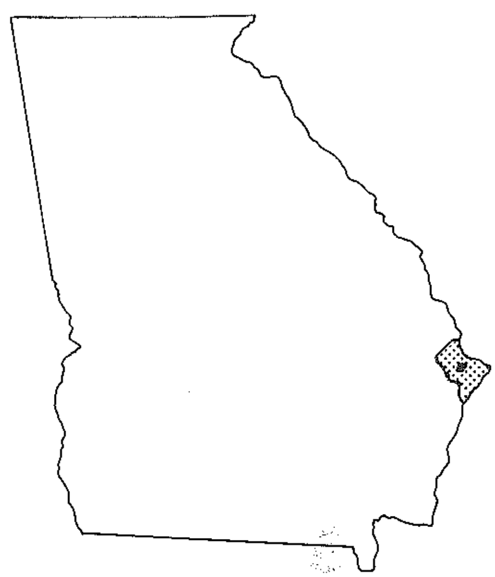
FLOOD INSURANCE STUDY

CITY OF SAVANNAH, GEORGIA

CHATHAM COUNTY



SEPTEMBER 4, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 135163

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

CITY OF SAVANNAH,
CHATHAM COUNTY,
GEORGIA

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Type 19 Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Savannah, Chatham County, Georgia, and to aid in the administration of the Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to revise the Flood Insurance Rate Map developed from data presented in the previously published Type 19 Flood Insurance Study. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study revises and supersedes a previous Flood Insurance Study for the City of Savannah. This information will be used by the community to update existing flood plain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land use and flood plain development.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, FEMA, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the storm surge for this study were obtained from the Type 19 Flood Insurance Study for the Unincorporated Areas of Chatham County, Georgia (Reference 1). The riverine hydrologic and hydraulic analyses for this study were obtained from the previous Type 19 Flood Insurance Study for the City of Savannah, Chatham County, Georgia, and Flood Plain Information Reports for Pipe Makers Canal, Dundee Canal and Salt Creek, Casey Canal-North, Casey Canal-South, Springfield Canal, Harmon Canal, and Wilshire Canal and Tributaries (References 2-9).

1.3 Coordination

On November 21, 1985, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Savannah, Chatham County, Georgia. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based upon the extent and validity of available existing hydrologic and hydraulic data.

Flooding caused by overflow of Harmon Canal, Wilshire Canal, Wilshire Canal Tributary A, Wilshire Canal Tributary A-1, Casey Canal, Springfield Canal, Springfield Canal Tributary A, Dundee Canal, and Pipe Makers Canal was studied by detailed methods.

A detailed coastal flooding analysis was performed for the City of Savannah where the flooding source is the Atlantic Ocean.

Approximate methods of analysis were used to study all remaining areas having a potential flood hazard that did not have detailed scientific or technical data available.

2.2 Community Description

The City of Savannah is located in Chatham County in eastern Georgia, about 20 miles west of the Atlantic Ocean. Savannah is bordered by the Towns of Vernonburg and Thunderbolt and the unincorporated areas of Chatham County on the east, the unincorporated areas of Chatham County on the south, Garden City and the unincorporated areas of Chatham County on the west, and Jasper County, South Carolina, on the north across the Savannah River.

The city is served by Interstate 16, U.S. Routes 17 and 80, State Routes 25, 26, 307, 359, and 404, the CSX railroad, the Norfolk Southern Railway, and one major airport. The 1980 population of Chatham County was reported to be 202,226. Savannah, the county seat and the largest city in the county, had a population of 141,390 in 1980 (Reference 10).

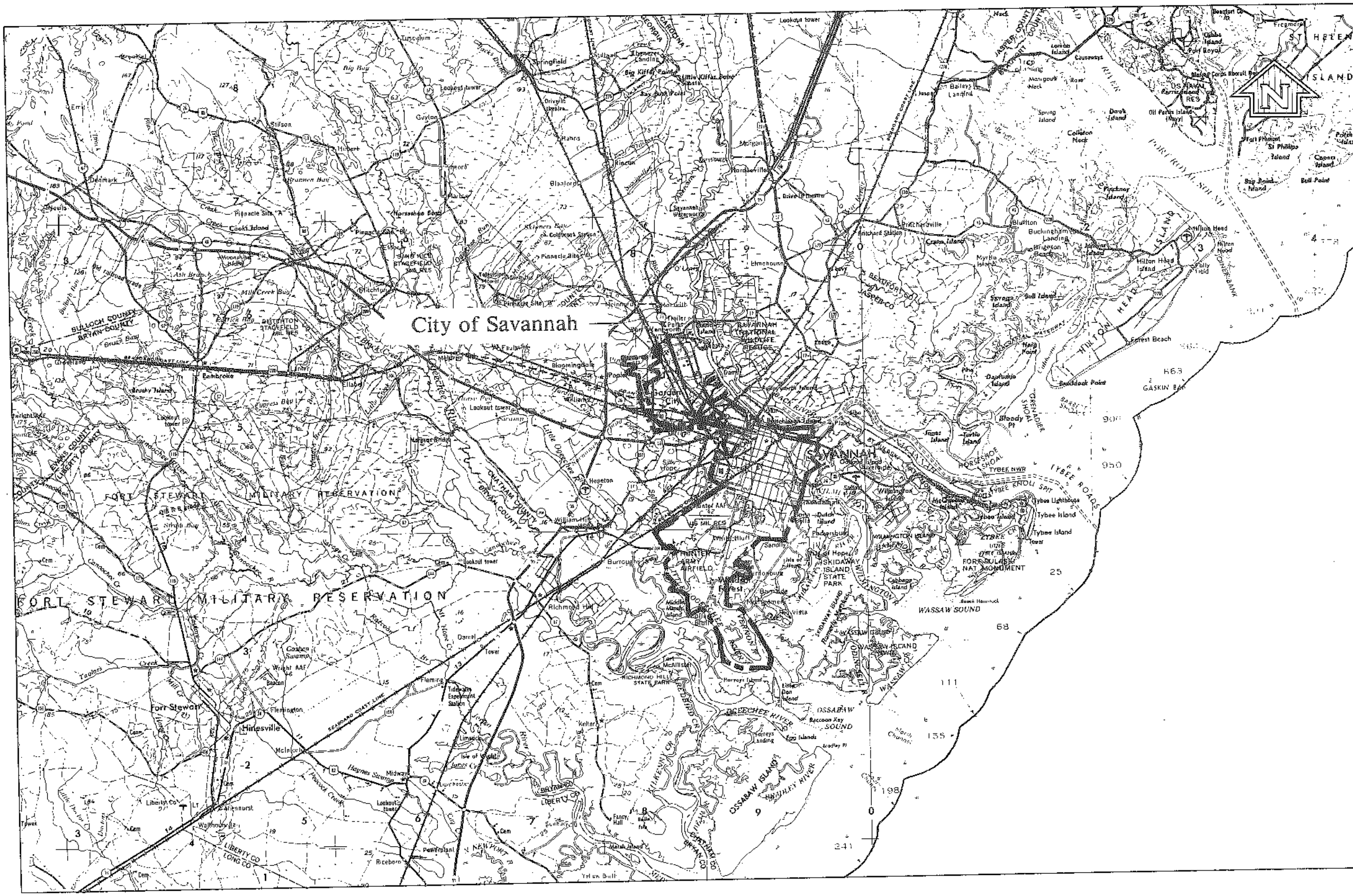


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SAVANNAH, GA

(CHATHAM CO.)

VICINITY MAP

The mean temperatures in Savannah range from a low of 50 degrees Fahrenheit (F.) in January to a high of 75 degrees F. in July. Average annual rainfall is 48 inches, with the summer months receiving the most precipitation. Natural vegetation consists mostly of southern mixed forest, made up of pine, gum, oak, and cypress trees (Reference 11).

2.3 Principal Flood Problems

Savannah is subject to flooding caused by hurricanes and tropical storms. Major storms and hurricanes caused flooding in 1871, 1881, 1885, 1893, 1896, 1898, 1911, 1940, 1944, 1947, 1952, 1959, and 1979 (References 12-14). The highest surges occurred during the hurricanes of 1881 and 1893, which caused flood heights up to 16 and 19 feet mean sea level (msl), respectively, in Savannah Beach (References 12 and 13).

The primary factors contributing to flooding in Chatham County are its openness to Atlantic Ocean surges and unfavorable bathymetry extending offshore. Many of the large streams near the coast have wide mouths and are bordered by extensive areas of low marsh. In addition, the terrain at the coast is generally too low to provide an effective barrier. The offshore ocean depths are shallow for great distances, generating a high Atlantic Ocean surge.

A storm history of Chatham County and its vicinity during the past 100 years is summarized below. Damage figures are determined in dollar values at the time of the storm. No attempt has been made to adjust these figures to current dollar values.

August 16-19, 1871

A tropical cyclone moved overland from Florida and caused damage along the Florida, Georgia, and South Carolina coasts. At Savannah, Georgia, the wind speed was 72 miles per hour (mph) from the north.

August 21-29, 1881

This storm reached hurricane intensity northeast of Puerto Rico on August 22. The lowest barometric pressure reading was 29.08 inches. The storm center entered the coast south of Savannah on August 27. Damage in Savannah was estimated at $1.5 million. Approximately 335 people were killed in and near the city. Nearly 100 vessels were wrecked along the Atlantic coast. Damage was very heavy on Tybee Island and other coastal islands near Savannah. The highest tide observed was estimated to reach an elevation of 16.5 feet msl at Savannah Beach, approximating a flood of at least a 100-year magnitude.

August 21-26, 1885

This storm moved inland north of Savannah on August 25. It caused heavy damage in North and South Carolina. Total damage was estimated at about $1.7 million. Damage inflicted by this storm in Georgia was relatively light.

August 15-September 2, 1893

This major hurricane, which originated near the Cape Verde Islands, reached the Georgia coast on August 27. It was accompanied by a tremendous storm wave that submerged the islands along the Georgia and South Carolina coasts. Between 2,000 and 2,500 people lost their lives on the coastal islands and in the lowland between Tybee Island and the City of Charleston, South Carolina. Property damage along the Atlantic coast was estimated at $10 million. Nearly every building on Tybee Island was damaged and the railroad to the island was wrecked. The highest tide known to have occurred in the county was estimated to have a range of 17.0 to 19.5 feet msl at Savannah Beach.

September 22-29, 1896

This hurricane entered the northwestern Florida coast near the Town of St. Mark, Florida. Its center passed through southeastern Georgia and South Carolina on September 28 and 29. Hurricane winds persisted when the hurricane moved inland. Savannah recorded maximum winds of 75 mph. Damage in Savannah was estimated at $1 million. Damage was also heavy on Tybee Island and over much of southeastern Georgia. Because the damaging hurricane wind was of a short duration near Chatham County and occurred during a low tide period, destruction caused by storm surge was relatively light compared with the hurricanes of 1881 and 1893.

August 30-September 1, 1898

This hurricane entered the Georgia-South Carolina coast on August 30. Its center passed over Tybee Island. Winds on Tybee Island were estimated at 100 mph. The storm surges were not high enough to cause extensive damage; however, the hurricane was accompanied by very heavy rain, and the countryside was flooded for 100 miles around Savannah. Most roads and railroads were impassable because of high water.

August 23-30, 1911

The center of this hurricane entered the coast between Savannah and Charleston on August 28. A maximum wind of 88 mph from the northwest was recorded at Savannah. Damage in the Savannah area was remarkably low; however, property on Tybee Island was heavily damaged. Excessive rains accompanied the storm and caused considerable damage to roads, crops, and other property throughout southern Georgia.

August 5-15, 1940

This was the first hurricane to affect Georgia since August 1911. Its center entered the South Carolina coast to the north of Savannah on August 11. The wind at Savannah reached 73 mph, and damage in the Savannah area was estimated at $850,000. The highest tide observed at the City of Beaufort, South Carolina, was estimated to be 12.4 feet msl. High tides of 7.4 and 6.4 feet msl were recorded at Fort Pulaski, Georgia, and at Fort Jackson, Savannah Harbor, Georgia, respectively.

October 12-23, 1944

This hurricane entered the gulf coast of Florida and moved northeastward across the peninsula. Its center crossed the east coast near Jacksonville, Florida, in a north-northeast direction and moved inland again near Savannah. The hurricane was downgraded to a tropical storm by the time it reached Georgia. The highest tide, 5.9 feet msl along the Georgia coast, was observed at Fort Pulaski, near the mouth of the Savannah River. The estimated damage in Georgia was $500,000.

October 9-16, 1947

The center of this hurricane entered the Georgia coast just south of Savannah on October 15. At Savannah, the maximum wind speed was 77 mph, and the lowest barometric pressure was 28.77 inches. Heavy losses were sustained at Savannah and Savannah Beach, where more than 1,500 buildings were substantially damaged. Total damage in the coastal area was estimated at more than $2 million. The highest tide, 7.9 feet msl, was recorded at Fort Jackson.

August 18-September 2, 1952 (Hurricane Able)

Hurricane Able moved inland on August 30. Its center passed near Beaufort with maximum winds of approximately 100 mph. Damage from this storm was estimated at about $2.8 million.

September 20-October 2, 1959 (Hurricane Gracie)

Hurricane Gracie moved inland on September 29. Its center passed over the South Carolina coast near Beaufort. Wind gusts of hurricane force were felt in the Savannah area, and damage was inflicted over the upper Georgia coastal area. The total damage inflicted by the storm was estimated at $14 million with damage in Georgia estimated at more than $500,000. High-water marks, which were reported near the Town of Edisto Beach, South Carolina, ranged from 7.3 to 11.9 feet msl.

August 25-September 7, 1979 (Hurricane David)

Hurricane David was the most intense storm of the century to affect the islands of the eastern Carribean. However, the storm was not a major hurricane when it struck the United States. David struck just north of the Town of Palm Beach, Florida, on September 3 and made a second landfall about 24 hours later near Savannah Beach, Georgia. In the United States, David was responsible for five deaths and about $300 million in damages. The death toll and damage were much greater in Dominica, Cuba, and the Dominican Republic (Reference 14).

2.4 Flood Protection Measures

Due to the parameters of this existing data study, information regarding flood protection measures in the community is obtained only from the source reports (References 1 and 2) and any other readily available sources. None of these sources provided information relating to the flood protection measures in the community.

Levees exist in the study area that provide the community with some degree of protection against flooding. However, it has been ascertained that these levees may not protect the community from rare events such as the 100-year flood. The criteria used to evaluate protection against the 100-year flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 100-year flood are not considered in the hydraulic analysis of the 100-year flood plain.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community. Analyses were also carried out to establish the peak elevation-frequency relationships for each coastal flooding source studied in detail.

The riverine hydrologic analyses were obtained from Flood Plain Information Reports (References 3-9).

Inundation from the Atlantic Ocean caused by passage of storms (storm surge) was determined by the joint probability method (Reference 15). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of the City of Savannah. Primary sources of data for this were "Tropical Cyclone Card Deck 993" (Reference 16), "Tropical Cyclones of the North Atlantic Ocean, 1871-1980" (Reference 17), "Tropical Cyclones of the North Atlantic Ocean" (Reference 18), and "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States" (Reference 19).

A summary of the parameters used for the area is presented in Table 1, Parameter Values for Surge Elevations.

For areas subject to flooding directly from the Atlantic Ocean, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 20).

The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the City of Savannah and are shown in Table 2, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects, and include the contributions from wave action effects.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the riverine sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

The riverine hydraulic analyses were obtained from Flood Plain Information Reports (References 3-9).

The hydraulic analyses for the riverine study are based only on the effects of unobstructed flow. The flood elevations shown in the Flood Plain Information reports (References 3-9) are, thus, considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

All dunes and structures were assumed to remain intact for purposes of this analysis.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 8 nautical miles by 5 nautical miles and 6,000 feet by 6,000 feet, depending on the resolution required.

CENTRAL PRESSURE DEPRESSION (MILLIBARS)	83	67	53	42	33	23	9
ASSIGNED PROBABILITIES[1]	0.03	0.08	0.11	0.13	0.16	0.29	0.20
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			20			28
PROBABILITY[1]	0.24			0.26			0.50
FORWARD SPEED (KNOTS)	7			11			15
PROBABILITIES:[1]	0.45			0.30			0.25
DIRECTION OF STORM PATH[1] (DEGREES FROM TRUE NORTH)			327		301		
PROBABILITY[1]			0.51		0.49		
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)	65[2] 0.00107		20[2] 0.0012		25[3] 0.00124		70[3] 0.00131

[1] AVERAGE OF DIFFERENT STORM TRACK LOCATIONS
[2] NAUTICAL MILES SOUTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[3] NAUTICAL MILES NORTH OF GEORGIA-SOUTH CAROLINA BOUNDARY

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SAVANNAH, GA

(CHATHAM CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS

(ENTERING HURRICANES)

CENTRAL PRESSURE DEPRESSION (MILLIBARS)	83	67	53	42	33	23	9
ASSIGNED PROBABILITIES[1]	0.03	0.08	0.11	0.13	0.16	0.29	0.20
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			20			28
PROBABILITY[1]	0.24			0.26			0.50
FORWARD SPEED (KNOTS)	7			11			15
PROBABILITIES:[1]	0.32			0.30			0.38
DIRECTION OF STORM PATH[1] (DEGREES FROM TRUE NORTH)				35			
PROBABILITY[1]				1.0			
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)	65[2] 0.0039[4] 0.0042[5]		20[2] 0.0045[4] 0.0048[5]		25[3] 0.0051[4] 0.0054[5]		70[3] 0.0058[4] 0.0061[5]

[1]AVERAGE OF DIFFERENT STORM TRACK LOCATIONS
[2]NAUTICAL MILES SOUTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[3]NAUTICAL MILES NORTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[4]15 NAUTICAL MILES OFFSHORE
[5]45 NAUTICAL MILES OFFHSORE

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SAVANNAH, GA

(CHATHAM CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS

(ALONGSHORE HURRICANES)

TABLE 1

CENTRAL PRESSURE DEPRESSION (MILLIBARS)	83	67	53	42	33	23	9
ASSIGNED PROBABILITIES[1]	0.03	0.08	0.11	0.13	0.16	0.29	0.20
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			20			28
PROBABILITY[1]	0.24			0.26			0.50
FORWARD SPEED (KNOTS)	7						13
PROBABILITIES:[1]	0.45						0.55
DIRECTION OF STORM PATH[1] (DEGREES FROM TRUE NORTH)			54		94		
PROBABILITY[1]			0.75		0.25		
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)	65[2] 0.0026		20[2] 0.0013		25[3] 0.00069		70[3] 0.00056

[1]AVERAGE OF DIFFERENT STORM TRACK LOCATIONS
[2]NAUTICAL MILES SOUTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[3]NAUTICAL MILES NORTH OF GEORGIA-SOUTH CAROLINA BOUNDARY

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SAVANNAH, GA

(CHATHAM CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS

(EXITING HURRICANES)

FLOODING SOURCE AND TRANSECT	FLOODING INSURANCE RATE MAP PANEL	STILLWATER ELEVATION (FEET NGVD)				ZONE	BASE FLOOD ELEVATION[1,2] (FEET NGVD)
		10-YEAR	50-YEAR	100-YEAR	500-YEAR		
ATLANTIC OCEAN							
1,2	0025,0030,0035,0040 0045,0050	10.6	12.7	14.0	15.4	VE AE	14—18 14—15
2	0025,0030,0035,0040 0045,0050	10.3	11.8	12.0	13.6	VE AE	14—17 12—14
3	0015,0020,0030	10.3	12.5	13.0	15.5	AE	13—14
N/A	0010,0015,0025,0035	10.3	11.8	12.4	13.6	AE	12
N/A	0005,0015	10.0	11.3	12.0	13.5	AE	12

[1]ROUNDED TO THE NEAREST FOOT AND MAY INCLUDE EFFECTS OF WAVE ACTION
[2]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SAVANNAH, GA

(CHATHAM CO.)

SUMMARY OF STILLWATER ELEVATIONS

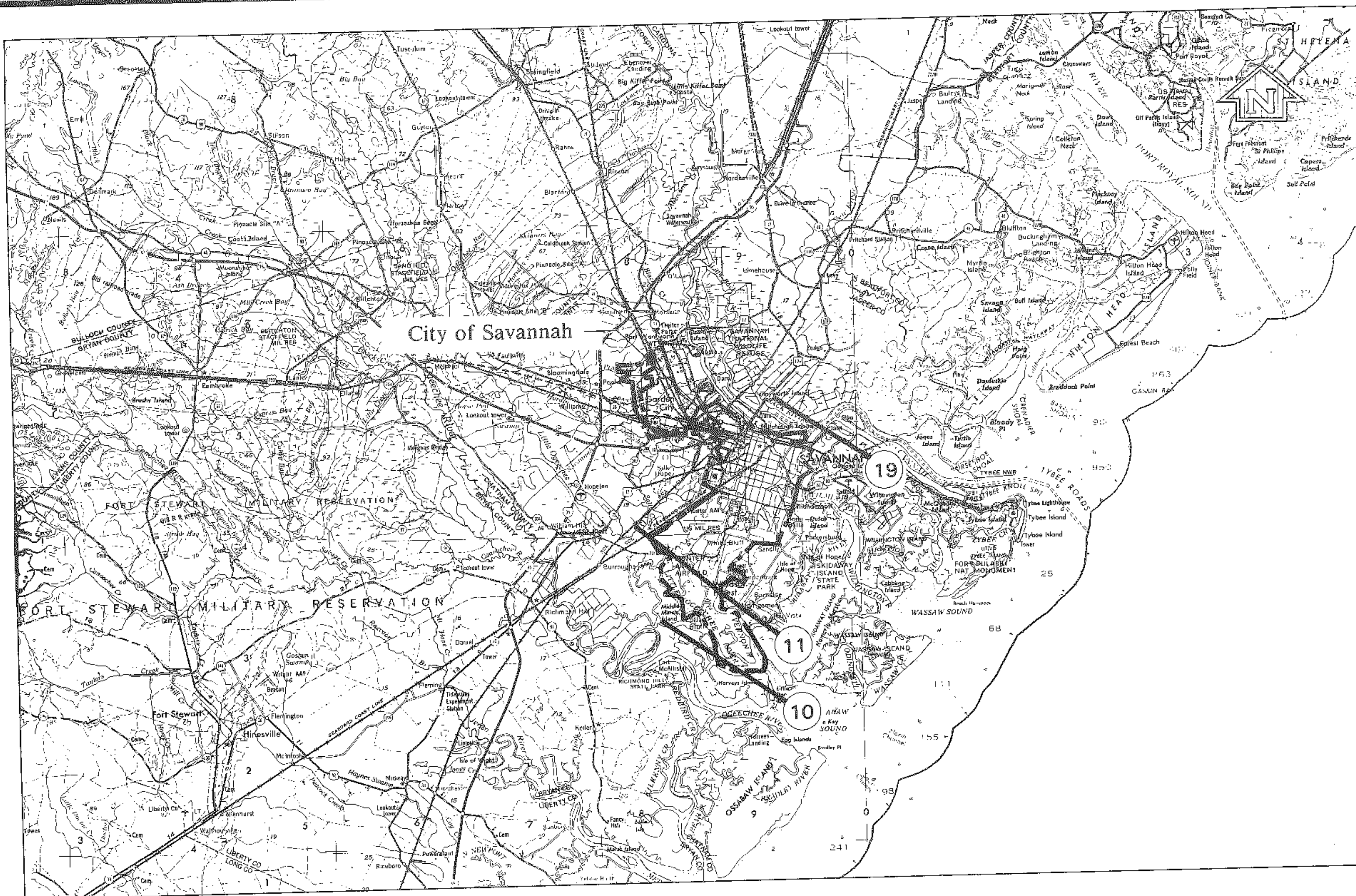
ATLANTIC OCEAN

Underwater depths and land heights for the model grid systems were obtained from National Oceanic and Atmospheric Administration (NOAA) nautical charts, U.S. Geological Survey topographic maps, and field surveys (References 21-23).

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (Reference 24). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in Reference 24. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 2, Transect Location Map, in accordance with the "Users Manual for Wave Height Analysis" (Reference 25). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at large intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was also computed at each transect. Table 3 provides a listing of the transect locations and stillwater starting elevations, as well as initial wave crest elevations.



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SAVANNAH, GA

(CHATHAM CO.)

TRANSECT LOCATION MAP

FIGURE 2

TABLE 3 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
1	across Raccoon Key (in Chatham County), continuing up to approximately 1.0 mile south of the Seaboard Coast Line Railroad	13.0	20.1
2	across the western side of Wassau Island (in Chatham County), continuing through the western portion of Skidaway Island	13.0	20.1
3	across Tybee Island (in Chatham County) approximately 2 miles southeast of the mouth of the Bull River	13.0	20.1

Figure 3 represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the A/V zone boundary.

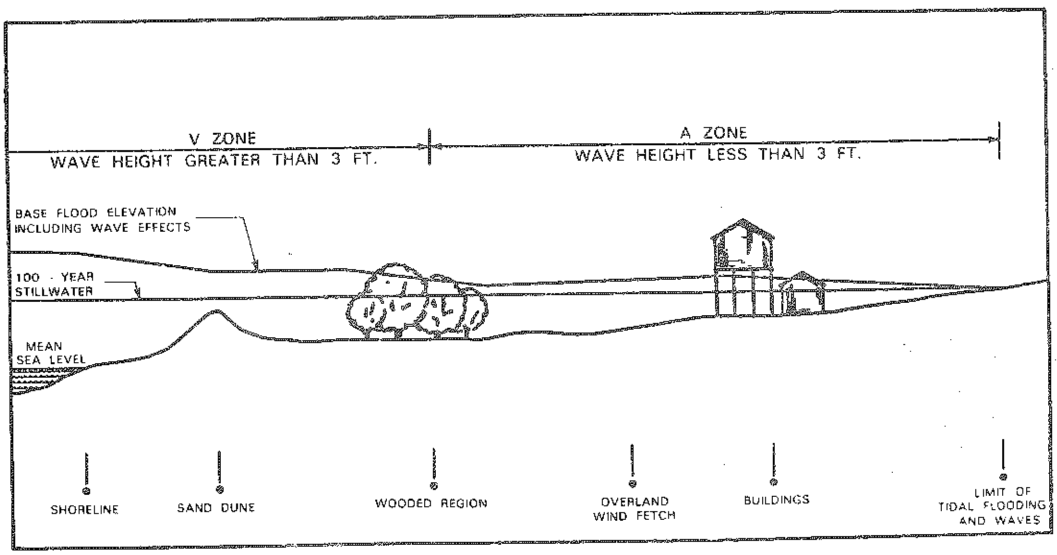


FIGURE 3 - Transect Schematic

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (Reference 23), aerial photographs (Reference 26), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the Type 19 Flood Insurance Study for the City of Savannah (Reference 2). For each coastal flooding source studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24000 and a contour interval of 5 feet (Reference 23).

The 100- and 500-year flood plain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the flooding sources studied by approximate methods, only the 100-year flood plain boundary is shown on the Flood Insurance Rate Map.

4.2 Floodways

The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

No floodway is presented in this study because no floodway was included in the Type 19 Flood Insurance Study for the City of Savannah (Reference 2).

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year flood plain that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal flood plains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone Z is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For flood plain management applications, the map shows by tints, screens, and symbols the 100- and 500-year flood plains.

6.0 OTHER STUDIES

Several agencies have conducted previous studies for the entire coast of Georgia that were not compared to this Flood Insurance Study. In 1959, the U.S. Weather Bureau and the U.S. Army Corps of Engineers published a study of meteorological characteristics of hurricanes along the Atlantic and Gulf coasts of the United States (Reference 27).

This Flood Insurance Study for the City of Savannah agrees with the previously published Flood Plain Information Reports for Pipe Makers Canal; Dundee Canal and Salt Creek; Casey Canal-North; Casey Canal-South; Springfield Canal; Harmon Canal; and Wilshire Canal and Tributaries (References 3-9).

This study agrees with the Flood Insurance Study for the Unincorporated Areas of Chatham County, and the studies currently in progress for the City of Garden City, the Town of Vernonburg, and the Town of Thunderbolt, Chatham County, Georgia (References 1, 28, 29, and 30).

Due to its more detailed analysis, this Flood Insurance Study supersedes the previously published Type 19 Flood Insurance Study for the City of Savannah (Reference 2).

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

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ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0035	26.86	nail in south side of guy pole at southwest corner of intersection of Abercorn Street and Mercy Boulevard
2	0035	22.77	spike in west side of power pole at northeast corner of intersection of Apache Avenue and Abercorn Street Extension

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