REPORT BY THE

Comptroller General

OF THE UNITED STATES

Improvements Being Made In Flood Fighting Capabilities In The Jackson, Mississippi, Area

Although the Congress approved the President's plan establishing the Federal Emergency Management Agency in September 1978, the Agency's organization was not completed until July 1979. At the time of GAO's review, eight top positions had not been permanently filled. None of the anticipated annual cost savings and personnel reductions will be realized until fiscal year 1982, at the earliest.

Efforts in fighting the April 1979 flood in Jackson, Mississippi, were hampered by a lack of coordination among Federal, State, and local agencies and inadequate flood preparation. The agencies are now working to resolve these problems. The Director of the Federal Emergency Management Agency should follow the progress of these corrective actions and provide necessary assistance.

This report was requested by the Chairman and Ranking Minority Member, Subcommittee on Limitations of Contracted and Delegated Authority, Senate Judiciary Committee.

CED-80-36

DECEMBER 18, 1979

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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Chairman and Ranking Minority Member
Subcommittee on Limitations of
Contracted and Delegated Authority SEN02518
Committee on the Judiciary
United States Senate

This report discusses the establishment of the Federal Emergency Management Agency and the activities of certain Federal, State, and local agencies involved with the April 1979 flooding in Jackson, Mississippi. We made this review in accordance with your request of May 15, 1979, as modified in later discussions with your offices.

As requested by your offices, we did not obtain written agency comments. The matters covered in the report, however, were discussed with agency officials, and their comments were incorporated where appropriate.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time, we will send copies to interested parties and make copies available to others upon request.

Elmer B. Staats

Comptroller General
of the United States

Federal Ag. reorganization
Flood Control
Agency missions
Water resources management

COMPTROLLER GENERAL'S REPORT TO THE CHAIRMAN AND RANKING MINORITY MEMBER, SUBCOMMITTEE ON LIMITATIONS OF CONTRACTED AND DELEGATED AUTHORITY, COMMITTEE ON THE JUDICIARY, UNITED STATES SENATE

IMPROVEMENTS BEING MADE IN FLOOD FIGHTING CAPABILITIES IN THE JACKSON, MISSISSIPPI, AREA

D I G E S T

GAO was asked to review the administration's progress in establishing the Federal Emergency Management Agency and the Federal role in the April 1979 flood in Jackson, Mississippi.

ESTABLISHMENT OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY

On June 19, 1978, the President transmitted a reorganization plan to the Congress to improve Federal emergency management and assistance. The plan called for establishing the Federal Emergency Management Agency, consolidating a number of civil preparedness and disaster relief functions. Under the provisions of statutes governing executive reorganizations, the Congress approved the plan effective September 16, 1978.

The Federal Emergency Management Agency was established in two phases:

--The first phase, effective April 1, 1979, implemented the congressionally approved plan by establishing the Agency and authorizing the transfer to it of functions from the United States Fire Administration and the Federal Insurance Administration as well as oversight responsibility for the Emergency Broadcast System.

--The second phase, effective July 15, 1979, transferred to the Agency other civil defense and emergency preparedness and mitigation functions vested by law in the President.

As of December 4, 1979, 8 of 17 top Agency positions had not been permanently filled.

In his message to the Congress, the President stated that annual cost savings of between $10-$15 million, including the elimination of 300 jobs, could be achieved by consolidating headquarters and regional facilities and staffs. GAO found that there was no detailed analysis to support the anticipated savings and that the actual areas for savings have not yet been specifically identified. Although identification of these areas has been designated a priority by the Agency's Director, Agency officials told GAO that none of the anticipated cost savings and personnel reductions will be realized until fiscal year 1982 at the earliest. (See ch. 2.)

THE JACKSON FLOOD

In April 1979, Jackson, Mississippi, experienced its worst flood of record when the Pearl River crested at Jackson at 43.3 feet--6 feet above the previous record crest. In Jackson alone, the flood inundated about 1,000 homes and displaced 17,000 people. Flood damage estimates range as high as $1/2 billion. (See p. 7.)

The flooded areas of Jackson included a commercial area containing the Mississippi State fairgrounds, although the area is protected by a Corps of Engineers levee. (See p. 12.)

FLOOD FIGHTING CAPABILITIES IN JACKSON CAN BE IMPROVED

Flood fighting efforts were hindered by a lack of coordination among some of the Federal, State, and local agencies involved. Specifically, GAO found that:

--Neither lines of communication nor coordination procedures had been established between the manager of the Ross Barnett Reservoir upstream from Jackson and the Corps of Engineers even though the reservoir's discharge rate could affect their flood fighting responsibilities. Coordination between the Corps and the

reservoir manager did not begin until late Saturday afternoon, April 14, well after the initial flood warning of Thursday, April 12, and after the reservoir manager began his own flood control actions.

--During the flood, the mayor of Jackson received conflicting Pearl River crest predictions from three Federal agencies--the National Weather Service, the U.S. Geological Survey, and the Corps of Engineers. These predictions varied by about 2.5 feet.

--Estimates of water inflow into the Ross Barnett Reservoir differed between two Federal agencies--the U.S. Geological Survey and the National Weather Service--by 20,000 cubic feet/second.

The inadequacy of river data and the untimely submission of rainfall reports by National Weather Service observers contributed to these coordination problems. Had the U.S. Geological Survey collected additional river data and the National Weather Service issued more timely rainfall reports, the concerned agencies would have had better information to analyze, predict, and control the waters of the Pearl River.

A lack of flood preparation and coordination among Federal, State, and local agencies contributed to the flooding in the Mississippi State fairgrounds area of Jackson, which is protected by the Corps' flood control project. Water entered this commercial area from several sources, including the city's sewer system and from water going around the Jackson Levee via an interstate highway interchange. Although it was known that the interchange was the lowest elevation in the flood protection system, no attempts were made to fortify this area. Better flood preparation and coordination by the agencies could have eliminated or minimized the water from these two sources. (See pp. 17 to 27.)

Federal, State, and local agencies are taking actions to resolve the coordination and flood

preparation problems identified in this report. (See pp. 27 and 28.)

THE ROLE OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY

The Federal Emergency Management Agency's role in the Jackson flood was limited to the efforts of three of the agencies which became part of the Agency under the reorganization plan. During the Jackson flood and postflood relief efforts, these agencies performed their traditional roles and did not assume any of the Agency's new responsibilities as it was just being organized. The Agency Director told GAO that problems found in Jackson concerning coordination and flood preparation are the types of problems that the Federal Emergency Management Agency was created to resolve. (See p. 29.)

Steps being taken by the various Federal, State, and local agencies will improve flood fighting capabilities in the Jackson, Mississippi, area. But, in line with its role to resolve disaster response problems, the Federal Emergency Management Agency should take the lead in assuring that the steps being taken by these agencies are completed effectively. (See pp. 29 and 30.)

RECOMMENDATION

To prevent a recurrence of the coordination and flood fighting problems experienced during the Jackson flood, the Federal Emergency Management Agency Director should follow the progress of the Federal, State, and local agencies' corrective actions and provide assistance, when necessary, to assure that those actions are completed. (See p. 30.)

The Agency concurs with GAO's recommendation. (See p. 30.)

Contents

ABBREVIATIONS

CFS	cubic feet per second
FEMA	Federal Emergency Management Agency
GAO	General Accounting Office
NWS	National Weather Service
USGS	United States Geological Survey

CHAPTER 1

INTRODUCTION

The Chairman and Ranking Minority Member of the Senate Judiciary Committee's Subcommittee on Limitations of Contracted and Delegated Authority requested that we review the administration's progress in establishing the Federal Emergency Management Agency (FEMA). The Congressmen were specifically concerned about such matters as the current status of FEMA, including the appointment of top officials, and whether anticipated cost savings are being realized. In addition, they requested that we review the prevention and flood fighting efforts of the various Federal agencies, including FEMA, during the April 1979 flood in the Jackson, Mississippi, area. In meetings with the offices of the subcommittee chairman and ranking minority member, a number of questions were developed which are addressed in this report. These questions are listed in appendix I.

CHAPTER 2

ESTABLISHMENT OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY

BACKGROUND

In August 1977, the President directed his ongoing Reorganization Project to review the performance of Federal emergency preparedness programs. In May 1978, after a comprehensive study, the project reported to the President that the Federal civil structure for responding to and recovering from the effects of a major natural catastrophe was in disarray. The project recommended that a new agency be formed and charged with comprehensive responsibility for planning, preparedness, response to, and recovery from large-scale emergencies ranging from natural and manmade disasters to civilian protection in nuclear war. The project also recommended that a White House emergency management committee be established and chaired by the new agency's administrator. The committee would be responsible for providing policy guidance to the new agency and advising the President in civil emergency situations.

On June 19, 1978, the President transmitted to the Congress Reorganization Plan No. 3 of 1978, which was to improve Federal emergency management and assistance. In his transmittal message to the Congress, the President stated:

> "By consolidating emergency preparedness, mitigation, and response activities, it [the plan] cuts duplicative administrative costs and strengthens our ability to deal effectively with emergencies."

The plan, according to the President, rests on several fundamental principles:

> "First, Federal authorities to anticipate, prepare for, and respond to major civil emergencies should be supervised by one official responsible to the President and given attention by other officials at the highest levels.
>
> "Second, an effective civil defense system requires the most efficient use of all available emergency resources.
>
> "Third, whenever possible, emergency responsibility should be extensions of the regular missions of Federal agencies.

"Fourth, Federal hazard mitigation activities should be closely linked with emergency preparedness and response functions."

To implement these principles, the plan called for establishing FEMA, into which would be placed a number of civil preparedness and disaster relief functions that were scattered in various departments and agencies.

The plan proposed that the National Fire Prevention and Control Administration (in the Department of Commerce), the Federal Insurance Administration (in the Department of Housing and Urban Development), and the oversight responsibility for the Federal Emergency Broadcast System (in the Executive Office of the President) be transferred to FEMA. The plan also provided that the FEMA Director, its Deputy Director, and its five principal program managers be appointed by the President with the advice and consent of the Senate. Also, the FEMA Director would report directly to the President.

In addition, the President advised in his message to the Congress that, if the Congress approved the plan, he would assign to FEMA all authorities and functions vested by law in the President and delegated to the Defense Civil Preparedness Agency (in the Department of Defense), the Federal Disaster Assistance Administration (in the Department of Housing and Urban Development), and the Federal Preparedness Agency (in the General Services Administration). The President also advised that he would transfer several other emergency preparedness and mitigation functions to FEMA, including:

--Oversight of the Earthquake Hazards Reduction Program, carried out by the Office of Science and Technology Policy.

--Coordination of Federal activities to promote dam safety.

--Responsibility for assistance to communities in developing readiness plans for severe weather-related emergencies, including floods, hurricanes, and tornadoes.

--Coordination of natural and nuclear disaster warning systems.

--Coordination of preparedness and planning to reduce the consequences of major terrorist incidents.

To increase White House oversight and involvement still further, the President stated that he would also establish an Emergency Management Committee (later renamed the Emergency Management Council) to be chaired by the FEMA Director. Its membership would be comprised of the Assistants to the President for National Security, Domestic Affairs and Policy, and Intergovernmental Affairs; and the Director, Office of Management and Budget. The committee would advise the President on ways to meet national civil emergencies. It would also oversee and provide guidance on the management of all Federal emergency authorities, advising the President on alternative approaches to improve performance and avoid excessive costs.

Under the provisions of statutes governing executive reorganizations (5 U.S.C. 901 et seq.) the Congress approved the plan effective September 16, 1978.

CURRENT STATUS OF REORGANIZATION

Originally, the administration planned that full implementation of the FEMA organization--transfer of both the authorities covered directly by the reorganization plan and the functions vested by law in the President--would take place in one step by April 1, 1979. However, due to administrative delays--in particular, selection of a FEMA Director and drafting of Executive orders--it was decided to implement the reorganization in two phases. The first phase, effective April 1, 1979, through Executive Order 12127, implemented the congressionally approved plan by establishing FEMA and authorizing the transfer to it of functions from the United States Fire Administration (formerly the National Fire Prevention and Control Administration) and the Federal Insurance Administration as well as oversight responsibility for the Emergency Broadcast System.

The second phase consisted of transfering to FEMA the various other civil defense and emergency preparedness and mitigation functions vested by law in the President, as detailed in the President's message to the Congress. This phase also included establishment of the Emergency Management Council. This phase was carried out through Executive Order 12148, effective July 15, 1979.

STATUS OF FILLING TOP FEMA POSITIONS

The approved reorganization plan provided for FEMA to have a director, a deputy director, and five principal program managers to be appointed by the President, with the

advice and consent of the Senate. The plan also called for 10 FEMA regional directors who were to be appointed by the FEMA Director.

As of December 4, 1979, only 9 of these top 17 positions had been permanently filled--the Director, 2 principal program managers, and 6 regional directors. We were informed by FEMA officials that a primary reason for eight positions not being filled is that it was necessary for the Director to have as much say as possible in who filled the top positions and the Director was not confirmed by the Senate until July 27, 1979. We were also informed that currently the Senate is considering nominations for the remaining three vacant principal program manager positions.

STATUS OF THE EMERGENCY MANAGEMENT COUNCIL

To increase White House oversight and involvement, the President established an Emergency Management Council by Executive Order 12148, effective July 15, 1979. The council is to advise the President on ways to meet national emergencies, oversee and provide guidance on the management of all Federal emergency authorities, and advise the President on alternative approaches to improve performance and avoid excessive costs. We were informed that the council will meet on an ad hoc, rather than a regular, basis. The council's first meeting is scheduled for December 14, 1979.

STATUS OF ANTICIPATED COST SAVINGS

In his June 19, 1978, message to the Congress, the President stated that cost savings of between $10-$15 million annually, including the elimination through attrition of about 300 jobs, could be achieved by consolidating headquarters and regional facilities and staffs.

FEMA officials informed us that there was no detailed analysis to support these anticipated savings and that the actual areas for savings had not yet been specifically identified. They said that identifying these areas has been designated a priority by the FEMA Director. However, there are several reasons why none of the anticipated cost savings and personnel reductions will be realized until fiscal year 1982 at the earliest:

--The Director is limited in his actions by the President's commitment that no Federal employee lose his/her job as a result of the reorganization.

--The original FEMA staffing, as anticipated during the reorganization hearing, was underestimated by approximately 90 positions. Therefore, when FEMA was formally established, it had 90 more positions than were originally anticipated.

--The Director did not assume his position until August 1, 1979, and has not had the opportunity to complete a structured program review to determine where programs can be effectively merged and duplication eliminated. However, a program analysis and evaluation staff has recently been organized and will serve, among other functions, as the first step in identifying areas for cost and personnel reductions.

In addition, the FEMA Director made two decisions which will result in one-time costs, reducing the fiscal year 1980 budget's anticipated savings. Upon reorganization, FEMA inherited 38 field locations. The FEMA Director has realigned these offices, reducing the number to 16. A large amount of funds will be required to relocate the field offices, including moving costs. The other large cost is a result of the Director's decision to move the Civil Defense Staff College from Battlecreek, Michigan, to Emmitsburg, Maryland. Each of these decisions will cost approximately $2-1/2 million in one-time relocation and moving costs.

CHAPTER 3

THE JACKSON FLOOD

Jackson, the capital of Mississippi, is the center of a large metropolitan area consisting of Hinds, Madison, and Rankin counties and includes approximately 324,000 people. The city is in central Mississippi, on the west bank of the Pearl River, about 150 miles upstream from the Gulf of Mexico. (See map on p. 8.) Above Jackson, the Pearl River drains an area of 3,100 square miles. Rainfall runoff from this upstream area flows largely uncontrolled until it reaches the State-owned and -operated Ross Barnett Reservoir, which is located 6 miles northeast of Jackson. Below the Ross Barnett Reservoir, the Pearl River flows past Jackson via a Corps of Engineers channelization and levee system which affords flood protection to parts of the cities of Jackson, Flowood, and Pearl.

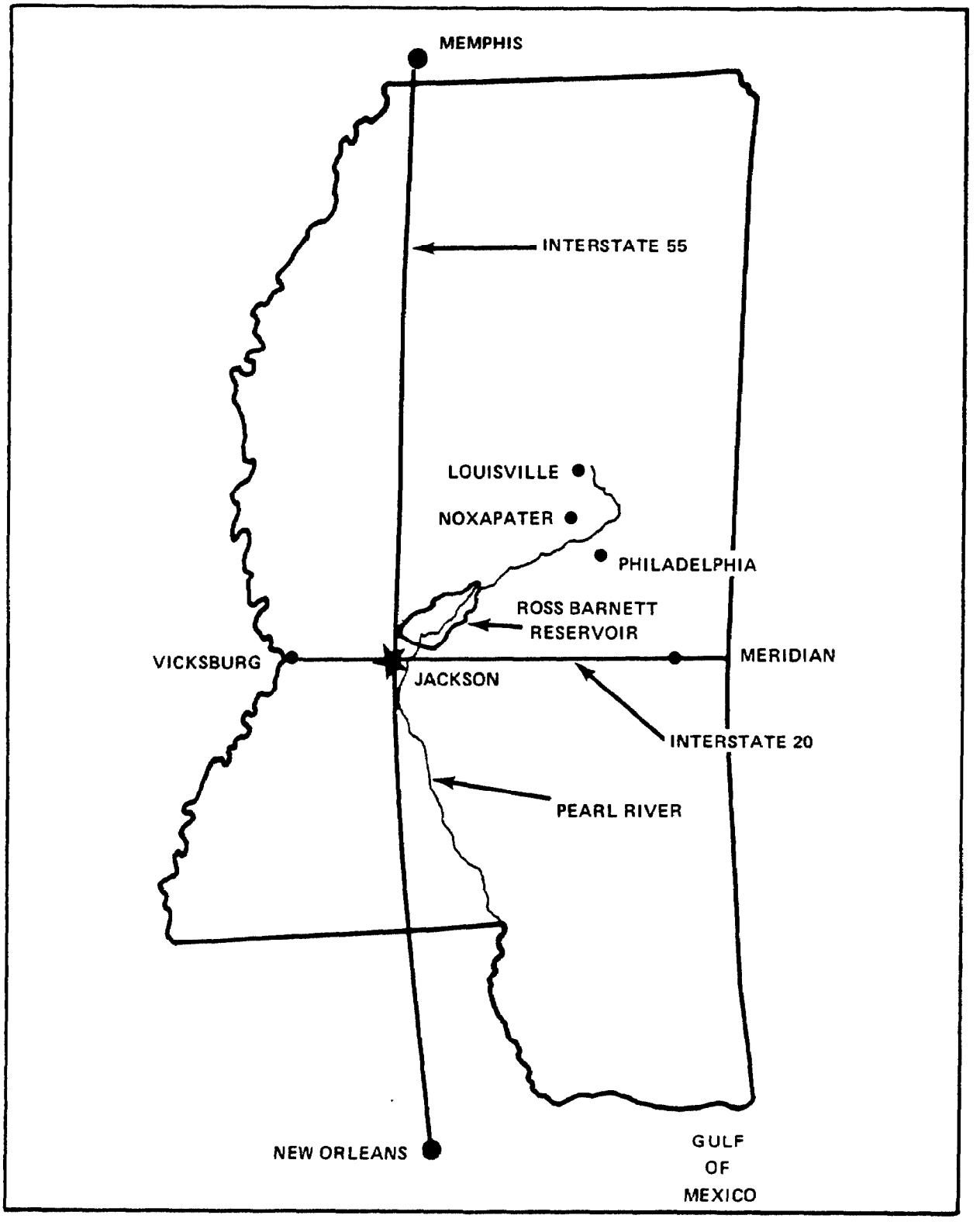
FLOODS OF RECORD IN JACKSON

The city of Jackson experienced floods of record in 1902, 1961, and 1979. In April 1902, the Pearl River crested at 37.2 feet at Jackson, and in December 1961 it reached 37.3 feet. The current flood of record occurred in April 1979, during which the Pearl River crested at Jackson at 43.3 feet, 6 feet above the previous record crest. In Jackson alone, the flood inundated about 1,000 homes and displaced 17,000 people. Estimates of damage from the flood range as high as $1/2 billion.

THE ROSS BARNETT RESERVOIR

The Ross Barnett Reservoir, completed in 1962, was designed essentially as a water supply and recreation facility. The reservoir's 3-mile-long earthen dam impounds a lake having a surface area of 30,000 acres, a length of 43 miles, and a storage capacity of 310,000 acre-feet. The average depth is approximately 10 feet. Although not constructed for flood control purposes, under certain operating conditions the reservoir can provide some degree of flood protection.

The Pearl River Valley Water Supply District was authorized in 1958 by the Mississippi State Legislature to plan, supervise, construct, operate, and maintain a reservoir on the Pearl River. The district is made up of representatives from the five central Mississippi counties--Hinds, Madison, Leake, Scott, and Rankin--which funded the building of the reservoir.



MAP OF MISSISSIPPI

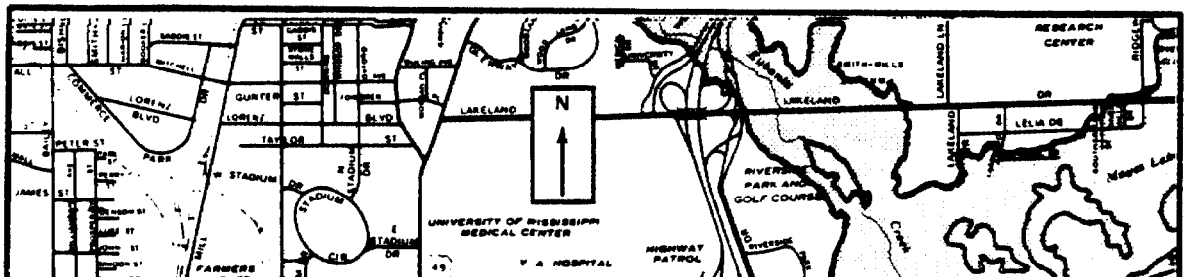
THE JACKSON-EAST JACKSON FLOOD CONTROL PROJECT

Prior to 1967, parts of the city of Jackson, and a large area across the Pearl River in the cities of Flowood and Pearl, were subject to recurrent flooding. The Jackson flooding included a small area on the west bank--the Jackson fairgrounds 1/--and a large area on the east bank, both which were inundated for periods of 3 to 9 weeks on the average of twice a year.

The Flood Control Act of 1960 (Public Law 86-645, July 14, 1960, 74 Stat. 488), authorized flood control improvements along the Pearl River at Jackson consisting of an east bank (East Jackson) and a west bank (Jackson) levee and the enlargement and realignment of 9.3 miles of the Pearl River channel between the two levees. The project was completed by the Corps in 1967.

The East Jackson Levee, about 10.3 miles long, protects a 5,870-acre area including the cities of Flowood and Pearl. The west bank, or Jackson Levee, which is about 1.5 miles long, protects an area containing 420 acres including the Mississippi State fairgrounds, the State coliseum, and a portion of downtown Jackson. The upper end of this levee connects to the Interstate 55 interchange at the Fortification Street Bridge which crosses over Interstate 55.

Both levees were built to protect against a river stage of 40.4 feet. 2/ This river height equates to a 175-year flood (that is, the chance of the river reaching 40.4 feet would be once in 175 years). The levees also were built with an additional 3 feet of soil to protect against the effects of wave action. The Fortification Street interchange



was also built to protect against a 40.4-foot river stage. However, the interchange was built with only 0.5 feet of additional height since it is not as susceptible to erosion as the earthen levees.

The levees included interior drainage facilities and pumping stations. Channelization of the river left a portion of the original riverbed inside the Jackson Levee. (See map on p. 10.) This portion is the lowest elevation inside the protected area and serves as a collection point (referred to as a lagoon) for runoff from local rains. The Corps installed a pumping station at the lagoon to move the water over the levee into the river. Similar facilities were installed on the East Jackson Levee.

THE FLOOD

On Wednesday evening, April 11, 1979, a large low-pressure weather system drifted over the Jackson area causing an exceptional amount of precipitation. Four inches of rain fell in 1 hour and over 8 inches were recorded during a 24-hour period. On Thursday morning, the National Weather Service (NWS) issued flash flood warnings for the Jackson area. Additional rain continued to fall intermittently in the metropolitan area until approximately 6 p.m. Thursday evening.

This low-pressure system, which had earlier produced killer tornadoes in Wichita Falls, Texas, moved northeastward from Jackson into the Upper Pearl River Basin near Louisville, Mississippi, and became stationary. (See map on p. 8.) Tremendous rainstorms resulted in the Upper River Basin, with Louisville recording 19.7 inches in a 36-hour period. Rainfall exceeded 12 inches at several other locations in the basin. This record rainfall caused immediate flooding in the Upper Pearl River Basin. The flooding was made worse because record rainfall during the previous 3 months had left streams and the soil's water content much higher than normal.

Reports of the record rains in the basin area reached the Jackson NWS office early Friday morning, April 13. The NWS office immediately released warnings alerting various Federal, State, and local officials and the citizens of the already drenched metropolitan area of the forthcoming flood.

Numerous emergency procedures were initiated by various agencies as well as individual residents. Many persons living in low-lying areas voluntarily evacuated their residences, while the mayor of Jackson ordered citizens in one section of the city to leave. The manager of the Ross Barnett

Reservoir advised us that he increased the reservoir's rate of discharge to provide additional storage capacity for the water coming from the Upper Pearl River Basin.

Federal, State, and local officials worked throughout the weekend and into the following week to protect lives and property. The river continued to rise and did not crest at Jackson until it reached 43.3 feet on Tuesday, April 17. This crest, which far exceeded previous record crests, equated to a 500-year flood.

Flood fighting efforts to protect property along the east bank of the Pearl River near the town of Flowood were successful. Property owners on the west bank, however, were less fortunate, as major flooding occurred in the following three areas of Jackson:

--A small portion of the central business district.

--Low-lying residential areas in the northeast section of the city.

--A commercial area commonly referred to as the fairgrounds.

According to NWS, flooding occurs along portions of Town Creek when the Pearl River reaches 32 feet at Jackson. Existing geographical conditions and physical structures cannot prevent flooding of portions of the central business district during periods of high water.

Many residential sections of northeast Jackson also had no protection from the April 1979 flood. Many houses have been constructed in low-lying areas, some within one-half mile of the river, with no protective structures in between. A primary reason for this development was the construction of the Ross Barnett Reservoir. This project, according to a federally funded study, provided Jackson residents with a false sense of security concerning future flooding. Consequently, more and more people built their homes and businesses in the flood plain.

The commercial area containing the Mississippi State fairgrounds and coliseum, although located well inside the Corps of Engineer's Jackson Levee, was flooded in April 1979. Because this flooding occurred in a protected area, we directed a substantial part of our effort toward determining why and how this area was flooded. This matter is discussed in detail in chapter 4. Also, appendix II provides a chronological listing of selected events relating to the flood.

MAJOR AGENCIES INVOLVED IN THE FLOOD

Numerous Federal, State, local, and private organizations provided services in coping with this major disaster. Some organizations aided in preflood preparation, some were involved in physically fighting the flood waters, and others assisted victims in obtaining postdisaster relief. Our review concentrated on those entities which played major roles in preflood preparation and those which actually were involved in the flood fighting effort. This report specifically addresses the efforts of six of these entities. Their basic missions and their roles during the flood are discussed below.

United States Geological Survey

The Mississippi office of the Water Resources Division of the United States Geological Survey, an agency within the Department of Interior, is located in Jackson. Its mission includes the installation and maintenance of equipment for measuring water height on streams throughout the State. Information from this equipment is collected and analyzed by USGS and furnished to other organizations such as NWS, the Corps, and reservoir management. During flooding conditions, USGS personnel verify the accuracy and physical condition of river measurement equipment and operate additional measuring devices. USGS does not, however, disseminate river height information to the public.

Preparation of rating tables to convert river height information into waterflow data (cubic feet per second (CFS)) is another important function of the Water Resources Division. For example, USGS prepares rating tables for computing water inflow into the Ross Barnett Reservoir. The reservoir manager relies heavily on this data in determining the water volume to be discharged through the reservoir's spillway.

National Weather Service

The National Weather Service, within the Department of Commerce's National Oceanic and Atmospheric Administration, is responsible for providing weather information to the public. The agency's mission includes observing and routinely reporting weather conditions and issuing warnings regarding inclement weather and floods. To facilitate this responsibility, NWS operates river forecast centers throughout the Nation which utilize computers in preparing river forecasts. During flood situations, the local NWS office

issues weather and river forecasts and flood warnings, as required, to keep public officials and the general public adequately informed.

Corps of Engineers

The Corps' mission includes planning, designing, and constructing civil works projects which aid navigation and/or flood control. Such projects in the Jackson metropolitan area center on the Corps-constructed Jackson-East Jackson Flood Control Project. Routine operations and maintenance of the project is performed by a local entity--Rankin-Hinds Pearl River Flood and Drainage Control District (hereafter referred to as the Rankin-Hinds District).

During flood situations, the Corps is authorized under Public Law 84-99 (69 Stat. 186) to be responsive to the public's needs in order to save human life, prevent immediate human suffering, and mitigate property damage. In performing this duty, Corps personnel are authorized to expend funds for such items as flood emergency preparedness; flood fighting and rescue operations; and repair or restoration of flood control works threatened, damaged, or destroyed by flood.

Rankin-Hinds Pearl River Flood and Drainage Control District

The Rankin-Hinds District, an entity authorized by Mississippi State statute, was organized to represent local interests for the Corps' flood control project in Jackson. The Rankin-Hinds District is currently responsible for the operation and maintenance of this project. The Rankin-Hinds District's Board of Directors, in accordance with the Corps' operation and maintenance manual, directs the operations and maintenance of the levees and associated pump stations. The Corps, through periodic field inspections, reviews the district's work.

During flood situations, the Rankin-Hinds District is responsible for taking all necessary measures for ensuring the integrity of the flood control project. District employees perform such tasks as

--making levee closures on all roads and railroads as specified in the manual,

--operating water pumps to prevent flooding inside the levees,

--monitoring the levees periodically to detect sand boils 1/ or weak spots, and

--reinforcing the levees with appropriate material as needed.

District officials maintain close contact with the Corps during flood situations. In severe situations, in which the Corps believes that the flood fight will exceed the physical and/or financial capability of all local and State organizations, the Corps may assume leadership over a flood fight.

Pearl River Valley Water Supply District

The Pearl River Valley Water Supply District, a State agency created in 1958, operates the 30,000-acre Ross Barnett Reservoir for water supply and recreational purposes. This agency is governed by a 14-member board of directors with a reservoir manager responsible for daily reservoir activities. The district's responsibilities include

--controlling the reservoir's water level,

--maintaining recreational facilities,

--discharging a sufficient volume of water to assure an adequate water supply for the city of Jackson, and

--stimulating shoreline development.

During severe flooding situations, the reservoir manager can minimize downstream flooding by storing water and controlling the reservoir's discharge rate. This function is limited, however, as the reservoir was not designed as a flood control project and no procedures exist to guide flood mitigation efforts.

Public Works Department, City of Jackson

The Public Works Department, which provides citizens of Jackson with such services as water, sewage, and garbage removal, employs approximately 800 people. The department's

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1/A disturbance in the surface soil caused by the escape of water into the protected area inside the levee.

responsibilities include the construction and maintenance of all city sewer lines and the sewage treatment plant. During a flood situation, the department is responsible for keeping all sewer facilities operating.

CHAPTER 4

FLOOD FIGHTING CAPABILITIES IN JACKSON CAN BE IMPROVED

Coordination problems among Federal, State, and local agencies were prevalent from the outset of the flood. A lack of data, untimely data, and conflicting data hampered the expeditious handling of several key flood situations. In addition, the degree of flooding in one section of Jackson was significantly increased by a failure of the city's sewer system and by water flowing around (flanking) the Corps' Jackson Levee. The latter two problems could have been eliminated or minimized had there been better flood preparation and coordination among the agencies involved.

COORDINATION PROBLEMS

Flood fighting efforts were hindered due to lack of coordination among some of the Federal, State, and local agencies involved. Although no exact amount of additional flooding or damage can be attributed to these problems, the lack of coordination hindered the work of several agencies. These problems are discussed below.

Lack of coordination concerning the reservoir's discharge rate

Neither lines of communication nor coordination procedures had been established between the reservoir manager and the Corps, even though the reservoir's discharge rate could affect the flood fighting responsibilities of the two entities. On April 14, 1979, the Corps informed the reservoir manager that an official from the Reservoir Control and Meteorology Section of the Corp's Mobile District Office could assist in operating the reservoir if the manager would agree to use the reservoir for flood control. The manager agreed, and he and the Corps official worked together to determine the reservoir's discharge rates during the remainder of the flood. Together, in this ad hoc arrangement, they worked to maximize the reservoir's storage capacity while bringing the water level within 3 inches of the top of the dam's emergency spillway. The Corps official who directed reservoir operations during the flood did not know and had never spoken to the reservoir manager prior to the April 1979 flood, although both had held their respective positions for several years.

Appendix I of the operation and maintenance manual the Corps prepared for the flood control project provides that:

"* * * Engineering Division personnel shall, where appropriate, visit non-Federal dams within the District to determine whether the Federal interest in flood control would be involved whenever the District becomes aware of conditions which indicate failure of the dam may be a possibility."

If a dam failure would affect a Corps project, the Corps is required to offer assistance to the owner of the dam during a flood emergency. We found no indication that the Corps had determined the impact the Ross Barnett Reservoir and dam could have on its levee project or established any lines of communication or procedures to provide assistance to the reservoir manager during flood emergencies. Coordination between the Corps and the reservoir manager did not begin until late Saturday afternoon, April 14, 1979, well after the initial flood warning of Thursday, April 12, and after the reservoir manager began his own flood control actions.

Conflicting crest predictions

During the flood, the mayor of Jackson received conflicting Pearl River crest predictions from three Federal agencies. NWS, the Federal agency responsible for making official river forecasts, on April 12 publicly forecasted a river crest in Jackson of 36 feet. On Friday, April 13, the NWS River Forecast Center in Slidell, Louisiana, predicted that by Monday, April 16, the river at Jackson could reach 38.5 to 39.5 feet. Also, on Friday, April 13, the mayor requested and received crest forecasts by USGS and the Corps of 40.0 feet and 42.1 feet, respectively. Although neither agency is responsible for preparing such forecasts for public information, they do prepare them for their own use. Actually, all these predictions underestimated the actual crest of 43.3 feet.

According to a National Oceanic and Atmospheric Administration consultant's report, the difference between the NWS and Corps predictions was due largely to a difference in the rating tables used. The report stated that the tables used by NWS were based on the Corps' flood plain information report, which had been superseded by two flood insurance studies. The Corps, the report stated, used the later studies and verified the information by making new studies during the flood. In contrast, the USGS prediction of 40 feet was based upon a USGS flood profile study performed in 1974.

An accurate crest forecast is critical in order for local officials to make appropriate evacuation and resource

allocation decisions for saving lives and property. Although NWS, USGS, and the Corps are not required to coordinate during the preparation of crest forecasts, we found no evidence that these agencies attempted to resolve their differences and provide the mayor with the most reliable estimate on which he could make critical decisions.

Conflicting reservoir water inflow data

Estimates of water inflow into the Ross Barnett Reservoir differed between USGS and NWS. USGS, using data from upstream river gauges, estimated that the peak inflow into the reservoir would be 160,000 CFS. The NWS River Forecast Center at Slidell, Louisiana, using data from various sources and a computer model, projected the peak inflow at 180,000 CFS. The reservoir manager informed us that he used the USGS inflow data in determining the reservoir's discharge rate because he was more comfortable with actual data than computer predictions and USGS had been more accurate in the past. Using USGS data, the reservoir manager and the Corps official worked to maximize reservoir storage as they brought the reservoir within 3 inches of the top of the dam's emergency spillway. The actual peak flow was 162,000 CFS.

The receipt of accurate inflow data is extremely important to the reservoir manager in determining how much water to store or release from the reservoir. However, in this instance there was no coordination between NWS and USGS to reconcile their forecasts and to provide the reservoir manager with one Federal Government forecast.

Lack of river data and untimely rainfall information

A factor contributing to the coordination problems discussed above was the lack of adequate river data and the untimely submission of rainfall reports. Collection of additional river data by USGS and the issuance of more timely rainfall reports by NWS would have provided concerned agencies with better information to analyze, predict, and control the waters of the Pearl River.

USGS maintains four gauges north of the reservoir to measure the height of the Pearl River. An additional gauge is located about 12 miles below the reservoir. The reservoir manager and Corps, NWS, city of Jackson, and USGS officials contend that additional gauges are needed to make river forecasts more accurately, especially during flood

situations. USGS, Corps, and NWS officials believe at least two additional river gauges should be installed above the reservoir. These new gauges, which could be read electronically via telephone, would provide users with additional data for use in analyzing, predicting, and controlling the flow of the Pearl River.

NWS has numerous rain gauges throughout the Pearl River Basin. These gauges are read each morning by paid weather observers who telephone their 24-hour rainfall accumulation data to the Jackson NWS office at about 7 a.m. each day.

Rainfall in excess of 10 inches fell in some locations in the Upper Pearl River Basin after 7 a.m. on April 12, 1979, and was not reported to NWS until the following day. Valuable time was lost during which various officials, including the reservoir manager and the mayor, could have been provided more timely data for making crucial decisions, such as determining reservoir discharge rates and evacuation of additional residential areas.

BETTER FLOOD PREPARATION AND COORDINATION COULD HAVE REDUCED FLOODING

A lack of flood preparation and coordination among Federal, State, and local agencies contributed to the flooding in the Jackson fairgrounds area. Water entered this commercial area from several sources including the city's sewer system and from water flanking the Jackson Levee. Better flood preparation and coordination among the involved agencies could have eliminated or minimized the water from these two sources.

City's sewer system contributes to flooding of fairgrounds area

Water and effluent from Jackson's sanitary sewer system, coupled with local rainfall, were two factors causing initial flooding inside the Jackson Levee. The amount of flooding caused by the sewer system is unknown. However, the fact that this source of water could not be controlled, and the health problem it posed, must be recognized and resolved to prevent recurrence during future flood emergencies.

Construction of the sewer system

In 1975, about 8 years after the Corps completed its flood control project, the Jackson Public Works Department installed a new 66-inch sanitary sewer line that passed

through the Corps' Jackson Levee. (See map on p. 10.) This main trunkline was to carry effluent from a portion of the densely populated areas of north Jackson and all of northeast Jackson to the city's sewage treatment plant in south Jackson. This new line passed through the protected area inside the Jackson Levee in generally a north-south direction. Two cut-off valves were installed on the line on either side of the Corps' levee. The north valve was located about 1/2 mile north of the point where the Corps' levee abuts Fortification Street, while the south valve was placed on the levee at the point where the sewer line exits the protected area.

Sewer system floods protected area

Jackson's sewage treatment plant has four pumps for handling effluent flowing into the facility--one 100-gallon-per-minute pump and three 30-gallon-per-minute pumps. When the flood began, the motor for the 100-gallon-per-minute pump was being repaired and the three smaller pumps were handling the inflow. As various sections of the city were inundated, the 66-inch line, which progressively increases to 96 inches at the plant, filled to capacity with effluent and floodwater. The three small pumps were unable to handle the volume flowing into the plant, and a valve at the plant on this main trunkline was partially closed to limit the inflow. This caused a backflow of floodwater and effluent in the line. Public works employees removed several manhole covers in the protected area, and line pressure blew off several others in the same area. However, this caused floodwater and effluent to enter the protected area, adding to accumulated water from the initial rainfall and creating a health problem.

On Friday, April 13, 1979, a local businessman, who owned property in the fairgrounds area, noticed floodwater and effluent exiting the manholes. Flooding was already occurring in portions of the protected area, and he believed the rising water would eventually endanger his business establishment. He contacted two public works department officials shortly after noon on Friday, requesting that the valves on either side of the levee be closed to minimize the flooding. City officials took no action at that time.

A meeting was held on Saturday morning in the mayor's office in which several subjects were discussed, including the valves. At that time, the flooding had increased in the protected area and water was still exiting the sewer line. Later that day, after much discussion among city officials and private citizens as to what to do about the valves,

the two valves were closed. Although it was thought this would correct the problem, floodwater and effluent continued to exit the manholes inside the protected area.

- Flooding continued from the sewer line because the north valve was inadequate to stop the flow of all sewage into the 66-inch line. During our review, we were informed that, at the junction box where the north valve is located, the existing 60-inch line divides into two parallel lines--one 54 inches and one 48 inches. These parallel lines eventually join together inside the fairgrounds area and form the 66-inch line. (See map on p. 10.) Closing this valve, however, only halted floodwater and effluent traveling in the 54-inch line. Floodwater and effluent in the 48-inch line remained unobstructed and maintained sufficient pressure to continue exiting the manholes inside the protected area.

Sewer line built without required permit

The Corps' operation and maintenance manual for the flood control project was prepared for the Rankin-Hinds District to use in operating and maintaining the project and provides as follows:

> "* * * Permits Governing Use of Right-of-Way: Rights-of-way have been procured and works have been constructed thereon for the protection of life and property. Use of rights-of-way for crossings by gas lines, oil lines, utilities and other uses of similar nature are to be allowed only under the terms of a permit. * * *
>
> "* * * permits allowing use of any part of the right-of-way will be issued by the Drainage District subject to the restriction that no permit will be issued without the prior approval of the District Engineer. * * *
>
> "* * * Applications for use of the right-of-way should be addressed initally to the Rankin-Hinds Pearl River Flood and Drainage Control District, which in turn will forward the application to the District Engineer, Mobile, Alabama, with its recommendation. * * * If approval is recommended by the Drainage District and the District Engineer has no objection, he will request that the Drainage District submit 3 copies of the permit bearing the signatures of the applicant and an official of the Rankin-Hinds Pearl River Flood and Drainage Control District. Upon compliance, two copies of the permit will be returned after being signed by the District Engineer."

During our review we were unable to locate a permit for the 66-inch sewer line, although an official of the city's public works department stated that one existed. However, our review of the department's records failed to disclose such a permit. The legal counsel for the Rankin-Hinds District stated a permit was not obtained, but, in his opinion, one should have been issued.

A Corps official from the real estate division of the Mobile district office stated that his review of the Corps' files regarding the flood control project did not yield any correspondence relating to a permit. He further stated that in a situation such as this the Rankin-Hinds District should have handled the matter, with the final consent for easement given by the Corps, after considering the effect of the sewer line on the Corps' flood control project.

Federal and local agencies unprepared to deal with sewer flooding

City, Rankin-Hinds District, and Corps officials were unprepared for any flooding from the sewer system, although the sewer line runs through the Corps' flood control project. No plans or operating procedures existed at their respective agencies for operating the valves during a flood emergency, nor could we find any evidence that the problem had been discussed among their agencies. Also, we could not find any documentation that the sewer system had been reviewed by the Corps, Rankin-Hinds District, or the city's public works department in terms of its effect on the Corps' levee. Consequently, much confusion arose when private citizens brought the severity of the sewer system problem to the attention of city officials.

Rising water halts pumping operations

Water continued rising rapidly inside the fairgrounds area throughout Saturday, April 14. At approximately 11 p.m. on April 14, all pumping operations on the Jackson Levee were halted as rising water inside the protected area threatened to enter the pumping station. Sources of this water have been attributed to the sewer system and several sand boils in the Jackson Levee. A Corps spokesman contended, however, that normally an insignificant amount of water passes through a sand boil. Rather, the major concern with a boil is usually the amount of material displaced. Regardless of the amount of water from each source, water entered the fairgrounds from the sewer system and the boils at a faster rate than pumps could expel it.

Fairgrounds inundated by water flanking Corps' levee

The entire fairgrounds area was flooded on Monday, April 16, 1979, as water from the rising Pearl River went around the north end of the Jackson Levee. Water flowed down the interstate highway and under the Fortification Street Bridge and in about 24 hours inundated the entire area protected by the levee. Officials from Federal, State, and local agencies, including the Corps, passed this area daily during the flood and should have seen the rising water coming progressively closer to where the levee abuts the Fortification Street Bridge and Interstate 55 interchange. No one, however, took any measures to prevent this flanking.

Physical design of levee

The north end of the Jackson Levee abuts the Fortification Street Bridge and Interstate 55 interchange, which forms a natural westward extension of the Corps' levee. (See map on p. 10.)

The Jackson Levee was designed to protect the fairgrounds area against a 40.4-foot flood. Additionally, 3 feet of soil was placed atop the levee to counteract wave action. The Interstate 55 interchange at Fortification Street was also built to an elevation sufficient to withstand a 40.4-foot flood. Additional height on the highway interchange, however, was limited to only 0.5 feet, as wave action would have little, if any, adverse effect on the roadway.

Water flanks Corps' levee

Floodwater from the rising Pearl River gradually moved closer toward the Fortification Street interchange on Interstate 55 on Friday, April 13, and Saturday, April 14. Floodwaters overtopped one ramp of the interchange, and at about 8:30 a.m. on Sunday, April 15, water flanked the north end of the levee by flowing under the Fortification Street Bridge, down the interstate roadbed, and into the protected area. The initial flow was very small and covered only a portion of one lane of the highway. (See picture on p. 25.)

On the same day, Sunday, April 15, the Corps began to increase the height of the Jackson Levee. Additional dirt and sandbags were placed along the entire embankment with heights of some sections of the levee increased by 3 feet. However, nothing was done to block the water coming into the protected area via the interchange. Therefore, water from the rising river, which initially covered only one lane of

(CREDIT: BOB HAND PHOTOGRAPHY, JACKSON, MISS.)

FORTIFICATION STREET
INTERCHANGE AT 2 P.M. APRIL 15, 1979

the interstate, slowly inundated the entire protected area by Monday, April 16.

Floodwater initially entering the fairgrounds area via the Fortification Street interchange flowed southeastward toward the lagoon area. The lagoon, however, had already exceeded its capacity. Gradually, the entire protected area lying east of Interstate 55 was inundated. On Monday, April 16, floodwaters entering the protected area eventually flooded the entire area on both sides of the interstate. The water inside the levee rose almost to the height of water on the riverside. At the crest of the flood, water was 14 inches deep in the second floor of a motel located near the State coliseum and 4 feet deep on the second floor of a building near the lagoon. Total losses from these two facilities alone were approximately $3.5 million. Additionally, many other buildings located in the protected area were flooded. Water did eventually flow over the levee at certain locations. However, by that time the protected area was flooded and this additional water was insignificant.

Flanking occurred in plain view

The location where water flanked the levee was not in a remote area. Aerial photographs of the interchange showed that the Corps used the area as a staging ground for dump trucks delivering dirt to reinforce the levee. (See picture on p. 25.) Further, many of the personnel going to or from the Corps' pumping station traveled via the Fortification Street interchange. The flanking occurred gradually in full view of various officials. Further, it was known that the Fortification Street interchange was the lowest elevation in the flood protection system. No attempts, however, were made to fortify the gap to prevent water from flanking the levee.

Who was responsible for building a closure at Fortification Street?

Responsibility for constructing a sandbag or dirt closure at Fortification Street was unclear. Corps officials were aware that the Fortification Street interchange was the lowest elevation in the flood protection system. However, they did not consider the interchange as a part of their flood control project and made no preparations for closing the gap. In addition, the Corps did not coordinate with other Federal, State, or local agencies to assure that they would close the gap to ensure the integrity of the flood control project. The Corps concentrated on keeping water from going over its levee, not around it. The end results from not closing the gap at Fortification

Street, however, negated Corps efforts to increase the height of the levee. In fact, the purpose for which the levees were constructed--flood protection--was defeated by the lack of a Fortification Street closure.

The Rankin-Hinds District also did not attempt to form a Fortification Street closure. This State entity, which maintains the flood control project for the Corps, contended that it was not responsible for making the closure as no such requirement was shown in the Corps' operation and maintenance manual for the flood control project. Six other levee closures, involving railroads and streets, were required by the manual and were made. However, one at Fortification Street was not required and, therefore, was not made.

Neither the State Highway Department nor city of Jackson officials made any effort to protect the fairgrounds area by constructing a closure at Fortification Street. It appears that even though responsibility for the closure was unclear, the need for a closure was obvious. Notwithstanding, no one assumed responsibility for making the closure during this emergency situation.

CORRECTIVE ACTIONS BEING TAKEN

Federal, State, and local agencies are taking actions to resolve the coordination and flood preparation problems identified in this report. These actions include the following:

--The Corps and the Mississippi Civil Defense sponsored an October 1979 meeting of Federal, State, and local agencies to develop an emergency plan of action and to establish coordination and lines of communication among the various agencies involved in a flood emergency.

--A meeting, organized by the Corps, was held in July 1979 during which NWS, USGS, and Corps officials discussed problems encountered during the April flood. No specific solutions were reached but, as a result of this meeting, new lines of communication were established among these three agencies.

--As of October 1979, an agreement was being formalized between NWS and the manager of the Ross Barnett Reservoir regarding more timely water inflow predictions. NWS has agreed to provide the manager with the reservoir inflow predictions 3 days in advance of the expected inflow.

--Corps officials and the manager of the Ross Barnett Reservoir have established lines of communication for exchanging information and discussing problems of mutual interest, such as how to maximize the flood control capability of the reservoir.

--NWS officials stated that in the future NWS will call the Corps and the reservoir manager regarding crest predictions during periods of high water on the Pearl River at Jackson (20 feet or more). NWS will provide its crest predictions and solicit comments concerning the predictions.

--NWS has held meetings with USGS to discuss peak reservoir inflow and river crest data on the Pearl River. Formal procedures are being developed whereby NWS will contact USGS before making reservoir inflow and river crest forecasts.

--NWS and USGS have planned to hold meetings to discuss the placement of additional river gauges on the Pearl River.

--USGS has provided NWS with the names and phone numbers of USGS river gauge observers in the Upper Pearl River Basin. This will facilitate more accurate NWS river forecasts.

--The NWS office in Jackson has established new rainfall reporting procedures. Observers now call in rainfall data at any time of day when 1/2 inch of rain falls. The observers will continue to call every 6 hours until the rain stops.

--The Corps has requested and received a written resolution from the Rankin-Hinds District in which it accepted responsibility for ensuring that corrective actions are taken regarding flooding from the Jackson sanitary sewer system. The Rankin-Hinds District will work with Jackson's Public Works Department to resolve all potential flooding problems.

--The Corps is designing a sandbag and dirt closure for the Fortification Street/Interstate 55 interchange. The Rankin-Hinds District will be responsible for making the closure when the Pearl River at Jackson reaches 37 feet and a further rise is predicted. Closure procedures, when finalized by the Corps, will be issued as an addendum to the project's operation and maintenance manual.

FEMA'S ROLE IN THE JACKSON FLOOD AND IN FUTURE FLOOD DISASTERS

FEMA's role in the Jackson flood was limited to the efforts of three of its component agencies which became part of FEMA under Reorganization Plan No. 3--the Federal Disaster Assistance Administration, the Federal Insurance Administration, and the Defense Civil Preparedness Agency. The Defense Civil Preparedness Agency assisted the Mississippi Civil Defense Council in monitoring the flood situation and in locating flood fighting resources. The Federal Disaster Assistance Administration coordinated all Federal disaster relief assistance, including the Federal Insurance Administration's administration of flood insurance claims. During the Jackson flood and postflood relief efforts, these agencies performed their traditional roles and did not assume any of FEMA's new responsibilities as it was just being organized.

We discussed our findings concerning the Jackson flooding with the FEMA Director to determine how FEMA will respond to such future disasters and how it will resolve the types of problems noted in this report. In addition, we discussed the Director's role as the one Federal official responsible to the President for supervising Federal efforts to anticipate, prepare for, and respond to major civil emergencies. We informed the Director that it appeared from the Reorganization Project's report to the President and from the hearings that the problems found in Jackson are the types of problems that FEMA was created to resolve.

The Director agreed that the problems found in Jackson concerning coordination and flood preparation are the types of problems that FEMA was created to resolve. He informed us that FEMA will attempt to resolve such problems through better disaster planning--FEMA will emphasize and coordinate the planning of Federal, State, and local agencies. In addition, the Director stated that FEMA will perform critiques of actual disaster responses and will take the lead in resolving any problems noted. Further, the Director stated that FEMA will emphasize disaster mitigation; concerning flood disasters, this could include permanently relocating people from flood plains. Specifically addressing the coordination problems noted in this report, the Director stated that in the future local officials will look to the FEMA representative to resolve any coordination problems among Federal agencies that become evident during a disaster.

CONCLUSION

We believe that the steps being taken by the various Federal, State, and local agencies will improve flood fighting capabilities in the Jackson, Mississippi, area. Therefore, we are not making any recommendations to these agencies at this time. However, we believe that FEMA, in line with its role to resolve disaster response problems, should assume a leadership role in assuring that the steps being taken by these agencies are effectively completed.

RECOMMENDATION TO THE FEMA DIRECTOR

To prevent a recurrence of the coordination and flood fighting problems experienced during the April 1979 Jackson flood, we recommend that the FEMA Director follow the progress of the Federal, State, and local agencies' corrective actions and provide assistance, when necessary, to assure they are completed.

We discussed this recommendation with the FEMA General Counsel who concurred that it was proper, considering the role of FEMA.

CHAPTER 5

SCOPE OF REVIEW

Our review of the establishment of FEMA was conducted at FEMA headquarters, Washington, D.C., and at the Office of Management and Budget, Washington, D.C., where we interviewed agency officials and reviewed pertinent documents.

Our review of the April 1979 Jackson, Mississippi, flood concentrated on the period during which the Jackson area and the Pearl River watershed were receiving heavy rainfall and the subsequent period during which the actual flooding took place. Time constraints did not permit us to review in detail the effectiveness of the activities of those Federal agencies involved in the flood relief activities.

The review of the Jackson flood was performed at the following Federal agencies where we interviewed officials and reviewed pertinent documents:

--Corps of Engineers, Washington, D.C., and Mobile, Alabama.

--Federal Disaster Assistance Administration (now part of FEMA), Washington, D.C., and Atlanta, Georgia.

--National Weather Service, Washington, D.C., and Jackson, Mississippi.

--U.S. Geological Survey, Jackson, Mississippi.

We also interviewed the mayor of Jackson, Mississippi, and one of the two Jackson city commissioners. Others interviewed in the Jackson area included officials of the Pearl River Valley Water Supply District; Rankin-Hinds Flood Control and Drainage District; City of Jackson Public Works Department; the Office of Disaster Preparedness and Operations, City of Jackson; and private firms involved with the design and construction of the Corps' Jackson levee system.

SPECIFIC QUESTIONS ADDRESSED IN THIS REPORT

1. What has been done with respect to establishing FEMA since September 1978 when FEMA was approved by the Congress? (See pp. 2 to 6.)

2. What is the current status of FEMA's organization? (See pp. 4 to 6.)

3. Why were all designated agencies not put in FEMA on April 1, 1979, when it was established? (See p. 4.)

4. When will the remaining agencies be put into FEMA? (See p. 4.)

5. What is the status of appointing the six top officials in FEMA? (See pp. 4 and 5.)

6. Is there any sign that the savings noted in the President's message--$10-15 million annually and elimination of 300 jobs--are being realized, and if so, are these savings also reducing adequacy of Federal disaster relief capability? (See pp. 5 and 6.)

7. What actions were taken by the various Federal agencies from the beginning of the flooding in Jackson, Mississippi, through April 30, 1979, to assist the State and local officials in mitigation and relief efforts? (See pp. 7 to 16.)

8. What role did FEMA play, if any, in responding to the Mississippi flooding? (See p. 29.)

9. Did FEMA, or any other Federal agency, attempt to coordinate and disseminate information from appropriate Federal agencies on predicted extent of rain and flooding? Were Federal agency predictions during this time accurate? Specifically, did Federal agencies give accurate and timely information to local officials responsible for flood control operations of the Ross Barnett Reservoir? If not, could accurate and timely information have given these local officials an opportunity to take steps which might have saved people's homes and property? (See pp. 17 to 20.)

10. Did FEMA, or any other Federal agency, coordinate the relief effort of the Federal agencies right after the flood? (See pp. 29 and 34.)

11. If, during GAO's review of the Mississippi flood disaster (limited to the period April 12-30), coordination problems among Federal agencies are identified, determine if these types of problems were considered in the reorganization plan and related studies or hearings. (See pp. 29 and 30.)

CHRONOLOGY OF SELECTED EVENTS OF APRIL 1979 FLOOD

Wednesday evening, April 11--Heavy rainfall occurred in Jackson (over 8 inches).

Wednesday night, April 11--The Jackson Levee stationary pumps were started.

Thursday, April 12--NWS forecasted a river crest in Jackson of 36 feet.

Friday morning, April 13--Reports of record rainfall (as much as 20 inches) in Upper Pearl River Basin reached the Jackson NWS office.

Friday, April 13--The Mayor of Jackson received the Corps and USGS crest predictions of 42.1 and 40.0 feet, respectively.

Saturday, April 14--The reservoir manager received peak reservoir inflow predictions of 160,000 CFS and 180,000 CFS from USGS and NWS, respectively.

Saturday, April 14--The reservoir manager accepted assistance from the Corps.

Saturday afternoon, April 14--The two valves on the 66-inch sewer line were closed.

Saturday night, April 14--The Mayor of Jackson ordered evacuation of the fairgrounds area.

Saturday night, April 14--Pumping operations on the Jackson Levee were halted due to the rising water.

Sunday morning, April 15--Floodwater flanked the north end of the Jackson Levee at the Fortification Street interchange.

Monday, April 16--Water flooded the entire protected area inside the Jackson Levee.

Monday, April 16--President declared a Major Disaster for State of Mississippi. The Federal Disaster Assistance Administration began to coordinate Federal relief efforts.

Tuesday, April 17--The Pearl River crested at Jackson at 43.3 feet.

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