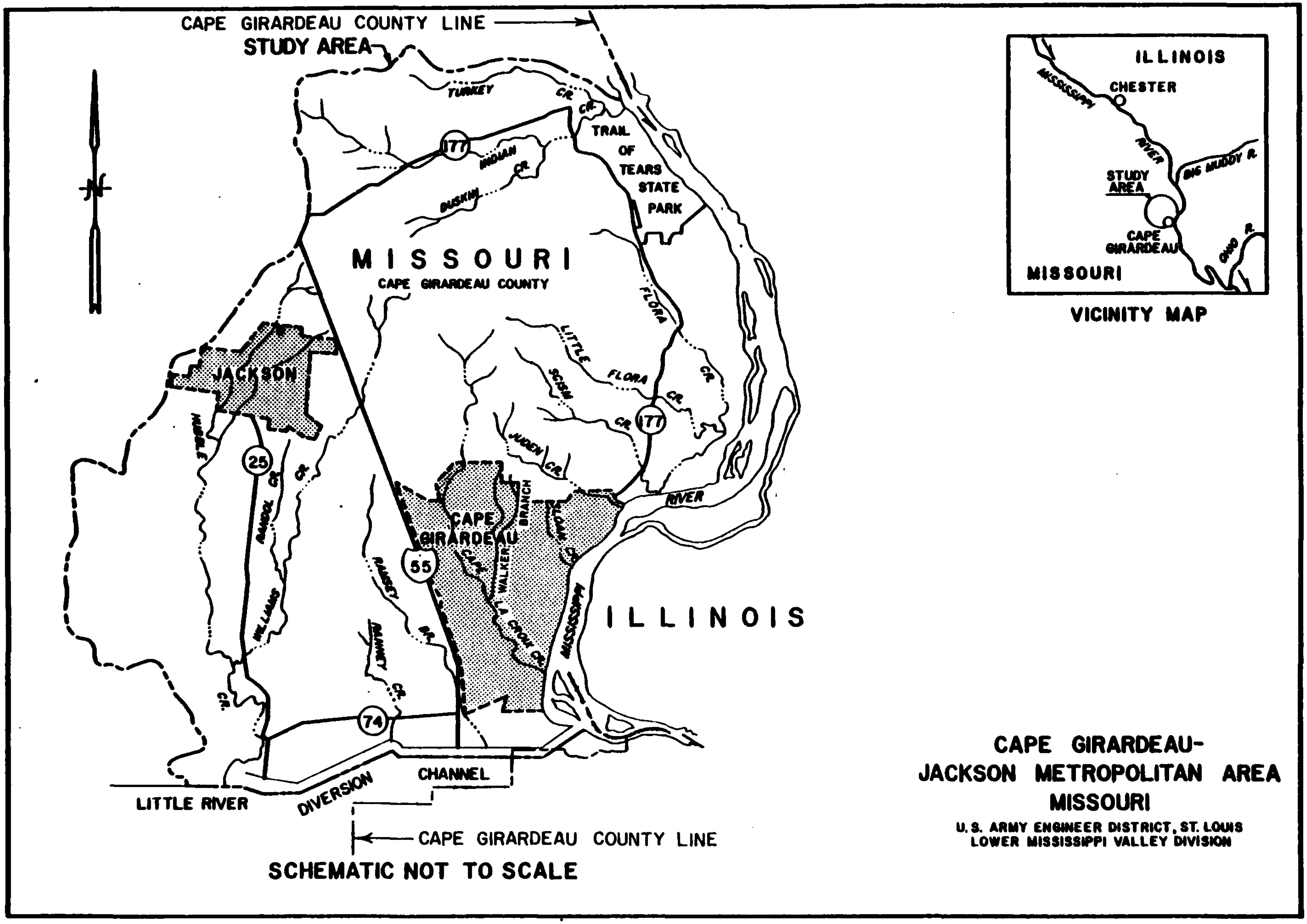
f. At least annually notify affected interests regarding the limitations of the protection afforded by the project; and

g. Prescribe and enforce floodplain management regulations to prevent encroachments, obstructions or channel modifications that would reduce the flood-carrying capacity or interfere with the maintenance and operation of the project.

h. Comply with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646) and Section 221 of the Flood Control Act of 1970 (Public Law 91-611).

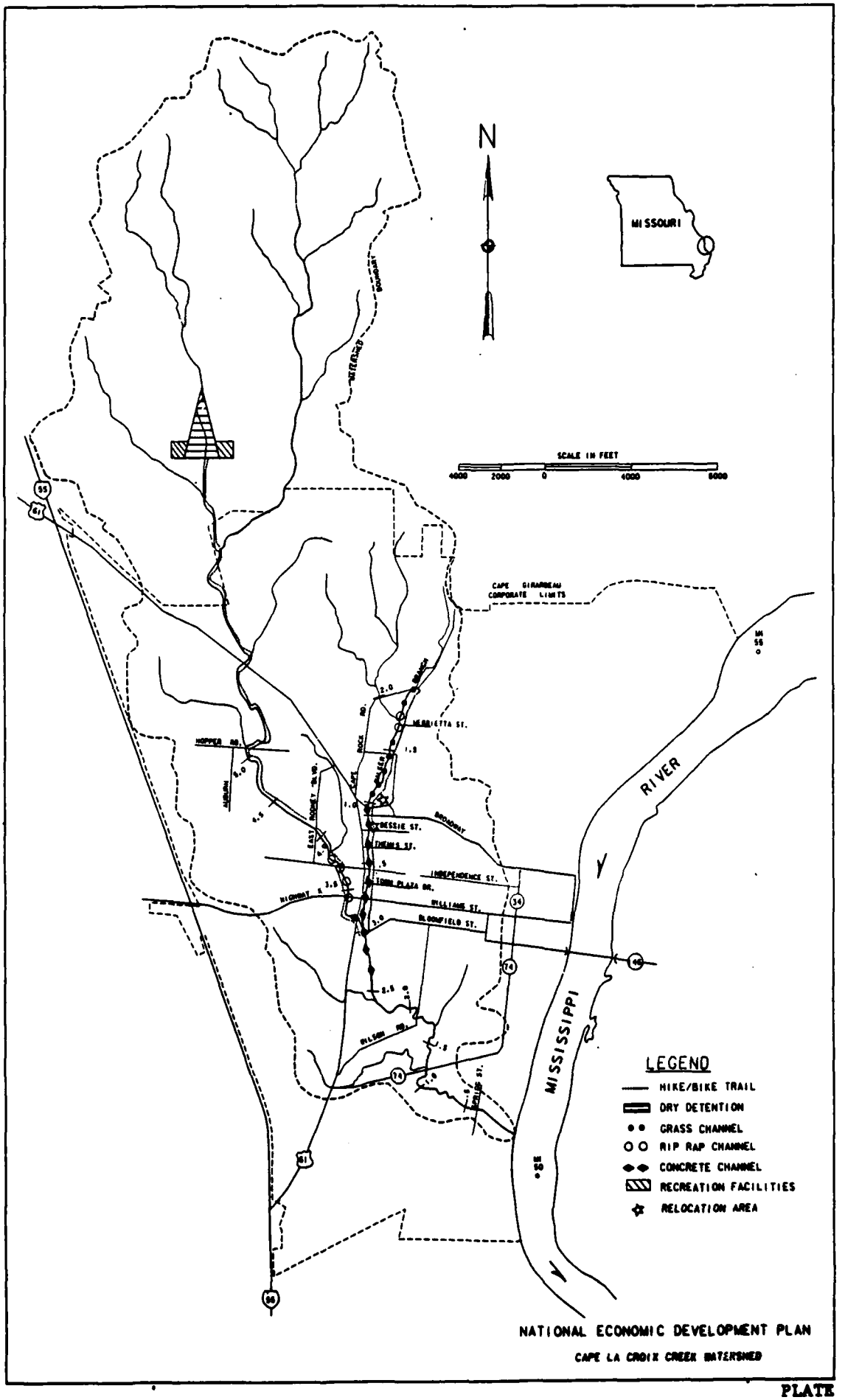
GARY D. BEECH
Colonel, CE
Commanding

PLATES



CAPE GIRARDEAU COUNTY LINE
STUDY AREA
TURKEY CR.
CR.
177
INDIAN CR.
DUSKIN
TRAIL OF TEARS STATE PARK
MISSOURI
CAPE GIRARDEAU COUNTY
FLORA
LITTLE FLORA CR.
SCISM CR.
CR.
JUDEN CR.
JACKSON
HUBBLE
25
RANDOL CR.
CR.
WILLIAMS
CR.
CAPE GIRARDEAU
BRANCH
WALKER
CAPE
LA CROIX CR.
SLOAN CR.
55
RAMSEY BR.
RANNEY CR.
74
RIVER
MISSISSIPPI
ILLINOIS
CHANNEL
DIVERSION
LITTLE RIVER
CAPE GIRARDEAU COUNTY LINE
SCHEMATIC NOT TO SCALE
ILLINOIS
CHESTER
MISSISSIPPI
RIVER
BIG MUDDY R.
STUDY AREA
CAPE GIRARDEAU
OHIO R.
MISSOURI
VICINITY MAP
CAPE GIRARDEAU-
JACKSON METROPOLITAN AREA
MISSOURI
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
LOWER MISSISSIPPI VALLEY DIVISION

PLATE 1



NATIONAL ECONOMIC DEVELOPMENT PLAN

CAPE LA CROIX CREEK WATERSHED

PLATE 2

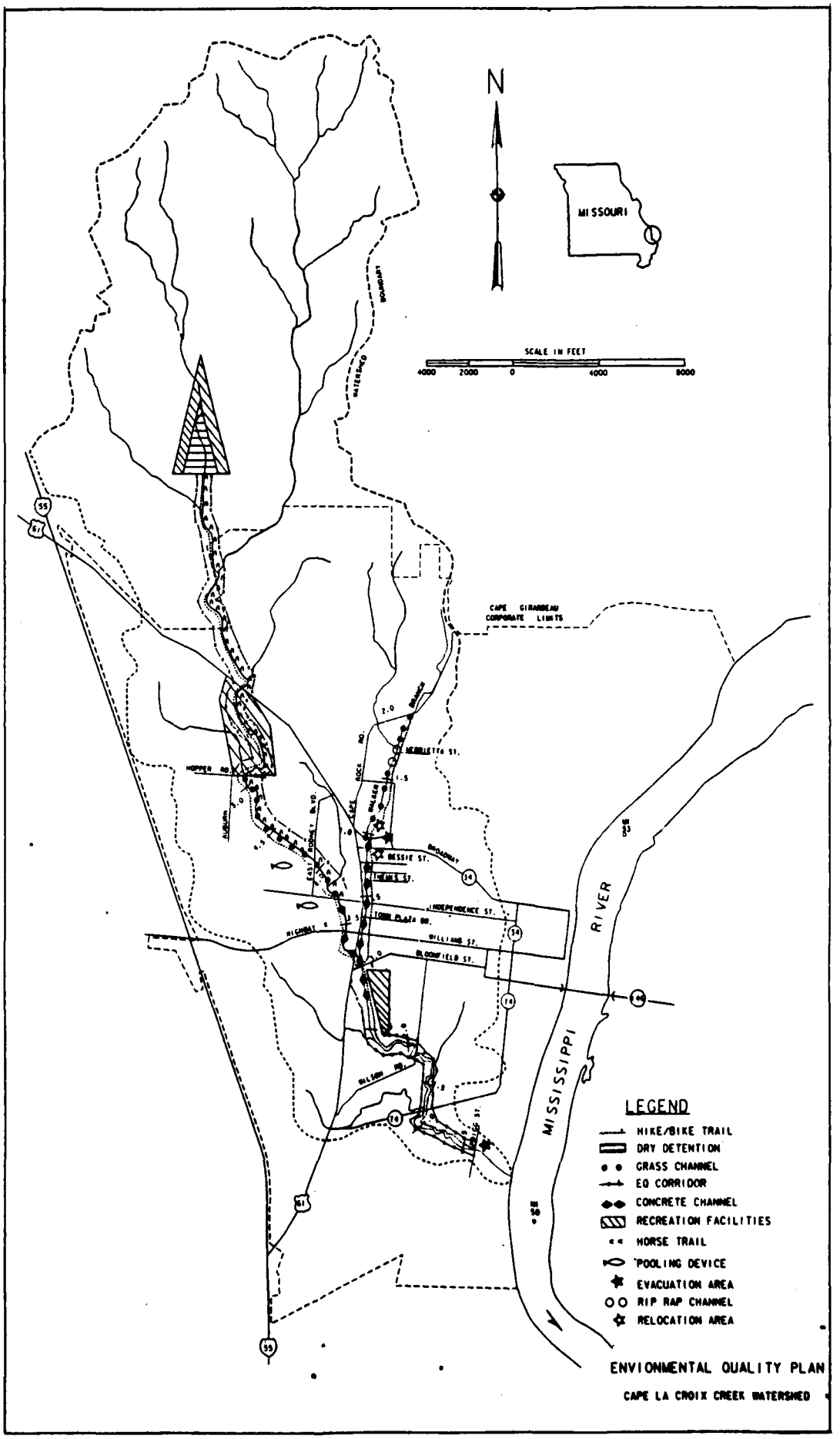
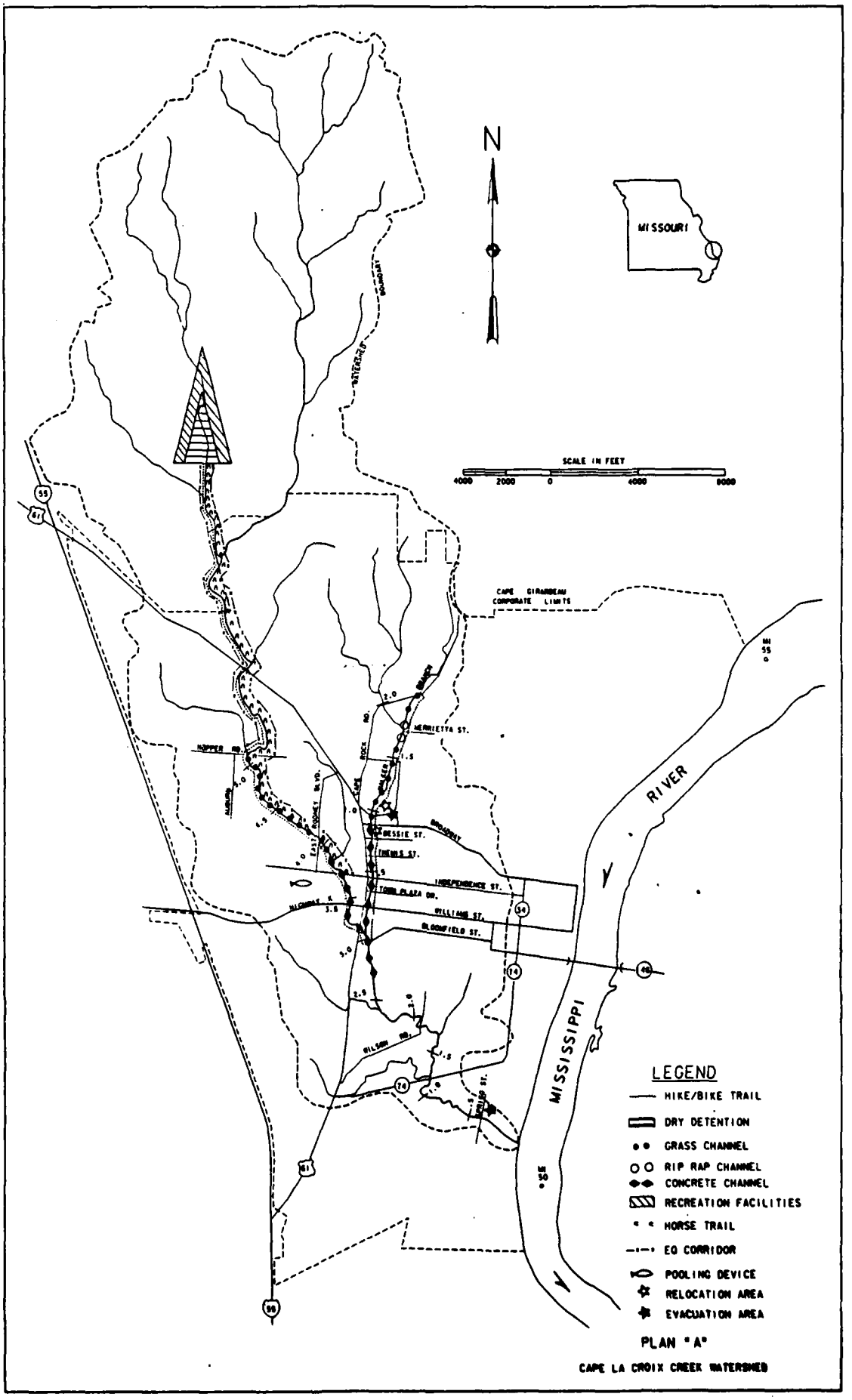

N
MISSOURI
SCALE IN FEET
4000 2000 0 4000 8000
CAPE GIRARDEAU CORPORATE LIMITS
MISSISSIPPI RIVER
LEGEND
HIKE/BIKE TRAIL
DRY DETENTION
GRASS CHANNEL
EQ CORRIDOR
CONCRETE CHANNEL
RECREATION FACILITIES
HORSE TRAIL
POOLING DEVICE
EVACUATION AREA
RIP RAP CHANNEL
RELOCATION AREA
ENVIONMENTAL QUALITY PLAN
CAPE LA CROIX CREEK WATERSHED

PLATE 3



PLAN "A"

CAPE LA CROIX CREEK WATERSHED

PLATE 4

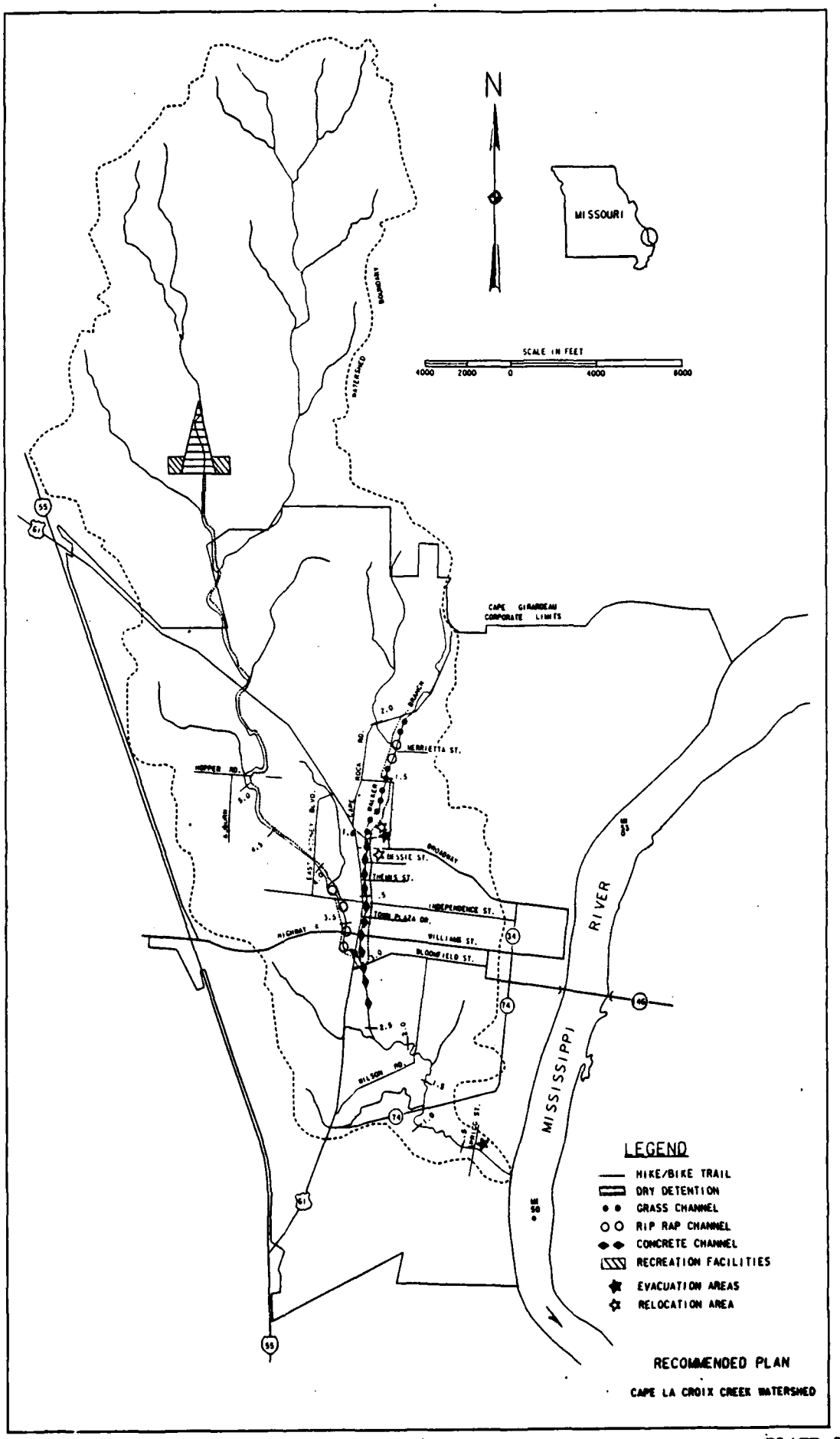
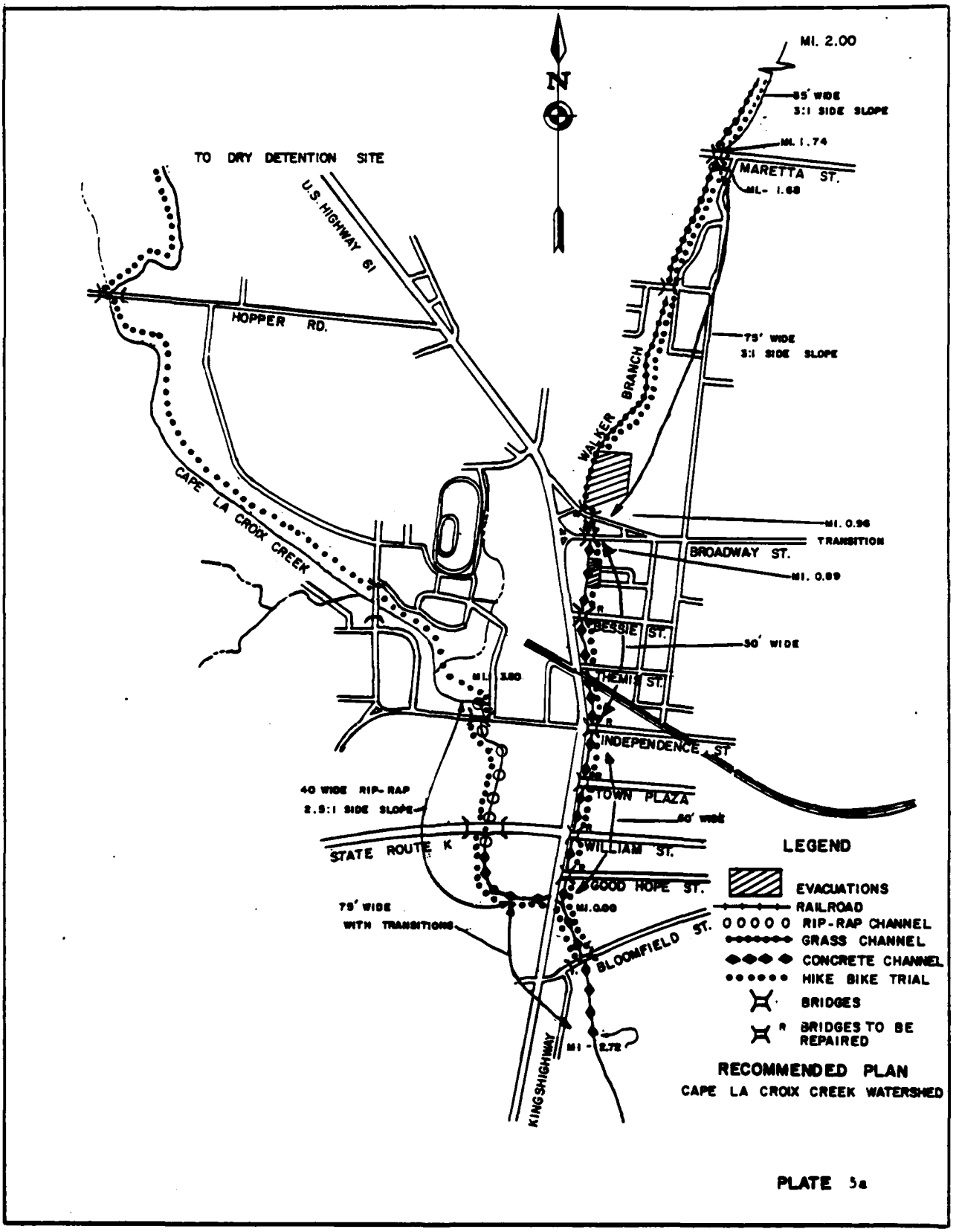
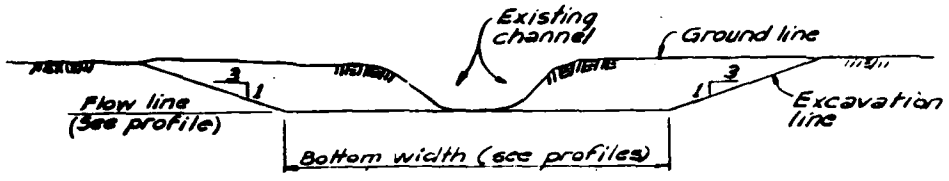
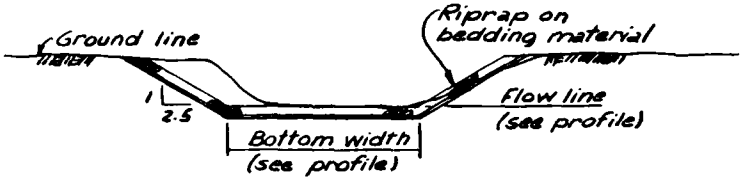

N
MISSOURI
SCALE IN FEET
4000 2000 0 4000 8000
WATERSHED BOUNDARY
CAPE GIRARDEAU CORPORATE LIMITS
HERRIETTA ST.
HOPPER RD.
BROADWAY
JESSIE ST.
THEMIS ST.
INDEPENDENCE ST.
WILLIAMS ST.
BLOOMFIELD ST.
WILSON RD.
MISSISSIPPI RIVER
LEGEND
HIKE/BIKE TRAIL
DRY DETENTION
GRASS CHANNEL
RIP RAP CHANNEL
CONCRETE CHANNEL
RECREATION FACILITIES
EVACUATION AREAS
RELOCATION AREA
RECOMMENDED PLAN
CAPE LA CROIX CREEK WATERSHED

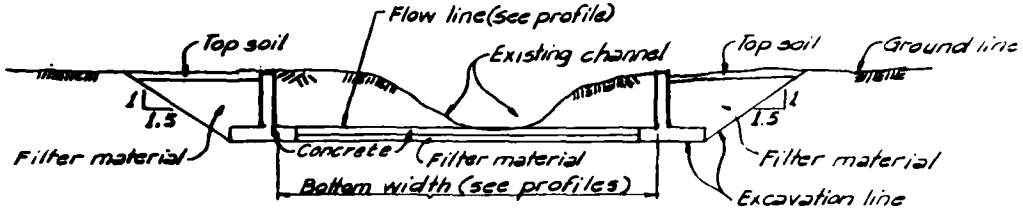
PLATE 5


MI. 2.00
85' WIDE
3:1 SIDE SLOPE
MI. 1.74
MARETTA ST.
MI.- 1.68
TO DRY DETENTION SITE
U.S. HIGHWAY 61
HOPPER RD.
75' WIDE
3:1 SIDE SLOPE
WALKER BRANCH
CAPE LA CROIX CREEK
MI. 0.96
TRANSITION
BROADWAY ST.
MI. 0.89
BESSIE ST.
30' WIDE
THEMIS ST.
MI. 3.80
INDEPENDENCE ST.
40 WIDE RIP-RAP
2.5:1 SIDE SLOPE
TOWN PLAZA
80' wide
STATE ROUTE K
WILLIAM ST.
GOOD HOPE ST.
75' WIDE
WITH TRANSITIONS
MI. 0.00
BLOOMFIELD ST.
KINGSHIGHWAY
MI - 2.72
LEGEND
EVACUATIONS
RAILROAD
RIP-RAP CHANNEL
GRASS CHANNEL
CONCRETE CHANNEL
HIKE BIKE TRIAL
BRIDGES
BRIDGES TO BE REPAIRED
RECOMMENDED PLAN
CAPE LA CROIX CREEK WATERSHED
PLATE 5a



EARTH CHANNEL





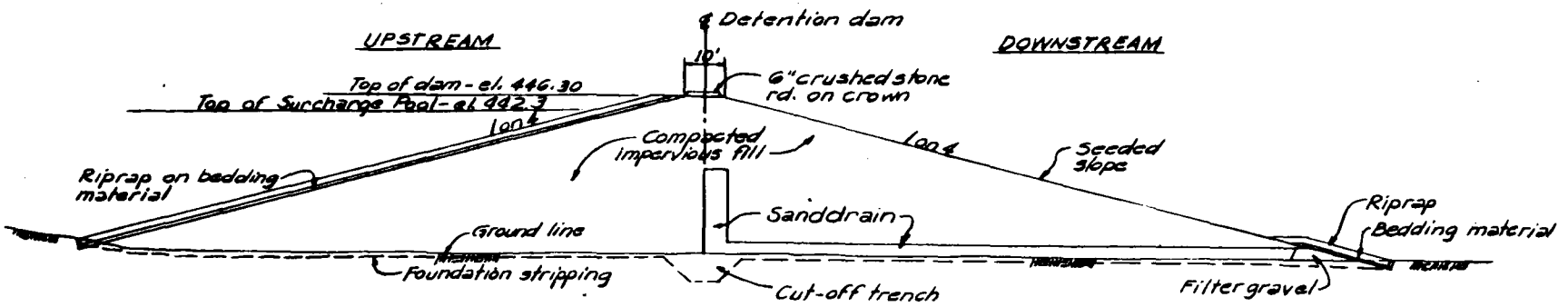
CONCRETE CHANNEL

TYPICAL CHANNEL SECTIONS

NO SCALE

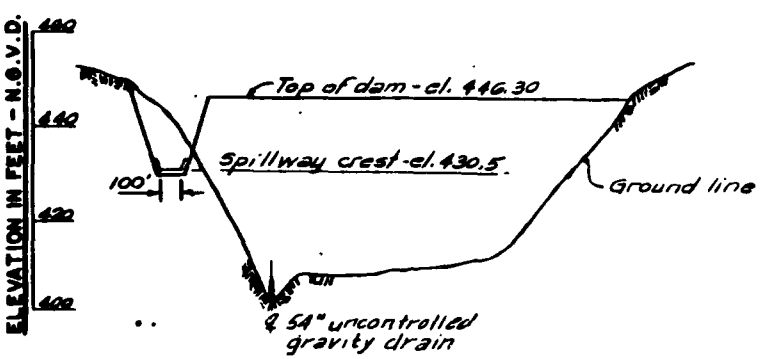
CAPE GIRARDEAU - JACKSON
METROPOLITAN AREA
MISSOURI 12063
RECOMMENDED PLAN
FLOOD CONTROL COMPONENTS
TYPICAL CHANNEL SECTIONS
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MO.

PLATE 6



DETENTION DAM-TYP. SECTION

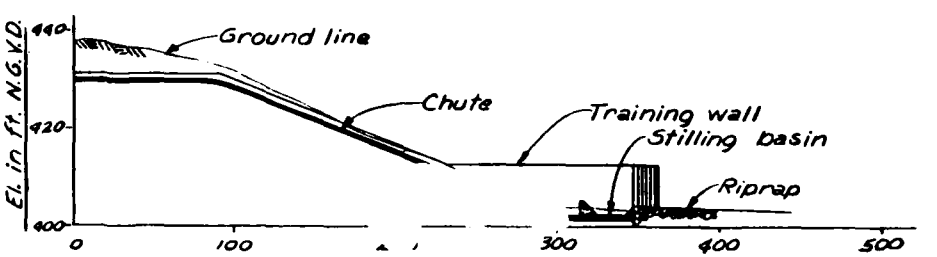
NO SCALE



DETENTION DAM PROFILE

SCALE IN FEET - HORIZ.

400 0 400 800



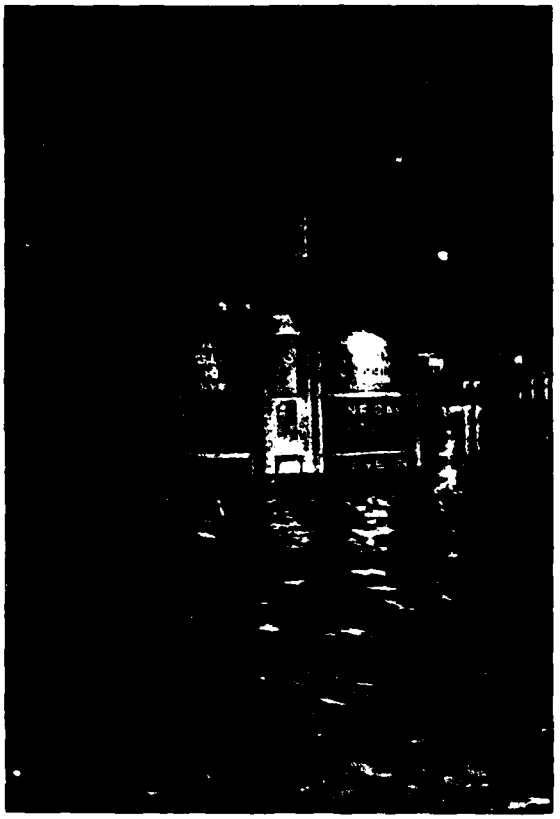
SECTION THRU SPILLWAY

NO SCALE

CAPE GIRARDEAU - JACKSON METROPOLITAN AREA
MISSOURI 12083
RECOMMENDED PLAN
FLOOD CONTROL COMPONENTS
DETENTION DAM PROFILE AND SECTION
U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MO.

PLATE 7

The severity of both commercial and residential damages caused by flash flooding from Cape La Croix and Walker Creeks is demonstrated in the following photos taken in 1973, 1977 and 1981.
Most photos shown on plates 8 thru 12 courtesy of Mike Rosenthal and the Southeast Missourian.



The Miller's Photo Labs, Inc. Drive-In is on the west side of the Town Plaza Shopping Center. Water poured over a wide stretch on either side of Kingshighway south of its intersection with Broadway. May 1973.

The Jack Smith Factory Outlet store, at 300 North Kingshighway, received considerable damage to its inventory. May 1973.

Above, United Oil Co. is inundated by water pouring down the highway from Walker and Cape La Croix Creeks to the west. May 1973.

Below, Mr. and Mrs. Roger Wehrheim, 610 Laura, spent Memorial Day cleaning up their rented home, one of approximately 50 homes flooded in their neighborhood. The couple said most of their furniture and clothing were lost. Water was chest high in their living room when Civil Defense workers rescued the couple. May 1973.

PLATE 9

Only the roof of a car protrudes from the water that moved into the Tate Distributing Co. on Kingshighway just off Broadway and adjacent buildings. (May 1973).

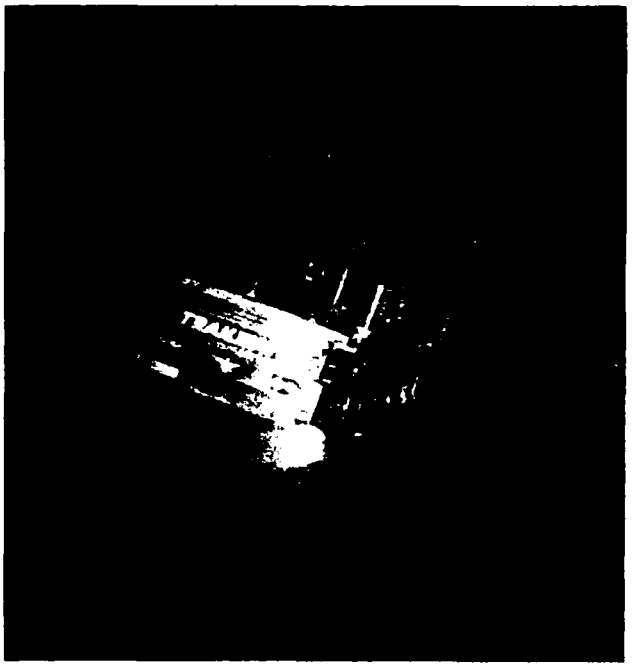
Hart Bakery. May 1973.

PLATE 10

Floodwaters swept through the residence of Mr. and Mrs. Gene Boren, 2256 Kingshighway, creating the jumble of furniture Mrs. Boren is working to clear. May 1973.

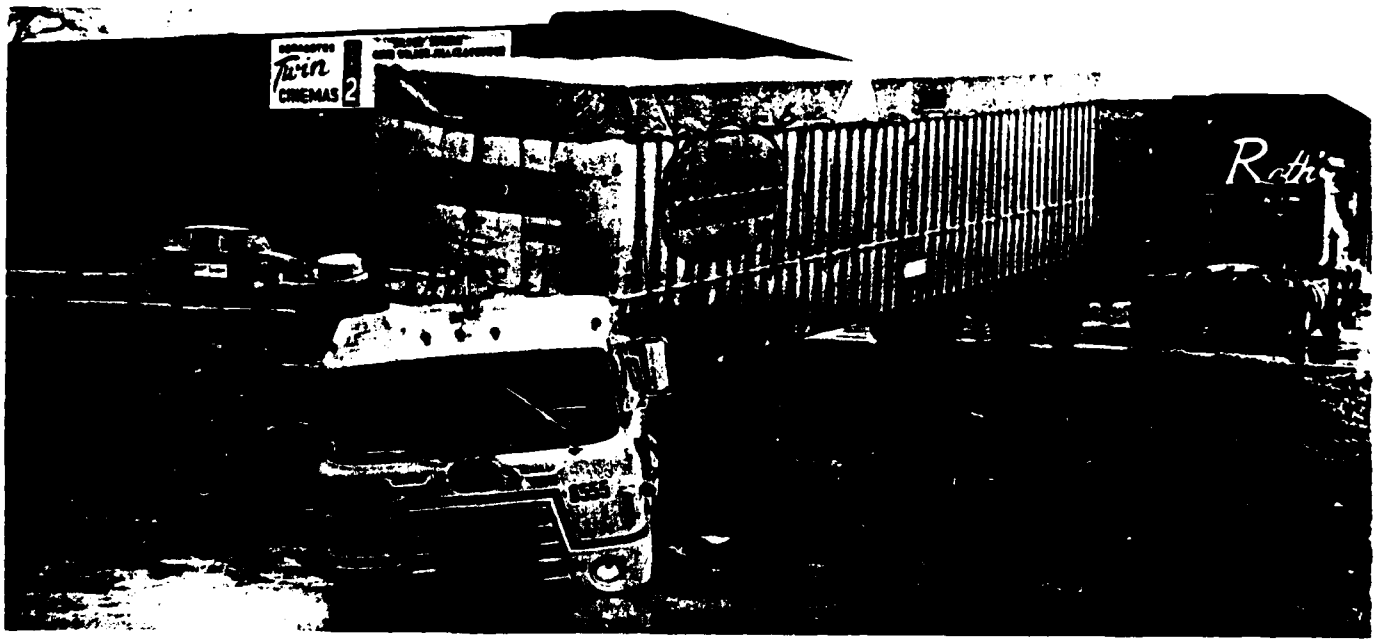
Below, residents of the Golladay Addition, just off Kingshighway, place their soggy belongings in their yards. May 1973.

PLATE 11



These March, 1977 photos show, upper left, a Continental Trailways bus sitting off the road near Wieser Motor Company and, upper right, Stan Popp, an insurance agent, standing amidst debris in his office taking calls from clients about the flood.

Below, a large transport is shown in Walker Creek as a result of the flood.



These three 1981 photos, courtesy of The Bulletin Journal, display damage to a bridge abutment, left, an incapacitated tractor trailer, below left, and a compact car, below right, which ended up in the ditch as a result of this flood event.

(UPI) BULLETIN-JOURNAL
CAPE GIRARDEAU, MISSOURI
CORRERO PUBLISHING HOUSE, INC.
VOLUME 11, NUMBER 125
SUNDAY, AUGUST 28, 1982

THE FLOODWATERS FROM Cape La Croix Creek had just started to fall around 6 a.m. Friday morning after heavy rains hit the area. Here, was a view of the Kingshighway-Independence St. intersection. In left background is a taxicab whose driver tried to make it through the water, and failed. Part of the flooding problem was blamed on the narrow bridge in the background which carries Independence over Cape La Croix Creek. Nearly five inches of rain fell on Cape Girardeau and Jackson early Friday morning.

Merchants, residents cleaning up following Friday flood problems

By David Hente
Staff Writer

CAPE GIRARDEAU—When Cape Girardeau Police Officers, Rick Fehr and Mark Majoros waded out onto the flooded 00 block of Kingshighway around 5 a.m. Friday morning to retrieve a wooden rowboat that was floating down the highway from a display at the Long John Silver Seafood Shoppe, there was no doubt in their minds that it had rained hard early that morning.

Just as there was no doubt in the minds of several west end merchants who were busy Friday cleaning up their businesses, or for residents of the Golliday Addition, off Kingsway Drive, who had to be awakened around 2 a.m. by police so they could walk from their homes in water 2-3 feet deep along Terry Lane.

Actually, the city of Cape Girardeau didn't really receive that much rain. The FAA Flight Service Station at the Municipal Airport measured only one-and a-half inches. But the Jackson City Utilities powerhouse rain guage showed 5.5 inches had fallen between midnight and 6 a.m., which isn't too far north of the Cape La Croix-Walker Creek watershed. There were othe. reports of near five inches of rainfall to the north of Jackson in the Perryville and Madison County area.

After lightning far to the west and northwest much of Thursday evening, the line of slow moving thunderstorms, accompanied by almost continuous lightning and thunder, finally arrived in the Cape-Jackson area around 2 a.m.

"Right away, it started getting bad," said Cape Girardeau Police Shift Commander, Lt. Dennis Dolan. "When all the usual places in that end of town that are prone to flooding began to flood, we became alarmed."

Dolan first ordered his officers to get out of their cars and wake up residents of the flood-plagued Golliday Addition, which is located east of Walker Creek, off Kingsway Drive. Officer Danny Niswonger said the water was about 3-4 feet deep by the time they got back to their patrol cars. "Most of the people were asleep, and when they opened the front door for us, they found their front yards under about 2 or 3 feet of water," remarked Niswonger.

He said all of the residents quickly got dressed, picked up their pets and fled, walking through the rising water

See FLOODING, Page 6

Jackson struggles with storm

JACKSON —The city of Jackson was dark and wet Thursday night when stormy weather and about 3½ inches of rain pounded the city in three hours, causing a city-wide power outage and flooding.

"Several people got water in their basements last night," commented Jackson Chief of Police Robert Clifton, Friday. "There were houses that had water up to their basement windows."

One older Jackson couple even requested the fire department evacuate them from their flooded house. The couple was able to return to their home at about 5 a.m. Friday.

Although no dollar figure for the storm damages was available, Clifton noted it would probably be fairly substantial.

"I know of two chain-link fences that were uprooted - one at the city park and one at Yamnitz Body Shop," said Clifton. Other damages in the city were reported by owners of Old Mill Lumber Co., who said they lost several pieces of lumber and some septic tanks that apparently just floated away. COOP also reported the loss of some gas tanks.

"It was quite a storm," commented Clifton. "The streets and creeks were just too full for our drainage systems

See JACKSON, Page 6

PLATE 14

Weather
Cape Girardeau — Cloudy with rain tonight, lows in 50s. Mostly cloudy with some showers possible Saturday. Highs in 70s. (See Weather, Page 9)

THE SOUTHEAST MISSOURIAN

Vol. 79-No. 176 CAPE GIRARDEAU, MO., FRIDAY, APRIL 29, 1983 25 Cents

Plenty of water

Some of the flooding brought about by today's heavy rainfall occurred along Kingsway northeast of the Broadway-North Kingshighway intersection. At left, Walker Creek water stands in the entrance to the Golladay Subdivision just north of Kingsway, an area which floods frequently when heavy rains occur. At right, the sign on top of the swing set proclaiming the park on the opposite side of Kingsway "Jaycees Joyland," is only a joyland if you enjoy water sports. Over five inches of rain fell on parts of the area this morning, and more rain was expected.

Heavy rains leave 'everything bank-full'

By JOHN H. RAMEY
Missourian Staff Writer

Disaster agencies in a number of Southeast Missouri counties were closely monitoring rivers and streams as a vast storm system that moved in prior to dawn continued today to dump heavy rains on the area. Some flash flooding occurred west of here and flooding on some Cape County streams at times appeared to be imminent, officials said.

"Everything's bank-full," said D. Bryan Miller, director of disaster operations for Cape County. "If it keeps up throughout the day and more storms develop tonight, we could be in for real problems."

Bollinger County civil defense authorities already were facing problems at midmorning. Civil Defense Director Jim Bollinger said Crooked Creek, which runs through Marble Hill-Lutesville, was out of its banks and a number of residents along the creek on the Lutesville side were being evacuated.

"Everything's bankfull. If it keeps up throughout the day and more storms develop tonight, we could be in for real problems."—D. Bryan Miller, director of disaster operations for Cape County.

At noon, Crooked Creek had not entered the Woodland School west of the twin cities, said Bollinger. But there was a foot of water over Highway 34 in front of the school and it was spilling into the school yard.

Bollinger said a number of volunteers were at the school early today to place furniture and other equipment out of the reach of flood waters, should they enter the building.

The school was closed for the day.

In Cape County, the situation was not as bad, although officials said if the rains continue throughout the day, it could worsen.

All creeks and rivers were swollen, and the Whitewater River in the Millersville-Burfordville area was spilling out of its banks, said Miller.

"We've got spotters along a number of creeks," he observed. "They reported that the upper part of the Cape LaCroix watershed (in Cape County) was the fullest they had ever seen it early this morning."

Miller said a brief break in the rain at midmorning, however, stopped creeks in the watershed from continuing their rises. But another heavy outbreak of rain late this morning threatened to change that situation.

By 11 a.m., a total of 5.5 inches of rain had fallen at Marble Hill. By 10 a.m., 3.03 inches had fallen at Jackson, and close to two inches had pelted the Cape Girardeau area.

At noon, Crooked Creek had not entered the Woodland School west of the twin cities, said Bollinger. But there was a foot of water over Highway 34 in front of the school and it was spilling into the school yard.

"Earlier this morning, it was raining at a rate of an inch an hour out here," said Miller from his office at Jackson.

Numerous county roads were flooded early this morning, some of which were impassable for a while, Miller noted. The flooding was not from flooded streams, but from the rapid runoff of surface water from hills, he noted.

"The National Weather Service is concerned that if it continues, and more comes tonight, it could be really bad," observed Miller.

The heavy rain reversed the fall of the Mississippi River, which has been out of its banks for three weeks. The river here stood at 35.5 today, a fall from Thursday, but the revised forecast called for it to rise to 35.7 feet Saturday, 35.9 Sunday and 36.3 Monday.

There was no crest forecast.

There was some flooding in Cape Girardeau early today. Walker Creek spilled into the Golliday Subdivision off Kingsway near Broadway and Kingshighway. A portion of South Kingshighway south of Bloomfield Road also was covered with water. Good Hope, in the vicinity of Spring street, was flooded, and the intersection of Broadway and Caruthers was impassable for a time.

Miller warned that the heavy rains west of Cape County — up to five inches fell in some of the Castor River watershed — could cause problems here as rising water in that watershed reaches Cape County. It could cause particularly serious problems if the heavy rains continue, he said.

In Cape County, the situation was not as bad, although officials said if the rains continue throughout the day, it could worsen. All creeks and rivers were swollen, and the Whitewater River in the Millersville-Burfordville area was spilling out of its banks.

At Sikeston, golf ball size hail was reported during the night.

The forecast called for continued thunderstorms tonight and Saturday. There also was a chance of scattered thunderstorms Sunday and Monday, the weather service said.

PLATE 15

Rain over...until Wednesday

By the Associated Press

The driving rainstorms that devastated Dixie wrung themselves out over the Atlantic coast today after causing at least one death and drenching New York City, where 3.38 inches of rain fell in Central Park and only the sea lions appreciated it.

Flood watches and warnings were posted in New Jersey, New York, Connecticut, Massachusetts and Virginia as waterways inched above flood stage.

Sunday's rainfall totaled 2.3 inches in Boston, 2.5 inches in Springfield, Mass., 2.54 inches in Newark, N.J., and 3.37 inches at Monroe, Conn., on the Housatonic River.

"The land is drenched, there's nowhere for that water to go but into the rivers," said police Capt. Thomas Mulcahey in Passaic, N.J., where residents were bracing for floods on the Passaic and Pompton rivers.

Evacuations were reported in Virginia and Connecticut. High winds and heavy rains knocked out power to 850 Connecticut homes.

Another major storm is brewing over the western Plains, forecaster Jack Hales said early today. The storm system won't influence weather until Wednesday, when the central Plains and the Mississippi Valley will get more rain. The system should move to the East Coast by the end of the week, Hales said.

Further west, in West Alton, Mo., authorities say it may be three weeks before the 300 to 500 people who were forced from their homes by a broken levee can return. The levee ruptured Friday and let in the waters of the swollen Mississippi River.

A National Weather Service forecaster in Kansas City said the worst of the rains are over — until Wednesday.

Another major storm is brewing over the western Plains, forecaster Jack Hales said early today. The storm system won't influence weather until Wednesday, when the central Plains and the Mississippi Valley will get more rain. The system should move to the East Coast by the end of the week, Hales said.

"The latter part of the week will be quite messy again," Hales said. "It should be a repeat performance of the other storm, with a lag time of two or three days."

A Virginia man was believed killed when his pickup truck was swept off a low-slung bridge over the Little River Sunday, authorities said.

The storm closed roads in Manhattan's Central Park, caused detours on commuter highways north of the city and disrupted subway service, authorities said.

The park's small zoo was nearly deserted except for three sea lions who frolicked in a rain-swollen pool.

Firefighters evacuated about 50 families at a Salem, Va., trailer court when rising water threatened the development Sunday, but they were allowed to return later in the day.

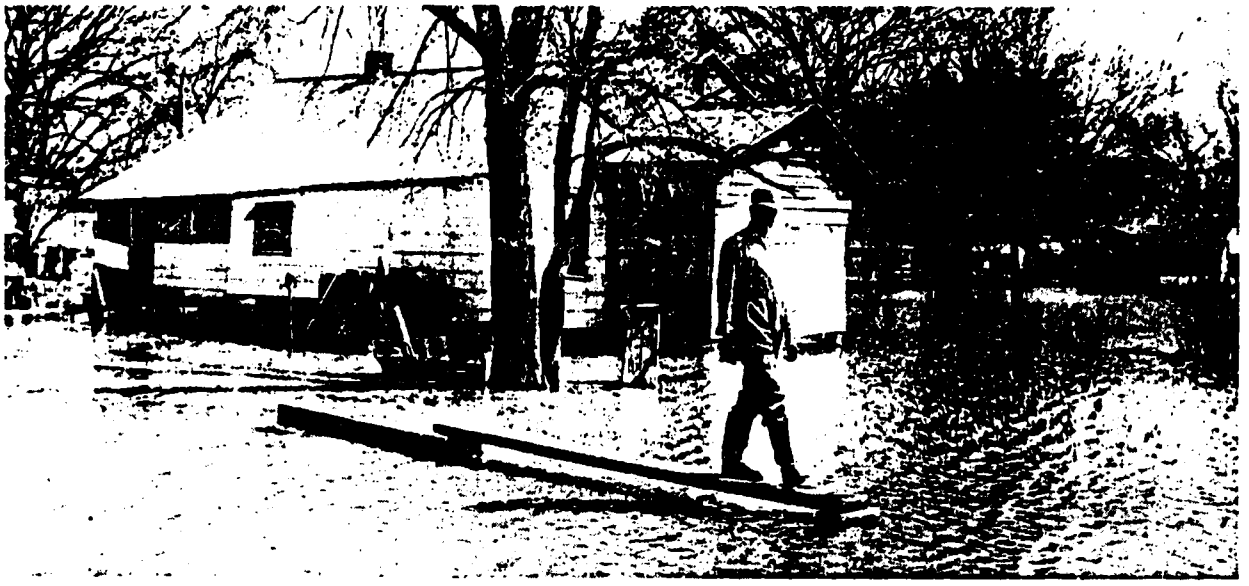
In Connecticut, about 50 families left their Westbrook homes, threatened by rising waters on Wright's Pond, about 25 miles east of New Haven. And four families in Essex, which was hard-hit by floods last year, also were forced to leave.

The New England storm brought winds up to 30 mph, with some higher gusts on Long Island Sound and poor visibility. The weather service issued a small craft advisory for boaters on the sound. Tides were expected to be 2½ feet above normal.

Flooded again . . .

Some residents of Thebes, Ill., had barely dried out from December's flood before being forced from their homes and businesses again by spring flooding. This view of Thebes shows the Mississippi River creeping into the business district of the community (Missourian Photograph by Ray Owen).

PLATE 16



High and dry

After the December flood brought about four inches of Mississippi River into Woodrow Pearson's home in Commerce, he decided to fight back. Pearson raised his house about a foot, and plans to put even more distance from his floor to the water when he gets the time. Having lived there for 30 years, Pearson said the river had never threatened his house until the 1973 floods.

Fred Lynch—Missourian

River crest expected tonight

By JAY WOLZ
Missourian Staff Writer

The Mississippi River is still expected to crest at Cape Girardeau tonight, but that crest will be slightly lower than the predictions issued over the weekend.

Earlier projections spotted the crest at 42.4 feet, then on Saturday the crest was revised to 42.3 feet and now today the National Weather Service has lowered its forecast another tenth of a foot to 42.2 feet. The river at Cape Girardeau this morning stood at 41.9 feet, nearly 10 feet above flood stage.

Local officials don't expect the water to recede very quickly. The anticipated river stages here for Tuesday, Wednesday and Thursday are 42.1, 42.0 and 41.7 feet, respectively.

City Manager Gary A. Eide said he isn't sure how many people have been forced to evacuate their homes in Cape Girardeau due to the flood, but said the number of displaced families is about the same as it was during the December flooding.

The Salvation Army has been standing by, ready to provide emergency shelter during the flood, but so far, aside from some transients, Lt. Ralph Ashcraft reports that only one Cape Girardeau family has found it necessary to utilize the Salvation Army for housing.

"We have had a number of families that have called in just for the reassurance that we're here," Ashcraft noted. "We have plenty of space for anyone who needs lodging."

Cape Girardeau Fire Chief Charles Mills said his department has received only about a dozen calls in the past week on the city's flood hotline (334-3311) and most of those calls have been related to housing.

Apparently, Eide said, most people displaced by the flood are staying with friends and relatives until they are able to move back to their homes.

Several highways in the Cape Girardeau area are closed due to the flooding including Highway 177 north of the city and Highway 25 at Dutchtown where Cape County Sheriff Herman ("Bob") Gribler reported that the pavement is covered by about 20 inches of water.

Major streets still closed by the flooding in Cape Girardeau include South Sprigg south of Highway 74 and North Main Street north of the Highway 177 turnoff.

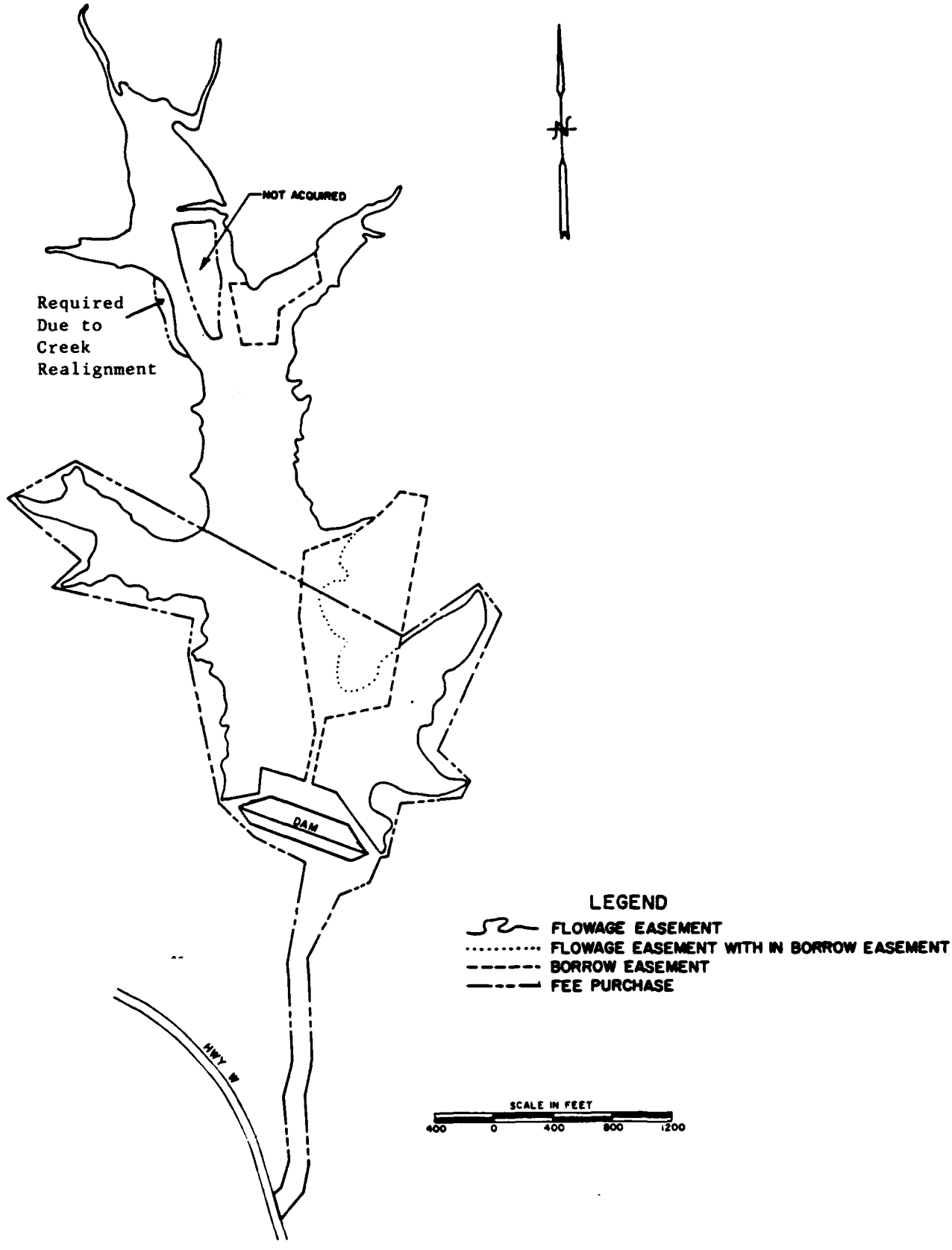
Eide said the flooding has forced the city to use a round-about route to travel to the city's landfill off of Highway 177 and on the south side of town city employees are using boats to get to the city's water treatment plant. "But the plant is secure," the city manager said.

Earlier river projections spotted the crest at 42.4 feet, then on Saturday the crest was revised to 42.3 feet and now today the National Weather Service has lowered its forecast another tenth of a foot to 42.2 feet. The river at Cape Girardeau this morning stood at 41.9 feet, nearly 10 feet above flood stage.

A levee at Powers Island near Commerce, damaged in the December floods, was breached Sunday flooding thousands of acres of Scott County farmland.

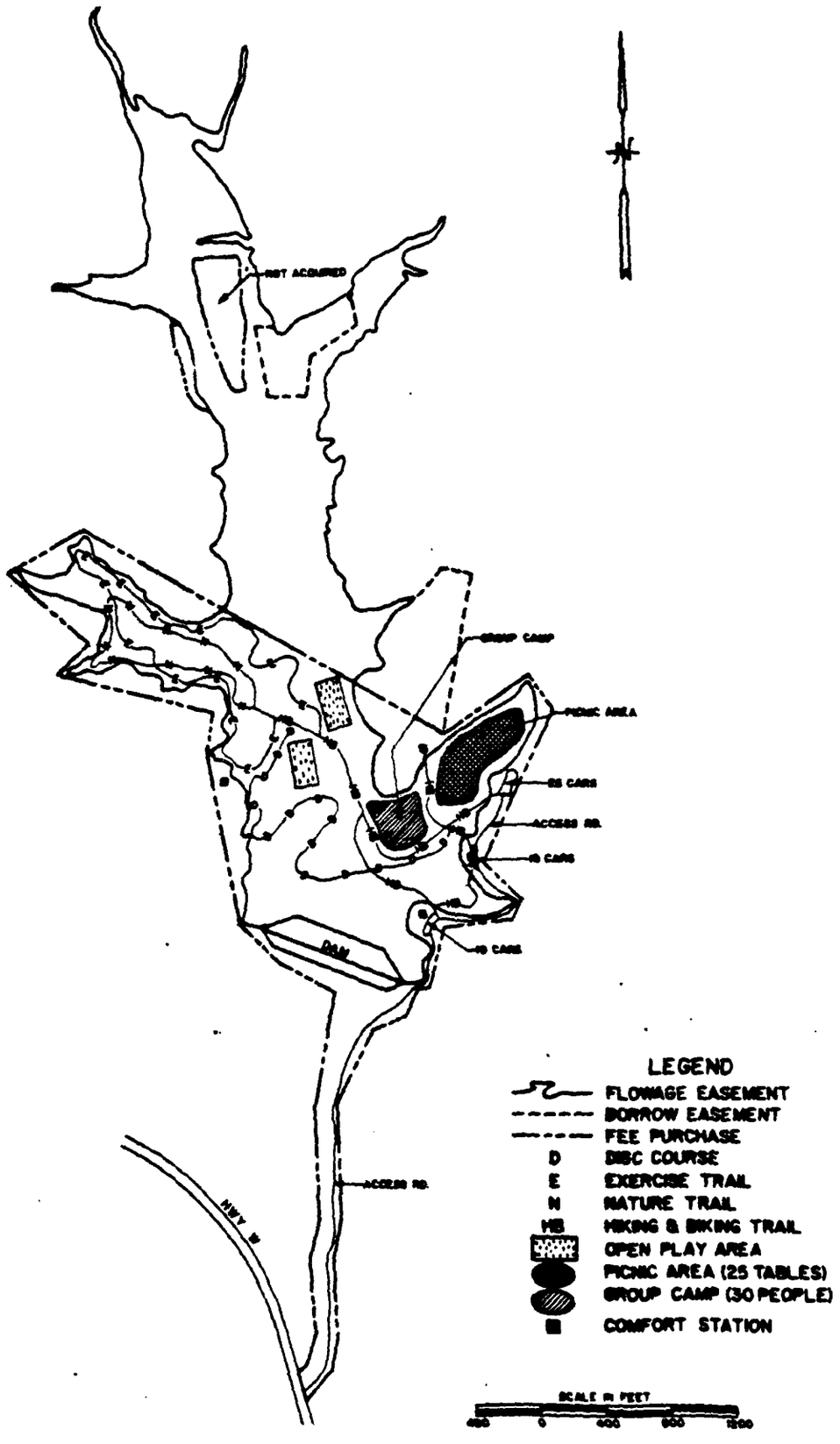
"Our information is that the levee just washed out," commented Ken Williams of the U.S. Army Corps of Engineers office in Memphis, Tenn. Williams said that as far as he knew, the flooding forced no evacuations.

SOUTHEAST MISSOURIAN APRIL 11, 1983



RECOMMENDED PLAN
DETENTION SITE I
LAND ACQUISITION

CAPE LA CROIX CREEK WATERSHED
PLATE 18



RECOMMENDED PLAN
DETENTION SITE 1
RECREATION PLAN

CAPE LA CROIX CREEK WATERSHED
PLATE 19

ENVIRONMENTAL ASSESSMENT

CAPE GIRARDEAU/JACKSON STUDY

CAPE LA CROIX CREEK AND WALKER BRANCH

This Environmental Assessment was prepared by the U.S. Army Corps of Engineers, St. Louis District, the responsible agency.

ABSTRACT: A plan of improvements is recommended for the Cape Girardeau/Jackson study area to address the needs for flood control, environmental protection and enhancement, and recreation on Cape La Croix Creek and Walker Branch.

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FTS: 273-5600

ENVIRONMENTAL ASSESSMENT

CAPE LA CROIX CREEK AND WALKER BRANCH

ENVIRONMENTAL ASSESSMENT

CAPE LA CROIX CREEK AND WALKER BRANCH

PURPOSE AND NEED FOR PROPOSED ACTION

The Cape La Croix Creek drainage basin covers 21.4 square miles with its headwaters in steep hills located about 4 miles north of the City of Cape Girardeau, Missouri. Cape La Croix Creek flows from its headwaters southward through the city to its confluence with the Mississippi River at river mile 50.2.

Flooding from Cape La Croix Creek and Walker Branch generally occurs in the spring and summer months due to intense and frequent thunderstorms. Flooding, however, may occur during any month of the year. These brief but rapidly rising floods are capable of causing significant damages. Backwater from the Mississippi River entering the creek is considered minimal in terms of property damage.

The primary study problem identified is severe flooding of the commercial/residential area along Cape La Croix Creek and Walker Branch. In an effort to reduce this problem within the flood plains of these two streams, various alternative flood control measures were considered.

The basic planning objectives established and used in developing the alternative plans were: (1) to reduce the incidence and amount of damage from flooding in the urban and urbanizing areas of the Cape La Croix Creek watershed; (2) to protect or enhance the environment where possible; and (3) to improve the quality and quantity of outdoor recreational opportunities in the project area to meet future needs with emphasis on the flood prone areas.

The formulated plan that most clearly met the planning objectives, and afforded the greatest total damage protection, while at the same time maintaining a viable benefit/cost ratio was designated the Recommended Plan.

Structural features of this plan consist of a 140 acre dry detention basin, and channel modifications. The channel modifications consist of concrete-lined rectangular channels along Cape La Croix (75 feet wide) between miles 2.8 and 3.2 and along Walker branch (50-60 feet wide) between mile 0.0 and 0.90. A grass-lined trapezoidal channel would be placed along Walker (75 feet wide) between mile 0.9 and 1.7 and (35 feet wide) between mile 1.7 and 2.00. A trapezoidal rip-rap channel would extend between Cape La Croix Creek (miles 3.2 and 3.8). Various concrete or rip-rap transitions would occur between the channelized sections and between channelized areas and the natural channel.

The plan includes bridge replacements at eight street locations and several relocations of structures. The Recommended Plan also includes the construction of recreational facilities at the relocation sites, 7.3 miles of recreational trails, and designated park lands located at the lower end of the dry detention site.

ADVERSE IMPACTS OF THE PROPOSED ACTION

No highly significant adverse environmental impacts were determined for the Recommended Plan, and no specific mitigation measures were found to be required. A discussion of the more significant adverse project impacts is

given below by specific resource categories.

A Clean Water Act, Section 404(b) (1), evaluation along with a request for state water quality certification will be obtained prior to actual project construction.

There are two nationally endangered species that could occur in the project area, the bald eagle and the peregrine falcon. No known critical habitat for these species exists within the project area. (See APPENDIX H for details).

Land Resources

Construction of the concrete-lined channel with its vertical walls will change the local landform from its present natural appearance. The soils of the detention basin qualify as prime farmland and a permanent 10 acre loss of this land would occur due to the placement of a dam, spillway, and access road. Farm lands within the detention site will be imparted by flooding to a greater extent once a dam is constructed. This fact could make agricultureal pursuits, particularly row crop production somewhat riskier.

Air Resources

During the removal of structures, and the construction of the channels, detention reservoir and bridges, dust, fumes and noise will be produced. This will cause short-term adverse impacts to air quality and noise levels.

Water Resources

The concrete-lined channels would eliminate the natural discharge/recharge processes of any subsurface water movement from the ground to the stream and vice versa along creek sections where they are placed. However, ground water effects in these reaches would not be serious since the Mississippi River is the prime water supply source for the area.

Biological Resources

Aquatic communities will be eliminated along reaches where the construction of the concrete-lined channel will occur. At least initially most water dependent species will be eliminated along earthen channelized and rip-rap channel areas due to the impacts of an increased sediment load, increased water temperature and the disruption of food resources.

The overall impacts of the project to aquatic and terrestrial organisms is perceived as minor. This is true in view of the fact that the prior flood control efforts of local authorities, including channel straightening, draglining and vegetation removal, have left these reaches in an already degraded state, and of very low value to fish and wildlife. Only short-term impacts on wildlife populations are expected to occur within the dry detention basin as a result of annual spring flooding.

Cultural Resources

Prior to project construction, those cultural sites located within the proposed impact areas would have to be evaluated for significance in a manner consistent with the National Historic Preservation Act of 1966. Should significant sites be situated in these areas, all adverse effects of the action would be mitigated through cultural resource data recovery. These investigations would be coordinated with the Missouri State Historic Preservation Officer and the Advisory Council on Historic Preservation. Presently known cultural sites that could potentially be impacted by the project consist of five locations, four prehistoric and one historic, within the detention basin, and one archaeological site within the area of the earthen channel that will be constructed.

BENEFICIAL IMPACTS OF THE PROPOSED ACTION

The Recommended Plan makes positive contributions toward the three basic study objectives of flood control, environmental quality and recreation.

The following is a discussion of the more significant beneficial environmental impacts by resource category.

Man-made Resources

A high degree of flood protection would be provided to commercial and residential areas with the construction of the project channels and the dry detention basin. The percent damage reduction would be 84 percent.

The small existing bridges contribute to flooding by restricting water flow. Bridge removal or the replacement of bridges with larger structures would reduce the flooding problem. Relocations of buildings would eliminate all flood related damages to these structures.

Land Resources

The construction of the concrete-lined and earthen channels and the dry detention basin could result in a net long-term energy savings by reducing flood induced property repairs. With the preservation of prime farmland soils in the detention basin from future residential development, some productive agricultural practices could still continue.

Water Resources

Due to construction of the channelization features, bankline erosion would be reduced, thus benefitting water quality. Project related vegetational increases at the detention site would also benefit water quality by reducing erosion.

Flood damage will be greatly reduced because of the increased carrying capacity of the concrete-lined channel, earthen channel, and the storage capacity of the detention reservoir.

Biological Resources

The projects provision of undeveloped land acreage in the detention park, and the implementation of recreational landscaping would increase the food and cover available to wildlife, and would provide at least some opportunity for non-consumptive wildlife use.

Cultural Resources

Although survey results indicate that as many as six sites may be impacted by channel improvements and construction of the detention basin, more detailed archaeological investigations would be conducted by the Corps of Engineers (St. Louis District) at each site to insure the conservation of significant cultural artifacts. An attempt would be made to preserve in place, all archaeological properties. Land use projections by the year 2040 indicate that the project area will be almost exclusively urban. In view of this anticipated adverse change, the project plan may in fact provide positive contributions to cultural resources by site conservation or archaeological data recovery.

ALTERNATIVES

Preliminary analyses in the early stages of the study served to eliminate a number of potential plans due to the lack of economic efficiency or of being non-applicable. Structural measures eliminated included the extensive relocation of buildings, levees, and floodwalls. Environmental quality features eliminated included purchases of wetlands, the creation of wetlands from borrow pits, and a hillside fish pond impoundment. Boat ramps and fishing piers were likewise deleted as recreational features (APPENDIX B).

After preliminary analysis, seven (including the no action alternative) plans were considered for detailed development. The recommended plan has already been described. Due to economic factors, the Non-Structural and the Standard Project Flood Plans were not considered economically viable, and the development of specific environmental and recreational features for these plans was not considered appropriate. The three remaining plans, the National Economic Development (NED) plan, the Environmental Quality (EQ) plan and Plan 'A' and their general impacts are discussed below.

No Action

Future land use maps prepared by the Southeast Missouri Planning Commission (SEMO), and data compiled by the St. Louis District's economics section, were used to predict future land use changes within the project area. Based on this information, it appears that commercial and residential development will spread northward in the Cape La Croix Creek and Walker

Branch basins and that industrial development will occur along the lower sections of Cape La Croix Creek. The close proximity of this urban expansion will reduce or eliminate wildlife and its habitats. Such development should not further encroach on the floodplain since the community has inacted the National Flood Insurance Program and is required to comply with agreements made with Federal Insurance Administraton (FIA) and Federal Emergency Management Agency (FEMA).

Natural flood disasters will continue to occur, producing flood damages and social disruptions. Streambank erosion, flood control and agricultural practices will continue to degrade the aquatic ecosystem.

Encroaching urbanization will result in the loss of cultural resources and wetlands.

Through State and Federal pollution control measures, water quality should exhibit a net improvement compared to existing conditions.

National Economic Development (NED) Plan

This plan was formulated to produce the greatest tangible net benefits. All structural features are identical to those previously described in the Recommended Plan, with the exception that the relocation of the structures involves fewer buildings which are technically catagorized as a non-structural improvement. No specific environmental features are included in the NED plan.

Adverse impacts for the NED plan are essentially the same as those described for the Recommended Plan. Beneficial impacts include increased flood protection, long-term energy savings by reducing flood related property damages, and the reduction of stream bank erosion due to channelization features.

Plan 'A'

This plan increased the NED plan flood protection to the 92 percent level, while still maintaining a B/C ratio above unity (1.4). The chief structural difference between Plan 'A' and the Recommended Plan is that Plan 'A' includes additional channelization between Cape La Croix Creek miles 3.8 and 5.1. Other differences when compared with the Recommended Plan include: (1) utilization of the entire detention site for recreation; (2) horse trails; (3) the purchase of a 20-foot wide environmental quality (EQ) Corridor along selected reaches of Cape La Croix Creek; and (4) the placement of an aquatic habitat structure along Cape La Croix Creek at mile 3.7 would also be included.

Environmental Quality (EQ) Plan

This plan maximized environmental enhancement and also contained a number of compatible recreational features. All structural components are identical to those contained in Plan A. . The EQ plan contains all of the environmental and recreational features described for Plan A, in addition to the following

features: (1) 313 acres of designated park lands (200 acres at the detention site, 86 acres located above Hopper Road and 27 acres located below Bloomfield Street); (2) additional recreational trails; (3) a 20-feet wide EQ Corridor along selected reaches of the Creeks; and (4) fish pond improvements near the dry detention reservoir site.

Adverse impacts are essentially the same as those described for Plan A. Beneficial impacts of the EQ plan are the same as those for Plan A, except for the inclusion of habitat preservation and management at the detention site, Hopper Road, the Meander site park lands, and along the stream corridor. Preservation of additional acreages of prime farmland would also occur with the acquisition of the park land.

COORDINATION

A Section 404 (b)(1), evaluation has been prepared. A state water quality certification will be requested prior to construction.

See APPENDIX H and Volume 4 for the results of coordination with the U.S. Fish and Wildlife Service (USFWS) as required by Section 7 of the Endangered Species Act. The USFWS and the Missouri Department of Conservation (MDOC) have been involved throughout the formulation of this planning effort. (See Volume 4 for the USFWS Final Coordination Act Report.)

The National Historic Preservation Act of 1966, as Amended, and Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971 are the chief cultural resource directives. The results of the 1977 and 1982 cultural resource surveys were transmitted to the Missouri State Historic Preservation Officer (SHPO).

Executive Order 11988, Flood Plain Management, 24 May 1977, has been considered during the formulation of all alternatives (See APPENDICES A and B). Executive Order 11990, Protection of Wetlands, 24 May 1977, has been considered during the formulation of all alternatives and all impacts are described in the main report. (See APPENDICES F and I for additional information.)

An analysis of the impacts on prime and unique farmlands is included in EA and in APPENDIX F in accordance with the Council on Environmental Quality (CEQ) Memorandum, 30 August 1976. The effects of each alternative on this resource are described in APPENDIX B.

The comments and comment responses received on this report have been bound separately in Volume Four - Public Views and Responses.

STATEMENT OF RECIPIENTS

The Survey Report and Environmental Assessment was furnished to the following agencies, organizations, and individuals for review and comment:

Advisory Council on Historic Preservation

U.S. Department of Agriculture

Forest Service

Soil Conservation Service

U.S. Department of Commerce

U.S. Department of Health, Education, and Welfare

U.S. Department of Housing and Urban Development

U.S. Department of the Interior

Fish and Wildlife Service

National Park Service

U.S. Department of Transportation

U.S. Environmental Protection Agency

Federal Power Commission

U.S. House of Representative

U.S. Senate

Governor of Missouri

Missouri State Legislators

Mayor Cape Girardeau

Mayor of Jackson

American Fisheries Society, Missouri Chapter

Audubon Society

National Audubon Society

Audubon Society of Missouri

Coalition for the Environment

Izaak Walton League

Conservation Federation of Missouri

Missouri Archaeological Society

Missouri State Historic Preservation Officer

Missouri Department of Natural Resources

Missouri Department of Conservation

Missouri Highways and Transportation Department

Sierra Club

The Wildlife Society, Missouri Chapter

Southeast Missouri State University

Parks and Recreation Department, City of Cape Girardeau

County of Cape Girardeau

Cape of La Croix Creek and Walker Branch Drainage and Levee District

COMPLIANCE

The detailed plans developed during the final iteration were subjected to a review of their compliance with certain environmental regulations and directives. Their degree of compliance is shown in Table 1. The SPF and NS plans are not displayed because these plans were not developed to the same level of detail (no recreation or fish/wildlife costs or benefits were calculated) since flood control by itself was unjustified for these two plans.

TABLE 1

RELATIONSHIP OF CAPE GIRARDEARU/JACKSON PLANS

TO ENVIRONMENTAL REQUIREMENTS

GUIDANCE	RECOMMENDED	NED PLAN	PLAN EQ	PLAN "A"
Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. Council on Environmental Quality, 29 November 1978	FC	FC	FC	FC
Clean Water Act of 1977 (Public Law 92-500, as amended, Section 404)	FC	FC	FC	FC
Executive Order 11988, Flood Plain Management, 24 May 1977	FC	FC	FC	FC
Executive Order 11990, Protection of Wetlands, 24 May 1977	FC	FC	FC	FC
Analysis of Impacts on Prime and Unique Farmlands in EIS. Council on Environmental Quality Memorandum, 30 August 1976	FC	FC	FC	FC
Endangered Species Act of 1973 as amended	FC	FC	FC	FC
Principles and standards for Planning Water and Related Land Resources. Water Resources Council, 10 November 1973	FC	FC	FC	FC
Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971	FC	FC	FC	FC
River and Harbor and Flood Control Act of 1970, Public Law 91-611, Section 122	FC	FC	FC	FC
National Historic Preservation Act of 1966, as Amended	FC	FC	FC	FC
Fish and Wildlife Coordination Act of 1958	FC	FC	FC	FC
Archaeological and Historic Preservation Act of 1974	FC	FC	FC	FC

FC = Full Compliance

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

CAPE GIRARDEAU/JACKSON, MISSOURI

CAPE LA CROIX CREEK AND WALKER BRANCH

Based upon the Environmental Assessment, it has been determined that the environmental effects of the Recommended Plan are minor and that the prepartion of an Environmental Impact Statement is not warranted. Listed below are specific factors considered in making this determination.

1) Construction related activities will have minor short-term adverse impacts to air quality and noise levels.

2) The newly channelized areas would have a localized minor long-term adverse aesthetic impact.

3) Minor adverse impacts to aquatic habitat and organisms would result from the destruction or degradation of habitat along channelized sections of the project.

4) There would be no impact on Endangered Species.

5) Terrestrial habitat would be enhanced by land acquisition for a detention reservoir.

6) Water quality would be enhanced by reducing erosion.

7) Flood protection would enhance the quality of human living conditions.

GARY D. BEECH
COL, CE
Commanding