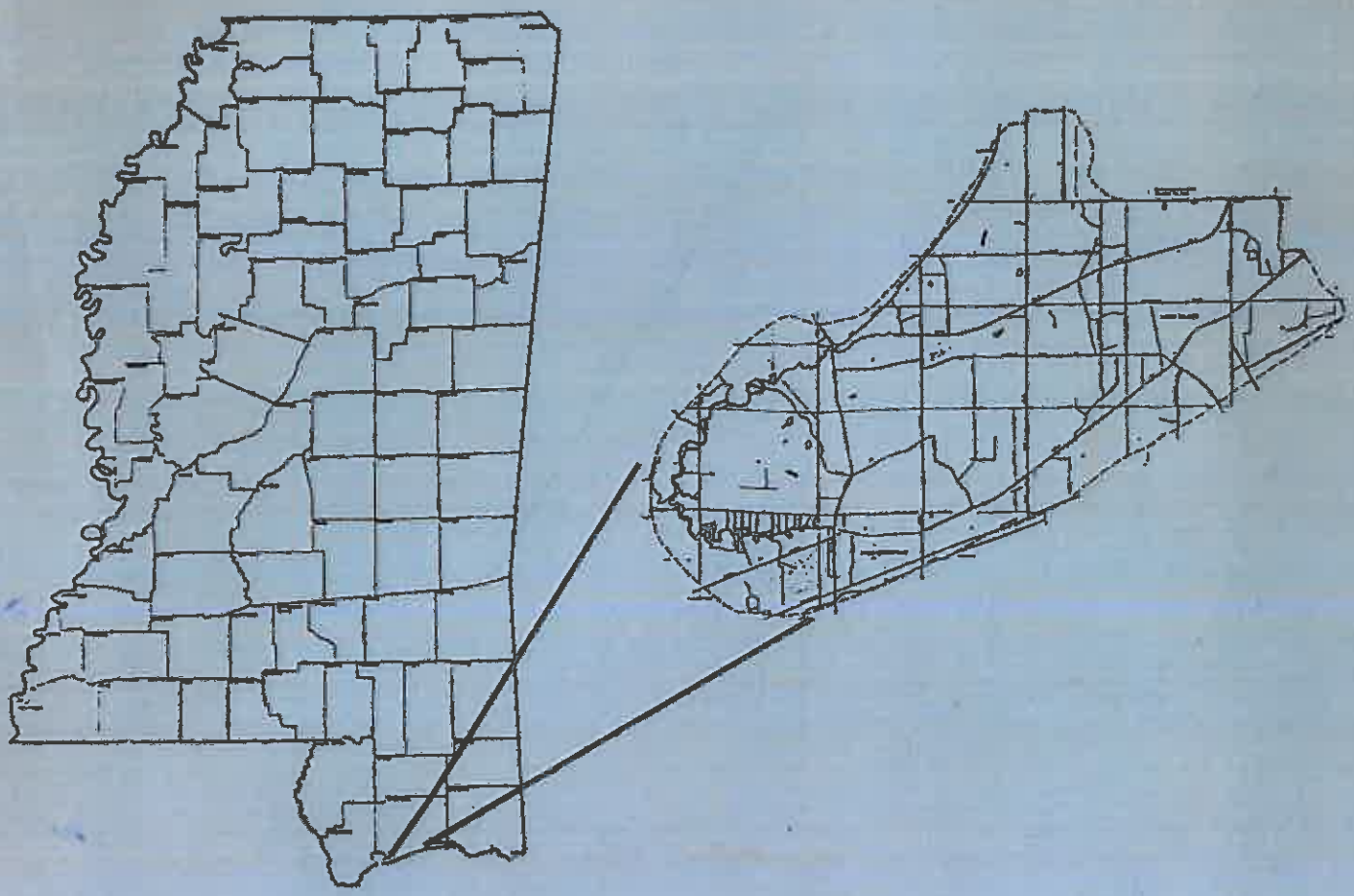
LONG BEACH WATERSHED

PLAN
AND
ENVIRONMENTAL IMPACT STATEMENT

HARRISON COUNTY, MISSISSIPPI



U.S. DEPARTMENT OF AGRICULTURE
JACKSON, MISSISSIPPI

Exhibit 3

WATERSHED PLAN - ENVIRONMENTAL IMPACT STATEMENT

FOR

LONG BEACH WATERSHED
Harrison County, Mississippi

Abstract: This document describes a project formulated for the purpose of reducing flood damages to an urban area. Works of improvement consist of 8.3 miles of channel modifications which include 6.7 miles of channel enlargement and 1.6 miles of selective snagging. Overall, the project does not reduce the environmental quality of the watershed. Economic benefits of the proposed plan exceed costs. The Sponsors and landusers will pay 15 percent of the $1,794,900 installation cost. This document fulfills the requirements of the National Environmental Policy Act and is to be considered for authorization for funding under PL-566.

Prepared under the Authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 U.S.C.-1001-1008) and in accordance with Section 102(2)(c) of National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 U.S.C. 4321 et seq.).

Prepared by: Long Beach Water Management District
City of Long Beach
Harrison County Soil and Water Conservation District
U.S. Department of Agriculture, Soil Conservation Service

For additional information contact:

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Jackson, Mississippi 39269, Phone: 965-5205

FINAL

October 1989

Watershed Agreement

between the

Long Beach Water Management District
City of Long Beach
Harrison County Soil and Water Conservation District
(Referred to herein as Sponsors)

STATE OF MISSISSIPPI

and the

Soil Conservation Service
United States Department of Agriculture
(Referred to herein as SCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by Sponsors for assistance in preparing a plan of works of improvement for the Long Beach Watershed, State of Mississippi, under the authority of the Watershed and Flood Prevention Act (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to SCS; and

Whereas, there has been developed through the cooperative efforts of the Sponsors and SCS a plan for works of improvement for the Long Beach Watershed, State of Mississippi, hereinafter referred to as the Watershed Plan-Environmental Impact Statement, which plan is annexed to and made a part of this agreement.

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through SCS, and the Sponsors hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The Sponsors will acquire, with other than P.L. 566 funds, such landrights as will be needed in connection with the works of improvement (Estimated Cost $256,500).

2. The Sponsors hereby agree that they will comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. 4601 et seq. as implemented by 7 C.F.R. Part 21) when acquiring real property interests for this federally assisted project. If the Sponsor is legally unable to comply with the real property acquisition requirements of the Act, it agrees that, before any federal financial assistance is furnished, it will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance. In any event, the Sponsor agrees that it will reimburse owners for necessary expenses as specified in 7 C.F.R. 21.1006 (c) and 21.1007.

The cost of relocation payments in connection with the displacements under the Uniform Act will be shared by the Sponsors and SCS as follows:

	Sponsors (Percent)	SCS (Percent)	Estimated Relocation Payment Costs (Dollars)
Relocation Payments	14.54	85.46	0 1/

3. The Sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of the works of improvement.

4. The Sponsors will obtain all necessary federal, state, and local permits required by law, ordinance, or regulation for installation of the works of improvement.

5. The percentages of the construction cost to be borne by the Sponsors and SCS are as follows:

Works of Improvement	Sponsors (Percent)	SCS (Percent)	Estimated Construction Costs (Dollars)
Channel Work	0	100	1,242,600

6. The percentages of the engineering services costs to be borne by the Sponsors and SCS are as follows:

Works of Improvement	Sponsors (Percent)	SCS (Percent)	Estimated Engineering Costs (Dollars)
Channel Work	0	100	206,600

7. The Sponsors and SCS will each bear the costs of the project administration that each incurs, estimated to be $4,500 and $84,700, respectively.

1/ Investigation of the watershed project area indicates that no displacements will be involved under present conditions. However, in the event that displacement becomes necessary at a later date, the cost of relocation assistance and payments will be cost shared in accordance with percentages shown.

8. The Sponsors agree to participate in and comply with applicable Federal floodplain management and flood insurance programs before construction starts.

9. The Sponsors will be responsible for the operation, maintenance, and replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with agreements to be entered into before issuing invitations to bid for construction work.

10. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto, will be the actual costs incurred in the installation of works of improvement.

11. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

12. A separate agreement will be entered into between SCS and Sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. This plan may be amended or revised only by mutual agreement of the parties hereto, except that SCS may deauthorize or terminate funding at any time it determines that the Sponsor has failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the Sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the Sponsor or recoveries by SCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between SCS and the Sponsor having specific responsibilities for the measure involved.

14. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

15. The program conducted will be in compliance with all requirements respecting nondiscrimination, as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15), which provide that no person in the United States shall, on the grounds of race, color, national origin, sex, age, handicap, or religion, be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity conducted or assisted by the Department of Agriculture.

Long Beach Water Management District

By _____

Title _____

Date _____

_____
Address Zip Code

The signing of this plan was authorized by a resolution of the governing body of the Long Beach Water Management District adopted at a meeting held on _____.

_____ _____
Address Zip Code

Date _____

City of Long Beach

By _____

Title _____

Date _____

_____
Address Zip Code

The signing of this plan was authorized by a resolution of the governing body of the City of Long Beach adopted at a meeting held on _____.

_____ _____
Address Zip Code

Date _____

Harrison County Soil and Water Conservation District

By _____

Title _____

Date _____

_____
Address Zip Code

The signing of this plan was authorized by a resolution of the governing body of the Harrison County Soil and Water Conservation District adopted at a meeting held on _____.

_____ _____
Address Zip Code

Date _____

Soil Conservation Service

United State Department of Agriculture

Approved by:

_____
L. Pete Heard
State Conservationist

_____
Date

LONG BEACH WATERSHED
Harrison County, Mississippi

Watershed Plan - Environmental Impact Statement

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LONG BEACH WATERSHED

WATERSHED PLAN - ENVIRONMENTAL IMPACT STATEMENT

SUMMARY

Project Name: Long Beach Watershed

State: Mississippi County: Harrison

Sponsors: Long Beach Water Management District
City of Long Beach
Harrison County Soil and Water Conservation District

Description of Recommended Plan: The recommended plan provides for technical and financial assistance for the construction of 8.3 miles of channel modification.

Land treatment practices were not included in the recommended plan since it was determined that the need for land treatment in the predominately urban watershed is not significant.

Alternatives Considered: Three alternatives were considered. Alternative No. 1 is the no project alternate. Alternative No. 2 is a structural alternative. It is also the National Economic Development (NED) alternative and the recommended plan. Alternative No. 3 is a nonstructural alternative.

Resource Information

Size of watershed (acres)	10,857
Land Use (acres):	
Grassland	1,036
Forest Land	5,833
Urban and Built-up	2,454
Idle Land	948
Marsh Land	521
Miscellaneous Land 1/	65

Endangered Species - None identified in project area.
Cultural Resources - No sites listed or eligible for listing in National Register of Historic Places

1/ Includes 35 acres of aquacultural ponds and 30 acres of other type ponds.

Prime Farmland (acres) - 1,093

Problem Identification: Homes, businesses, health care facilities, streets, bridges, and utilities within the watershed are being damaged by flooding. Average annual flood damages total $237,000.

Project Purpose: The purpose of the project is to reduce flood damages to residences and businesses within the floodplains of Canal No. 1 and Canal No. 2-3.

Principal Project Measures: The principal project measures consist of channel modifications that include 6.7 miles of channel enlargement and 1.6 miles of selective snagging.

Project Cost:

PROJECT MEASURE	PL 566 Funds		Other Funds		Total Funds	
	Dollars	Percent	Dollars	Percent	Dollars	Percent
Channel Work						
Installation	1,242,600	100	0	0	1,242,600	100
Engineering	206,600	100	0	0	206,600	100
Project Admin.	84,700	95	4,500	5	89,200	100
Land Rights	0	0	256,500	100	256,500	100
TOTALS	1,533,900	85	261,000	15	1,794,900	100

Annualized Project Benefits:

Nonagricultural Benefits - $234,700

Impacts:

EFFECTS ON WATERSHED LAND USE
WITHIN
100-YEAR FLOODPLAIN

Land Use	Present	Future Without Project	Future With Project
	Acres	Acres	Acres
Grassland	13	13	0
Idle Land	77	77	44
Forest Land	1,058	1,058	881
Urban & Built-up Land	568	568	308
Marsh Land	9	9	7
Other Land	7	7	6
TOTAL	1,732	1,732	1,246

Natural Resources Changed or Lost:

	Net Change
Forest Land (ac)	37 gained
Grassland (ac)	45 lost
Idleland (ac)	37 lost
Wetlands (ac)	0
Cultural Resources (no.)	0
Wildlife Habitat (HU's)	12.7 lost
Prime Farmland (ac)	Insignificant Change

INTRODUCTION

The Long Beach Watershed Sponsors filed an application for federal assistance to the Mississippi Soil and Water Conservation Commission on March 14, 1985. The Commission gave the request a priority rating of two (2) during a watershed planning selection meeting in March 1986.

The Soil Conservation Service's Water Resources Planning Staff conducted a field reconnaissance study in November 1985. This study showed there was the potential to develop a watershed project in the Long Beach Watershed. The watershed was authorized in June 1988.

The Watershed Plan-Environmental Impact Statement was formulated to provide financial and technical assistance to install measures to reduce flooding and to document the impacts of these measures on the land and related water resources of the watershed. Cost-sharing responsibilities are identified. The document also presents alternative plans, a recommended plan, and the effects of these plans. The plan shows the justification of federal assistance to implement the watershed project.

The Sponsors, identified in the watershed agreement and the plan summary, developed the plan. Other Federal, State, and local agencies provided input during the planning process. The United States Department of Agriculture--Soil Conservation Service assisted the Sponsors in plan development and preparation of this document.

The plan was prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 U.S.C. 1001-1008) and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 U.S.C. 4321 et seq). Responsibility for compliance with the National Environmental Policy Act rests with the Soil Conservation Service.

PROJECT SETTING

Size and Location

The Long Beach Watershed is located in the extreme southwest portion of Harrison County, Mississippi, approximately 162 miles southeast of Jackson, Mississippi, and approximately 68 miles northeast of New Orleans, Louisiana. The watershed contains 10,857 acres and consists of two (2) man-made canals; Canal No. 1 being the upper end of Johnson Bayou and Canal No. 2-3 being the upper end of Bayou Portage. Both bayous flow into St. Louis Bay which flows into the Gulf of Mexico. The two canals are basically parallel and flow in a southwesterly direction.

The watershed is predominately urban and outlying built-up areas. A large portion of the City of Long Beach (4,566 acres) and a portion of the City of Pass Christian (1,455 acres) is located within the watershed. The rest of the watershed is predominantly forest land with some grassland occurring.

There are 4,240 acres downstream of Espy Avenue that are affected by the 100 year tidal surge. These acres were not evaluated in this study.

Climate

Based on the 1987 Annual Summary at the Gulfport Naval Center, Mississippi, the average annual precipitation is 62.85 inches. The wettest month is September with an average of 7.23 inches and the driest month is October with an average of 2.98 inches. The average annual temperature is 67.9 degrees Fahrenheit. January is the coldest month with an average temperature of 51.6 degrees and July is the hottest month with an average temperature of 82.2 degrees.

Geology, Topography, Soils

The watershed lies in the Gulf Coast Flatwoods Physiographic area, a flat strip of land which parallels the coastline and terminates in a man-made seawall and white-sand beach. Elevations range between 5 and 30 feet above mean sea level.

Borings to depths of 16 feet below natural ground indicate the lack of thick, traceable beds. Layers of sand, silt and clay are irregular in thickness and extent and are apparently lenticular. These coastal deposits of the Holocene Epoch are typical of estuarine environments.

Unconformably underlying the coastal deposits is the Citronelle Formation, a blanket-like Pleistocene deposit composed principally of sand and gravel. The base of the Citronelle in the project area is approximately 200 feet below mean sea level and is dipping southward at a rate of less than 10 feet per mile.

The soils in the watershed are mapped and described in detail in "Soil Survey of Harrison County, Mississippi," issued June 1975. The predominant soils include: Harleston, Hyde, Latonia, Plummer and Ponzer. Slopes range from 0 to 5 percent.

Harleston fine sandy loam (ML or SM) is a moderately well-drained soil occurring on ridgetops. It is strongly to very strongly acidic. Permeability is moderate, available water capacity is medium, and runoff is slow.

Hyde silt loam (CL) is a very poorly drained soil in depressions and drainageways. It is strongly to very strongly acidic. Permeability is moderately slow, available water capacity is high, and runoff is slow to very slow.

Latonia loamy sand (SM) is a well-drained soil on low ridges. It is strongly to very strongly acidic. Permeability is moderately rapid, available water capacity is medium, and runoff is low.

Plummer loamy sand (SM) is a poorly drained soil on wet flats and in drainageways. It is strongly to very strongly acidic. Permeability of the surface and subsurface layers is rapid, the available water capacity is low, and runoff is slow.

Ponzer organic matter (Pt) occurs in lower lying level areas and in depressions subject to flooding. It is very poorly drained and strongly to extremely acidic. Permeability is moderate and available water capacity is high.

Land Use

The present land use of the watershed consists of approximately 1,036 acres of grassland (9 percent); 948 acres of idle land (9 percent); 5,833 acres of forest land (53 percent); 2,454 acres of urban and built-up land (23 percent); 521 acres of marsh land (5 percent); and 65 acres of other land (1 percent) which includes 35 acres of aquacultural ponds and other ponds.

Population Centers

Long Beach Watershed is located entirely in Harrison County. According to the 1980 Census, Harrison County has a population of 157,665. The City of Long Beach, which contains 42 percent of the area of the watershed, has a population of 14,204. The City of Pass Christian, which contains 13 percent of the watershed, has a population of 5,014. The outlying areas of the watershed are predominately urban and built-up.

The cities of Pass Christian, Long Beach, Gulfport, and Biloxi are, respectively, contiguous. Gulfport and Biloxi, which are both county seats of Harrison County, have populations of 39,676 and 49,311, respectively. Long Beach is also located approximately 68 miles northeast of New Orleans, Louisiana, and 78 miles west of Mobile, Alabama.

Numerous modes of transportation provide the project area with private and commercial transportation. The watershed lies between U. S. Highway 90 and Interstate 10, which both run in an east-west direction. Also many all-weather roads provide access throughout the watershed. Railway transportation is provided by the Illinois Central Gulf and the Seaboard Systems which intersect in Gulfport. Access to seaports on the Gulf of Mexico is convenient. Several large airports are also located in the county.

Social and Economic Data

The watershed is predominantly urban. Therefore the economy is supported by nonagricultural industries; such as tourism, import-export trading and shipping, fishing, and shipbuilding. At present, industry and business in the surrounding cities such as Gulfport, Biloxi and Pascagoula, support a large part of the Long Beach Watershed work force. The majority of the

businesses damaged by flooding are enterprises which serve the needs of the people who live in the watershed and adjacent areas. An industrial park is located within the watershed that houses business enterprises such as the Regina Vacuum Cleaner Company, the largest employer in Long Beach. Because of the jobs provided by the many industries, the Mississippi Employment Security Commission reported the 1986 unemployment rate for Harrison County at 8.9 percent. This rate is lower than the Mississippi state average rate of 11.7 percent.

Approximately 9 percent of the businesses within the benefited area of the project are owned or operated by minorities and 20 percent of the residences are owned or occupied by minorities. Minorities will be given the same consideration as nonminorities under this program.

General

The Sponsors, in their application for assistance, have identified flooding of homes and businesses as the major problem. Meetings with the Sponsors and contacts with homeowners, landowners, local business owners, and local and federal agencies have reaffirmed the flooding problem.

Flood Damages

Flooding has been a problem for homeowners and owners and/or operators of businesses within the floodplains of the watershed for many years. The major source of the floodwaters causing the flood damages is from excess rainfall in the form of runoff from the drainage areas of Canal No. 1 and Canal No. 2-3. Both canals were originally constructed in or about 1918. Since 1918, urbanization within the drainage area of the Long Beach Watershed has steadily increased. This steady increase in urbanization within the drainage area, as well as encroachment along and within the floodplains of Canal No. 1 and Canal No. 2-3, have continually increased runoff and therefore increased the flood problems within the watershed.

A second source of the floodwaters causing the flood damages comes from outside the Long Beach Watershed. Turkey Creek Watershed lies north and east of and shares a common boundary with Long Beach Watershed. During times of peak flows, part of the floodwaters from Turkey Creek Watershed breaks over the watershed boundary and flows down Canal No. 1 and Canal No. 2-3 within the Long Beach Watershed.

Overbank flooding from the 100-year storm event averages 3.5 to 6 feet in depth with velocities of .25 to 1.25 feet per second. Due to the magnitude

of the flooding and the depth of flooding in some areas, there is a threat to loss of life. However, there has been no known loss of life as a direct result of flooding.

There are 27 businesses and 181 homes that are subject to damages from a storm with a 1 percent chance of occurrence or a storm of a magnitude expected only once every 100 years. Streets, bridges, and utilities within the watershed are also damaged by floodwater. Damages from the 100-year storm are estimated to be $1,701,500, and the damages from the 1-year storm are estimated to be $17,100 and includes 3 businesses and 4 homes.

Thirty-two businesses and 232 homes flood from the 500-year storm or the storm with a .2 percent chance of occurrence. Damages from the 500-year storm are estimated to be $2,767,700. For flood damages from storms with a reoccurrence interval of less than 100 years, see pages C-24 and C-26.

Average annual damages from flooding amount to $237,000 (See Table 5).

Erosion and Sediment

There is relatively little erosion occurring in the watershed and no one source can be identified as a major contributor. It is estimated that the present sediment yield at the outlet of the watershed is approximately 1,750 tons per year, a large percentage of which is sediment in suspension. This can be attributed to the flat lying topography and to low flow velocities in the canals.

Future urbanization in the watershed, however, may introduce a potential sediment problem. However, if reasonable erosion control measures are implemented during urban construction, sediment reaching the channels should remain minimal.

Scoping of Concerns

An informal scoping process was used to identify issues of likely significance and to determine the intensity of analysis for each factor. A broad range of economic, environmental, and social factors were considered during the scoping process. Flooding was the major issue identified, and opportunities to reduce flooding were targeted for analysis. Those participating in the process include the Soil Conservation Service, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, Mississippi Bureau of Pollution Control, the Mississippi Bureau of Marine Resources, and Mississippi Department of Archives and History.

Those factors considered and their significance are listed on Table I-1.

TABLE I-1

SIGNIFICANT ISSUES

Economic, Environmental and Social Factors	Degree of Impact 1/	Significant to Decisionmaking 2/	Remarks
1. Floodwater	High	Yes	
2. Erosion and Sedimentation	Low	No	
3. Land Use and Flora	Low	No	
4. Prime Agricultural Land	Low	No	
5. Streams	Medium	No	
6. Lakes and Wetlands	Low	No	Conduct inventory
7. Groundwater	Low	No	
8. Wildlife	Low	No	Conduct habitat evaluation
9. Fish	Low	No	
10. Water Quality	Low	No	
11. Endangered and Threatened Plants and Animals	None	No	Conduct biological assessment
12. Transportation	Medium	No	
13. Employment	Medium	No	
14. Air Quality	None	No	
15. Mineral Resources	None	No	
16. Cultural Resources-Historical	Low	Yes	Conduct survey

1/ High - Must be considered in the analysis of alternatives

Medium - Should be considered for most alternative solutions

Low - Consider, but not too significant

None - Need not be considered in analysis

2/ Yes or No

Existing Resources

Land Resources - The present land use of the watershed consists of approximately 1,036 acres of grassland (9 percent); 948 acres of idle land (9 percent); 5,833 acres of forest land (53 percent); 2,454 acres of urban and built-up land (23 percent); and 521 acres of marsh land (5 percent); and 65 acres of other land (1 percent) which includes 35 acres of aquacultural ponds and other ponds.

Streams - Canal No. 1 and No. 2-3 were constructed in or about 1918 and originate in Harrison County near the western edge of Gulfport. The downstream limit of work was in the vicinity of Menge Avenue. Canal No. 1 has a drainage area of 5,179 acres and empties into Johnson Bayou. Canal No. 2-3 has a drainage area of 5,678 acres and empties into Bayou Portage. Upstream of Menge Avenue, the canals have few of the characteristics of natural coastal streams. The canals exhibit steep banks in most areas and sandy streambeds. The portions below Menge Avenue have received little modification and exhibit characteristics of typical coastal streams. These reaches are tidally influenced and have margins of aquatic vegetation.

Wetlands - Type 1, 2, 3, 5, 6, and 7 wetlands, as defined by U.S. Fish and Wildlife Service Circular 39, occur in the fresh water areas of the watershed. Type 10, 12, and 13 wetlands occur in the brackish water areas of the lower portion of the watershed. All type 10, 12, and 13 wetlands occur in areas of tidal influence and are downstream of planned channel work.

Type 1, 2, 3, 5, 6, and 7 wetlands are located sporadically along both canals in undeveloped areas. Urban expansion has resulted in the loss of these wetland types in the past and it is projected that further urbanization will exert even more pressure on existing wetlands. There are approximately 43 acres of type 1, 5, 6, and 7 wetlands in the floodplain of Canal 2-3 in the area upstream of Espy Avenue. There are approximately 163 acres of type 1, 5, 6, and 7 wetlands in the floodplain of Canal 1 upstream of Espy Avenue.

Approximately 4,400 acres (40.5 percent) of the soils in the watershed are classified as hydric. An additional 2,600 acres (23.9 percent) are classified as having hydric inclusions within the mapping unit. Many of the hydric soils in the watershed have been previously drained as part of urban development. A portion of the remaining undrained hydric soils may be wetlands as defined in the 1985 Food Security Act (FSA). Much of the lower watershed, below Menge Avenue, is relatively undeveloped, however, some development has taken place along Johnson Bayou and Bayou Portage.

There is no cropland in the watershed, therefore there are no farmed wetlands (FW).

Fish and Aquatic Resources - Canals No. 1 and No. 2-3 upstream of Menge Avenue have been altered in the past and have little resemblance to natural coastal streams. Downstream Menge Avenue, the stream is unaltered and is tidally influenced. Above the area of tidal influence, the canals have little flow during dry periods of the year and have little value as a fishery resource. Canal No. 1 empties into Johnson Bayou and Canal No. 2-3

empties into Bayou Portage. The bayous are a part of the Bay of St. Louis estuary which supports important fisheries resources including spotted sea trout, redfish, brown and white shrimp and blue crab.

Wildlife Habitat - Wildlife habitat in the watershed is composed of 5,833 acres of forest land, 1,036 acres of grassland, 948 acres of idle land and 521 acres of coastal marsh. Urban, built-up, and miscellaneous land makes up 2,519 acre or 23 percent of the watershed. Because the watershed is urban in nature and the human population density is high compared to rural areas of the state, the watershed does not provide suitable conditions for wildlife species with relatively large ranges such as the white-tailed deer or wild turkey.

Although habitat types are diverse, their proximity to urban areas and human activity limits their value to some wildlife species. The most significant pressure on wildlife habitat is from increased urbanization and development.

In order to project the potential impacts of the project, two methods were used. Existing habitat quality was determined for forest land using the methodology outlined in the "Habitat Evaluation Procedure" (HEP), developed by the U.S. Fish and Wildlife Service. Habitat quality for grassland and idle land was determined using the methodology outlined in the "Wildlife Habitat Appraisal Guide" (WHAG), developed jointly by SCS and the Missouri Department of Conservation.

The habitat requirements of the raccoon, barred owl, and gray squirrel were used to evaluate the habitat quality of hardwood forest types, and the raccoon and barred owl were used for the pine forest type. The cottontail rabbit and bobwhite quail were used to evaluate grassland and idle land.

Because the project will not affect the coastal marsh habitat, an HSI value for this habitat type was not determined. Land classified as urban was not evaluated.

Results of the habitat evaluation are shown in Table I-2.

Table I-2

WILDLIFE HABITAT EVALUATION (PRESENT CONDITIONS)
Long Beach Watershed, Mississippi

Habitat Type	Habitat Suitability Index (HSI) 1/	Acres (Ac)	Habitat Units (HU's) 2/
Forest land			
Hardwood	.470	950	446
Pine	.486	4,883	2,373
Grassland	.288	1,036	298
Idle Land	.465	948	441
Watershed 3/	.455	7,817	3,558

1/ On a scale of 0.0 to 1.0, with 1.0 representing optimum and 0.0 totally unsuitable habitat.

2/ Calculated by multiplying acres by the HSI value.

3/ Does not include 2,519 acres of urban, built up, and miscellaneous land and 521 acres of marshland.

Endangered Species - Through coordination with the U.S. Fish and Wildlife Service Endangered Species Field Office, it was determined that no endangered, threatened, or proposed species or their critical habitat occur in the project area. In accordance with U.S. Fish and Wildlife Service procedures, the project was assigned Log No. 4-3-86-689.

Cultural Resources - There are no sites in the watershed that are listed in the National Register of Historic Places (NRHP). According to the records at the Mississippi Department of Archives and History, there are no known recorded sites in the watershed that are considered eligible for inclusion in the NRHP. A cultural resource survey of these areas has been accomplished and the findings have been coordinated with the State Historic Preservation Officer (SHPO). No eligible sites were located as a result of the survey. There is a remote possibility that unrecorded sites exist in the area where works of improvement are planned.

Water Quality - Water quality in the canals is affected by both point and nonpoint sources of pollution. The Mississippi Bureau of Pollution Control has identified seven point discharges in the watershed. Discharge effluents enter lateral ditches before entering the canals.

Nonpoint pollution sources are primarily from urban sources such as oil and rubber products from roads and parking lots and fertilizers and pesticides from yards. Due to the insignificant agricultural activity in the watershed, agricultural sources of pollution are not significant.

Canal No. 1 and Canal No. 2-3 are classified as "fish and wildlife" streams by the State of Mississippi. Waters in this classification are intended for fishing and for propagation of fish, aquatic life, and wildlife. Waters in this classification are also suitable for incidental recreational contact.

During the scoping process, concern was expressed over possible dioxin contamination of soil which might enter Canals No. 1 and No. 2-3 from a storage site on the U.S. Naval Reservation. The storage site has been cleaned up and subsequent testing by the Mississippi Bureau of Pollution Control revealed no residues of dioxin which might impact water quality.

It was determined in consultation with appropriate agencies that water quality sampling was not needed since the proposed project would have an insignificant effect on water quality. In addition the concerns over the possible impacts from dioxin were alleviated by the results of the Mississippi Bureau of Pollution Control study.

Ground Water - Ground water development is extensive in the project area. Fresh water occurs to depths of 2,500 feet in sand aquifers of Pliocene and Miocene Age. Most wells, however, tap aquifers 600 to 1,200 feet below mean sea level, leaving vast amounts of deeper, untapped reserves.

All domestic and public water supplies and some industrial water supplies use ground water. The quality of this water is generally good but locally contains excessive concentrations of dissolved solids. Saltwater intrusion is not a problem except in shallow aquifers that are hydraulically connected to estuarine streams.

Main recharge to the aquifers that supply wells occurs several miles to the north, where the aquifer systems are at or near the surface. Recharge occurs by infiltration of rain that falls directly on the outcrops, by percolation through the overlying sandy deposits, and by intermovement between aquifers where conditions of permeability and head permit.

Forecasted Conditions

Future Without Project - If no action is taken, flooding will continue to occur in the project area. Urban expansion is expected to continue as shown in Table E-1 for future without project conditions. Increased runoff from this area of expansion will aggravate the flooding problem.

On-Going Programs - There are no on-going programs in the area to help alleviate the present flooding problem. The only deterrent that will help in slowing the urban development of these flooded areas is the enforcement of the regulations of the National Flood Insurance Program. Harrison County and the Cities of Long Beach and Pass Christian are currently under the regular flood insurance program.

FORMULATION OF ALTERNATIVES

General

The primary objective of the Sponsors is to reduce the $237,000 in annual damages due to flooding.

The project was formulated with the cooperation of the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, Mississippi Bureau of Marine Resources, Mississippi Bureau of Pollution Control, Mississippi Department of Archives and History, Sponsors, and other groups and individuals.

The NED recommended alternative was evaluated for farmland protection in accordance with the Farmland Protection Policy Act (PL-97-98) using single-site development criteria.

Formulation Process

Flooding - A hydraulic model of the floodplain was prepared to determine the extent of present flooding conditions and to evaluate the effects of structural measures and nonstructural measures.

During the formulation process, it was noted that the topography of the area limited the structural practices for flood reduction to clearing and snagging, selective snagging, channel enlargement, and a levee. Nonstructural measures considered include flood warning techniques, floodplain purchase and relocation, and floodproofing techniques.

Incremental Analysis

During the formulation process, it was determined that the topography of the area limited the structural practices for flood reduction to channel modification.

The incremental analysis was limited to finding the channel size that would minimize the threat to loss of life and would be the most cost effective. An incremental evaluation was not made of the individual channels due to their having a common floodplain in the upper reach. (See the Flood Damage discussion in the Problem and Opportunity section.)

Evaluation of Alternatives

Alternative No. 1 - This is the "No Project" alternative which consists of foregoing implementation of any project and supplies a base for measuring effects of other alternatives.

Effects - Average annual damages in the amount of $237,000 to homes and businesses will continue to occur.

Alternative No. 2 - This alternative is the NED and the recommended alternative which consists of 8.3 miles of channel modification for flood control.

Costs: Total project cost - $1,794,900 : PL 566 share - $1,533,900; other share - $261,000; average annual cost - $139,700; annual OM&R - $5,700; total annual cost - $145,400.

Effects - Installation of this alternative will reduce flooding of 232 homes and 32 businesses as well as the public utilities located in the project area, and will result in $224,100 of average annual benefits. Net benefits will amount to $78,700 annually.

Alternative No. 3 (Nonstructural) - This alternative will consist of closure of openings of 152 buildings, moving 10 buildings, relocation of people and contents from 4 buildings, elevating 7 buildings, and constructing floodwalls around 28 buildings.

Costs: Total project cost - $3,567,300 : PL 566 share - $2,675,500; other share - $891,800; average annual cost - $316,700; annual OM&R - $13,200; total annual cost - $329,900.

Effects - Installation of this alternative will result in the reduction of flood damages to 24 commercial buildings and 177 residential buildings and will result in $230,000 of average annual benefits. Net benefits will amount to a negative $99,900.

Comparison of Alternative Plans

During the formulation of candidate plans, analyses of impacts on a range of environmental, economic and social factors were made. These issues were identified during the scoping process. A summary of these and other impacts are found in the summary and comparison of candidate plans data that follows (Table A-1).

TABLE A-1
Summary and Comparison of Candidate Plans

Effect	Without Project	Alternative 1 No Project	Alternative 2 NED Plan	Alternative 3 Nonstructural Plan
Measures	--	--	6.7 miles of channel enlargement, 1.6 miles of clearing and snagging.	Closure of openings 152 buildings, movin 10 buildings, relocating people and contents 4 buildings elevating 7 building and floodwalls constructed around 28 buildings.
Project Investment	--	$0	$1,794,900	$3,567,300
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT				
Adverse Annualized	--	--	$ 145,400	$ 278,300
Beneficial Annualized	--	--	$ 224,100	$ 219,600
Net Beneficial	--	--	$ 78,700	$ - 58,700

Table A-1
(Continued)

OTHER SOCIAL EFFECTS ACCOUNT

Effect	Without Project	Alternative 1 No Project	Alternative 2 NED Plan	Alternative 3 Nonstructural Plan
Beneficial				
	Urban damages occur from flooding of 232 homes and 32 businesses; amounts to $237,000.	No effect	Reduce flood damages by 99 percent.	Eliminate flood damages to 201 buildings.
	Flooding of streets, yards, homes, and businesses results in inconveniences to the people of the area. The time required for cleanup and repair following a flood cannot be used for normal activities.	No effect	Periods of inconvenience will be greatly reduced or eliminated.	Periods of inconvenience will be reduced somewhat.

REGIONAL ECONOMIC DEVELOPMENT ACCOUNT

Positive Effect			
Annualized			
Region	--	No effect	$224,100	$219,600
Rest of Nation	--	No effect	$ 0	$ 0
Negative Effect			
Annualized			
Region	--	No effect	$ 21,100	$ 70,100
Rest of Nation	--	No effect	$124,300	$210,200

ENVIRONMENTAL QUALITY ACCOUNT

Beneficial	--	No effect	No effect
Adverse	--	No effect	Loss of 12.7 AHU's 1/

1/ Animal Habitat Units

Project Interaction

There are no other federal or nonfederal projects with which any of the candidate plans will have significant economic, environmental, or physical interactions. Installation of this project and benefits to be received is not contingent on implementation of plans of other agencies.

Risk and Uncertainty

Installation of the structural measures is dependent on the ability and willingness of the Sponsors to secure the necessary landrights and to fund their portion of the cost.

It is unlikely that the installation of the nonstructural plan would be socially acceptable to the residents and owners of businesses in the watershed.

Rationale for Plan Selection

Alternative No. 1 (No Project)	Alternative No. 2 (NED Plan)	Alternative No. 3 (Nonstructural Plan)
$167,500 in annual damages to 232 homes and $69,500 in annual damages to 32 businesses	$2,300 in annual damages remaining due to flooding	$7,000 in annual damages remaining due to flooding
temporary loss of worktime due to flooding and cleanup period	reduce loss of worktime due to flooding and cleanup	some reduction in loss of worktime due to flooding and cleanup

RECOMMENDED PLAN

Purpose and Summary

The purpose of the recommended plan is to reduce the $237,000 in annual damages from the flooding of residences, businesses and utilities within the Long Beach Watershed.

The recommended plan provides for technical and financial assistance for the construction of 8.3 miles of channel modification.

Plan Elements

Land Treatment - Land treatment practices will not be included in project planning since it was determined that the need for land treatment in the predominantly urban watershed is not significant. The ongoing programs should adequately protect the land resources within the watershed. Therefore, an accelerated land treatment program is not needed.

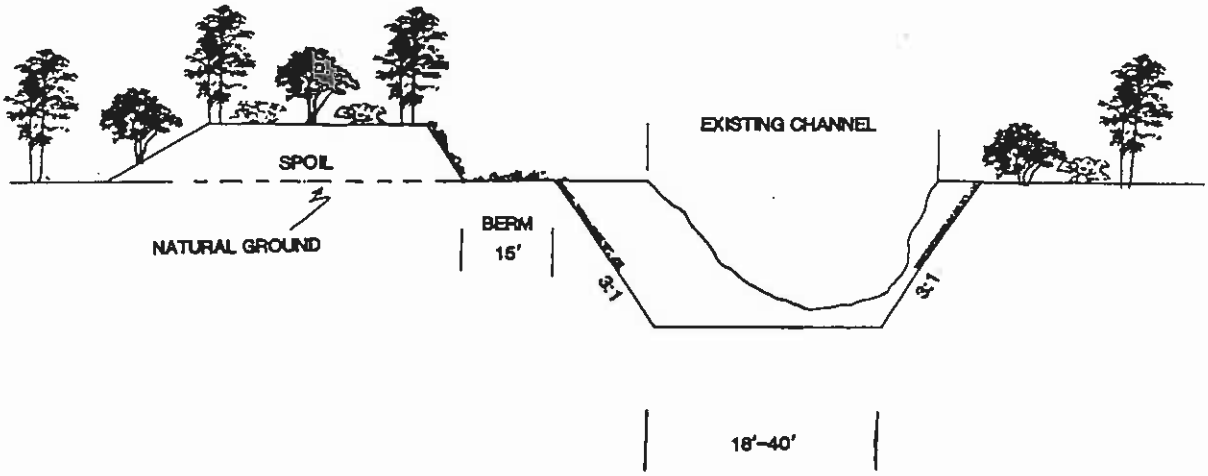
Structural Measures - The planned structural measures consist of 8.3 miles of channel modifications including 6.7 miles of channel enlargement and 1.6 miles of selective snagging. The major objective of the modifications to the channel system is to provide additional capacity for carrying the peak discharge from the 100-year storm event below first floor elevations of buildings located in the floodplain.

Channel enlargement will be required on two manmade canals in the watershed. There will be 3.8 miles of earth-lined channel and 0.2 miles of rock riprap lined channel constructed on Canal No. 1. Two and seven tenths (2.7) miles of earth-lined channel will be constructed on Canal No. 2-3.

As shown in Table 3A, a significant portion of the 100-year frequency discharge occurs out-of-bank at most reaches on the planned channels. In general, bankfull capacities of the enlarged channel sections range from approximately the 2-year frequency discharge to approximately the 25-year frequency discharge. The bankfull capacities are dependent upon the overbank flow that is available without causing damages to buildings in the floodplain.

The earth-lined channel sections will be constructed on 3 to 1 side slopes due to the sandy bank materials. As shown in Figure 1, the majority of the construction will be from one side with spoil being placed along one side also.

FIGURE NO. 1
CHANNEL WORK
TYPICAL CROSS SECTION



To reduce sediment from construction, the spoil, berm, and channel slopes will be vegetated after every 1000 feet of construction, or at weekly intervals, whichever comes first, so long as soil moisture conditions permit.

The 0.2 miles of rock riprap lined channel will be located on Canal No. 1 immediately downstream of Beat Line Road. Since right-of-way widths are limited in this reach, the modifications planned have a relatively small cross sectional area with a steep hydraulic gradient. Consequently, channel velocities are high. Therefore, the rock riprap lined reach will be necessary to insure the stability of the bed and bank materials in this reach and upstream reaches as well.

Sediment traps will be installed at the downstream end of the constructed channels. The sediment traps will provide storage for sediment from the increased yields during the construction of the project as well as normal yields from the watershed. The traps will consist of overexcavating the channel section by 2 feet for a distance of approximately 350 feet on Canal No. 1 and approximately 250 feet on Canal No. 2-3.

The 1.6 miles of selective snagging will consist of removing log jams that are obstructing or diverting flow, cutting damaged trees, and cutting trees that are leaning over the channel at an angle greater than 30 degrees from vertical. Removal operation will be performed primarily with hand-operated equipment, water-based equipment, or small equipment used in a manner that will minimize soil and water disturbances. (See Appendix C, Investigation and Analysis Report.)

Mitigation Features

The loss of 57 acres of forest land habitat, including 36 acres of bottom land hardwood and 21 acres of pine habitat will be mitigated for by planting a total of 191 acres to selected hardwood species. Acreage was determined by using habitat evaluation procedures to determine the value of

habitat lost due to construction and projecting values of mitigation plantings. Sites for planting include 97 acres in the right-of-way area along the channels and 94 acres located within the Long Beach Industrial Park. Hardwood species, including at least four appropriate species of oak will be planted in alternating rows on a 12 foot matrix spacing. Appropriate management will be used to insure survival of the plantings.

The channel will be constructed with 3:1 side slopes to encourage the establishment of herbaceous aquatic vegetation on the side slopes. This will reduce bank erosion and improve trapping of sediment resulting in improved water quality. Also sediment traps will be located at the lower end of each channel to reduce downstream sedimentation both during and following construction.

Permits and Compliance

The U.S. Army Corps of Engineers requires a Section 404 permit based on the following criteria: (1) total drainage area upstream of the proposed construction and (2) area affected at the normal high water mark. A Section 404 permit will be required before construction begins for Canal No. 1 and Canal No. 2-3 due to the drainage area requirement and the area affected at the normal high water mark.

Before any Federal funds can be spent on the Long Beach Watershed project, the local sponsors must be in full compliance with the Federal flood plain management and flood insurance program.

Costs

Estimated costs for installing the project are shown in Tables 1 and 2. Table 1 reflects the division of the total estimated installation cost between PL-566 and other funds. The PL-566 cost is $1,533,900 and the cost to be borne by others is $261,000. Explanations of key cost accounts shown in Table 2 are provided below.

Construction - Table 2 reflects the construction estimates for installing planned structural measures. Included are the costs of all materials, equipment, and labor. These costs are estimated to be $1,242,600 and will be borne entirely by PL-566 funds.

Engineering - Table 2 includes the costs for making detailed engineering investigations prior to construction of structural measures, together with the costs of preparing landrights work maps and final designs and specifications, as well as construction inspection. This cost is estimated to be $206,600 and will be borne entirely by PL-566 funds.

Landrights - Table 2 reflects the estimated cost or value of easements and rights-of-way needed for installation of structural measures, modifications to improvements such as roads, utility lines, etc., and legal fees and surveys needed in acquiring landrights. These costs are estimated to be $256,500 and will be borne entirely by others.

Project Administration - Contract administration, maintenance of records, and other overhead costs of installing structural measures are included in Table 2. The PL-566 cost is estimated to be $84,700 and the cost to be borne by others is $4,500.

Operation, Maintenance and Replacement - These costs are estimated to be $5,700 annually and will be borne by others.

Installation and Financing

Sequence of Installation - The planned works of improvement are to be installed over a two year installation period. The sequence of installation is shown in the following Table R-1. The table also shows the yearly scheduled obligation of PL-566 and other funds for the project.

Table R-1

DISTRIBUTION OF FUNDS BY PROJECT YEAR
Long Beach Watershed, Mississippi

Project Year	Installation Funds PL-566	Other	Technical Assistance	Project Administration	TOTAL
1	$428,100	$ 97,000	$ 76,700	$32,100	$ 633,900
2	$814,500	$159,500	$129,900	$57,100	$1,161,000
TOTAL	$1,242,600	$256,500	$206,600	$89,200	$1,794,900

Responsibilities - The responsibilities for installing and financing the structure are as follows:

From Public Law 566 funds the Soil Conservation Service will:

A. Provide engineering surveys for design, landrights needs and installation.

B. Perform geologic investigations and prepare designs for all channel work.

C. Provide design and installation services.

D. Provide 100 percent of the construction cost.

The Long Beach Water Management District will:

A. Secure all permits, easements, and rights-of-way necessary for the installation, operation, maintenance, and replacement of all structural practices.

B. Make necessary enlargements or replacements of bridges and culverts and make necessary modifications of roads and utilities.

C. Provide local and administrative services necessary for the installation of the project.

D. Be responsible for operation and maintenance of structural measures installed.

The Long Beach Water Management District has the power of "eminent domain" and will exercise their authority as needed to acquire necessary landrights.

Contracting - All plan elements will be installed by a formal contract administered by the Soil Conservation Service. The Long Beach Water Management District will provide their share of the construction cost in advance of bid advertisement.

Landrights and Relocations - Perpetual easements will be obtained by the Long Beach Water Management District for the construction, operation, and maintenance of structural measures.

No relocations are anticipated, but if they become necessary, the Sponsors will follow standard SCS procedures as outlined in Property Management Regulations in conformance with the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (PL 91-646).

Financing - The Sponsors recognize the expense of organization, cost of legal services, and miscellaneous costs that they must bear. The Sponsors will be responsible for all landrights and easements necessary for the installation of the project measures. Costs incurred by Sponsors will be paid with funds from existing resources.

Operation, Maintenance, and Replacement

The Long Beach Water Management District will assume the responsibility to operate, maintain, and replace (when necessary) all measures included in the plan. This responsibility includes the financing of these actions. Operation and maintenance funds could be secured through assessments as provided by Mississippi Code 1972, Section 51-33-3 (f). The annual cost for the operation, maintenance, and necessary replacement of all planned measures remaining to be constructed is estimated to be $5,700.

Inspections of all structural measures will be made by the Long Beach Water Management District with technical assistance from the Soil Conservation Service upon request and as resources permit. Inspections will be made as frequently as necessary, but at least annually, and after each damaging storm to determine operation and maintenance needs.

Plans for operation and maintenance will be contained in the O&M Agreement which will be executed prior to signing a landrights or project agreement. In addition to specific Sponsor responsibilities for project measures, the O&M Agreement will include specific provisions for retention, use, and disposal of property acquired or improved with PL-566 assistance. The O&M Agreement will be based on the National Operation and Maintenance Manual.

An O&M plan that will become part of the O&M Agreement will be developed for each plan element. SCS will assist the Long Beach Water Management District in preparing an operation and maintenance plan for Canal No. 1 and Canal No. 2-3.

TABLE 1 - ESTIMATED INSTALLATION COST

Long Beach Watershed, Mississippi

Installation Cost Item	Unit	Number Nonfederal Land	Estimated Cost (dollars) 1/ Public Law 83-566 Funds Nonfederal Land SCS 2/	FS 2/	Total	Other Funds Nonfed Land	TOTAL
STRUCTURAL MEASURES							
Channel Work	Mi.	8.3	1,533,900		1,533,900	261,000	1,794,900
SUBTOTAL STRUCTURAL			1,533,900	0	1,533,900	261,000	1,794,900
TOTAL PROJECT			1,533,900	0	1,533,900	261,000	1,794,900

1/ Price Base 1988.
2/ Federal agency responsible for assisting in installation of works improvement

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TABLE 2 - ESTIMATED COST DISTRIBUTION
STRUCTURAL AND NONSTRUCTURAL MEASURES

Long Beach Watershed, Mississippi

(Dollars) 1/

	Installation Cost P.L. 566 Funds				Installation Cost Other Funds			
	Construction	Engineering	Project Admin.	Total P.L. 566	Land Rights	Project Admin.	Total Other	Total Installation cost
STRUCTURAL MEASURES								
Channel Work								
Canal No. 1	814,500 2/	129,900	54,200	998,600	159,500	2,900	162,400	1,161,000
Canal No. 2-3	428,100 2/	76,700	30,500	535,300	97,000	1,600	98,600	633,900
Subtotal Channel Work	1,242,600	206,600	84,700	1,533,900	256,500	4,500	261,000	1,794,900
SUBTOTAL STRUCTURAL MEASURES	1,242,600	206,600	84,700	1,533,900	256,500	4,500	261,000	1,794,900
GRAND TOTAL	1,242,600	206,600	84,700	1,533,900	256,500	4,500	261,000	1,794,900

1/ Price Base 1988.
2/ Includes $58,400 for mitigation on canal 1, and $34,500 for mitigation on canal 2-3.

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TABLE 3 - STRUCTURAL DATA
CHANNEL WORK
LONG BEACH WATERSHED, MISSISSIPPI

Channel Name Reach	Station	Drainage Area (sq mi)	100 Yr Fq Design Discharge (cfs)	Water Surface Elevation (ft/msl)	Hydraulic Gradient (ft/ft)	Channel Gradient (ft/ft)	Channel Dimensions Bottom Width (ft)	Channel Dimensions Elevation (ft/msl)	Channel Dimensions Side Slopes (ft/ft)	"n" Value Aged	"n" Value As-Built	Velocities Aged (ft/s) 1/	Velocities As-Built (ft/s) 2/	Excavation Volume (cu yds)	Type of Work 3/	Existing Channel Type 4/	Present Flow Condition 5/
Canal No. 1	10+40														VIII	M	P
	46+27	0.92	1150	20.8			22	14.7	2.0						VI	M	P
				20.8			22	11.7	2.0						VI	M	P
					0.00018	0.00036								13100			
	55+40	1.48	1120	20.7			40	11.4	3.0	0.030	0.025	1.83	1.58		II	M	P
			240 7/	20.7			A=1490	18.4	P=1250	0.100		0.16					
					0.00012	0.00046								6200			
	59+80	1.48	1400	20.6			43	11.2	2.0						II	M	P
				20.5			43	11.2	2.0						II	M	P
					0.00021	0.00101								1400			
	60+80	1.79	870	20.4			40	11.1	3.0	0.030	0.025	1.36	1.44		II	M	P
			530 7/	20.4			A=2400	16.8	P=1010	0.100		0.22					
					0.00006	0.00036								15400			
	71+80	1.79	1010	20.4			40	10.7	3.0	0.030	0.025	1.52	1.49		II	M	P
			610 7/	20.4			A=2470	16.8	P=1010	0.100		0.25					
					0.00008	0.00045								11000			
	79+70	1.79	1030	20.3			30	10.3	3.0	0.030	0.025	1.78	1.74		II	M	P
			710 7/	20.3			A=2510	16.8	P=1010	0.100		0.28					
					0.00011	0.00043								20100			
	98+30	2.12	2100	20.1			24	9.5	2.0						II	M	P
				19.6			24	9.5	2.0						II	M	P
					0.00024	0.00104								1400			
	99+55	2.12	1760	19.6			30	9.4	3.0	0.030	0.025	2.85	2.51		II	M	P
			490 7/	19.6			A=1420	16.5	P=930	0.100		0.34					
					0.00027	0.00042								40500			
	132+70	2.85	1180	18.7			30	8.0	3.0	0.030	0.025	1.69	2.23		II	M	P
			1020 7/	18.7			A=3660	14.4	P=1770	0.100		0.28					
					0.00009	0.00045								54600			
	165+85	3.67	2090	18.4			30	6.5	3.0	0.030	0.025	2.56	2.68		II	M	P
			600 7/	18.4			A=1550	13.4	P=520	0.100		0.38					
					0.00018	0.00041								54400			
	194+50	4.10	2900	17.9			23	5.3	2.0						VII	M	P
				17.7			23	5.3	2.0						VII	M	P
					0.00033	0.00033								600			
	194+80	4.10	2760	17.7			30	5.3	2.0	0.035	0.035	4.06	4.06		VII	M	P
			520 7/	17.7			A=2360	14.5	P=1220	0.100		0.22					
					0.00058	0.00058								7900			

(Continued)

TABLE 3 - STRUCTURAL DATA (CONTINUED)
CHANNEL WORK
LONG BEACH WATERSHED, MISSISSIPPI

Channel Name Reach	Station	Drainage Area (sq mi)	100 Yr Fq Design Discharge (cfs)	Water Surface Elevation (ft/msl)	Hydraulic Gradient (ft/ft)	Channel Dimensions: Bottom Gradient (ft/ft)	Bottom Width (ft)	Bottom Elevation (ft/msl)	Side Slopes (ft/ft)	"n" Value Aged	"n" Value As-Built	Velocities Aged (ft/s) 1/	Velocities As-Built (ft/s) 2/	Excavation Volume (cu yds)	Type of Work 3/	Existing Channel Type 4/	Present Flow Condition 5/
Canal No. 1 (Cont.)	200+00	4.10	2330	17.4			20	5.0	1.5	0.030	0.030	4.86	4.86		VII	M	P
			810 7/	17.4			A=2790	14.5	P=1220	0.100		0.29					
					0.00067	0.00033								3100			
	203+00	4.10	2400	17.2			20	4.9	1.5	0.035	0.035	5.08	5.08		VII	M	P
			840 7/	17.2			A=2360	14.5	P=1220	0.100		0.36					
					0.00100	0.00040								1900			
	204+00	4.10	2680	17.1			40	4.9	3.0	0.030	0.025	2.85	2.70		II	M	P
			250 7/	17.1			A=1020	14.5	P=710	0.100		0.25					
					0.00021	0.00048								25700			
	213+65	4.36	3310	16.9			40	4.4	3.0	0.030	0.025	3.45	2.63		II	M	P
			380 7/	16.9			A=1250	12.8	P=710	0.100		0.31					
					0.00030	0.00044								81500			
	255+50	5.42	2340	15.7			40	2.6	3.0	0.030	0.025	2.23	1.13		II	M	P
			1370 7/	15.7			A=4380	11.7	P=1650	0.100		0.31					
					0.00012	0.00012								1200			
	257+20	5.42	3700	15.6			14	2.5	2.5								
				15.6			14	2.5	2.5								
Canal No.2-3	10+65														VIII	M	P
	57+70	0.83	900	19.7			18	12.6	3.0	0.030	0.025	3.27	2.99		II	M	P
			10 7/	19.7			A=170	19.5	P=180	0.100		0.05					
					0.00060	0.00100								800			
	58+70	0.83	780	19.6			18	12.5	3.0	0.030	0.025	2.82	2.94		II	M	P
			150 7/	19.6			A=1420	18.8	P=950	0.100		0.10					
					0.00044	0.00096								20800			
	85+70	0.83	990	18.4			18	9.9	3.0	0.030	0.025	2.69	2.48		II	M	P
			20 7/	18.4			A=130	18.3	P=250	0.100		0.15					
					0.00033	0.00091								15100			
	97+80	2.25	1300	18.0			20	8.8	3.0	0.030	0.025	2.98	2.90		II	M	P
			30 7/	18.0			A=520	17.4	P=1780	0.100		0.06					
					0.00036	0.00061								2000			
	99+45 6/	2.25	1300	17.9			20	8.7	2.5						II	M	P
				17.9			20	8.7	2.5								
					0.00037	0.00095								17900			
	114+15	2.25	1250	17.4			24	7.3	3.0	0.030	0.025	2.26	3.21		II	M	P
			600 7/	17.4			A=1990	14.7	P=1080	0.100		0.30					
					0.00018	0.00091								37100			

(Continued)

TABLE 3 - STRUCTURAL DATA (CONTINUED)
CHANNEL WORK
LONG BEACH WATERSHED, MISSISSIPPI

Channel Name Reach	Station	Drainage Area (sq mi)	100 Yr Fq Design Discharge (cfs)	Water Surface Elevation (ft/msl)	Hydraulic Gradient (ft/ft)	Channel Dimensions: Bottom Gradient (ft/ft)	Bottom Width (ft)	Bottom Elevation (ft/msl)	Side Slopes (ft/ft)	"n" Value Aged	"n" Value As-Built	Velocities Aged (ft/s) 1/	Velocities As-Built (ft/s) 2/	Excavation Volume (cu yds)	Type of Work 3/	Existing Channel Type 4/	Present Flow Condition 5/
Canal No. 2-3 (Cont.)	141+65	2.79	1990	16.9			40	4.8	3.0	0.030	0.025	2.16	2.24		II	M	P
			200 7/	16.9			A=1130	14.5	P=580	0.100		0.18					
					0.00012	0.00043								4300			
	143+90 6/	2.79	2200	16.9			28	4.7	2.0						II	M	P
				16.7			28	4.7	2.0								
					0.00017	0.00068								30600			
	160+10	4.28	2580	16.4			40	3.6	3.0	0.030	0.025	2.58	2.94		II	M	P
			210 7/	16.4			A=430	13.6	P=190	0.050		0.48					
					0.00016	0.00065								30300			
	172+45	4.28	3080	16.2			40	2.8	3.0	0.030	0.025	2.89	3.06		II	M	P
			910 7/	16.2			A=2250	13.8	P=1480	0.060		0.40					
					0.00019	0.00068								69200			
	197+40	4.92	3460	15.7			40	1.1	3.0	0.030	0.025	2.82	3.11		II	M	P
			470 7/	15.7			A=1025	13.6	P=540	0.060		0.46					
					0.00017	0.00033								5700			
	200+40	4.92	3900	15.7			38	1.0	2.0								
				14.9			38	1.0	2.0								

1/ Aged Velocities are based on design discharges.
2/ As-built velocities are based on bankfull discharge or the 10-year frequency discharge, whichever is smaller.
3/ I-Establishment of new channel including necessary stabilization measures. II - Enlargement or realignment of existing channel or stream. III-Cleaning out natural or manmade channel (includes bar removal and major clearing and snagging operation). IV-Clearing and Snagging. V-Stabilization as primary purpose (by continuous treatment or localized problem areas present capacity adequate). VI-Grade Control Structure. VII-Rock riprap lined channel. VIII-Selective snagging.
4/ N - Unmodified, well defined natural channel or stream. M - Manmade ditch or previously modified channel. O - None or practically no defined channel.
5/ Pr - Perennial - Flows at all times except during extreme drought.
I - Intermittent - Continuous flow through some seasons of the year but little or no flow through other seasons.
E - Ephemeral - Flows only during periods of surface runoff, otherwise dry.
S - Ponded water with no noticeable flow-caused by lack of outlet or high ground water.
6/ Road Section with headwater and tailwater conditions shown on separate lines.
7/ This line represents the out of bank flow segment at this station.

TABLE 4 - ANNUALIZED ADVERSE NED EFFECTS
Long Beach Watershed, Mississippi
(Dollars) 1/

Evaluation Unit	Amortization of installation cost	Operation and Maintenance cost	TOTAL
Structural Measures	139,700	5,700	145,400
TOTAL	139,700	5,700	145,400

1/ Price Base 1988. Structural measures discounted and annualized for 100 year evaluation period at 8 7/8 percent interest.

May-89

TABLE 5 - ESTIMATED ANNUALIZED FLOOD DAMAGE REDUCTION BENEFITS
Long Beach Watershed, Mississippi
(Dollars) 1/

Item	Est. Annualized Damages		Damage Reduction Benefits
	Without Project	With Project	
Floodwater			
Nonagriculture			
Residential	167,500	2,000	165,500
Commercial	69,500	300	69,200
Road & Bridge			
TOTAL PROJECT	237,000	2,300	234,700 2/

1/ Price base current 1988 urban property values.
2/ When annualized and discounted for a 102 year period of analysis at 8 7/8 percent intrest, benefits are $224,100.

May-89

TABLE 6 - COMPARISON OF BENEFITS AND COSTS
Long Beach Watershed, Mississippi
(Dollars) 1/

Evaluation Unit	Average Annual Benefits 1/				Average Annual Cost 2/	Benefit Cost Ratio
	Damage Reduction					
	Agri.	Res.	Comm.	Total		
Structural Measures	0	160,000	64,100	224,100	145,400	1.5to1.0
TOTAL	0	160,000	64,100	224,100	145,400	1.5to1.0

1/ Price base 1988.
2/ From table 4.

May-89

EFFECTS OF RECOMMENDED PLAN

General Effects

A broad range of economic, environmental, and social factors were considered during the evaluation process. Areas of potential impact were evaluated and an analysis made of those with significant impact to decision making. The area downstream of Espy Avenue was not evaluated for damages or benefits, due to the 100 year tidal surge influence.

Installation of the project practices will have little or no effect on visual quality, or air quality, and no further consideration was given to the impacts of these resources.

There will be no displacement resulting from this project. A description of other project effects follows.

Flood Damage Reduction

Reduced flooding to the urban areas within the floodplains of the canals will benefit the watershed area. The costs or inconveniences of floodwater during periods of heavy rain will be reduced for the people who live and/or work in the floodplain. Flooding of both public and private property (181 homes and 27 businesses from the 1 percent chance occurrence storm) will be reduced. The threat to loss of life will be eliminated.

The number of buildings damaged from the .2 percent chance occurrence storm will be reduced by 186 homes and 28 businesses.

Damages to urban properties will be reduced by $224,100 annually.

Land Resources

The present, future without project, and future with project land use in the watershed are shown in Table E-1. The degree of impact to prime agricultural land for the work proposed in this project is not a significant issue to decision making due to the area being largely urban and the improbability of any of the area being converted to cropland.

TABLE E-1
EFFECTS ON WATERSHED LAND USE

	Present		Future Without Project		Future With Project	
	Acres	Percent	Acres	Percent	Acres	Percent
Grassland	1,036	9	622	6	577	5
Idle Land	948	9	569	5	532	5
Forest Land	5,833	53	3,500	32	3,537	32
Urban and Built-Up Land	2,454	23	5,580	51	5,625	52
Marsh Land	521	5	521	5	521	5
Other Land	65	1	65	1	65	1
TOTAL	10,857	100	10,857	100	10,857	100

Streams

Because of the already poor habitat conditions due to past alteration and low flow conditions during much of the year, the proposed work will have little effect on existing stream habitat. Existing vegetation on streambanks will be removed during construction, however, planted vegetation should establish rapidly due to favorable climate and growing conditions. There will be no significant effect on stream conditions below Menge Avenue where more favorable habitat conditions occur.

Wetlands

Increased channel width and the access along one side of the channel will result in the loss of 36 acres of hardwoods located on wetland sites. To mitigate for this loss, 36 acres of appropriate hardwood species will be planted on hydric soils in the watershed.

Wetlands located in the temporary right-of-way which will be cleared during construction will be replanted to appropriate species of hardwoods. Since the soils in these areas are hydric, it is reasonable to expect that a predominance of hydrophytic herbaceous vegetation will develop as understory vegetation as the planted hardwoods grow. This successional type habitat will provide habitat values equal to existing habitat over the life of the project and will add diversity to the habitat types found in the watershed.

Fish-Aquatic Resources

The value of fisheries habitat in the canals above the area of tidal influence is negligible and the project will have little impact on the existing fisheries resource. In the areas immediately downstream of planned work and in Johnson Bayou and Bayou Portage, there may be a temporary increase in turbidity levels during construction.

In order to minimize potential impacts from increased turbidity, a number of preventive steps will be taken. Sediment traps with a capacity of approximately 1,000 cubic yard will be constructed in channel at the lower ends of each canal to trap sediment during construction. After construction, the accumulated sediment can be removed to allow the sediment

traps to function in the future. This would have the effect of improving water quality with respect to sediment as compared with existing conditions.

Spoil, berm, and channel slopes will be vegetated after every 1,000 ft of construction or weekly as soil moisture conditions allow. This will minimize the exposure time of bare soil to rainfall. By establishing quick vegetative cover quickly, erosion from unprotected spoil and channel slopes will be minimized.

Channel side slopes will be 3:1. These slopes will encourage the growth of aquatic plants such as alligator weed, water primrose and parrot feather. This vegetation will help reduce sediment transport to downstream areas. Channel vegetation control will be by mowing rather than by using herbicides, thus allowing the growth of non-woody species on the side slopes and preventing any adverse impacts related to herbicide use.

Wildlife Habitat

Construction of the 2 channels will result in the temporary loss of 36 acres of pine forest habitat and 61 acres of hardwood forest habitat. These areas will be replanted following construction with appropriate species to reestablish forest habitat. There will be a loss of 21 acres of pine and 36 acres of hardwood habitat in the permanent right-of-way. To mitigate for losses associated with the temporary and permanent right-of-ways, 94 acres of appropriate species will be planted in the watershed.

Other habitat types in the watershed will not be affected by the installation of the project with the exception of 94 acres of grassland or idle land which will be planted to trees to mitigate loss of forest land along the channel.

Increased urbanization will continue to exert pressure on existing habitat. It is projected that urban and built-up land will increase from a present size of 2,454 acres to 5,580 acres. This increase will result in the conversion of grassland, idle land, and forest land. Table E-2 provides a summary of the effects of the project on wildlife habitat values.

Table E-2

WILDLIFE HABITAT EVALUATION (FUTURE WITHOUT AND FUTURE WITH PROJECT)
Long Beach Watershed, Mississippi

Habitat Type	Without Project			With Project			
	HSI 1/	Acres	HU's 2/	HSI	Acres	HU's	Net Change
Forest land							
Hardwood	.470	570	267.9	.470	607	285.3	+17.4
Pine	.486	2,930	1424.0	.486	2,930	1424.0	0
Grassland	.288	622	179.1	.288	577	166.2	-12.9
Idle Land	.465	569	264.6	.465	532	247.4	-17.2
Watershed	.455	4,691 3/	2135.6	.458	4,646 4/	2122.7	-12.7

1/ Habitat Suitability Index, on a scale of 0.0 to 1.0, with 1.0 representing optimum habitat and 0.0 totally unsuitable habitat.

2/ Calculated by multiplying acres by HSI value.

3/ Does not include 5645 acres of urban, built-up, and other land and 521 acres of marshland.

4/ Does not include 5690 acres of urban, built-up, and other land and 521 acres of marshland.

Endangered Species

There will be no effect on any endangered, threatened or proposed species or their critical habitat as a result of this project.

Cultural Resources

The planned works of improvement will not impact any site that is listed in the NRHP or any known site that is considered eligible for inclusion in the NRHP. If any eligible sites are discovered during construction, mitigation (including recovery) will be accomplished in coordination with the SHPO to assure no adverse impact to the resource.

Water Quality

The primary impact to water quality is urban runoff. The proposed project will have little impact on the water quality of the canals. The seven point discharge sites empty into lateral ditches before entering the canal and therefore, the proposed action will have little effect on these sources.

The effect on the downstream water quality of Bayou Portage and Johnson Bayou will be limited because the detention time in the canals will be reduced only slightly. Turbidity levels may temporarily increase during construction and before vegetation is established, however, timing of construction and construction techniques, as described in the Fish-Aquatic Resources Section, will be used to minimize the effects of increased turbidity levels.

Ground Water

Channel excavation will have a minor affect on the near surface water table. As distance from the channel increases, effect on the water table progressively lessens. This minor change in the water table profile will have a negligible impact on ground water reserves.

Resources of Principal National Recognition

The effects of the recommended plan on resources that are recognized by certain federal policies are shown in Table E-3.

Table E-3

EFFECTS OF THE RECOMMENDED PLAN ON
RESOURCES OF PRINCIPAL NATIONAL RECOGNITION

Types of Resources	Principal Sources of National Recognition	Measurement of Effects
Air Quality	Clean Air Act, as amended (42 U.S.C. 1857h-7, et seq.)	No effect.
Areas of Particular Concern Within the Coastal Zone	Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451, et seq.)	No effect.
Endangered and Threatened Species Critical Habitat	Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.)	No endangered, threatened or proposed species or critical habitat present in planning area.
Fish and Wildlife Habitat	Fish and Wildlife Coordination Act (16 U.S.C., Sec. 661, et seq.)	Loss of 12.7 Animal Habitat Units.
Flood Plains	Executive Order 11988, Flood Plain Management	The 100 year floodplain will be reduced from 1,732 acres to 246 acres.
Historic and Cultural Properties	National Historic Preservation Act of 1966, as amended (16 U.S.C., Sec. 470, et seq.)	The planned project will not affect any places listed in or eligible for listing in the National Register of Historic Places.
Prime and Unique Farmland	CEQ Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act. Farmland Protection Policy Act of 1981.	No effect.
Water quality	Clean Water Act of 1977 (33 U.S.C. 1251 et seq.).	After a temporary reduction during construction, water quality will return to pre-construction conditions.
Wetlands	Executive Order 11990, Protection of Wetlands Clean Water Act of 1977. (42 U.S.C. 1857h-7, et seq.).	There will be no net change in wetland acreage.
Wild and scenic rivers	Wild and Scenic Rivers Act as amended (16 U.S.C. 1271 et seq.).	Not present in planning area.

Relationship to Other Plans, Policies, and Controls

Long Beach Watershed lies in both the Southern Mississippi Planning and Development District and the Harrison County Development District. This plan is not in conflict with the objectives, plans, or goals of these districts. The project would complement any future plans on this watershed.

The United States Army Corps of Engineers, Mobile District, has recently completed a feasibility study for a locally constructed channel in Bayou Portage and has recommended that it become an authorized segment of the Federal project for Wolf and Jordan Rivers, Mississippi. That recommendation is now before Congress. Since this channel is beyond the lower limit of the Long Beach Watershed, there should be no interaction.

CONSULTATION AND PUBLIC PARTICIPATION

The local newspaper and TV station have been active in keeping people in the area informed of planning activities on Long Beach Watershed. Below is a listing of major public involvement:

Request for Technical Assistance	February 2, 1984 - Sponsors requested SCS perform surveys and design. They would request the Naval Construction Battalion ("Seabees") to do the work.
Meetings with Sponsors	July 23, 1984 - Discussion on surveys and design.
	January 16, 1986 - The plan was presented to the Sponsors and several landowners. At this meeting the Sponsors requested SCS to study the effects of Turkey Creek overflowing into the Long Beach Canal No. 1. It was agreed that the engineering consulting firm working on the project would do the survey work and SCS would do the hydrology studies.
	June 26, 1986 - Environmental concerns were discussed. Also a review of design adjustments needed to reduce adverse environmental effects were agreed on.
	February 13, 1989 - SCS personnel met with the Sponsors to update them on the status of work and environmental concerns.

Application	March 14, 1985 - Request for federal assistance sent to the Mississippi Soil and Water Conservation Commission.
Scoping Meeting and Field Review	September 3 and 30, 1986 - Conducted field review with U.S. Fish and Wildlife Service; Bureau of Pollution Control, Mississippi Department of Natural Resources; and Bureau of Marine Resources, Mississippi Department of Wildlife Conservation. A representative of EPA made a review of the watershed with maps and data supplied. The Chief Archaeologist from Mississippi Department of Archives and History reviewed maps of the watershed. April 19, 1989 - Conducted field review with U.S. Fish and Wildlife Service to evaluate mitigation plans in the watershed.
Authorization	June 23, 1988 - Planning authorization granted under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566).

Public Meeting	July 17, 1989 - Public Meeting held in the Long Beach Public Library at Long Beach, Mississippi, to present the Draft Plan-EIS for discussion and receive comments. Thirty-three people attended. Comments were received supporting the project, however, there were some concerns over stopping the channel work at Espy Avenue. These concerns were adequately addressed during the course of the meeting.

Agencies from which written comments have been received on the Draft Plan-Environmental Impact Statement are:

U.S. Environmental Protection Agency

U.S. Department of Commerce

U.S. Department of Health and Human Services

State of Mississippi Department of Wildlife, Fisheries and Parks

U.S. Department of the Interior

U.S. Environmental Protection Agency

Comment:

°A member of our regional technical staff participated in the interagency scoping meeting and several site investigations during the beginning of the planning phase to assist in determining the significant issues to be evaluated in the EIS. During this process the interagency team sought an overall project design which would provide a degree of flood control to the subject portion of the watershed consonant with protecting the remaining environmental amenities along the existing canals/floodplain. This early coordination proved to be beneficial since the major structural elements of the preferred alternative closely follow the specific suggestions made by representatives of the resource agencies during this development stage. Further, the unavoidable adverse environmental consequences have been reduced to the minimum level compatible with project objectives. The loss of riparian forested vegetation is the most regrettable aspect attendant to increasing the flow capacity of the canals. Nonetheless, if the mitigation plan to replace these losses by selected planting is scrupulously administered, the trade-off in health and safety benefits to the affected public from increased flood protection is such that we would not oppose the requisite Section 404 permit.

Response:

None required

Comment:

°There remains one aspect associated with this proposal that we find troubling, viz., continued development in the floodplain which could obviate a portion of the benefits which are justifying the expenditure of Federal funds. During the on-site investigations it became apparent that the

original development in the floodplain which engendered the request for flood relief was being augmented by additional building even further down slope. This complicated the design process since additional development had to be recurrently considered by your engineering planning unit. This development is even more perplexing as it is our understanding that Harrison County is a participant in the Federal Emergency Management Agency's program of flood insurance which seeks to avoid just this type of improvident activity. It may be the case that a percentage of this development is being accomplished by use of fill pads to elevate the first floor elevations to an acceptable level. Nonetheless, the impacts of this additional fill on the areal extent of the existing flood plain together with the effects of this alteration on the efficacy of the project design remains an open issue in our minds. From our perspective the sponsors should be tasked to ensure that the flood control benefits resulting from 1.5 million dollars of Federal funds are not lessened throught ill-conceived development in the watershed.

On the basis of our review a rating of EC-2 has been assigned to the proposal. That is, we have a degree of environmental concern regarding certain of the induced/secondary impacts associated with the proposed flood control measures. These concerns center on continued residential/commercial development in the floodplain of the watershed which may be fostered by these measures. This development could reduce the anticipated societal/economic benefits associated with the plan. These benefits were the basis on which EPA justified the habitat losses required to provide increased flood protection. In the absence or reduction of these benefits we would be forced to rethink our lack of significant objections to the

Section 404 permit for canal excavation. We await with interest to learn in the Final EIS how this situation will be addressed by the local sponsor.

Response:

We agree with your concern over development that has taken place in the Long Beach Watershed flood plain. We have discussed this issue with the sponsors of the project. They assured us that they are participating in the Federal Emergency Management Agency's program of flood insurance and will continue to do so.

As agreed by phone with a representative of the Environmental Protection Agency, the following statement is being added to the plan and Environmental Impact Statement, "Before any Federal funds can be spent on the Long Beach Watershed project, the local sponsors must be in full compliance with the Federal flood plain management and flood insurance program."

U.S. Department of Commerce

Comment:

A preliminary review of C&GS records has indicated the presence of both horizontal (H) and vertical (V) geodetic control survey monuments in the proposed project area. Attached are the published horizontal geodetic control data for quadrangles 300883 and 300892 and Horizontal Control Projects G17307 and GPS-084. In addition, a computer generated listing of vertical control stations located in both quadrangles also is attached.

This information should be reviewed for identifying the location and designation of any geodetic control monuments that may be affected by the proposed project. If there are any planned activities which will disturb or

destroy these monuments, C&GS requires not less than 90 days' notification in advance of such activities in order to plan for their relocation.

C&GS recommends that funding for this project includes the cost of any relocation required for C&GS monuments.

Response:

The referenced published data has been reviewed and no geodetic control monuments will be affected by the proposed project.

U.S. Department of Health and Human Services

Comment:

We have reviewed the Watershed Plan and Draft Environmental Impact Statement (DEIS) for "Long Beach Watershed, Mississippi." We are responding on behalf of the U.S. Public Health Service. We have reviewed the document for potential impacts on public safety health. We concur that the proposed 6.7 miles of channel enlargement and 1.7 miles of selective snagging will reduce risks to human life, health, and safety caused by floods in the impact area.

Response:

None required.

Comment:

We did note that the recommended plan will require some clearing and snagging along stream banks. We assume that some snagging will be done on shore and some from water-based equipment. Since these operations are potentially hazardous, some accident reduction measures are needed. We suggest that the Final Environmental Impact Statement (FEIS) include

proposed recommendations to reduce the likelihood of traumatic injuries during these operations.

Response:

Contractors are required to comply with the standards set by the Secretary of Labor in 29 CFR, Part 1926 and 29 CFR, Part 1910, as well as the Soil Conservation Service supplement to OSHA, Parts 1910 and 1926 which outline measures to ensure the safety of workers.

State of Mississippi

Department of Wildlife, Fisheries, and Parks

Comment:

In reviewing the draft Environmental Impact Statement, it appears that all of our concerns have been addressed and we feel the study is comprehensive in its coverage of the flooding problem.

We feel, however, that continued development within this flood plain should be discouraged and that a buffer zone of 50' to either side of the canal should be incorporated into this plan. This buffer zone would serve as an easement to provide filtration of upland run-off and provide a wildlife corridor.

Response:

A component of the mitigation features described in the plan is the planting of selected hardwood species on the temporary right-of-way following construction. This will create a buffer zone, greater than 50 feet wide, along one side of the channel. The opposite side of the channel will be undisturbed. Refer to page 30, Figure No. 1 for a typical channel cross section.

U.S. Department of the Interior

Comment:

The draft environmental statement references, but does not present in detail, the wildlife mitigation plan the Fish and Wildlife Service (FWS) developed jointly with the Soil Conservation Service for the Long Beach project. The mitigation plan includes specific detailed reforestation measures to be used in reestablishing hardwood forests on the temporarily cleared easements. Remaining losses would be compensated by reestablishing 94 acres of hardwood forests on wetland sites not contiguous with the project area. These recommendations were included in the FWS's June 5, 1989, letter to the Soil Conservation Service. We believe that the mitigation plan should be presented in detail as part of the proposed action in the final environmental statement to facilitate review by other agencies and the public.

Response:

A more detailed description of mitigation features has been added to pages 31 and 32 of the plan.

Comment:

The FWS also is concerned over the enforcement of flood zoning ordinances within the project area. It appears that residential structures have recently been built within the floodway zones established by the Federal Emergency Management Agency under the Federal flood insurance program. Without strict enforcement of flood zoning, this project could result in the development of hardwood forests and riparian and forested wetlands for residential purposes. This would both reduce the wildlife resources and reduce or negate the flood reduction benefits associated with the proposed

project. We recommend that effective flood zoning ordinances be developed and incorporated into the project. The existing problems relative to flood plain development in the project area and the project's potential to induce further development should be presented in the final environmental statement to fully assess the project's effect on the environment.

Response:

We agree with your concern over development that has taken place in the Long Beach Watershed flood plain. We have discussed this issue with the sponsors of the project. They assured us that they are participating in the Federal Emergency Management Agency's program of flood insurance and will continue to do so. As part of the compliance requirements for participation, the City of Long Beach has adopted flood zoning ordinances.

In order to stress the need for continued compliance, the following statement is being added to the Plan and Environmental Impact Statement, "Before any Federal funds can be spent on the Long Beach Watershed project, the local sponsors must be in full compliance with the Federal flood plain management and flood insurance program."

List of Preparers and Qualifications

Name	Title	Present Job	Degree	Subject	Title	Years	Professional Qualifications
F. E. Keeter	Staff Leader	12	B.S.	Engr.	Staff Ldr. Engr.	18 14	---
J. W. Ellis	Ag. Economist	16	B.S.	Ag. Econ.	Ag. Economist Soil Consvt.	16 2	---
G. Hearst	C. E. Tech.	25	---	----	C. E. Tech.	28	---
M. J. Hinton	Wildlife Biologist	3	B.S. M.S.	Zoology Wildlife Biology	Biologist Soil Consvt.	9 1	---
M. H. Leach	Soil Consvst.	6	B.S.	Agronomy	Soil Consvst. Distrct Consvt.	9 6	---
L. A. Rowe	Assistant Staff Leader	3	B.S.	Geology	Asst. Staff Ldr. Geologist	3 30	---
Glynda Clardy	Ag. Economist	4	B.S. M.A.	Fisheries Mgt. Ag. Econ.	Ag. Economist	4	---
J. L. Williams	Hydraulic Engr.	5	B.S.	Ind. Engr.	Hydraulic Engr. Civil Engr. Ind. Engr.	5 4 2	
D. C. Peacock	District Consvst.	3	B.S.	General Agriculture	District Consvt. Soil Consvt.	12 3	
W. B. Davidson	C. E. Tech.	4	---	---	C. E. Tech.	27	
M. E. Sullivan	Civil Engr.	2	B.S.	Civil Engr.	Civil Engr. Planning Engr. Ag. Engr. Soil Mech. Engr.	2 2 3 1	Registered Professional Engineer
S. H. Rimes	Engr. Tech.	3	--	---	Engr. Tech. Clerk-Typist	3 3	
S. T. Duffy	Geologist	2	B.S.	Geology	Geologist	2	

Appendix A

Letters of Comment Received

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

JUL 0 5 1989

4PM-EA/GJM

Mr. L.Pete Heard, State Conservationist
Soil Conservation Service, Suite 1321
Federal Building, 100 West Capitol Street
Jackson, Mississippi 39269

Subject: Draft Environmental Impact Statement (DEIS) for the Long Beach Watershed Plan (Harrison County), Mississippi
EPA Log No.: D-SCS-E36165-MS

Dear Mr. Heard:

Under the authority of Section 102(2)(C) of the National Environmental Policy Act and Section 309 of the Clean Air Act, EPA, Region IV has reviewed the subject document and offers the following observations for your use in preparation of the Final EIS:

° A member of our regional technical staff participated in the interagency scoping meeting and several site investigations during the beginning of the planning phase to assist in determining the significant issues to be evaluated in the EIS. During this process the interagency team sought an overall project design which would provide a degree of flood control to the subject portion of the watershed consonant with protecting the remaining environmental amenities along the existing canals/floodplain. This early coordination proved to be beneficial since the major structural elements of the preferred alternative closely follow the specific suggestions made by representatives of the resource agencies during this development stage. Further, the unavoidable adverse environmental consequences have been reduced to the minimum level compatible with project objectives. The loss of riparian forested vegetation is the most regrettable aspect attendant to increasing the flow capacity of the canals. Nonetheless, if the mitigation plan to replace these losses by selected planting is scrupulously administered, the trade-off in health and safety benefits to the affected public from increased flood protection is such that we would not oppose the requisite Section 404 permit.

° There remains one aspect associated with this proposal that we find troubling, viz., continued development in the floodplain which could obviate a portion of the benefits which are justifying the expenditure of Federal funds. During the on-site investigations it became apparent that the original development in the floodplain which engendered the request for flood relief was being augmented by additional building even further down slope. This complicated the design process since additional development had to be recurrently considered by your engineering planning unit. This development is even more perplexing as it is our understanding that Harrison County is a participant in the Federal Emergency Management Agency's program of flood insurance which seeks to avoid just this type

of improvident activity. It may be the case that a percentage of this development is being accomplished by use of fill pads to elevate the first floor elevations to an acceptable level. Nonetheless, the impacts of this additional fill on the areal extent of the existing flood plain together with the effects of this alteration on the efficacy of the project design remains an open issue in our minds. From our perspective the sponsors should be tasked to ensure that the flood control benefits resulting from 1.5 million dollars of Federal funds are not lessened throught ill-conceived development in the watershed.

On the basis of our review a rating of EC-2 has been assigned to the proposal. That is, we have a degree of environmental concern regarding certain of the induced/secondary impacts associated with the proposed flood control measures. These concerns center on continued residential/commercial development in the floodplain of the watershed which may be fostered by these measures. This development could reduce the anticipated societal/economic benefits associated with the plan. These benefits were the basis on which EPA justified the habitat losses required to provide increased flood protection. In the absence or reduction of these benefits we would be forced to rethink our lack of significant objections to the Section 404 permit for canal excavation. We await with interest to learn in the Final EIS how this situation will be addressed by the local sponsor.

If we can be of further assistance in discussing the above matters, feel free to contact Dr. Gerald Miller (404-347-3776) of the Review Staff.

Sincerely,

Heinz J. Mueller, Acting Chief
NEPA Review Staff
Federal Activities Branch

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

Office of the Chief Scientist

July 13, 1989

Mr. L. Pete Heard
U.S. Department of Agriculture
Suite 1321, Federal Building
100 West Capitol Street
Jackson, Mississippi 39269

Dear Mr. Heard:

This is in reference to your Draft Environmental Impact Statement on the Long Beach Watershed, Harrison County, Mississippi.

We hope our comments will assist you. Thank you for giving us an opportunity to review the document.

Sincerely,

David Cottingham

David Cottingham
Director
Ecology and Environmental
Conservation Office

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF CHARTING AND GEODETIC SERVICES
ROCKVILLE, MARYLAND 20852

JUL 5 1989

MEMORANDUM FOR: David Cottingham
Ecology and Environmental Conservation Office
Office of the Chief Scientist

FROM: Rear Admiral Wesley V. Hull, NOAA
Director, Charting and Geodetic Services

SUBJECT: DEIS 8906.05 - Long Beach Watershed,
Harrison County, Mississippi

The subject statement has been reviewed within the areas of Charting and Geodetic Services' (C&GS) responsibility and expertise and in terms of the impact of the proposed actions on C&GS activities and projects.

A preliminary review of C&GS records has indicated the presence of both horizontal (H) and vertical (V) geodetic control survey monuments in the proposed project area. Attached are the published horizontal geodetic control data for quadrangles 300883 and 300892 and Horizontal Control Projects G17307 and GPS-084. In addition, a computer generated listing of vertical control stations located in both quadrangles also is attached.

This information should be reviewed for identifying the location and designation of any geodetic control monuments that may be affected by the proposed project. If there are any planned activities which will disturb or destroy these monuments, C&GS requires not less than 90 days' notification in advance of such activities in order to plan for their relocation.

C&GS recommends that funding for this project includes the cost of any relocation required for C&GS monuments. For further information about these monuments, please contact the National Geodetic Information Branch, N/CG17, Rockwall Bldg., room 20, National Geodetic Survey, NOAA, Rockville, Maryland 20852, telephone 301-443-8631.

Attachments

cc:
N/CG1x29 - Rexrode
N/CG17 - Spencer

JUL 10 1989
RECEIVED
EC

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333

August 3, 1989

L. Pete Heard
State Conservationist
USDA, Soil Conservation Service
Suite 1321 Federal Building
100 West Capitol
Jackson, Mississippi 39269

Dear Sir:

We have reviewed the Watershed Plan and Draft Environmental Impact Statement (DEIS) for "Long Beach Watershed, Mississippi." We are responding on behalf of the U.S. Public Health Service. We have reviewed the document for potential impacts on public safety health. We concur that the proposed 6.7 miles of channel enlargement and 1.7 miles of selective snagging will reduce risks to human life, health, and safety caused by floods in the impact area.

We did note that the recommended plan will require some clearing and snagging along stream banks. We assume that some snagging will be done on shore and some from water-based equipment. Since these operations are potentially hazardous, some accident reduction measures are needed. We suggest that the Final Environmental Impact Statement (FEIS) include proposed recommendations to reduce the likelihood of traumatic injuries during these operations.

Thank you for sending this document for our review. Please insure that we are included on your mailing list for the FEIS for this project as well as further documents which are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

David E. Clapp, Ph.D.,P.E.,CIH
Environmental Health Scientist
Center for Environmental Health
and Injury Control

STATE OF MISSISSIPPI
Department of Wildlife,
Fisheries and Parks
RAY MABUS
Governor

August 11, 1989

Mr. L. Pete Heard
State Conservationist
U.S. Soil Conservation Service
Suite 1321, Federal Building
100 W. Capital St.
Jackson, MS 39269

Dear Mr. Heard:

This letter is written to provide our comments regarding the Long Beach Watershed Plan for Harrison County, Mississippi.

In reviewing the draft Environmental Impact Statement, it appears that all of our concerns have been addressed and we feel the study is comprehensive in its coverage of the flooding problem.

We feel, however, that continued development within this flood plain should be discouraged and that a buffer zone of 50' to either side of the canal should be incorporated into this plan. This buffer zone would serve as an easement to provide filtration of upland run-off and provide a wildlife corridor.

We appreciate the opportunity to provide comments on this project and request that the Soil Conservation Service keep us advised of further development of this plan.

Sincerely,

Philip L. Lewis
Chief, Wetlands Division

PLL:DRH:ph

2620 Beach Boulevard, Biloxi, MS 39531, (601) 385-5860

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
WASHINGTON, D.C. 20240

TAKE PRIDE IN AMERICA

AUG 17 1989

AUG 21 A 9:48

ER 89/520

Mr. L. Pete Heard
State Conservationist
Soil Conservation Service
Suite 1321, Federal Building
100 West Capitol Street
Jackson, Mississippi 39269

Dear Mr. Heard:

We have reviewed the work plan and draft environmental statement for Long Beach Watershed, Harrison County, Mississippi, as requested in your letter of June 9, 1989. Several comments are provided for your consideration.

The draft environmental statement references, but does not present in detail, the wildlife mitigation plan the Fish and Wildlife Service (FWS) developed jointly with the Soil Conservation Service for the Long Beach project. The mitigation plan includes specific detailed reforestation measures to be used in reestablishing hardwood forests on the temporarily cleared easements. Remaining losses would be compensated by reestablishing 94 acres of hardwood forests on wetland sites not contiguous with the project area. These recommendations were included in the FWS's June 5, 1989, letter to the Soil Conservation Service. We believe that the mitigation plan should be presented in detail as part of the proposed action in the final environmental statement to facilitate review by other agencies and the public.

The FWS also is concerned over the enforcement of flood zoning ordinances within the project area. It appears that residential structures have recently been built within the floodway zones established by the Federal Emergency Management Agency under the Federal flood insurance program. Without strict enforcement of flood zoning, this project could result in the development of hardwood forests and riparian and forested wetlands for residential purposes. This would both reduce the wildlife resources and reduce or negate the flood reduction benefits associated with the proposed project. We recommend that effective flood zoning ordinances be developed and incorporated into

the project. The existing problems relative to floodplain development in the project area and the project's potential to induce further development should be presented in the final environmental statement to fully assess the project's effect on the environment.

Thank you for the opportunity to comment on this proposal.

Sincerely,

Jonathan P. Deason
Director

Appendix B

Urban Floodplain Maps

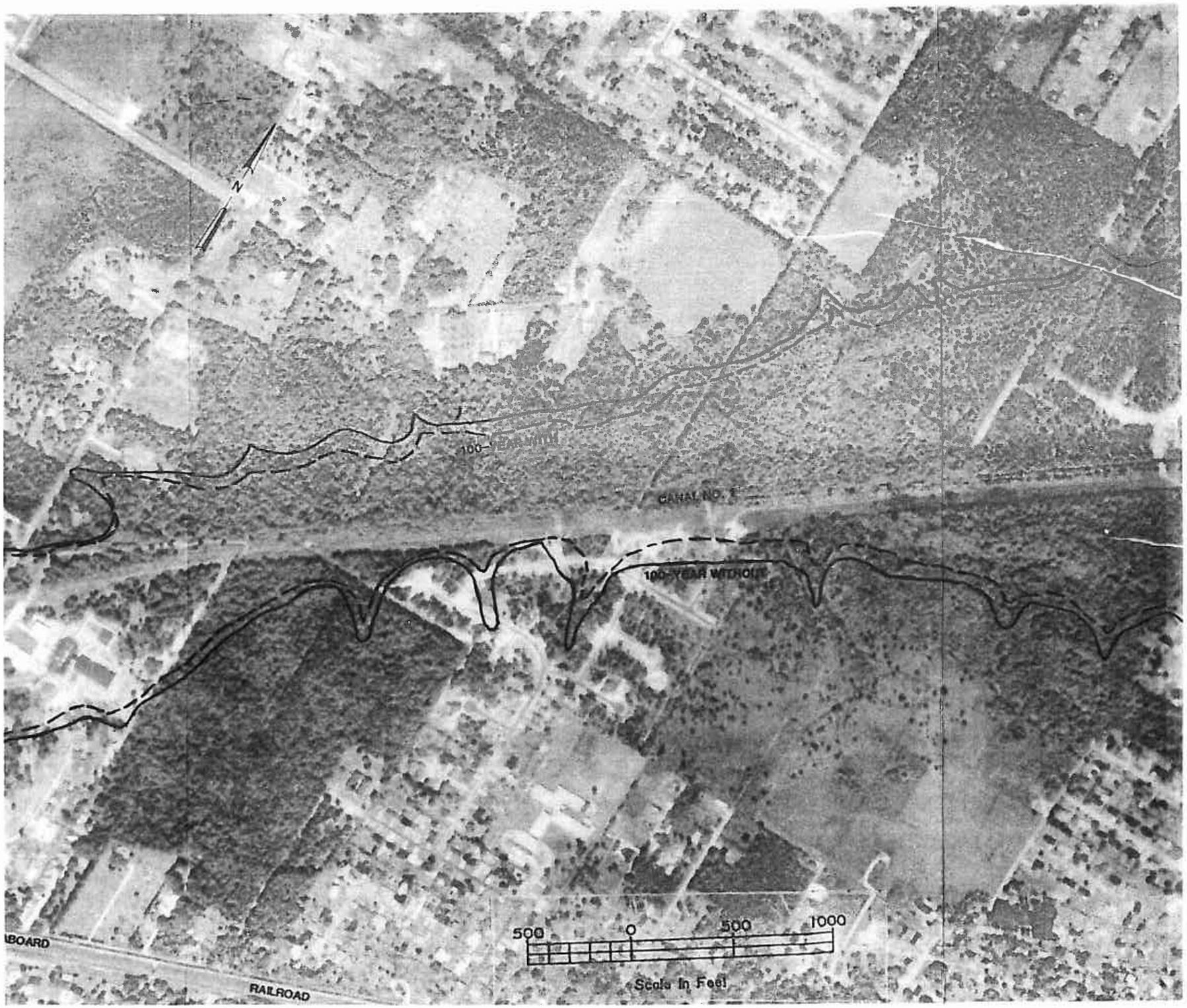
URBAN FLOOD PLAIN
100-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

100-YEAR FLOOD WITHOUT PROJECT
100-YEAR FLOOD WITH PROJECT

APRIL 1989



URBAN FLOOD PLAIN
100-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

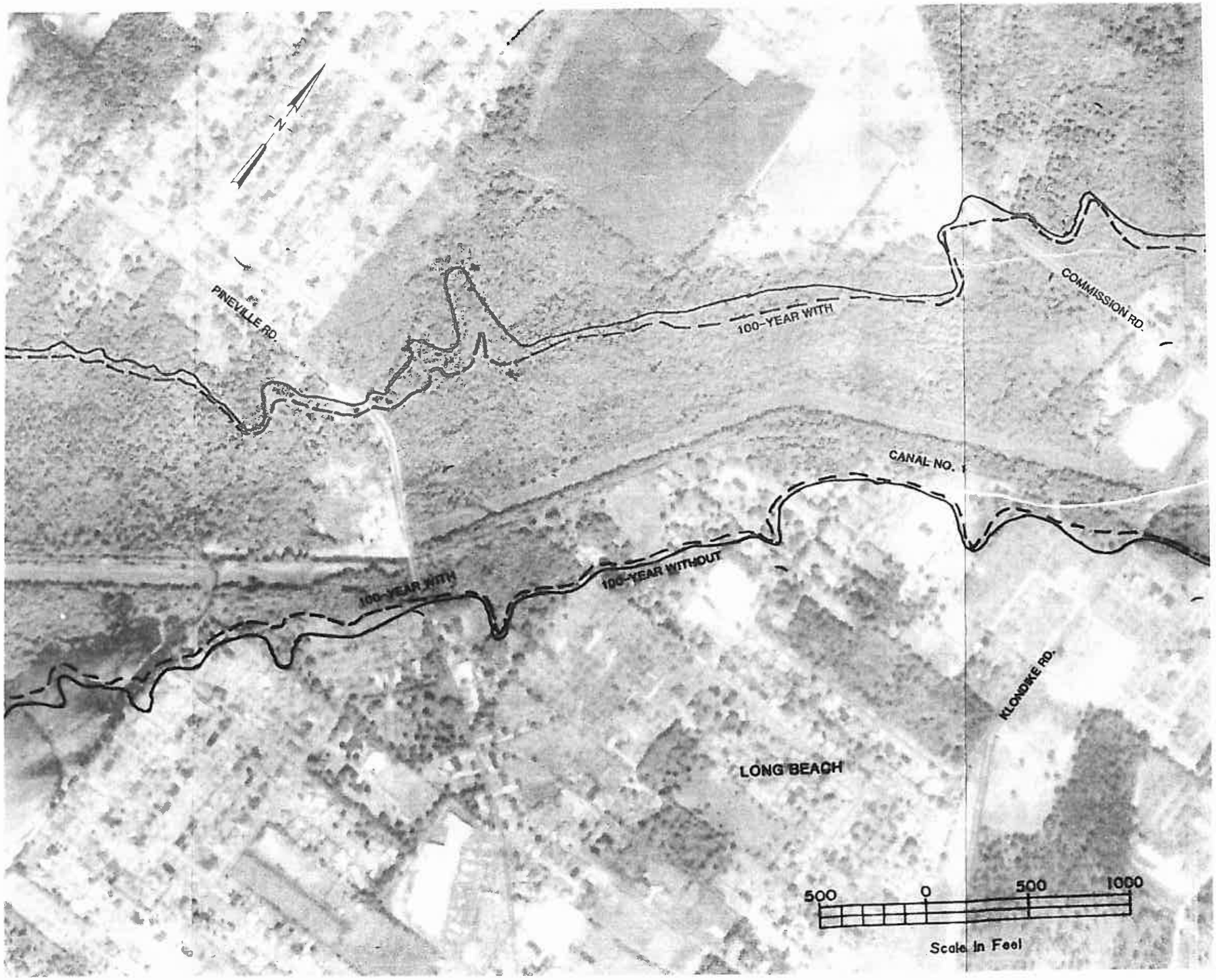
LEGEND

———— 100-YEAR FLOOD WITHOUT PROJECT
— — — — 100-YEAR FLOOD WITH PROJECT

APRIL 1989

URBAN FLOOD PLAIN
100-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI



LEGEND

100-YEAR FLOOD WITHOUT PROJECT
100-YEAR FLOOD WITH PROJECT

APRIL 1989

URBAN FLOOD PLAIN
100-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

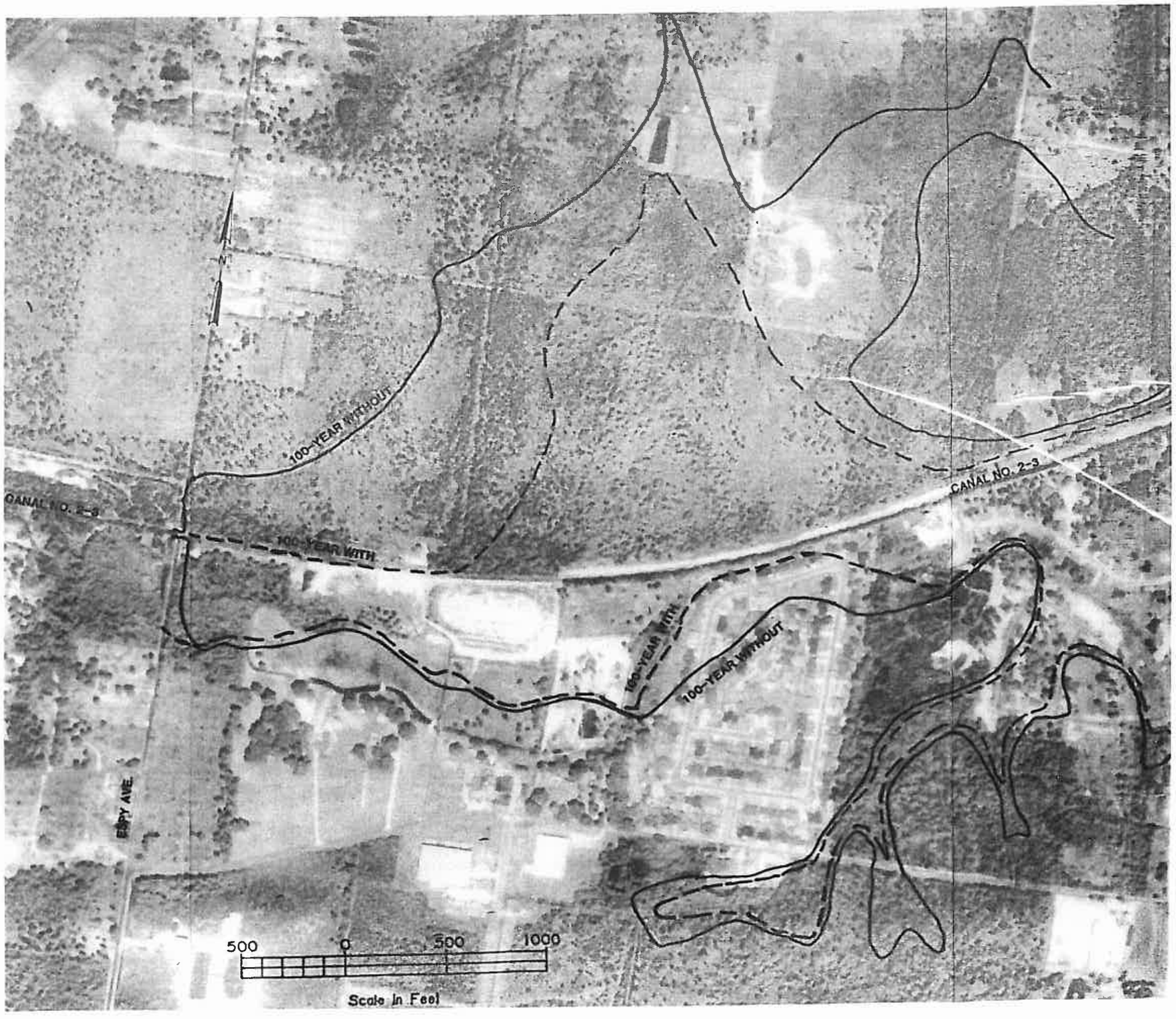
LEGEND

——————— 100-YEAR FLOOD WITHOUT PROJECT
— — — — 100-YEAR FLOOD WITH PROJECT

APRIL 1989

URBAN FLOOD PLAIN
100-YEAR FLOOD

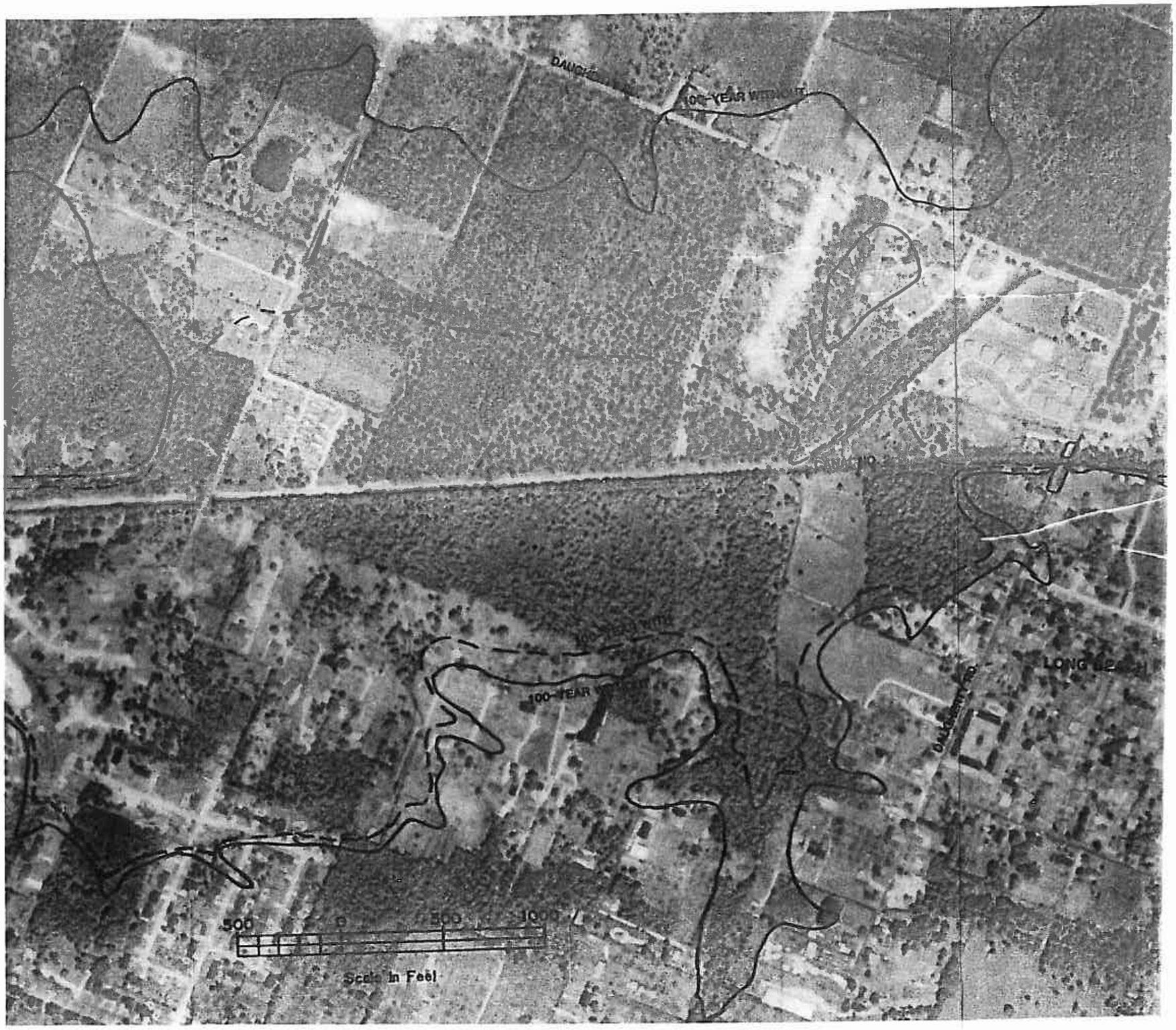
LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI



LEGEND

100-YEAR FLOOD WITHOUT PROJECT
100-YEAR FLOOD WITH PROJECT

APRIL 1989



URBAN FLOOD PLAIN
100-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

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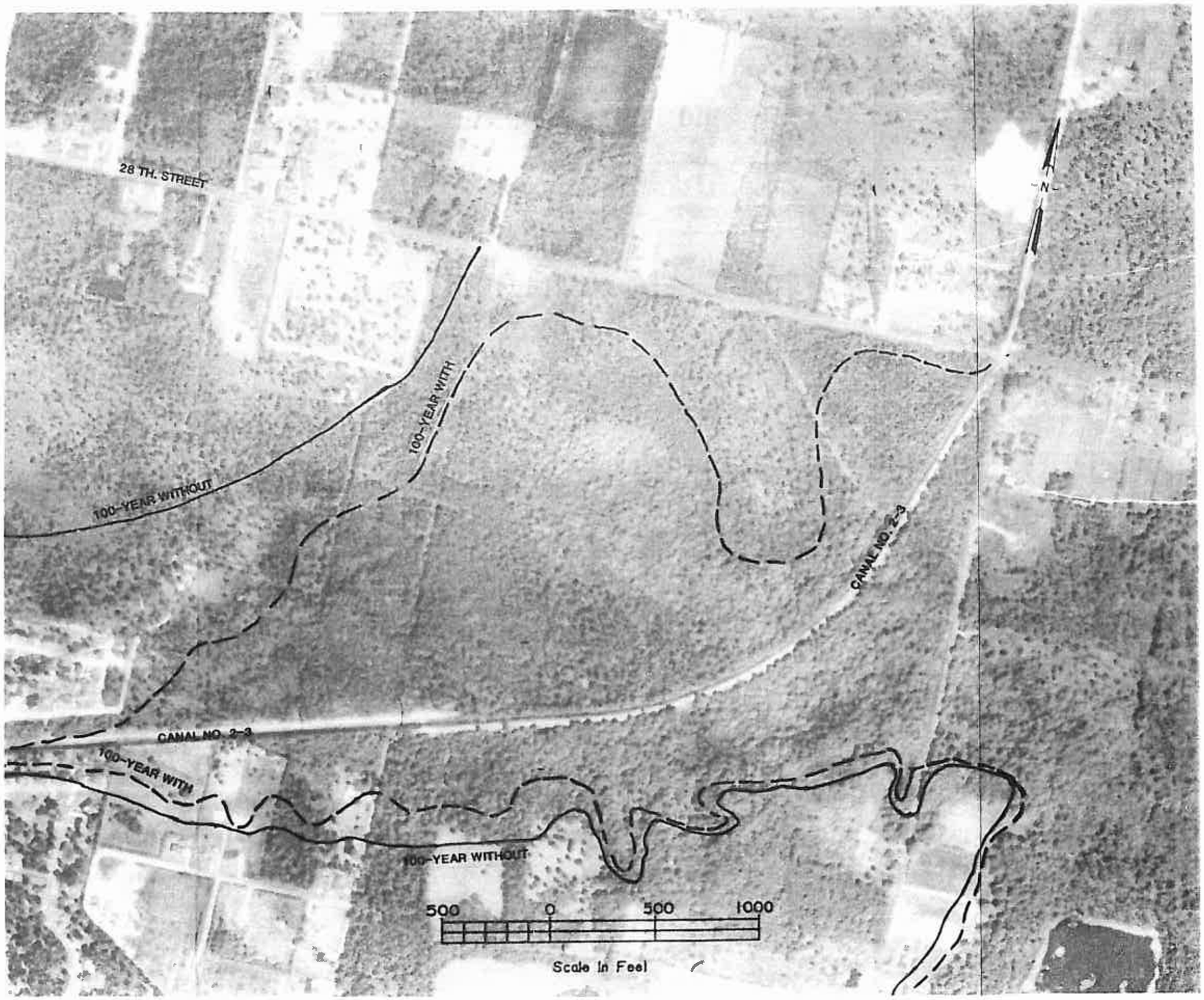

URBAN FLOOD PLAIN
100-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

100-YEAR FLOOD WITHOUT PROJECT
100-YEAR FLOOD WITH PROJECT

APRIL 1989

URBAN FLOOD PLAIN
500-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

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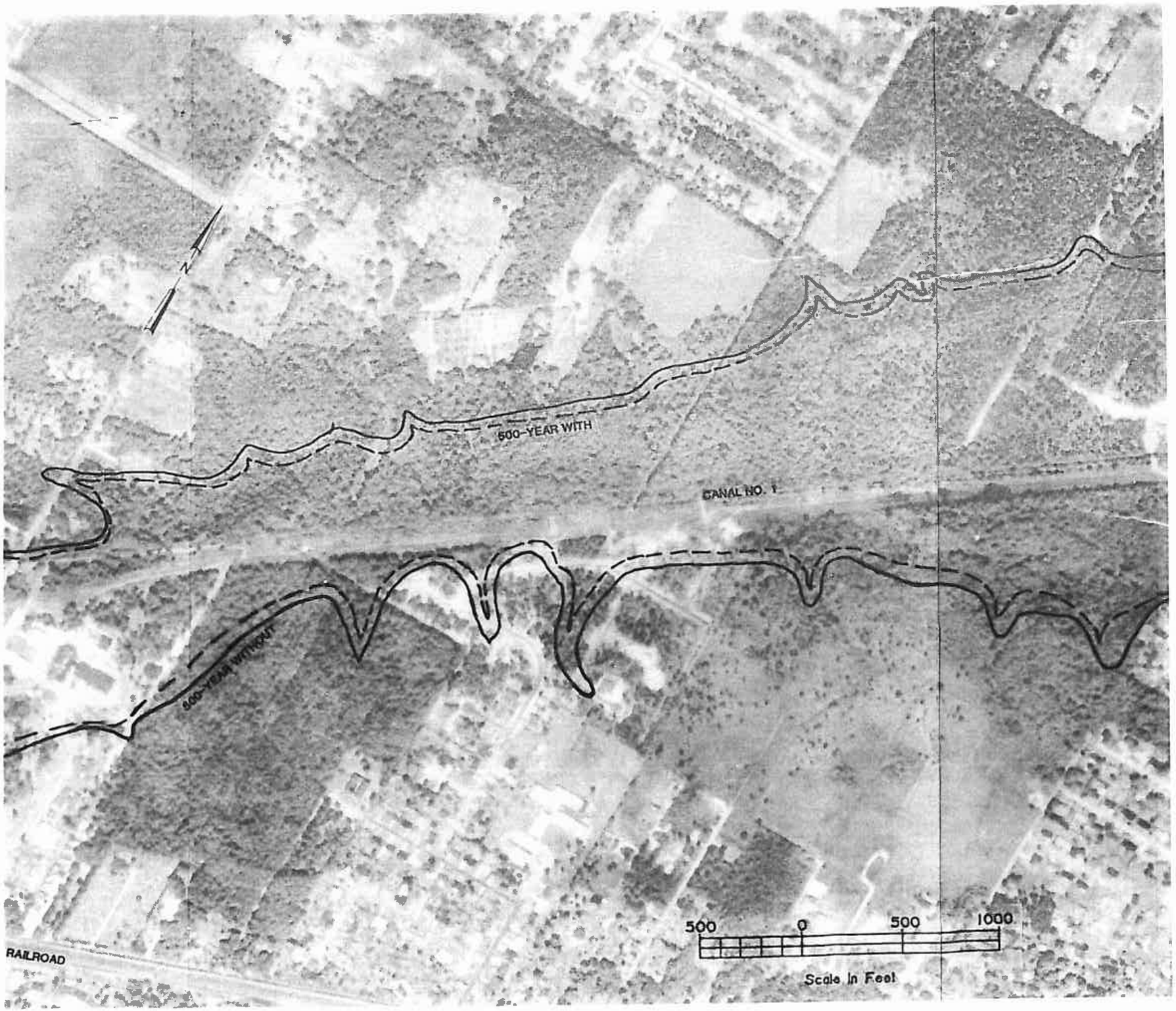
APRIL 1989



URBAN FLOOD PLAIN
500-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

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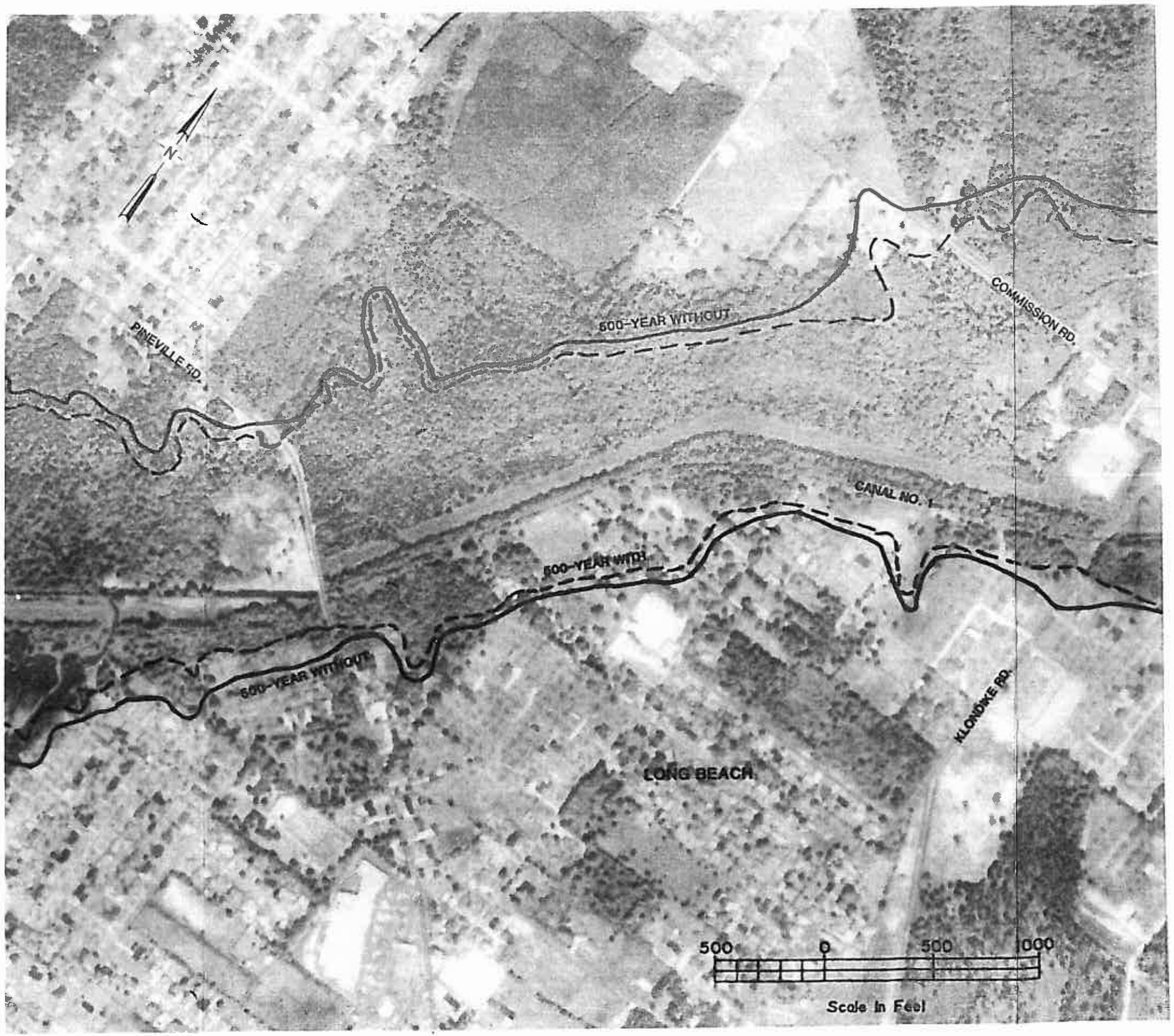


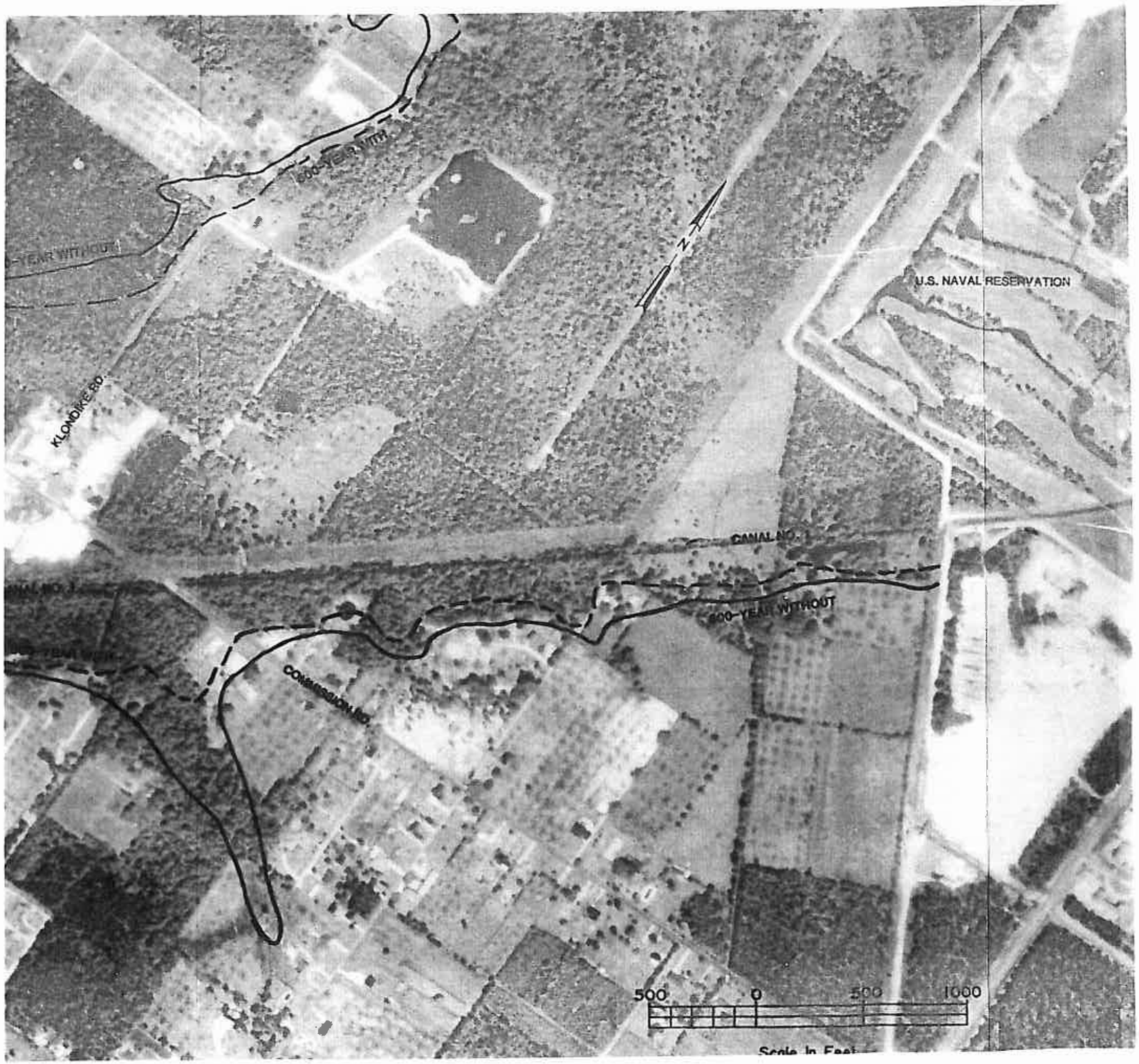
URBAN FLOOD PLAIN
500-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

500 YEAR FLOOD WITHOUT PROJECT
500-YEAR FLOOD WITH PROJECT

APRIL 1989



URBAN FLOOD PLAIN
500-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

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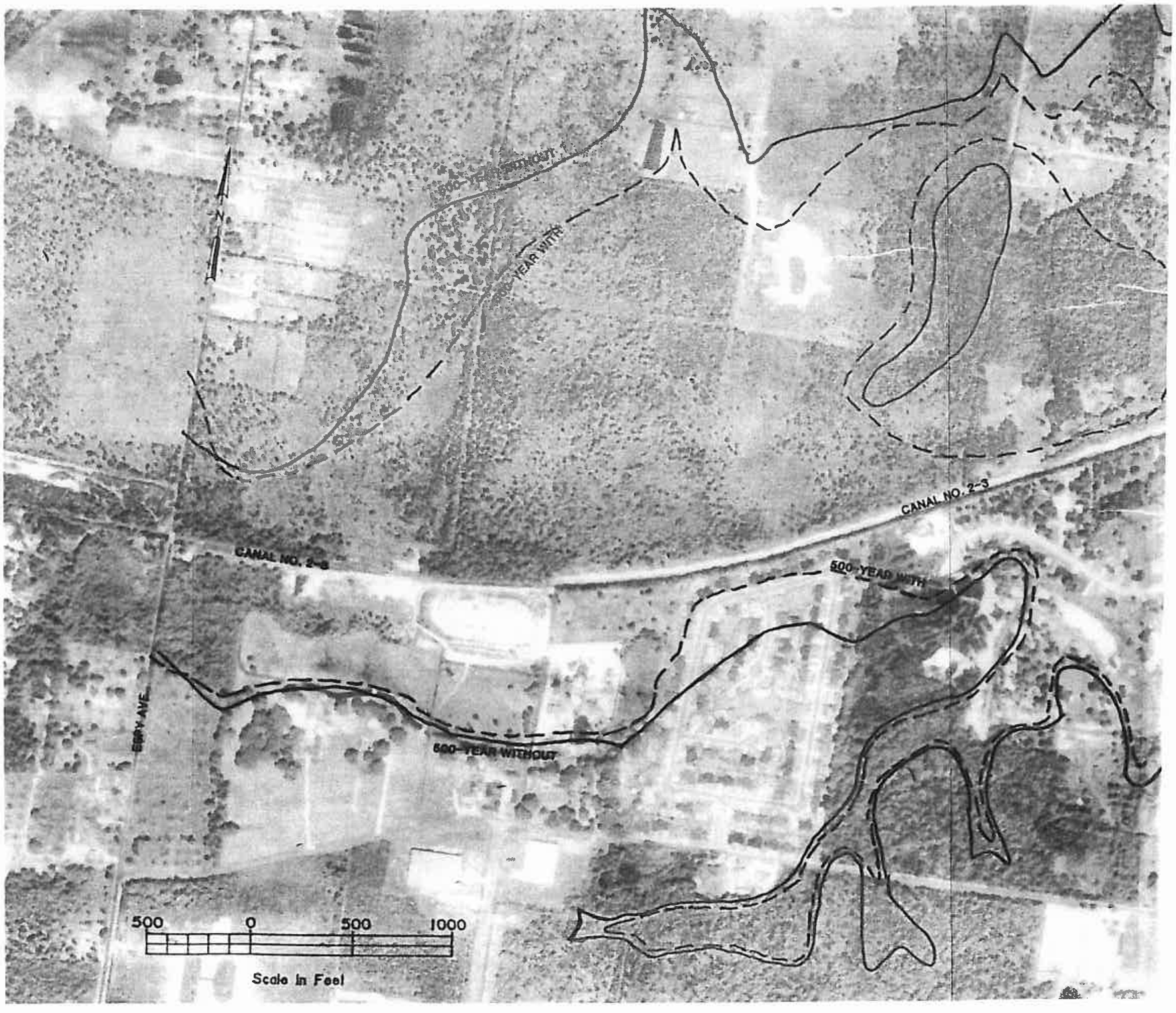

URBAN FLOOD PLAIN
500-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

500-YEAR FLOOD WITHOUT PROJECT
500-YEAR FLOOD WITH PROJECT

SHEET 5 OF 7

APRIL 1989

URBAN FLOOD PLAIN
500-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

——— 500-YEAR FLOOD WITHOUT PROJECT
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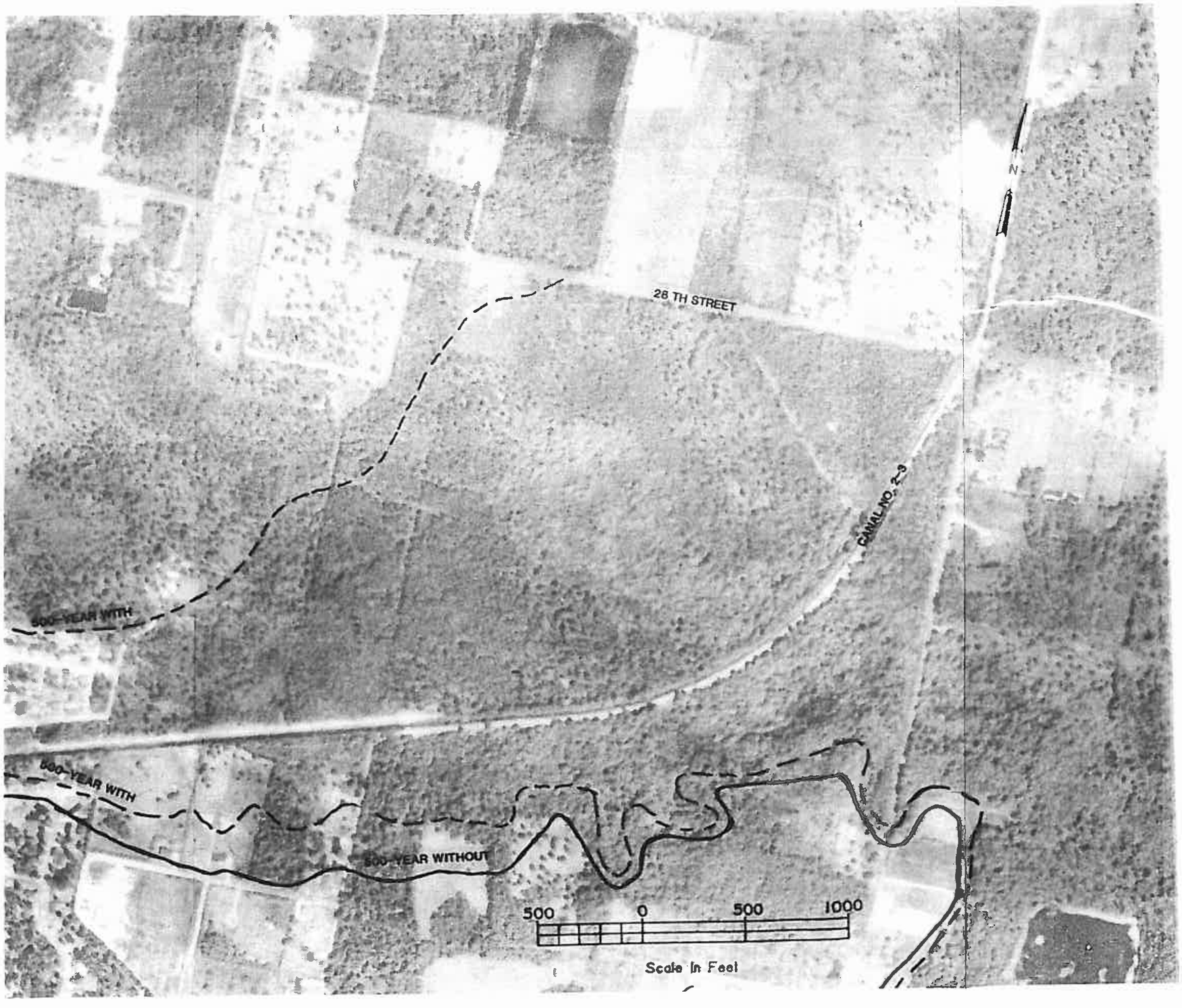
APRIL 1989



URBAN FLOOD PLAIN
500-YEAR FLOOD

LONG BEACH WATERSHED
HARRISON COUNTY
MISSISSIPPI

LEGEND

500-YEAR FLOOD WITHOUT PROJECT
500-YEAR FLOOD WITH PROJECT

SHEET 7 OF 7

APRIL 1989

SOIL CONSERVATION SERVICE

VICINITY MAP

LEGEND

- WATERSHED BOUNDARY
- CITY LIMITS
- TOWN
- PRIMARY ROAD
- RAILROAD
- DRAINAGE
- CANAL
- LAKE
- LEVEE
- POWER LINE
- CEMETERY
- CHANNEL ENLARGEMENT
- SELECTIVE SNAGGING
- DROP STRUCTURE
- AREA BENEFITED

PROJECT MAP

LONG BEACH WATERSHED

HARRISON COUNTY
MISSISSIPPI

0 ¼ ½ ¾ 1
MILE

0 ¼ ½ ¾ 1
KILOMETER

MAY 1989 1003607-01

Appendix C

Investigation and Analysis Report

PROJECT FORMULATION

Project formulation began by inventorying existing resources in the watershed and scoping problems and opportunities. The primary concerns of the Sponsors and local people were flood damages to residences and businesses. Lakes, wetlands, prime agricultural land, cultural resources, and threatened and endangered species are all resources of national concern.

The project was formulated with the cooperation of the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, Mississippi Bureau of Pollution Control, Sponsors, and other groups and individuals.

All alternatives were evaluated for farmland protection in accordance with the Farmland Protection Act (PL 97-98).

COST ALLOCATION

The channel work for Long Beach is entirely for the purpose of flood prevention and is allocated 100 percent to flood prevention.

The cost-sharing rates used for this project are as follows for each cost account.

Cost Account	PL-566 Funds	Local Funds
Construction	100%	0%
Engineering Services	100%	0%
Project Administration 1/	--	--
Land Rights	0%	100%

1/ PL-566 and local project administration costs will be paid as they are incurred.

Structural Measures

Channel modifications are planned for Canal No. 1 and Canal No. 2-3 to reduce urban flooding. There are 27 commercial buildings and 181 residential buildings located in the floodplain of the watershed that would receive damages from the 100-year frequency storm event under existing conditions. However, a significant reduction in damages will occur as a result of the channel work planned for Canal No. 1 and Canal No. 2-3. Once these structural measures are installed, the flooding of first floor elevations from the 100-year frequency storm event would occur on only 4 residential buildings, and there would be no threat to loss of life.

Channel Enlargement: The 4.0 miles of channel enlargement planned for Canal No. 1 consist of 3.8 miles of earth-lined channel and 0.2 mile of rock riprap lined channel. The earth-lined reaches will have 3 to 1 side slopes due to the sandy (SM's) bank materials, and bottom widths will range from 30 to 40 feet. An aged roughness coefficient of 0.030 was used in Manning's Equation to design the channel segments for the following reasons:

1. The flat side slopes should be well maintained in an urban environment.
2. The geometry of the planned channel sections is hydraulically efficient (hydraulic radius greater than 5.0).

The rock riprap lined reach is planned due to limited right-of-way widths. Bottom widths range from 20 to 30 feet, side slopes range from 1.5:1 to 2:1, and roughness coefficients range from 0.030 (grouted) to 0.035.

The 2.7 miles of channel enlargement planned for Canal No. 2-3 consist entirely of earth-lined channel. The earth-lined reaches will have 3 to 1

side slopes, due to the sandy bank materials, and bottom widths will range from 18 to 40 feet. The planned channel segments will be hydraulically efficient and the side slopes of the channel will be vegetated and well maintained; therefore, a roughness coefficient of 0.030 was used in Manning's Equation to design the channel segments.

Since a significant portion of the total discharge of the 100-year storm event occurs "out-of-bank," the KD tables provided in the WSP2 computer program (TR-61) were utilized to estimate out-of-bank flows. Then Manning's Equation was used to size the channel to carry the remaining discharge.

Channel stability was evaluated using the Tractive Stress approach outlined in TR-25 in accordance with NCHP Standard 582 (Open Channel). For aged conditions, bankfull discharge was compared to design discharge and the larger discharge was used to check stability. For as-built conditions, bankfull discharge was compared to the 10-year frequency discharge, and the smaller discharge was utilized to check stability.

At the upstream end of the Canal No. 1, (station 46+27) a full-flow open drop structure is planned to lower the channel bottom approximately 3 feet in order to transition from the existing channel bottom (upstream of channel work) to the constructed channel bottom. The rock riprap structure was designed using procedures outlined in the proceedings of the conference "Applying Research to Hydraulic Practice," Jackson, Mississippi, 1982. "The Design and Construction of Low Drop Structures" by Little and Daniel was utilized to plan a structure in accordance with NCHP Standard 410 (Grade Stabilization Structure).

A profile of each canal is provided in Figure 1 and Figure 2. Water surface elevations for the existing and planned conditions are shown for the 100-year frequency storm event.

FIGURE C-1

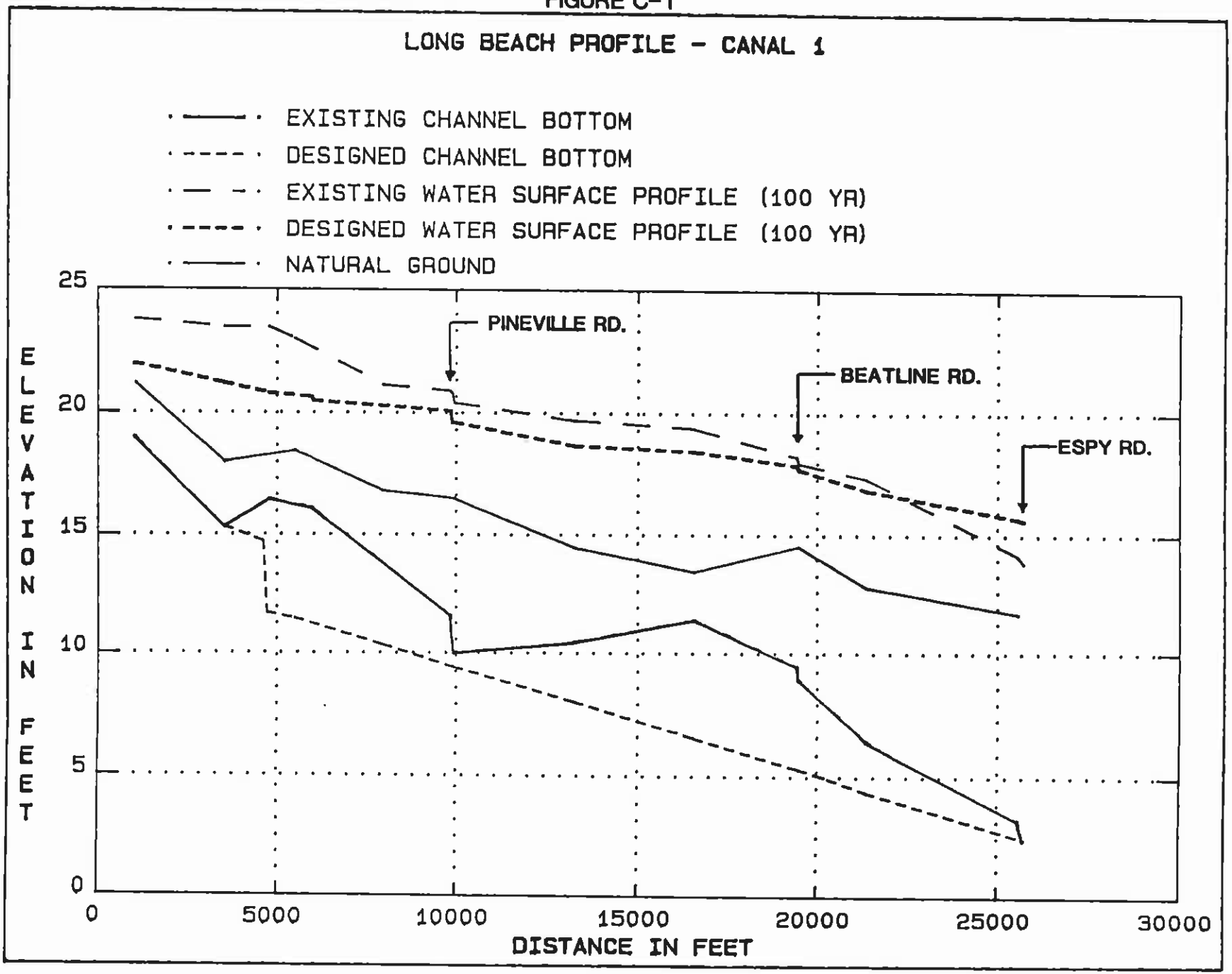
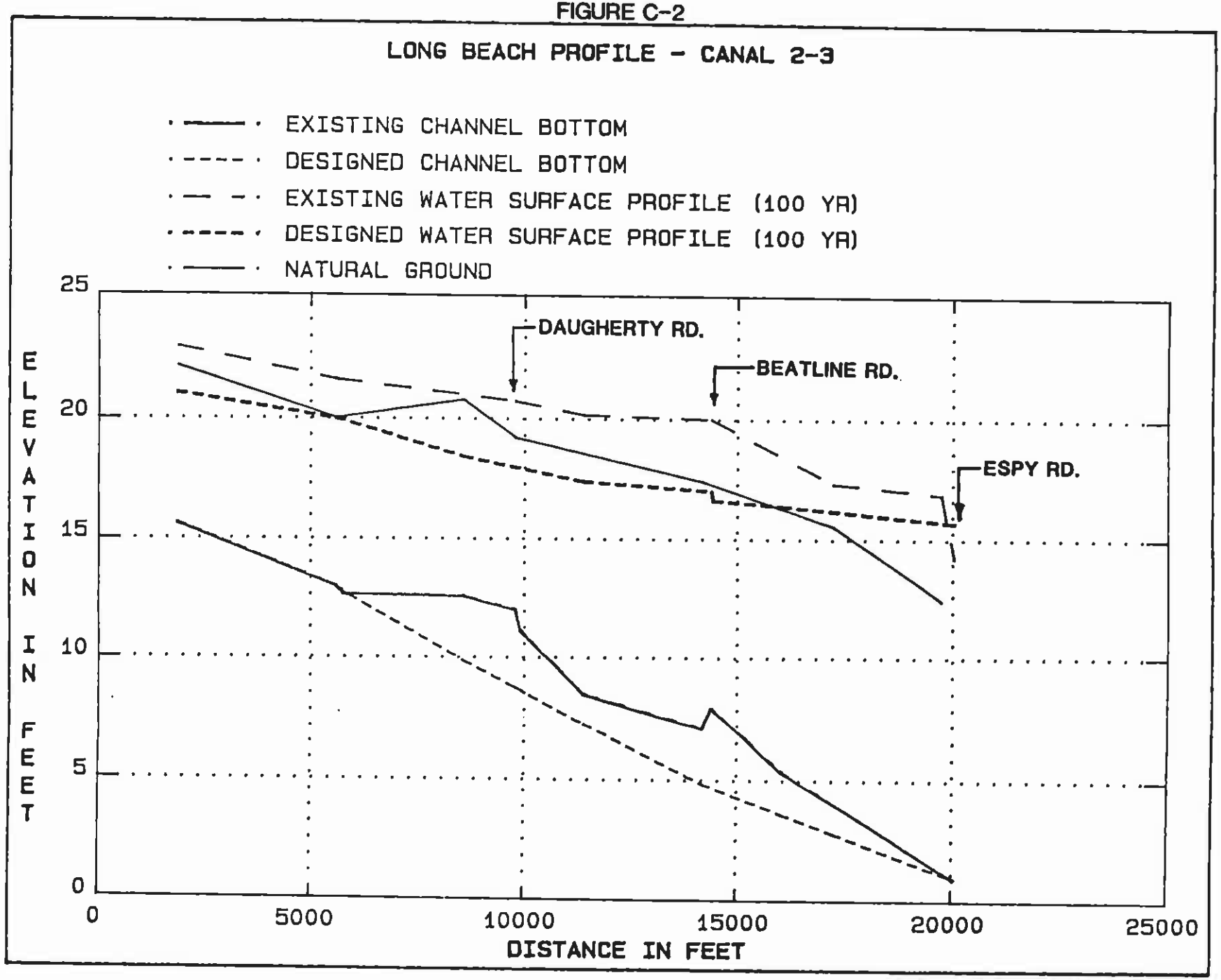

LONG BEACH PROFILE - CANAL 1
EXISTING CHANNEL BOTTOM
DESIGNED CHANNEL BOTTOM
EXISTING WATER SURFACE PROFILE (100 YR)
DESIGNED WATER SURFACE PROFILE (100 YR)
NATURAL GROUND
PINEVILLE RD.
BEATLINE RD.
ESPY RD.
ELEVATION IN FEET
25
20
15
10
5
0
0
5000
10000
15000
20000
25000
30000
DISTANCE IN FEET

FIGURE C-2


LONG BEACH PROFILE - CANAL 2-3
EXISTING CHANNEL BOTTOM
DESIGNED CHANNEL BOTTOM
EXISTING WATER SURFACE PROFILE (100 YR)
DESIGNED WATER SURFACE PROFILE (100 YR)
NATURAL GROUND
DAUGHERTY RD.
BEATLINE RD.
ESPY RD.
ELEVATION IN FEET
25
20
15
10
5
0
0
5000
10000
15000
20000
25000
DISTANCE IN FEET

Selective Snagging: Selective snagging is planned for the upstream reaches of both canals. There will be 0.7 and 0.9 miles of selective snagging performed on Canal No. 1 and Canal No. 2-3, respectively. In general, no stream work, including bank clearing or removal of materials should be allowed except at specific locations where significant blockages occur. Snag removal should be accomplished with the minimum clearing possible to provide access to the streams.

I. Materials to be Removed from the Channel

A. Log Jams - Only those log accumulations that are obstructing flows or diverting flows into the bank should be removed.

B. Other Logs

1. Affixed Logs - Isolated or single logs will not be disturbed if they are embedded, jammed, rotted, or waterlogged in the channel or in the floodplain, are not subject to displacement by current, and are not presently blocking flows. Generally, embedded logs that are parallel to the channel are not considered to cause blockage problems and will not be removed. Affixed logs that are crossways to the flow of waters in the channel and are trapping debris to the extent that could result in significant flooding or sedimentation may be removed.

2. Free Logs - All logs that are not rooted, embedded, jammed, or sufficiently waterlogged to resist movement by river currents may be removed from the channel.

C. Rooted Trees - No live, rooted trees should be cut unless:

1. They are leaning over the channel at an angle greater than 30 percent from vertical.
2. They have severely undercut or damaged root systems and are in danger of falling into the channel.
3. They are relying upon adjacent vegetation for support and it appears that they will fall into the channel and create a blockage to flows.

II. Work Procedures and Equipment to be Used

A. Log Removal - First consideration will be given to the use of hand operated equipment to remove log accumulations. When the use of hand operated equipment is not feasible, vehicled equipment may be used under the following restrictions and guidelines.

1. Water-based equipment (e.g., a crane or winch mounted on a small, shallow draft barge or other vessel) should be used for removing material from the streams.
2. When it can be demonstrated that stream conditions are inadequate for the use of water-based equipment, the smallest feasible equipment without tracking systems that minimize ground disturbance will be specified for use.
3. Access routes for equipment should be selected to minimize disturbance to existing floodplain vegetation, particularly in the riparian zone. Equipment should be selected which will require little or no tree removal to maneuver in forested areas.

B. Rooted Trees - Whether dead or alive, rooted trees selected for removal shall be cut well above the base, leaving the stump and roots undisturbed. Procedures for removing the felled portion will be the same as for other logs.

C. Log Disposal - General - All logs or trees designated for removal from the stream or floodway shall be removed or secured in such a manner as to preclude their reentry into the channel by floodwaters. Generally, they will be transported well away from the channel and positioned parallel to the stream channel so as to reduce flood flow impediment.

III. Reclamation Measures

All disturbed areas should be reseeded or replanted with plant species which will stabilize soils and benefit wildlife. Revegetation should be in accordance with recommendations of the Staff Biologist within agronomic, hydrologic, and maintenance constraints.

Non-structural Measure Plan

This alternative consists of a combination of the following non-structural measures: floodplain regulation, floodplain purchase including relocation and moving, flood warning, and flood proofing.

Floodplain Regulation: Local government regulations have been adopted restricting development in the floodplain. If there is a necessity to build in the floodplain, the structure should be built according to codes established by government agencies, and should not cause any significant changes in flood depths. Floodplain regulation would be effective in preventing damages to future development.

Flood Warning Techniques: Flood warning techniques could be developed by Long Beach and Pass Christian to alert occupants of potential flood situations. This would be accomplished by radio and television broadcasts and fire station alert signals. These techniques would not prevent

flooding, but could save lives and reduce damages by giving occupants time for taking precautions.

Floodplain Purchase and Relocation: Due to the depth of flooding and/or the type of structure, four commercial buildings would need to be relocated and ten residential buildings would need to be moved.

The four commercial buildings needing to be relocated would be purchased and the adjoining property would be used for wildlife areas. Comparable buildings would be constructed above the 100-year water surface elevation in order to provide adequate facilities for an acceptable relocation.

The ten residential buildings needing to be moved are all mobile homes. The flood plain land where these mobile homes are located would be purchased and used as wildlife areas. The same area would be purchased to provide new sites for the mobile homes.

Flood Proofing Techniques: Flood proofing a structure can be accomplished by elevating the building, constructing a floodwall or flooddike around the building, or closure of openings by waterproof masonry, plastic, and floodshields. Combinations of methods may be required and the degree of protection varies with the technique used.

Elevating can be accomplished using brick or block pillars or pouring a new foundation. Elevating is a fast and efficient method of flood proofing. Depending on the method chosen, the structural strength will vary greatly, with a completely enclosed lower area being the most sound. Elevating a building will assure the occupants of being free from water damage caused

by the 100-year frequency storm. If the building is elevated to a sufficient height, the lower area may be converted into a garage or storage area, but is not recommended as a living area. There are 5 residential buildings and 2 commercial buildings that would need to be elevated.

Floodwalls may be used around buildings where it is not necessary to get a vehicle into or out of the building. If required, a ramp may be constructed over the floodwall, or an opening left in the wall. Fourteen residential and 14 commercial buildings could be treated by use of floodwalls.

Closure of openings is possible on all brick, block, and poured concrete buildings; however, application to wood structures is limited to those in excellent condition. The purpose of this method is to eliminate unnecessary openings, and it can be used in conjunction with other flood proofing measures. Closures of openings can either be permanent with brick, block or concrete, or temporary with pressure shields. One hundred forty-eight residential and 4 commercial buildings could be treated by closure of openings.

Expected Environmental Impacts: All adverse environmental impacts associated with construction of channels would be foregone by implementing this alternative.

If this alternative would be installed, a gradual improvement would occur in biological productivity and water quality because of structural removal, and subsequent reduction in domestic pollution. Floodplain regulations would curtail development in floodplain areas subject to inundation by the 100-year frequency flood. The relocation of four commercial buildings and

the moving of ten residential buildings from the flood plain would create a social adjustment for residents. Neighborhood associations and past life styles would be lost.

Since existing wildlife habitat would be lost due to relocations, the gain of wildlife habitat in the flood plain would not result in a net gain of wildlife habitat. It can be expected that the quality of wildlife habitat gained in the flood plain would not be significantly greater than that lost in relocation areas, especially since it would be located in an urban setting. Therefore, the overall environmental benefits would be those associated with improved water quality.

Estimated Costs: This alternative is estimated to cost $3,567,300 with an annual operation and maintenance cost of $13,300. The installation cost includes $144,400 for floodplain purchase and relocation; and $3,422,900 for flood proofing. Approximately $2,675,500 of this cost would be borne by PL-566 funds and the remaining expenses ($891,800 installation cost plus $13,300 annual operation and maintenance costs) would be borne by local units of government and individual landowners.

Summary: There are 177 residential and 24 commercial buildings subject to damage by the 100-year storm under existing conditions. All 201 buildings could be treated with some type of non-structural measure. Table C-1 is a summary of planned measures.

TABLE C-1

LONG BEACH WATERSHED

NON-STRUCTURAL PLAN

Type of Building	No. of Buildings	Type of Treatment 1/	Installation Cost	Annual O&M Cost
Commercial	14	FW	$ 284,600	$ 1,300
Commercial	4	COO	77,500	300
Commercial	2	EB	28,200	---
Commercial	4	REL	92,400	---
Residential	14	FW	265,700	1,300
Residential	148	COO	2,682,500	10,400
Residential	5	EB	84,400	---
Residential	10	MOV	52,000	---
TOTAL	201		$3,567,300	$13,300

1/ (COO) - Closure of Openings; (MOV) - Move Building; (REL) - Relocate People and Contents to New Building: (EB) - Elevate Building: (FW)- Floodwalls

BIOLOGY

Early in the planning process, the U.S. Fish and Wildlife Service, EPA, Mississippi Department of Wildlife Resources and the Mississippi Bureau of Pollution Control were consulted regarding environmental issues. As a result of the consultation, agreement was reached on several points. These agreements were used as a basis for determining the extent and intensity of environmental investigations.

Due to the fact that both Canals No. 1 and No. 2-3 exhibit no or low flows upstream of the area of tidal influence during much of the year and that the existing fisheries resource is extremely limited, it was decided that no survey of fish populations was needed.

Two evaluation procedures were used to determine the quality of existing wildlife habitat. The Wildlife Habitat Appraisal Guide, developed by SCS and the Missouri Department of Wildlife Conservation, was used for grassland and idle land. The Habitat Evaluation Procedure (HEP), developed by the U.S. Fish and Wildlife Service, was chosen for the forest land habitat because most impacts were expected in this habitat type and the more intensive system was felt most appropriate.

Wildlife habitat quality was determined based on projections of land use and other changes for future with and future without project conditions.

Wetland habitat was quantified by conducting field surveys and using aerial photography. U.S. Fish and Wildlife Service Circular 39 criteria was used.

Early in the planning process, the U.S. Fish and Wildlife Service, EPA, Mississippi Department of Wildlife Resources and the Mississippi Bureau of Pollution Control were consulted regarding environmental issues. As a result of the consultation, agreement was reached on several points. These agreements were used as a basis for determining the extent and intensity of environmental investigations.

Due to the fact that both Canals No. 1 and No. 2-3 exhibit no or low flows upstream of the area of tidal influence during much of the year and that the existing fisheries resource is extremely limited, it was decided that no survey of fish populations was needed.

Two evaluation procedures were used to determine the quality of existing wildlife habitat. The Wildlife Habitat Appraisal Guide, developed by SCS and the Missouri Department of Wildlife Conservation, was used for grassland and idle land. The Habitat Evaluation Procedure (HEP), developed by the U.S. Fish and Wildlife Service, was chosen for the forest land habitat because most impacts were expected in this habitat type and the more intensive system was felt most appropriate.

Wildlife habitat quality was determined based on projections of land use and other changes for future with and future without project conditions.

Wetland habitat was quantified by conducting field surveys and using aerial photography. U.S. Fish and Wildlife Service Circular 39 criteria was used.

Hydric soils were identified using soil survey information and the project's affects on wetlands as defined in the 1985 Food Security Act was considered. Since no cropland is present in the watershed and none is expected to be established in the future, a detailed survey of wetlands as defined in the 1985 Food Security Act was not initiated.

HYDROLOGY

Engineering field surveys and valley section surveys were made on both Canal No. 1 and Canal No. 2-3 in the Long Beach Watershed and on Turkey Creek in the Turkey Creek Watershed. Stage versus discharge curves were developed at various increments for each of the valley cross sections using SCS's WSP2 computer program.

Runoff curve numbers were developed for both watersheds for present and with project conditions. Hydrologic cover conditions were determined from field examinations. With this and additional information on land use, land treatment conditions, soil surveys and geologic conditions, the hydrologic soil cover complexes were computed.

The hydrologic data for the watersheds were utilized in SCS's computer program for project formulation (TR-20). Eight storms were routed through the watersheds. These included the 24-hour duration storm for the 500-, 100-, 50-, 25-, 10-, 5-, 2-, and 1-year frequencies. The U.S. Weather Service publication, Technical Paper No. 40, was used to obtain rainfall for each of these frequencies, except for the 500-year which was extrapolated. From this study, depth of flooding by storm events was determined throughout the watersheds.

No published stream gage data was available for calibrating the WSP2 and TR-20 computer models. However, detailed flood insurance studies for the City of Long Beach, City of Pass Christian, and Harrison County, Mississippi, were available through the U.S. Federal Emergency Management Agency (FEMA). The FEMA data was used to calibrate the WSP2 and TR-20 computer models before project conditions.

GEOLOGY

A field reconnaissance of the watershed was conducted to obtain information pertinent to streambank erosion and sediment transport efficiency of the canals. The Universal Soil Loss Equation was used to estimate sediment yield for the various land covers. On-site geologic and soils investigations were initiated by drilling 22 exploratory power auger borings. Soil cores from each boring were logged and described using the Unified Soil Classification System. Thirty-five samples were collected at various depths and submitted to the SCS - Soils Mechanics Laboratory in Fort Worth, Texas, for additional analysis and classification. This information was used in conjunction with drainage-spacing equations to estimate the affect channelization will have on the water table.

LAND USE

Present land use was determined by on-the-ground observation with the use of aerial photographs. Future with project and future without project conditions were based on estimates of an interdisciplinary study team.

WATER QUALITY

The State of Mississippi has classified Canals No. 1 and No. 2-3 as fish and wildlife streams. Both the EPA and Mississippi Bureau of Pollution

Control were consulted and it was agreed that due to the limited scope of the project, no water quality studies were needed. It was agreed that SCS would design and use construction techniques as appropriate to minimize sedimentation of downstream areas during construction.

ECONOMICS

Urban Damage Schedules

Urban damage information is recorded on Office of Management and Budget (OMB) approved forms. Examples of these forms are as follows.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD DAMAGE—COMMERCIAL—INDUSTRIAL

EXAMPLE

Watershed Any Creek State Miss Reach 1

Interviewer JWE Date 8/19/86

Type of Business _____ Address _____ Owner _____

Structure:

Construction: Frame ☐ Brick ☒ Metal ☐ Other (specify) on slab

Market Value (do not include land) $ 100,000

Size: Basement _____ sq. ft. 1st Floor 3,000 sq. ft. No. of Floors 1

Value of Contents: (estimated) Basement $ _____ 1st Floor $ 80,000 2nd Floor $ _____

Other $ _____

1st Floor Storage (per cent stored in relation to elevation):

0.0 - 1.0 ft. 10 % 1.1 - 3.0 ft. 40 % 3.1 - 5.0 ft. 35 % 5.1 ft. and over 5 %

Number of Employees 12 How Often Do Damaging Floods Occur? Once every 3-5 years

Date of Flood _____ Type of Flood: Backwater ☐ Flowing ☒

Depth of Flood: Grounds _____ ft. Basement _____ ft. 1st floor .5 ft. 2nd Floor _____ ft

	Estimated Damages (Dollars)			Remarks
	Basement	1st Floor	Other	
Grounds – Parking lots, walks, signs	XXX	XXX	$	(Loss prevented by evacuation, emergency preparations, etc.)
Lawns, shrubs	XXX	XXX		No time to prepare
Structure – Foundation	XXX	XXX		
Walls	XXX	XXX		
Other	XXX	XXX		
Contents – (Stock)				
Merchandise	$	$	$	
Equipment				
Records				
Misc. (specify) _____				
Other – Loss of Business	XXX	XXX	$	
Evacuation-Reoccupation	XXX	XXX		
Flood proofing	XXX	XXX		
Employee Wages Lost	XXX	XXX		
Misc.	XXX	XXX		
Totals	$	$ 2000	$	
TOTAL LOSS FOR FLOOD			$	

Estimated Damages at Higher or Lower Stages Than This Flood

Higher 1' $ _____ 2' $ _____ 3' $ _____ 4' $ _____ 5' $ _____

Lower 1' $ _____ 2' $ _____ 3' $ _____ 4' $ _____ 5' $ _____

JUNE 1972
FILE CODE WS-14

FORM APPROVED
OMB NO. 40-R3805
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD DAMAGE – RESIDENTIAL PROPERTIES

EXAMPLE

Watershed Any Creek State Miss

Reach 1 Interviewer JWE Date 8/19/86

Occupant _____

Address _____ Years lived here _____

Times residence flooded: No. _____ Dates _____

Date of specific flood event _____ Hrs. of advance warning received _____

Depth of water in basement _____

Describe source of floodwater (through windows, walls, basement drains, etc.)

Depth of water on or above first floor _____

Depth of water on grounds or lawn _____

Depth of water in garage _____

Depth of water in other buildings _____

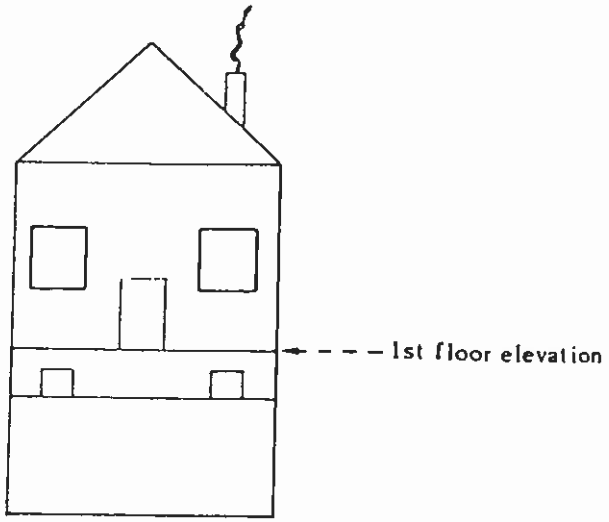
Depth of water in automobiles _____

Location of automobiles when flooded

Depth below the above flood at which damages begin _____

FLOOD DAMAGE – RESIDENTIAL PROPERTIES

Show height of experienced flood stage (depth) on the residence. Denote basement windows and depressed basement entranceways as related to first floor elevation and depth of inundation by specific flood event.



Class of Structure (check one)	Type		
	Frame	Masonry	Other (specify)
Single story, no basement		✓	
Single story, with basement			
Two story, no basement			
Two story, with basement			
Split level			
Mobile home			
Other (specify)			

Conventional foundation

FLOOD DAMAGE - RESIDENTIAL PROPERTIES - APPRAISAL

Item	Specific Flood Event and Dates of Stages Above and Below							
	Specific Flood Event							
	Extent of Damage (Dollars)(Specify price base if different from flood year)							
Structure - House								
Outbuildings								
Driveways and walks								
Contents - Basement: Furniture								
Appliances								
Personal belongings								
First Floor: Furniture								
Appliances								
Personal belongings								
Lawn								
Vehicles								
Other (specify)								
Cleanup (Lawns, driveways, basement, floors, etc.)								
Subtotal - Direct Damages								
Emergency measures of evacuation, etc.								
Loss of income								
Other (specify)								
Subtotal - Indirect Damages								
Total Damages								

Size of residence 1500 sq. ft.

Market value of residence (do not include lot) $ 50,000

Replacement value of contents $ 17,000

Remarks:

Flood Damages

Urban flood damages were computed for without and with project conditions. The URB1 computer program was used to estimate these damages. Present values and numbers of buildings were used for future without project conditions. No projection of increasing property value was used, and it was assumed that any additional building in the floodplain would be above the 100-year flood elevation.

Property values were estimated by an on site inspection of each building. For commercial property, an interview was made with each inspection to determine building and content values. Additional data was recorded when available such as past flooding data, percent of content damaged at various flood depths, etc. For residential property, building value was based on information gathered from the Federal Housing Authority and local realtors. Interviews were not easily obtained in the residential areas and were only conducted where the owners were available and willing to give information. Based on the responses received, it was decided not to rely on interviews in this watershed for the residential property damages, but to use damage coefficient tables developed from previous urban studies, and only gather physical data on site.

Base damage coefficient tables were developed using data from SNTC Technical Note 603, Flood Insurance Studies by the Corps of Engineers and Soil Conservation Service studies.

Cost

The principles and guidelines require the NED costs and benefits be converted to an annual equivalent value over the period of analysis. This period of analysis includes the installation period and the evaluation period. To prevent an extension of the project life beyond that which has been used in estimating costs, the following procedure was used. Total installation costs for structural measures were discounted from the year that they were incurred to the beginning of the period of analysis by converting them to present value equivalents. This provided identically discounted costs in terms of present values. When the present values were determined, they were amortized over the period of analysis to established average annual equivalents. Installation costs of all measures were amortized for a 100-year project life at 8 7/8 percent interest. See Table C-2.

These annual installation costs were added to the annual operation and maintenance cost to get the total annual cost.

Benefits

Methods used in making the investigations and analyses follow those approved by the Soil Conservation Service in benefit-cost evaluations for urban floodplains. Basic data was obtained from local people, city employees, Department of Agriculture publications, and other Federal agencies.

See the URB1 Summary Sheets that follow.

The break even year for this project will be the 6th year.

REV 08/22/96

LONG BEACH WATERSHED

PRESENT CONDITIONS

URBAN DAMAGE FOR ALTERNATE 1

ALTERNATE TOTAL (SUMMATION OF REACHES)

COMMERCIAL BUILDINGS

STORM FREQUENCY	BUILDINGS FLOODED	PROPERTY DAMAGE	CONTENTS DAMAGE	TOTAL DAMAGE
0.2	32	102064	366105	468169
1.0	27	63658	276553	340411
2.0	26	50667	234207	284894
4.0	26	41310	201027	242337
10.0	24	26297	137514	163811
20.0	18	11272	79821	91093
50.0	6	2473	42231	44704
100.0	3	244	7572	7816

AVERAGE ANNUAL PROPERTY DAMAGE = 8566

AVERAGE ANNUAL CONTENTS DAMAGE = 60952

AVERAGE ANNUAL DAMAGE = 69516

$69,500

CLASS INTERVAL OF PROPERTY VALUE	NO. OF HOUSES	AVERAGE ANNUAL DAMAGE. PROPERTY	CONTENTS	TOTAL
0 THRU 2499	2	23	6248	6271
2500 THRU 4999	1	67	277	344
12500 THRU 14999	1	374	12050	12424
15000 THRU 19999	2	96	0	96
20000 THRU 24999	1	54	0	54
25000 THRU 29999	1	961	16610	17571
30000 THRU 39999	3	1393	15	1408
40000 THRU 49999	9	2214	12051	14265
50000 THRU 74999	7	3117	12275	15392
75000 THRU 99999	2	240	1374	1614
OVER 100000	3	27	52	79

TOTAL PROPERTY VALUE = 1602600

TOTAL CONTENTS VALUE = 1339300

URB1 (USDA/WCC) XEQ 03/06/85 08.10
REV 06/22/84

LONG BEACH WATERSHED

WITH PROJECT CONDITIONS

URBAN DAMAGE FOR ALTERNATE 1

COMMERCIAL BUILDINGS

ALTERNATE TOTAL (SUMMATION OF REACHES)

STORM FREQUENCY	BUILDINGS FLOODED	PROPERTY DAMAGE	CONTENTS DAMAGE	TOTAL DAMAGE
0.2	4	1005	23605	24610
1.0	2	190	5316	5506
2.0	1	127	3185	3312
4.0	1	90	2260	2350
10.0	1	3	67	70

AVERAGE ANNUAL PROPERTY DAMAGE = 12

AVERAGE ANNUAL CONTENTS DAMAGE = 313

AVERAGE ANNUAL DAMAGE = 325

$300

CLASS INTERVAL OF PROPERTY VALUE	NO. OF HOUSES	AVERAGE ANNUAL DAMAGE PROPERTY	CONTENTS	TOTAL
0 THRU 2499	1	0	28	28
12500 THRU 14999	1	10	231	241
25000 THRU 29999	1	2	50	52
40000 THRU 49999	1	0	4	4

TOTAL PROPERTY VALUE = 86200

TOTAL CONTENTS VALUE = 227900

LONG BEACH WATERSHED

PRESENT CONDITIONS

URBAN DAMAGE FOR ALTERNATE 1

ALTERNATE TOTAL (SUMMATION OF REACHES)

RESIDENTIAL BUILDINGS

STORM FREQUENCY	BUILDINGS FLOODED	PROPERTY DAMAGE	CONTENTS DAMAGE	TOTAL DAMAGE
0.2	232	1652364	647146	2299510
1.0	161	985714	375337	1361051
2.0	146	712783	266504	979287
4.0	121	531019	195116	726135
10.0	94	326590	116855	443445
20.0	67	155739	53303	209042
50.0	34	50452	15760	66212
100.0	4	7756	1494	9250

AVERAGE ANNUAL PROPERTY DAMAGE = 124086

AVERAGE ANNUAL CONTENTS DAMAGE = 43431

AVERAGE ANNUAL DAMAGE = 167517 **$167,500**

CLASS INTERVAL OF PROPERTY VALUE	NO. OF HOUSES	AVERAGE ANNUAL DAMAGE PROPERTY	CONTENTS	TOTAL
15000 THRU 19999	7	998	115	1113
20000 THRU 24999	9	6092	1463	7555
25000 THRU 29999	5	1319	308	1627
30000 THRU 39999	8	5731	678	6409
40000 THRU 49999	17	20749	6978	27727
50000 THRU 74999	153	79677	30231	109908
75000 THRU 99999	31	9346	3592	12938
OVER 100000	2	174	66	240

TOTAL PROPERTY VALUE = 13400200

TOTAL CONTENTS VALUE = 4093000

URB1 (USDA/HCC) XEQ 03/03/89 12.02
REV 06/22/88

LONG BEACH WATERSHED

WITH PROJECT CONDITIONS

URBAN DAMAGE FOR ALTERNATE 1

ALTERNATE TOTAL (SUMMATION OF REACHES)

RESIDENTIAL BUILDINGS

STORM FREQUENCY	BUILDINGS FLOODED	PROPERTY DAMAGE	CONTENTS DAMAGE	TOTAL DAMAGE
0.2	46	168756	62740	231496
1.0	14	42501	13864	56365
2.0	4	7681	1655	9336
4.0	2	3857	616	4473
10.0	1	123	7	130

AVERAGE ANNUAL PROPERTY DAMAGE = 1533

AVERAGE ANNUAL CONTENTS DAMAGE = 498

AVERAGE ANNUAL DAMAGE = 2031

$2,000

CLASS INTERVAL OF PROPERTY VALUE	NO. OF HOUSES	AVERAGE ANNUAL DAMAGE PROPERTY	CONTENTS	TOTAL
15000 THRU 19999	1	1	0	1
20000 THRU 24999	5	18	0	18
30000 THRU 39999	1	150	8	158
40000 THRU 49999	4	250	62	312
50000 THRU 74999	28	919	351	1270
75000 THRU 99999	5	195	77	272

TOTAL PROPERTY VALUE = 2467300

TOTAL CONTENTS VALUE = 750000

TABLE C-2
PRESENT VALUES—BENEFITS AND COSTS
Long Beach Watershed, Mississippi
0.08875 Percent (Discount Rate)
102 Years (Period of Anaylsis)

YEARS	PV FACTOR	COSTS	PV COSTS	OM&R	PV OM&R	BENEFITS	PV BENEFITS
1	0.92272	633900	584913				0
2	0.85142	1161000	988494	2,600	2214	163,800	139452
3	0.78562			6,100	4792	234,700	184385
4	0.72491			6,100	4422	234,700	170136
5	0.66889			6,100	4080	234,700	156988
6	0.61720			6,100	3765	234,700	144857
7	0.56950			6,100	3474	234,700	133662
8	0.52549			6,100	3206	234,700	123333
9	0.48488			6,100	2958	234,700	113802
10	0.44741			6,100	2729	234,700	105008
11	0.41284			6,100	2518	234,700	96893
12	0.38093			6,100	2324	234,700	89405
13	0.35150			6,100	2144	234,700	82496
14	0.32433			6,100	1978	234,700	76121
15	0.29927			6,100	1826	234,700	70239
16	0.27614			6,100	1684	234,700	64811
17	0.25480			6,100	1554	234,700	59802
18	0.23511			6,100	1434	234,700	55181
19	0.21694			6,100	1323	234,700	50917
20	0.20018			6,100	1221	234,700	46982
21	0.18471			6,100	1127	234,700	43351
22	0.17044			6,100	1040	234,700	40001
23	0.15726			6,100	959	234,700	36910
24	0.14511			6,100	885	234,700	34058
25	0.13390			6,100	817	234,700	31426
26	0.12355			6,100	754	234,700	28997
27	0.11400			6,100	695	234,700	26756
28	0.10519			6,100	642	234,700	24689
29	0.09706			6,100	592	234,700	22781
30	0.08956			6,100	546	234,700	21020
31	0.08264			6,100	504	234,700	19396
32	0.07626			6,100	465	234,700	17897
33	0.07036			6,100	429	234,700	16514
34	0.06492			6,100	396	234,700	15238
35	0.05991			6,100	365	234,700	14060
36	0.05528			6,100	337	234,700	12974
37	0.05101			6,100	311	234,700	11971
38	0.04706			6,100	287	234,700	11046
39	0.04343			6,100	265	234,700	10192
40	0.04007			6,100	244	234,700	9405
41	0.03697			6,100	226	234,700	8678
42	0.03412			6,100	208	234,700	8007
43	0.03148			6,100	192	234,700	7389
44	0.02905			6,100	177	234,700	6818
45	0.02680			6,100	164	234,700	6291
46	0.02473			6,100	151	234,700	5805
47	0.02282			6,100	139	234,700	5356
48	0.02106			6,100	128	234,700	4942
49	0.01943			6,100	119	234,700	4560
50	0.01793			6,100	109	234,700	4208
51	0.01654			6,100	101	234,700	3883
52	0.01526			6,100	93	234,700	3583
53	0.01409			6,100	86	234,700	3306
54	0.01300			6,100	79	234,700	3050
55	0.01199			6,100	73	234,700	2815
56	0.01107			6,100	67	234,700	2597
57	0.01021			6,100	62	234,700	2396
58	0.00942			6,100	57	234,700	2211
59	0.00869			6,100	53	234,700	2040
60	0.00802			6,100	49	234,700	1883
61	0.00740			6,100	45	234,700	1737
62	0.00683			6,100	42	234,700	1603
63	0.00630			6,100	38	234,700	1479
64	0.00581			6,100	35	234,700	1365
65	0.00537			6,100	33	234,700	1259
66	0.00495			6,100	30	234,700	1162
67	0.00457			6,100	28	234,700	1072
68	0.00422			6,100	26	234,700	989
69	0.00389			6,100	24	234,700	913
70	0.00359			6,100	22	234,700	842
71	0.00331			6,100	20	234,700	777
72	0.00306			6,100	19	234,700	717
73	0.00282			6,100	17	234,700	662
74	0.00260			6,100	16	234,700	611
75	0.00240			6,100	15	234,700	563
76	0.00222			6,100	14	234,700	520
77	0.00204			6,100	12	234,700	480
78	0.00189			6,100	12	234,700	443
79	0.00174			6,100	11	234,700	408
80	0.00161			6,100	10	234,700	377
81	0.00148			6,100	9	234,700	348
82	0.00137			6,100	8	234,700	321
83	0.00126			6,100	8	234,700	296
84	0.00116			6,100	7	234,700	273
85	0.00107			6,100	7	234,700	252
86	0.00099			6,100	6	234,700	233
87	0.00091			6,100	6	234,700	215
88	0.00084			6,100	5	234,700	198
89	0.00078			6,100	5	234,700	183
90	0.00072			6,100	4	234,700	169
91	0.00066			6,100	4	234,700	156
92	0.00061			6,100	4	234,700	144
93	0.00056			6,100	3	234,700	132
94	0.00052			6,100	3	234,700	122
95	0.00048			6,100	3	234,700	113
96	0.00044			6,100	3	234,700	104
97	0.00041			6,100	2	234,700	96
98	0.00038			6,100	2	234,700	89
99	0.00035			6,100	2	234,700	82
100	0.00032			6,100	2	234,700	75
101	0.00030			6,100	2	234,700	70
102	0.00027			6,100	2	234,700	64
SUM OF PRESENT VALUES		1573407			64207		2524693
AVERAGE ANNUAL EQUIVALENTS		139664			5699		224105
BENEFIT-COST RATIO		1.5					

Appendix D

Project Map