THE KIBLER LAW FIRM

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March 13, 2012

Lorena Vaughn
U.S. EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

RE: Mr. Henry R. Stevenson, Jr. and Parkwood Land Company; Docket No. CWA-06-2011-2709

Dear Ms. Vaughn:

Enclosed please find the materials requested by Pat Rankin in the above-referenced cause. If there are any questions, please feel free to contact our offices.

Sincerely,

Charles (Chuck) Kibler, Jr.

CMK/cc

Enclosures

FILED
2012 MAR 19 PM 4:13
REGIONAL HEARING CLERK
EPA REGION VI

FLOODWAY REVIEW

ON

PARKWOOD LAND COMPANY TRACT

IN

ORANGE COUNTY, TEXAS

PREPARED BY
SKINNER ENGINEERING SERVICES COMPANY
FIRM No. F-2120
P.O. BOX 67
SILSBEE, TEXAS 77656
PHONE 409-385-2074

NOVEMBER 2, 2011

1.0 EXECUTIVE SUMMARY

Our firm was hired by Mr. Sonny Stevenson to investigate the data used to determine ahow a tract of land he owns in Orange County, Texas was calculated to be in the floodway of the Neches River. The tract is shown to be located in the floodway on the Flood Insurance Rate Map prepared by the Federal Emergency Management Agency for this area. The tract of land is located adjacent to and north of Interstate Highway 10 and on the east bank of the Neches River. The tract of land is completely enclosed by a levee system.

We told Mr. Stevenson that we would review the data used by the Federal Emergency Management Agency to calculate the floodway of the Neches River in the area of his tract. We would need to look at the cross sections and additional data used for said calculations. We wanted to determine if the levee system around Mr. Stevenson's property had been accounted for in the calculations of the floodway.

We contacted the Federal Emergency Management Agency Engineering Library in Alexandria, Virginia to request the data used to calculate the floodway on the Neches River in the area of said tract. They could only find the final computer printout of the calculated floodway. They could not find the cross sections used for the calculations. They said I could contact the Federal Emergency Management Agency Region 6 office in Denton, Texas to see if they had the data. The Region 6 office did not have the information and said I could try the United States Corp of Engineers office in Galveston, Texas to see if they had the information. I could not get a response from the Corp office in Galveston.

Based on the information that we did receive, it would appear that the levee system on Mr. Stevenson's property was not accounted for in the calculations of the floodway along the Neches River. The Flood Insurance Rate Map for the area of tract should be reviewed and Mr. Stevenson's property should be designated outside the floodway of the Neches River.

2.0 INTRODUCTION

On August 17, 2011 Mr. Sonny Stevenson came to our office to discuss a tract he owns in Orange County, Texas. Said tract is a 96.659 acre tract in the Gilbert Stephenson Survey, Abstract Number 167 in Orange County, Texas conveyed from Edwin Arnaud, Inc. to Parkwood Land Company (Mr. Stevenson is Owner) as Tract 3 in deed dated September 19, 2006 and is recorded in the Official Public Records of Orange County, Texas under Clerks File Number 303215. The tract is located north of Interstate Highway 10 and east of the Neches River. The tract is bounded on the west and north by the Neches River, on the east by Bairds Bayou and on the south by Interstate Highway 10.

Mr. Stevenson stated he was having a difficult time obtaining a building permit from Orange County to perform any construction in the site. The site is shown to be in the floodway of the Neches River on the Flood Insurance Rate Map prepared by the Federal Emergency Management Agency for Community Number 480510, Panel Number 0125 B, effective date of the F.I.R.M. is January 6, 1983. The site is shown to be located in Zone A12 with a 100 year flood elevation of approximately 11.

Mr. Stevenson stated that there was a levee that had been constructed along the his property from the southwest corner, being at the intersection of the east bank of the Neches River and the north line of Interstate Highway 10 and northward along the Neches River to Bairds Bayou and then southwest along the west side of Bairds Bayou to the southeast corner on Interstate Highway 10. The levee had been constructed prior to 1917.

Mr. Stevenson requested that we investigate the methodology used to determine that the property is located in the Floodway on the reference Flood Insurance Rate Map.

Mr. Stevenson supplied our office with the information he had on the tract. It was understood that we would use the information Mr. Stevenson provided and information we had in our office on the tract. We would request the information from the Federal Emergency Management Agency concerning the data used to determine the floodway boundary on the referenced Flood Insurance Rate Map.

3.0 HISTORY

The levee was constructed on the property by excavating a canal east of the east bank the Neches River and west of the west bank of Bairds Bayou. The canal was located approximately 100 feet inland from the river and bayou. The spoil from the canal was deposited east of the canal along the Neches River and west of the canal along Bairds Bayou for the levee construction. There was effectively a barrier island left between the canal and the river and bayou. The elevation of the levee was to be approximately 13 feet based on information supplied our office.

We were supplied an instrument from the East Beaumont Townsite Company to Orange County dated November 28, 1917 for road right of way on the tract. The instrument referenced the levee and stated it was for protection of the property from flooding from the Neches River and if damaged the levee would be restored to a height to protect the property from flooding. Based on this information it would appear that the levee was constructed on the property prior to November 28, 1917.

The barrier island, canal and levee are shown on The Orange County Drainage Map dated January 1927 and accepted November 1, 1931 and on record at the Orange County Drainage Districts Office. The east end of the bridge crossing the Neches River on this tract is shown to have an elevation of 22.18 on the plat. The levee is at the bridge. Portion of the map is shown in on Exhibit 1 in the Appendix.

A map prepared in 1947 for a proposed borrow source show the barrier island, canal and levees and the area inside the levees as a muck disposal area. The map is shown in Exhibit 2 in the Appendix.

In a series of aerial photographs of the area from 1938, 1989, 2004, 2006 and 2010 are included in the Appendix as Exhibits AP-1 thru AP-5. The barrier island, canal and levee are visible in all photographs. The barrier island is diminishing more in each photograph.

In a series of Topographic Maps prepared by the U. S. Geological Survey for this area in 1932, 1943, 1960, 1970 and 1994 are shown in the Appendix as TM-1 thru TM-5. The barrier island, canal and levee are shown on the maps in 1932, 1943 and 1994. The barrier island and canal is shown in 1960 and 1970, the levee is not shown.

4.0 FLOOD INSURANCE STUDY

The Flood Insurance Study for Orange County, Texas was prepared by the Federal Emergency Management Agency and completed in June 1980. The study was revised on June 5, 1997. The Flood Insurance Study is included in Exhibit 4 in the Appendix. The report in the Appendix includes only the charts or graphs pertaining to the Neches River, all others have been excluded.

The Flood Insurance Study is for only the unincorporated area of Orange County, Texas. In the Study under Item 2.1 it is stated that the Neches River was studied in detail. The peak discharges in the Neches River was calculated using the Corp of Engineers HEC-1 Flood Hydraulic package as stated in Section 3.1 of the Study. In Section 3.2 of the Study it is stated that the water surface elevations of the floods at the selected recurrence intervals were developed by using the Corp of Engineers HEC-2 water-surface profile computer model. The Study stated the cross sectional data used for the calculation in th HEC-2 model were obtained from the Corps of Engineers, Galveston District.

The Neches River was stationed going upstream, beginning at Sabine Lake and stations increasing going upstream, going to the west and north. To model the water surface of the River you take cross sections of the River and the land on either side of the River that may be subject to flooding, normally you take the section to the ground surface that will be outside the flooded area. The cross section are usually taken perpendicular to the flow of the River. Sections are normally taken at changes in the river or changes in the topography of the land adjacent to the River, all dependant on the size of the river and the surrounding terrain.

The first section taken in the Study is at River Station 108,600 (feet) and designated as section A in the Study. This section crosses the Parkwood Land Company tract. The section is approximately 350 feet north of the Interstate Highway 10 bridge over the Neches River. The section extends east and west from the river and is north of and approximately parallel to said Interstate Highway 10. The next section in the Study is taken 7,500 feet upstream at River Section 116,100 (feet) and designated as Section B in the Study.

The Study states the width of the floodway at section A is 7,000 feet in the unincorporated areas of Orange County, with 6,350 feet of the floodway section being in Orange County and 650 feet in Jefferson County. The 100 year flood elevation is 10.8 feet in the Study at Section A.

The Study states the width of the floodway at Section B is 9064 feet, with 4050 feet in Orange County and 5014 feet in Jefferson County. The 100 year flood elevation is stated to be 11.9 feet at Section B in said Study.

5.0 FLOODWAY ON PARKWOOD LAND COMPANY TRACT

The Section A extends east from the River. Beginning at the river bank going east, the land has been filled for decades, at approximately 650 feet from the east bank of the river the section enters the Parkwood Land Company tract on the west line of the property and existing levee and fill, extending across the Parkwood Land Company tract, at approximately 2350 feet from the east bank of the river the section crosses the levee and then the east property line of said Parkwood Land Company tract, then leaving the property. The section continues to the east.

The north end of the Parkwood Land Company tract is located approximately 3425 feet north of the bridge for Interstate Highway 10 crossing the Neches River. This would place the north end of the property at approximately River Station 111,675 feet.

The 100 year floodway elevation at the southwest corner of the property is 10.8 feet, as stated in the Study, said Section A crosses at or near the southwest corner of said Parkwood Land Company tract. Using a constant water surface grade in the Neches River from said Section A to said Section B would result in a 100 year floodway elevation of the river at the north end of the Parkwood Land Company property as being approximately 11.3 feet.

The elevation of the levee around the Parkwood Land Company tract are supposed to be maintained at 13 feet, based on information supplied our office. The levee has eroded to some extent over the years. If the levee was maintained at the elevation of 13 as it is supposed to, then the 100 year floodway would not flow across the Parkwood Land Company tract.

Parkwood Land Company would have to submit a supply "No-Rise/No-Impact" Certification to Orange County, Texas if they were to construct any improvements on the property, as the floodway is currently delineated on the Flood Insurance Rate Map referenced in Item 1.0 above. To calculate a "No-Rise/No-Impact" Certification an engineer has to request and receive from the Federal Emergency Management Agency all data originally used to calculate the floodway shown on the referenced Flood Insurance Rate Map. This data includes the original cross sections, coefficients of friction, convergence factors, cross section intervals and widths and any other data used in the original calculations. The Engineer would have to take new cross sections in the area of the proposed improvements, with said improvements on the new cross sections and recalculate the floodway to determine the rise caused by the constructing the proposed improvements.

6.0 RESEARCH OF FLOODWAY

Mr. Sonny Stevenson, owner of Parkwood Land Company, wanted me to research how the Federal Emergency Management Agency had included his property enclosed by a levee in the floodway shown on the referenced Flood Insurance Rate Map.

I told Mr. Stevenson I would request the information required for a "No-Rise/No-Impact" Certification to review. This is the step-backwater hydraulic model for the Neches River Reach 1 from River Station 95,000 feet, south of the Interstate Highway 10 bridge, to River Station 130,000 feet. This would have all the data used to calculate the floodway on the Parkwood Land Company tract. After reviewing the data I would be able to determine how the tract of land was included in the floodway.

On August 25, 2011 I sent my request for the data via e-mail to the Federal Emergency Management Agency. It was received by Susan Greene, EDR lead with Zimmerman Associates, Inc., who are responsible for research at the FEMA Engineering Library in Alexandria, Virginia. On August 26, 2001 I received a statement that the initial fee for the research would be $150.00. I sent in a check. On September 1, 2011 I received a letter via e-mail from Mr. Christopher Stewart with Zimmerman Associates, Inc. that an addition $105.00 would be needed to fill my data request. I understood from the start that there would be an addition charge. I sent in the check. On September 7, 2011 I received via e-mail the the output modeling files used to generate floodway. The information received in Exhibit 6 in the Appendix.

The information sent to me was the final output of the HEC-2 calculations on the Neches River. The output had the cross sectional intervals, width of floodway, water surface elevation, flowrates and additional information. The output did not have the cross sectional data, coefficients of friction or convergence factors, none of the raw data used to generate the floodway along the Neches River. The information was basically the same information that was included in the Flood Insurance Study. I responded to Mr. Stewart that day by stating in information was insufficient for review. He told me that was all he could find, but he would perform an additional search. He called back on September 9, 2011 and said he could not find any addition information and that I might call the Federal Emergency Management Agency office in Denton, Texas to see if they had the information. I requested that he send me a letter stating that he could not find the information, which he did.

On September 14, 2011 I called the Federal Emergency Management Agency Region 6 office in Denton, Texas and was told I would need to speak to Mr. Larry Speak, hydraulic engineer for the Texas area, but he would be out of the office until September 20, 2011. Mr. Speak called on September 20 and I told him what I was looking for and what I had been told by Zimmerman Associates, Inc. Mr. Speak said they were in the process of closing out the fiscal year and he was extremely busy, but he would research the matter and get back with me. He called back on

September 30, 2011 and said he could not locate the information. We discussed how the information was supposed to be located in Alexandria, Virginia, but I could try to contact the Corp of Engineers in Galveston, Texas to see if they had the information. Correspondence is included in Exhibit 7 in the Appendix.

I sent several days calling various offices at the Corp of Engineers in Galveston, Texas and would only get voice mail, I would leave a message and no one ever called me back.

7.0 CONCLUSION

The information that I did receive indicated that the only cross sections taken along the Neches River were at Section A and Section B shown in said Flood Insurance Study, which are 7,500 feet apart. The were no additional sections taken between said Section A and said Section B, therefore no additional sections were taken in the area enclosed by the levee around the Parkwood Land Company tract. Since the original data for said Section A is unavailable, it is unknown if the levees were includes in the section.

It would appear that there was an oversight by the Federal Emergency Management Agency in performing the hydraulic model of the Neches River to determine the 100 year floodway in the area of the Parkwood Land Company tract. The levees on the tract were overlooked and the area was included in the floodway as if the levees did not exist.

It is recommended that the Federal Emergency Management Agency review the floodway designation on the Parkwood Land Company tract and make adjustements to the floodway to reflect the conditions on the tract. I am of the opinion that the area should be designated flood Zone "B", area protected from 100 year flood by levees, on the Flood Insurance Rate Map.

Respectfully Submitted,
Skinner Engineering Services Company

J. Scott Skinner, P.E.
President

STATE OF TEXAS
J. SCOTT SKINNER
60376
REGISTERED
PROFESSIONAL ENGINEER

Exhibit AP

GOOGLE EARTH IMAGE
1938

EXHIBIT AP-1

GOOGLE EARTH IMAGE
1989

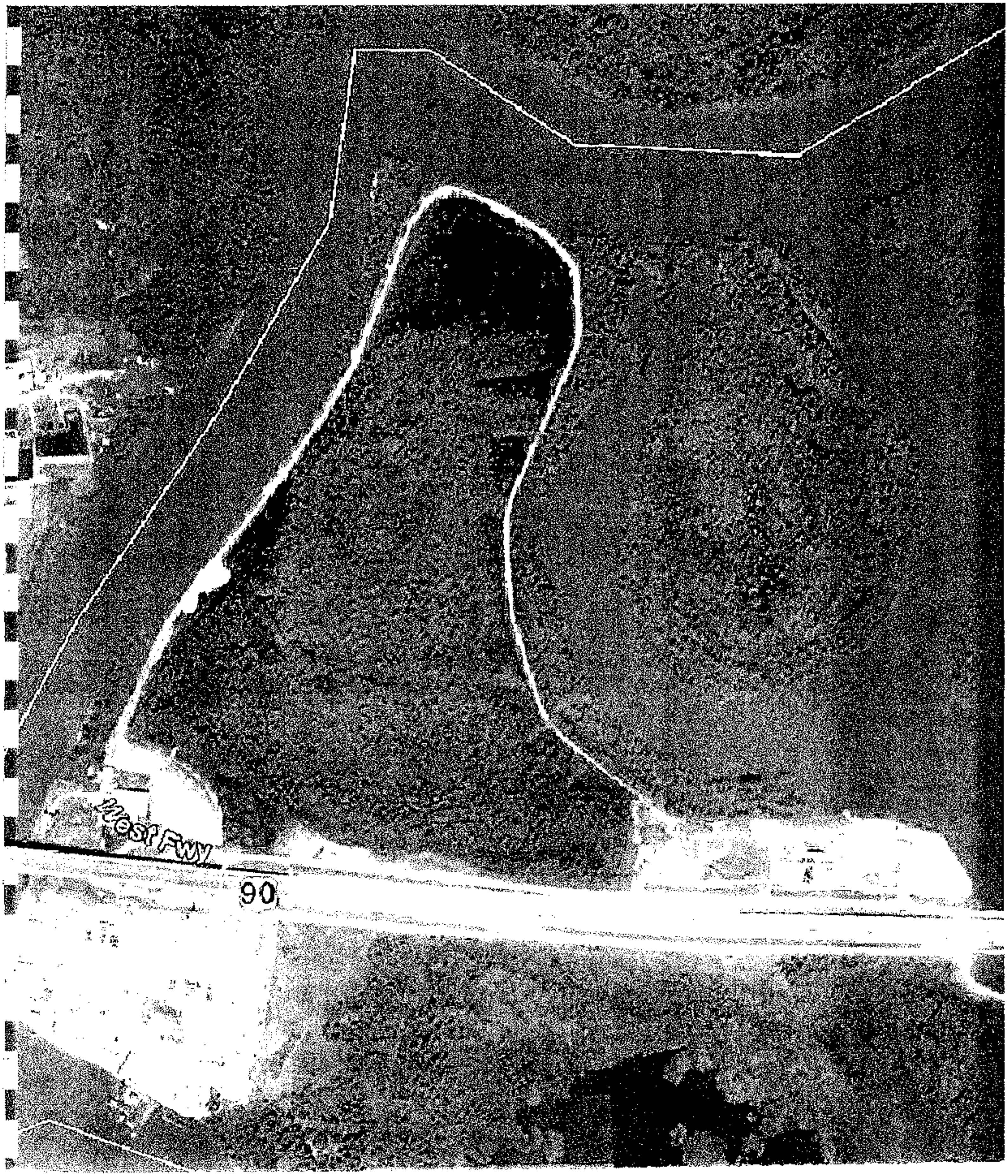
EXHIBIT AP-2

GOOGLE EARTH IMAGE
2004

EXHIBIT AP-3

GOOGLE EARTH IMAGE
2006

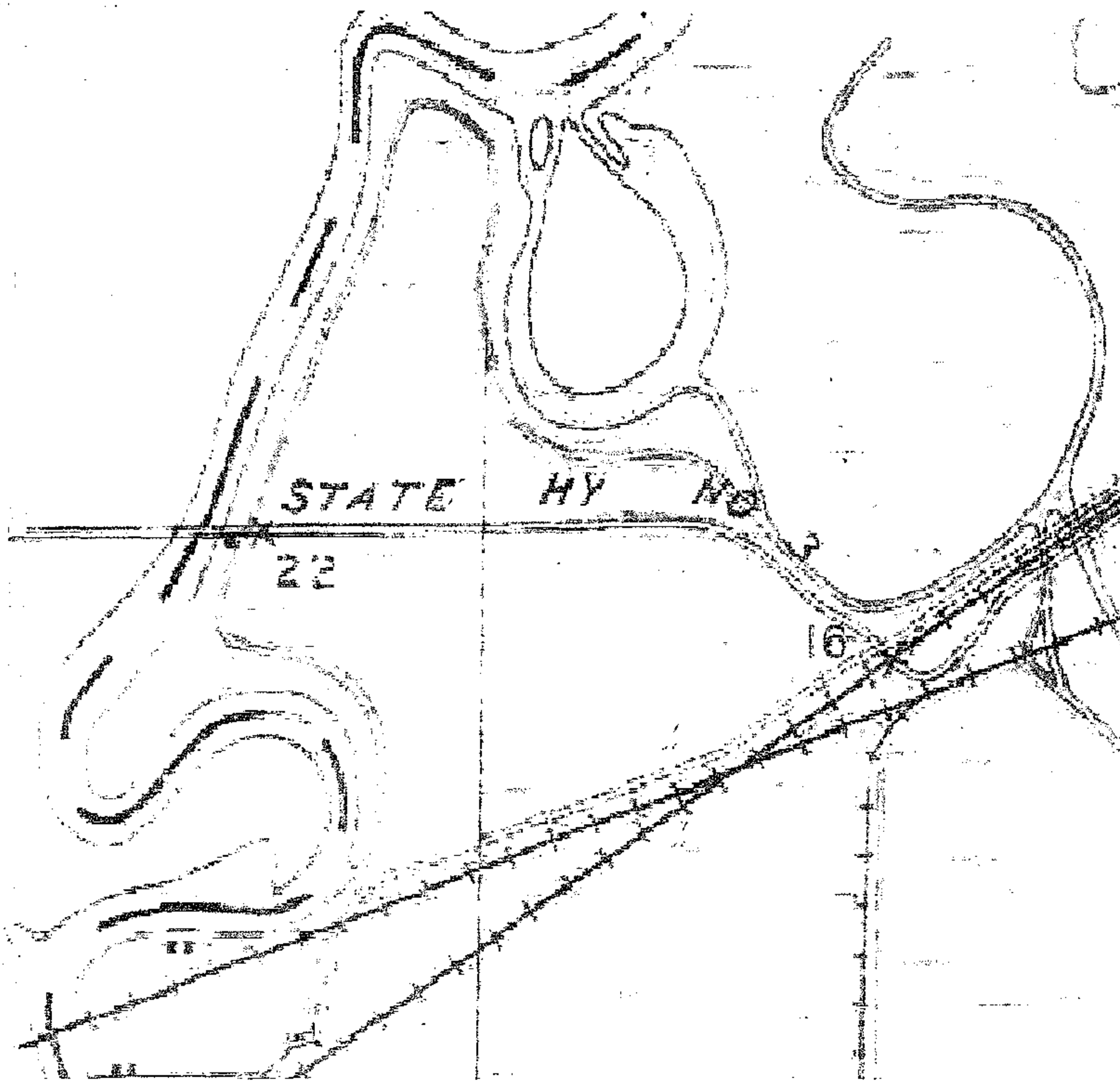
EXHIBIT AP-4



GOOGLE EARTH IMAGE
2010

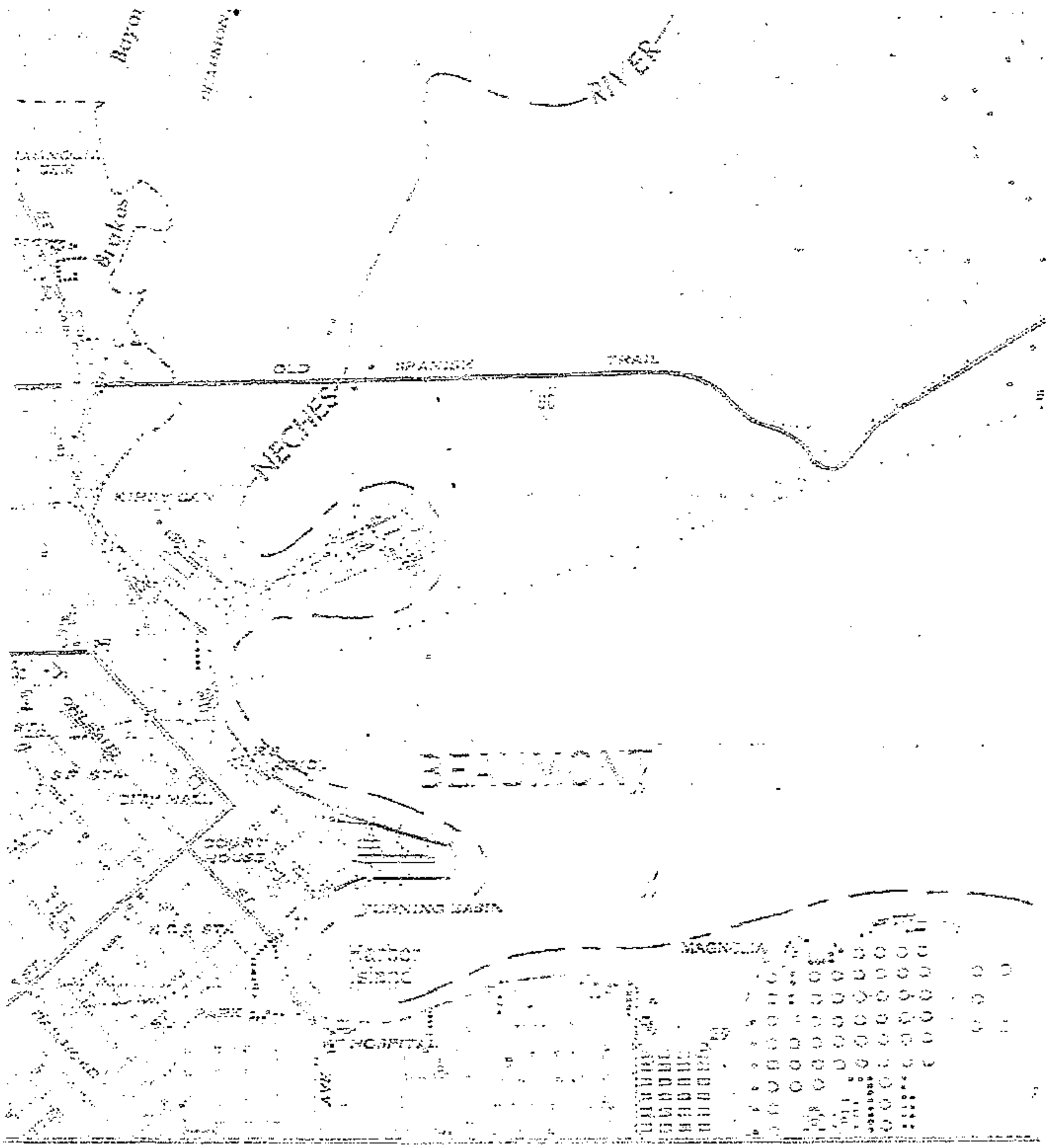
EXHIBIT AP-5

Exhibit TM



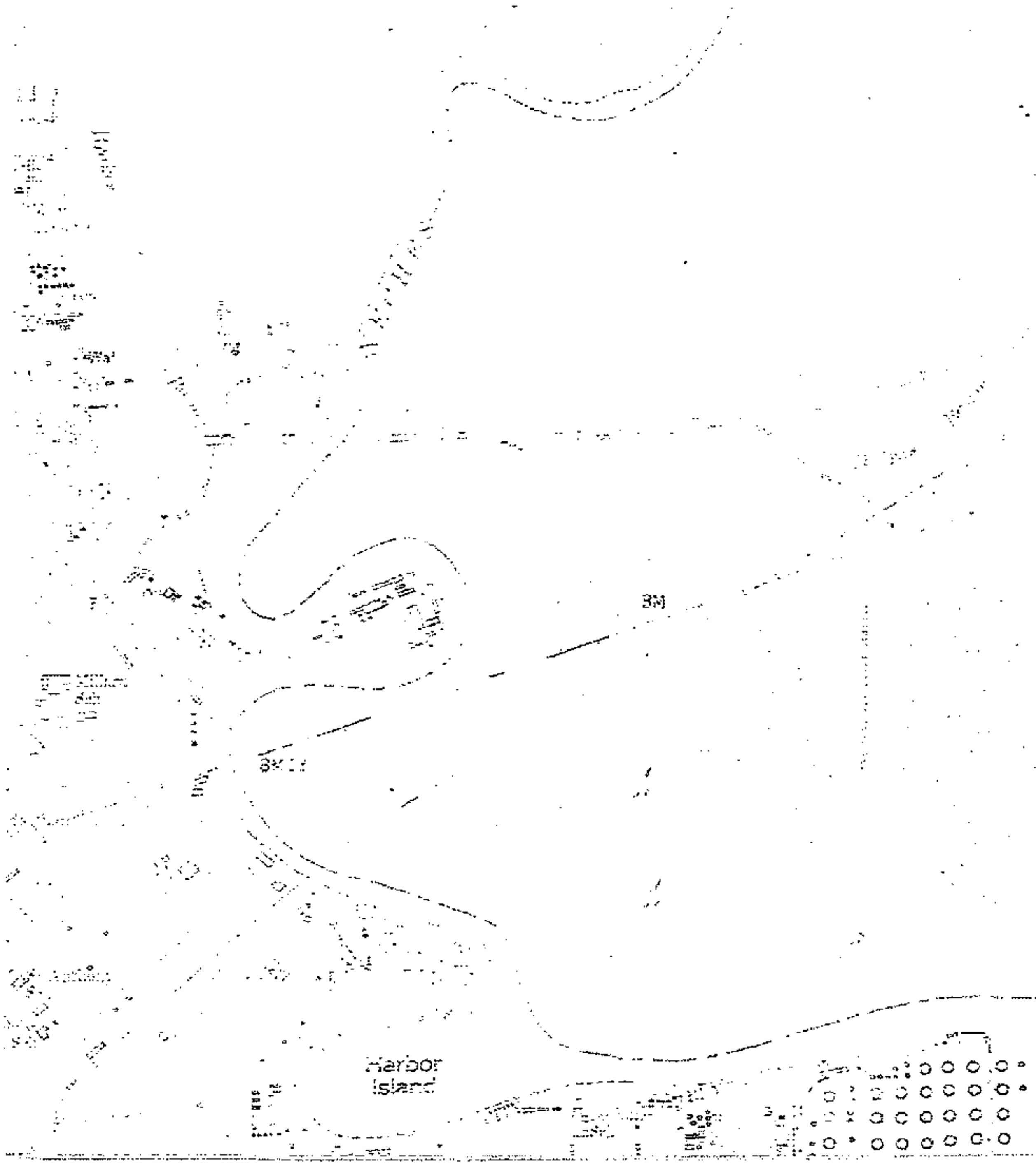
BEAUMONT TEXAS QUADRANGLE
USGS TOPOGRAPHIC MAP – 1932
CONTOUR INTERVAL 2 FEET

EXHIBIT TM-1



Beaumont East Quadrangle
USGS 7.5' Series Topographic Map - 1942

EXHIBIT TM - 2

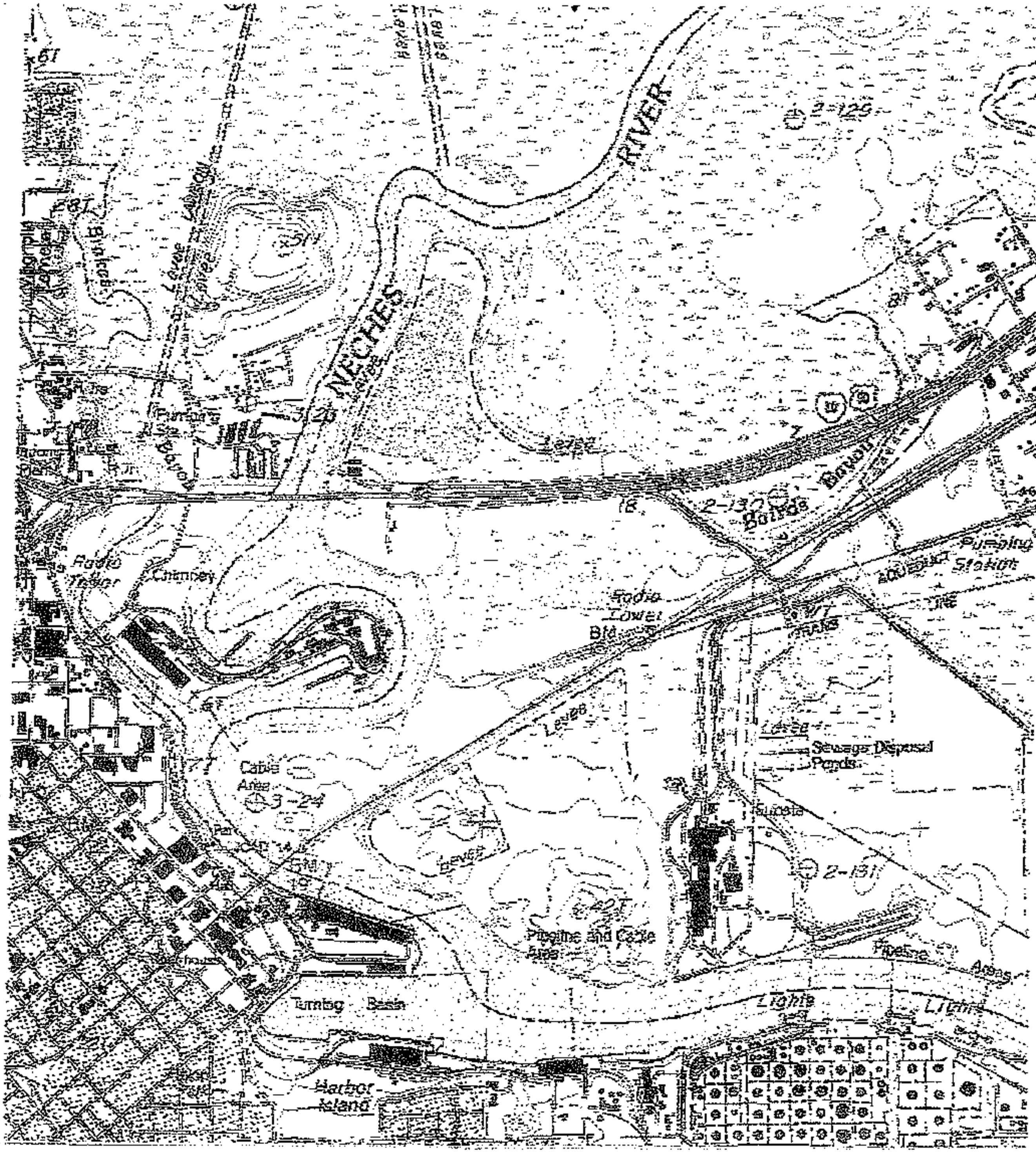


Beaumont East Quadrangle
USGS 7.5' Series Topographic Map - [illegible]

EXHIBIT TM - 3

Beaumont East Quadrangle
USGS 7.5' Series Topographic Map - [illegible]

EXHIBIT TM - 4



Beaumont East Quadrangle
USGS 7.5' Series Topographic Map - [illegible]

EXHIBIT TM - 5

Exhibit 1

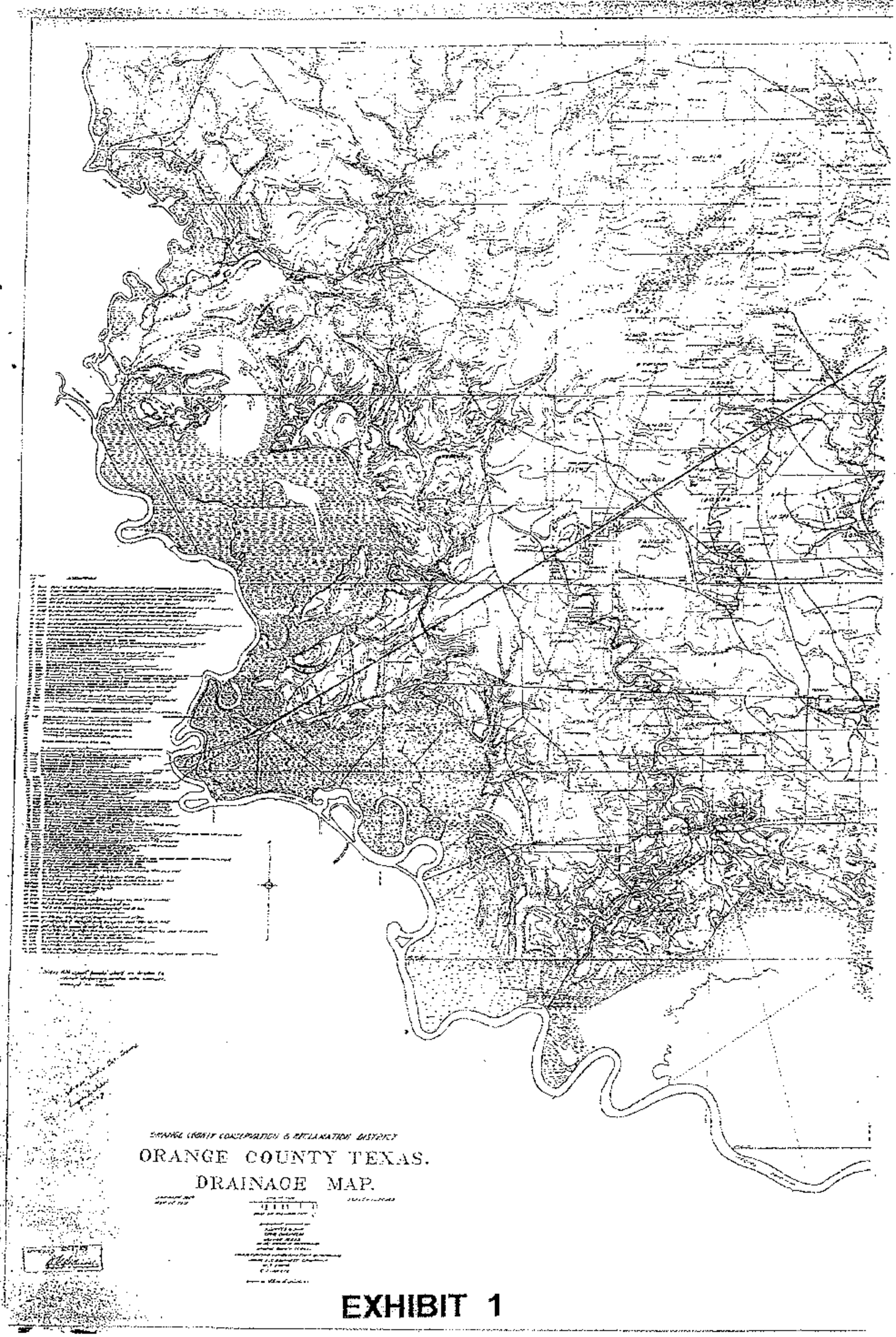

ORANGE COUNTY CONSERVATION & RECLAMATION DISTRICT
ORANGE COUNTY TEXAS.
DRAINAGE MAP.

EXHIBIT 1

Exhibit 2

Parkwood Land Company

1947 Survey of Dredge and Disposal Plans

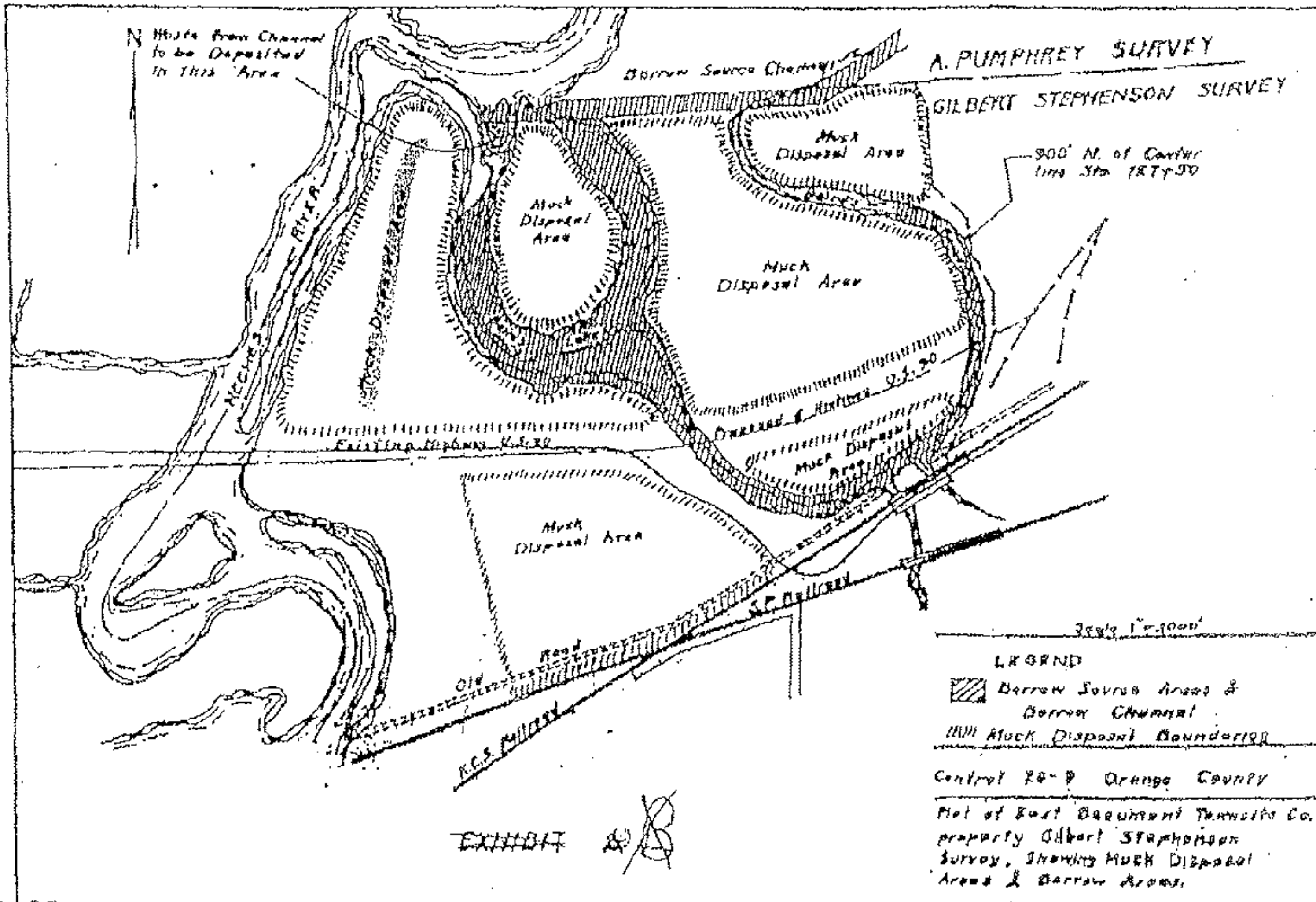
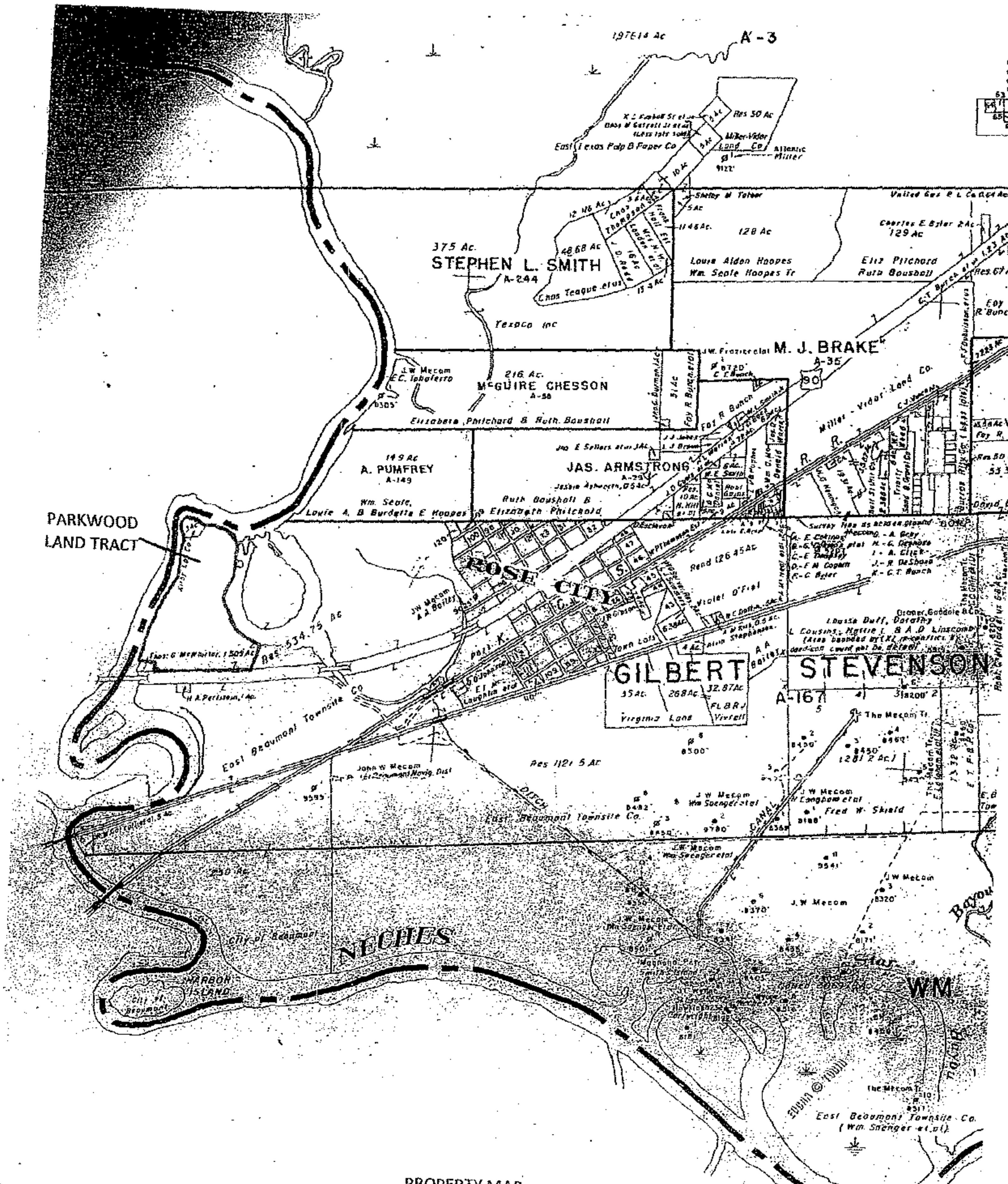


EXHIBIT 2

RECORD
O'CLOCK P.M.
ELS JR.

Exhibit 3



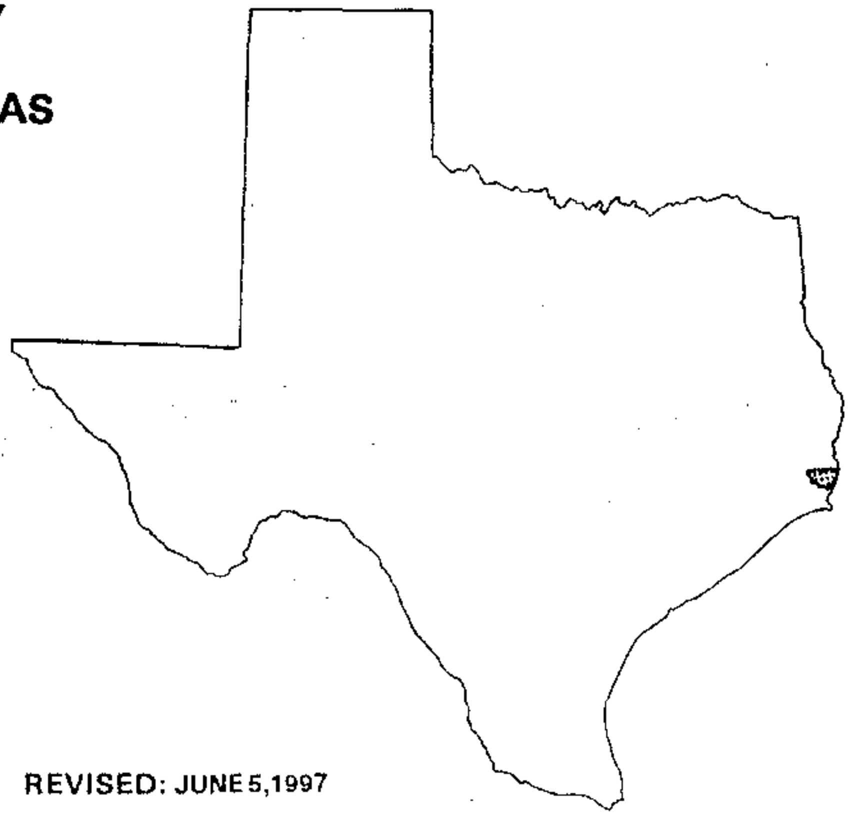
PROPERTY MAP

EXHIBIT 3

Exhibit 4

FLOOD INSURANCE STUDY

ORANGE COUNTY, TEXAS
UNINCORPORATED AREAS



REVISED: JUNE 5,1997

Federal Emergency Management Agency

COMMUNITY NUMBER - 480510

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 9.0.

Page

FIGURES

TABLES

EXHIBITS

FLOOD INSURANCE STUDY
UNINCORPORATED AREAS OF ORANGE COUNTY, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the unincorporated areas of Orange County, Texas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the unincorporated areas of Orange County to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR 60.3 (d&e). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

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

The hydrologic and hydraulic analyses for this study were performed by Tetra Tech, Inc. for the Federal Emergency Management Agency, under Contract No. H-4788. This study was completed in June 1980.

1.3 Coordination

The following organizations were contacted for coordination in the development of this study:

City of Bridge City, City of Orange, City of Pine Forest, City of Pinehurst, City of Vidor, City of West Orange, County of Orange, National Oceanic and Atmospheric Administration, Orange Chamber of Commerce, C.P. Smith Associates, Inc., Southeast Texas Regional Planning Commission, Texas Highway Department, Texas State Department of Community Affairs, Texas State Department of Highways and Public Transportation, Orange, Texas State Department of Water Resources, U.S. Army Corps of Engineers, Galveston District, U.S. Geological Survey, U.S. Soil Conservation Service.

The State Coordinator was involved with this study through the Denton Regional office of the Federal Emergency Management Agency.

On February 11, 1982, the results of the study were reviewed at a final coordination meeting in Orange, Texas. All changes resulting from that meeting have been included in this report.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Orange County, Texas. The area of study is shown on the Vicinity Map (Figure 1).

Not included in the study are the incorporated Cities of Bridge City, Rose City, Orange, Pine Forest, Pinehurst, Vidor, and West Orange.

The study analysis includes coastline flooding due to hurricane-induced storm surge. Both the open coast surge and its inland propagation were studied; in addition, the added effects of wave heights were also considered.

The following sources of flooding in the county were studied in detail: Gulf of Mexico/Sabine Lake, Adams Bayou, Anderson Bayou, Caney Creek, Coon Bayou, Cow Bayou, Cow Bayou Tributary, Gum Gully, Little Cypress Bayou, Little Cypress Bayou Tributary, Neches River, Sabine River, Sandy Creek, Ten Mile Creek, Ten Mile Creek West Fork, Tiger Creek and Walnut Run.

Areas affected by flooding due to rainfall, ponding and shallow sheet flow were also studied.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through 1985.

Approximate analyses were used to study those areas having a low dev ment potential or minimal flood hazards. The scope and methods of s were proposed to and agreed upon by FEMA and the County of Oran

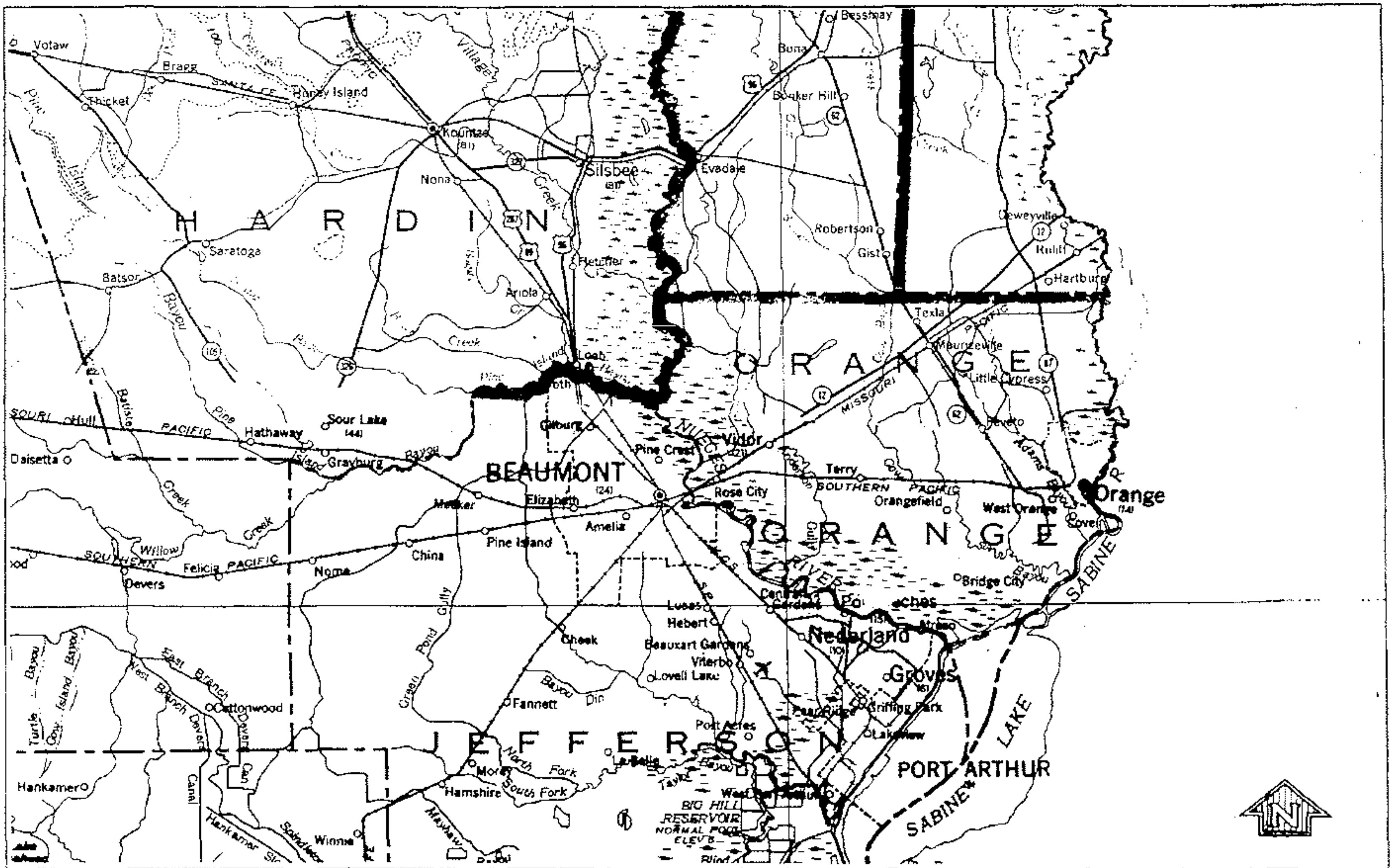


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

2.2 Community Description

Orange County occupies an area of approximately 359 square miles in southeastern Texas. The study area is bounded on the north by Newton and Jasper Counties, on the east by the Sabine River and the State of Louisiana, on the south by Sabine Lake, and on the west by Hardin and Jefferson Counties. The City of Orange, the county seat, is located approximately 110 miles east of Houston and approximately 20 miles northeast of Port Arthur.

The U.S. Bureau of the Census recorded the 1970 population of Orange County at 71,170 (21,281 in unincorporated areas), which represented approximately an 18 percent increase over the 1960 census estimate of 60,357. The 1975 population was estimated at 75,190 (Reference 1). The current permanent population is estimated to be about 81,800 and represents an increase of approximately 15 percent over the 1970 level. It is estimated that the population of Orange County will reach 87,115 by 1985 (Reference 2).

The majority of developed land in the county is primarily forest and agricultural land. Major urban, residential, and recreational areas are generally located in the extreme eastern and western portions of the county. Most commercial development extends along U.S. Interstate Highway 10 that runs east to west through the county. Major industrial development is located along the Sabine River. Leading industries in the area produce oil, timber, iron, steel and petrochemicals. A naval base and shipyard at Orange contribute to the economy.

Orange County is located in a humid subtropical climatic zone, which is characterized by moderate winters and warm summers. Rainfall is abundant and, on the average, is evenly distributed throughout the year. The hurricane season extends from June through October. In the City of Orange, the county seat and largest city, which is located in the southeastern portion of the study area, the average annual precipitation is approximately 59 inches and the average annual temperature is approximately 68 degrees F (Reference 3).

Soils in Orange County are clayey and loamy, have low to moderate infiltration rates, and produce a moderate to high runoff potential. The soils are classified into Soil Conservation Service Groups A, B, C, and D for hydrologic purposes.

Orange County is heavily wooded, with extensive wetlands along the Neches and Sabine River basins. Large stands of natural cypress in swamps exist north of the City of Orange along the lower Sabine River.

Physiographically, Orange County lies within the Gulf Coastal Plain province, which is characterized by relatively flat terrain with level or nearly level areas in the flood plains, and higher areas in the northern portions of the county. The elevations in the city range from elevation sea level to about 25 feet above the National Geodetic Vertical Datum (NGVD) of 1929. Some areas in Orange County have undergone minor subsidence due to continued groundwater withdrawal and the inelastic behavior of the underlying clay in those areas. The magnitude of the subsidence has been less than one foot (Reference 4).

The major streams within the county are the Sabine and Neches Rivers; Cow, Adams, and Little Cypress Bayous; Tiger, Ten Mile, and Caney Creeks; and Anderson Gully. The Sabine River, which forms the county's eastern border, rises in northwestern Hunt County and discharges into Sabine Lake at Orange County's southern border. It is about 579 miles long and drains about 9,756 square miles in eastern Texas and western Louisiana (7,426 square miles in Texas). It has an average annual flow of 8,700 cubic feet per second (cfs). The Neches River, which forms the county's southern border, rises southeast of Dallas and flows generally southeastward for 416 miles to Sabine Lake south of Vidor. It drains about 10,011 square miles and has an average annual runoff of about 7,200 cfs. Cow Bayou flows southward from Jasper County and empties into Sabine River near Bridge City. It drains about 174 square miles of mostly forested and undeveloped land. Sandy Creek and Cow Bayou Tributary are the major tributaries of Cow Bayou. Adams Bayou drains approximately 85 square miles in southern Newton and eastern Orange Counties. Gum Gully, a tributary of Adams Bayou drains about 5 square miles. Little Cypress Bayou flows through the north end of the Orange study limits. The watershed comprises about 25 square miles of southeast Texas. Little Cypress Bayou Tributary is the major tributary of Little Cypress Bayou. Tiger, Caney, and Ten Mile Creeks drain watershed areas of 30, 12, and 48 square miles respectively. Anderson and Terry Gullies, small coastal streams with poorly defined channels, drain a total area of 24 square miles.

2.3 Principal Flood Problems

Flooding in Orange County results primarily from stream overflow (caused by rainfall runoff, ponding, and sheet flow), and from tidal surges and associated wave action (caused by hurricanes and tropical storms) transmitted through the streams. High tide levels can intensify the stream overflow caused by rainfall runoff. Because of the flatness of the terrain, many inland areas are characterized by shallow flooding during heavy rainfalls. Not all storms which pass close to the study area produce extremely high tides. Similarley, storms which produce extreme conditions in one area may not necessarily produce critical conditions in other parts of the study area. The Sabine River and nearby streams are estuarine, and under certain conditions tides generated at their mouths can intrude far upstream. Rainfall which accompanies hurricanes aggravates the tidal flood situation.

Storms passing Texas in the vicinity of Orange County have produced severe floods as well as structural damage. Brief descriptions of several significant storms provide historic information to which flood hazards and flood depths can be compared (References 5, 6, 7, 8, 9, and 10).

April to June 1953

Heavy rainfall, produced by two storms, followed a period of above normal rainfall that had greatly built up the moisture content of the soil. Rainfall from April 28 to May 5 was more than 11 inches in the Lower Sabine and Neches River basins.

From May 13 to 19, 11.91 inches of rainfall was recorded in Orange. The storm caused extensive flooding in the lower areas -- homes were flooded, buildings damaged, roads inundated. There was minor flooding in downtown Orange on Water Street. The estimated velocities in the Sabine channel in the vicinity of Orange ranged up to 5 feet per second (fps); overbank velocities were lower (0.5 fps). The staff gage at Gulf State Utilities Pier in the City of Orange reached 6.0 feet NGVD on May 24. Flood damage to the area was estimated at $460,000.

September 21 to 23, 1958

This storm left 10.05 inches of rain in 24 hours, and 18.5 inches in 2 days. (Unofficial records show 14 inches in 9 hours at Orange). There was serious flooding in areas along the unimproved section of Adams Bayou. Estimated damages to Orange, West Orange and Pinehurst were $630,000. Of this, about $320,000 damage was to homes and buildings and about $240,000 to county roadways and structures.

September 9 to 12, 1961 (Hurricane Carla)

This hurricane, which made landfall near Port O'Connor, flooded more than 1.5 million acres of land in Texas. Tide levels reached 9.4 feet NGVD along the northern shore of Sabine Pass. Tides caused the Sabine River to rise to 7.4 feet at the City of Orange, and near Cow Bayou, Bridge City was under approximately 7 feet of water. Rainfall of 1.96 inches on the 11th and 12th in the City of Orange added to the flood conditions. Carla flooded 64 square miles of land in Orange County (18 percent of the total land area). Total damages were estimated at $1,707,000, of which $767,000 were attributed to tidal overflow.

September 17 to 28, 1963 (Hurricane Cindy)

This hurricane, which made landfall at High Island, brought 15.8 inches of rain in 24 hours in the Adams Bayou watershed. The torrential rainfall caused flooding and millions of dollars of damage to the Sabine-Neches area. The Sabine River crested at 4.4 feet NGVD and Adams Bayou reached 8.2 feet NGVD on September 18th.

April 19 to 24, 1979

Rainfall during this storm was recorded at more than 7 inches in Orange County, and caused flooding in many areas along the Neches and Sabine Rivers and Adams, Cow and Little Cypress Bayous. Most severely affected was the Lakeview area in the northwestern section of the county, where approximately 200 dwellings were damaged. The Neches River crested at 11 feet NGVD near Vidor (7 feet above flood stage), and the Sabine River crested at 1.3 feet above flood stage.

July 25, 1979 (Tropical Storm Claudette)

"Claudette," an upper air low pressure cell, originated in the Atlantic near Puerto Rico and moved westward into the Gulf of Mexico. It brought gale-force winds and heavy rainfall to many parts of southeastern Texas, causing severe flooding along streams and coastal areas. In Orange County, power lines were down in some rural areas and home, road and agricultural damages were high. Major damage to 29 homes occurred in Orange County. Cow Bayou and Adams Bayou overflowed their banks and flooded nearby low-lying areas. There was flooding in Pinehurst, Orange, West Orange, Bridge City, and Vidor.

2.4 Flood Protection Measures

There are many existing and planned structural flood protection measures in the county. Existing reservoirs in the Sabine Watershed, and flood retarding structures in the upper basin of the Sabine River, provide flood storage volume and assist in prevention of floods. In the vicinity of the City of Orange, there are earthen levees and floodwalls along the Sabine River. In the Bridge City area, the Cow Bayou channel was enlarged in 1952 to a 13-foot depth and 100 foot width from its mouth to stream mile 6.7. A diversion ditch crosses the Adams and Little Cypress Bayou watersheds in the upper portion of the study area.

Nonstructural flood protection measures in Orange County consist of a flood hazard prevention ordinance. The ordinance places controls on the types of development and activities which are permissible in the flood plain. The National Weather Service provides forecasting and community flash flood warning services.

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 which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium 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 equalled 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 one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here 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 peak elevation- and discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the unincorporated areas of Orange County.

The determination of coastal inundation caused by passage of a hurricane surge was approached by the Joint Probability Method (Reference 11). Storm populations were described by probability distributions of five 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 Orange County. Primary sources of data were the National Weather Service (References 12, 13, and 14); the National Hurricane Research Project (Reference 15); and the Monthly Weather Review (Reference 16). A summary of the parameters used for the Orange County area is presented in Table 1.

The determination of maximum wave crest elevations associated with the 10- and 100-year events was approached by the method recommended by the National Academy of Sciences (Reference 17). Further details are included in Section 3.3 of this study.

CENTRAL PRESSURE DEPRESSION (Millibars)	5	15	25	35	45	55	65	75	85	95	105
PROBABILITY: ENTERING EXITING PARALLEL	19%	19%	19%	8%	11%	6%	7%	6%	2%	2%	1%

STORM RADIUS (Nautical Miles)	20		35
PROBABILITY	75%		25%
FORWARD SPEED (Knots)	8	14	20
PROBABILITY: ENTERING EXITING PARALLEL	58%	31%	11%
CROSSING ANGLE (Degrees)	21	-24	-69
PROBABILITY	36%	30%	34%
FREQUENCY OF OCCURRENCE	2.21×10^{-3} storms/nautical mile/year		

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX
(UNINCORPORATED AREAS)

PARAMETER VALUES FOR SURGE ELEVATION COMPUTATIONS

Flood magnitude and frequency for areas subject to runoff flooding from the streams studied in detail were estimated using the Corps of Engineers HEC-1 Flood Hydrograph Package (Reference 18). Regionalized unit hydrograph and rainfall loss rate parameters were developed by hydrograph reconstitution studies using thirty storms in six gaged basins. The transposition of the HEC-1 model parameters from gaged to ungaged basins was based on hydrologic similarity, as assessed from soil maps (References 19 and 20), USGS topographic maps (Reference 21), recent air photos (Reference 22) and field reconnaissance. Urbanized watersheds were studied further using methodology developed by Beard (References 23 and 24). Rainfall data used to estimate flood discharges for the various frequency events were developed from hourly rainfall records from the National Climatic Center (Reference 25) and from TP-40 (Reference 26). The resulting "computational" storms used to generate peak discharges of selected frequency have depth-area-duration characteristics consistent with the Texas Gulf Coast area.

Flood discharge-frequency estimates for the Sabine and Neches Rivers were taken from the previously published Bridge City Flood Insurance Study (Reference 27) prepared by the Corps of Engineers.

All major proposed and current projects that affect the study area have been taken into account in this analysis.

A summary of drainage area-peak discharge relationships for each stream studied in detail is shown in Table 2.

TABLE 2 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
ADAMS BAYOU					
At Water Supply Canal Upstream of Orange	69.0 (36.5)[1]	3,440	4,800	5,400	6,780
At Roundbunch Road	82.5 (50.0)[1]	1,350	5,870	6,630	8,330
ANDERSON GULLY					
At Kansas City Southern Railroad Bridge	3.9 (2.4)[1]	1,350	1,650	1,850	2,200
CANEY CREEK					
At confluence with Tiger Creek	11.9	2,460	3,370	3,750	4,520
COON BAYOU					
At confluence with Cow Bayou	6.3	1,900	2,470	2,680	3,200

TABLE 2 - SUMMARY OF DISCHARGES - cont.

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
COW BAYOU					
At Farm Road 105	151	7,290	10,300	11,900	14,900
At Roundbunch Road	165	7,700	10,800	12,500	15,700
GUM GULLY					
At confluence with Adams Bayou	4.9	1,790	2,290	2,470	2,910
LITTLE CYPRESS BAYOU					
At confluence with Little Cypress Bayou Tributary	12.3 (4.3)[1]	1,700	2,080	2,330	2,800
At Little Cypress Creek	20.7 (10.3)[1]	2,220	2,960	3,270	3,970
At Jacks Landing	25.1 (15.7)[1]	2,470	3,370	3,750	4,620
LITTLE CYPRESS BAYOU TRIBUTARY					
At Little Cypress Creek	7.8 (6.4)[1]	1,940	2,430	2,720	3,280
NECHES RIVER					
At Beaumont	10,000	60,000	107,000	136,000	240,000
SABINE RIVER					
At I-10 Bridge	9,490	66,070	98,660	113,840	150,000
SANDY CREEK					
At confluence with Cow Bayou	7.0	1,970	2,580	2,810	3,370
TEN MILE CREEK					
At State Route 1131 Bridge	45.0	3,870	5,450	6,400	7,700
TEN MILE CREEK WEST FORK					
At Junction with Ten Mile Creek	2.3 (1.3)[1]	1,200	1,500	1,600	1,800
TIGER CREEK					
At confluence of Caney Creek	12.8	2,347	3,220	3,607	4,365
At mouth	30.4	3,151	4,417	5,036	6,000
WALNUT RUN					
At Farm Road 1131	3.3	1,600	2,050	2,200	2,600

[1]Effective drainage area contributing to the peak flow.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in Orange County were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

For areas subject to flooding directly from the Gulf of Mexico/Sabine Lake, the Federal Emergency Management Agency's standard coastal surge model (Reference 28) was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the five storm parameters defined previously). Performing such simulations for a large number of storms, each of known total probability, permits one to establish the frequency distribution of surge height 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, setup, or runup. The astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level.

The surge model employed in the procedure utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed using grid sizes of 5 nautical miles for the open coast computations, and one nautical mile for the Sabine Lake computations. The effects of the Sabine and Neches Rivers were included in the model.

The computed stillwater flood elevations for Orange County are tabulated in the Coastal Flood Insurance Zone Data Table (See Section 5.3).

Data for the model grid systems and the wave height calculations were obtained from U.S. Geological Survey topographic maps (Reference 21), National Oceanic and Atmospheric Administration nautical charts (References 29 through 33), and aerial photographs (Reference 22). The results of this study are considered accurate until local topography, vegetation, or cultural development undergo any major changes.

For areas subject to stream overflow, water-surface elevations of floods of the selected recurrence intervals were developed using the U.S. Army Corps of Engineers HEC-2 water-surface profile computer model (References 34 and 35).

Starting water-surface elevations for Caney Creek, Little Cypress Bayou Tributary, Gum Gully, Coon Bayou, Hudson Gully, Little Cypress Bayou, Ten Mile Creek West Fork, and Sandy Creek were set equal to the water-surface elevations at their confluence with the mainstream. The starting water-surface elevation for Anderson Gully was determined by the method of convergent profiles. Starting water-surface elevations for the Neches and Sabine Rivers and Adams Bayou were set equal to mean high tide. All other starting water-surface elevations were calculated at normal depth.

Cross sectional data for the backwater analyses for the Neches and Sabine Rivers, and Adams and Cow Bayous were obtained from the Corps of Engineers, Galveston District. Cross sectional data for the other streams studied in detail were obtained from field surveys and U.S. Geological Survey 7.5-minute topographic maps (Reference 21). All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry necessary for backwater analyses.

Channel roughness factors (Manning's "n") used in the hydraulic computation were based on field observations, aerial photos of the streams and flood plain areas, and on U.S. Geological Survey Water Supply Paper 1849 (Reference 36). Roughness values used for the main channels ranged from 0.03 to 0.08 and the values for their tributaries range from 0.014 to 0.05, with flood plain roughness values ranging from 0.05 to 0.25 for all floods.

Flood levels along the rivers and streams resulting from coastal flooding (surge and waves) and rainfall were determined independently of each other and combined statistically (Reference 28). In Orange County, the results of the analysis show that surge flooding predominates rainfall flooding. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed, selected cross section locations are also shown on the Flood Boundary and Floodway Map.

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

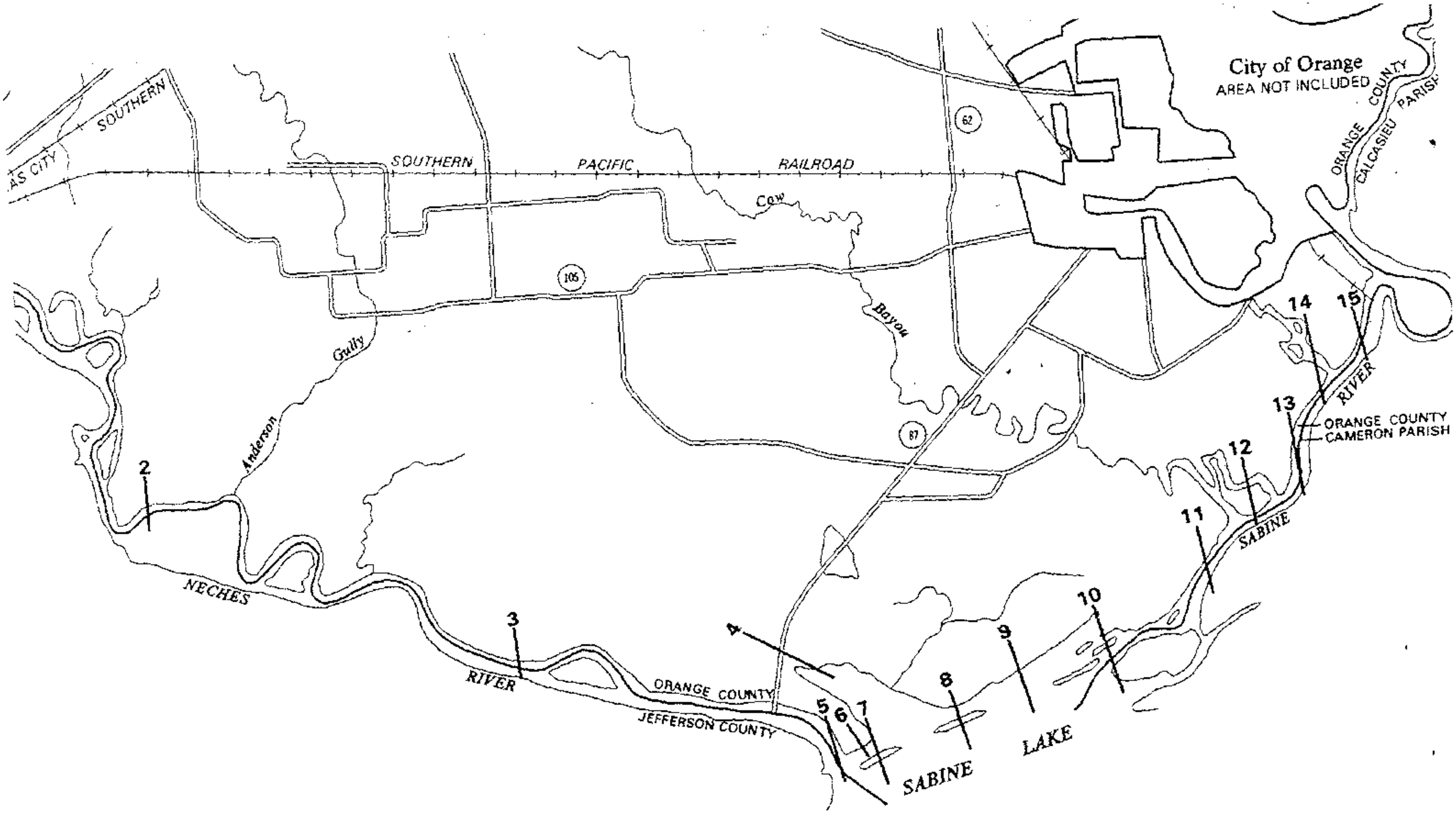
3.3 Wave Height Analysis

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in the National Academy of Sciences report (Reference 17). 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 elevation is 70 percent of the total wave height plus the stillwater elevation. The second major concept is that wave height may be diminished 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 17. 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 37). 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 larger 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.

The transects were continued inland until the wave was dissipated or until flooding from another source with equal or greater elevation was reached. 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. Areas with a wave component 3-feet or greater were designated as velocity zones. Other areas subject to wave action were designated as A Zones with base flood elevations adjusted to include wave crest elevations.

Figure 3 is a profile for a hypothetical transect showing the effects of energy dissipation on a wave as it moves inland. This figure shows the wave elevations being diminished by obstructions, such as buildings, vegetation and rising ground elevations and being increased by open, unobstructed wind fetches. Actual wave conditions in Orange County may not necessarily include all the situations illustrated in Figure 3. Figure 4 is a sample transect reflecting actual conditions in Orange County.


City of Orange
AREA NOT INCLUDED
ORANGE COUNTY
CALCASIEU PARISH
KANSAS CITY SOUTHERN
SOUTHERN PACIFIC RAILROAD
62
105
87
Cow Bayou
Anderson Gully
NECHES RIVER
ORANGE COUNTY
JEFFERSON COUNTY
SABINE LAKE
SABINE RIVER
ORANGE COUNTY
CAMERON PARISH
2
3
4
5
6
7
8
9
10
11
12
13
14
15

Computed wave elevations are based upon existing topography, vegetation and current development patterns and will require re-computation if significant changes occur in any of the above factors.

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 includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community.

The boundaries of the 100-year flood have been delineated using the computed flood elevations, and topographic maps at a scale of 1:24,000 with a contour interval of 5 feet (Reference 21).

For the streams not studied in detail, approximate methods were used. The boundaries oft he 100-year flood were determined with the aid of the topographic maps referenced above.

Flood boundaries are indicated on the Flood Insurance Rate Map (published separately). On this map, the 100-year flood boundary corresponds to the boundary of the area of special flood hazards (Zones A1, A2, A3, A4, A6, A7, A8, A12 and V12), and the 500-year flood boundary corresponds to the boundary of the area of moderate flood hazard (Zone B). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Small areas within the flood boundaries may lie above the flood elevations, and therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways proposed in this study for riverine areas were computed on the basis of equal conveyance reduction from each side of the flood plain. Floodway analyses were based on increasing the computed 100-year rainfall flooding level. The results of these computations are tabulated in Table 3 at selected cross section locations for each stream studied in detail.

As shown on the Flood Boundary and Floodway Map, the floodway widths were determined at cross sections. between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 5.

4.3 Base Flood Elevations

Areas within the community studied by detailed engineering methods have base flood elevations established in A and V Zones. These are the elevations of the base (100-year) flood relative to NGVD. In coastal areas affected by wave action, base flood elevations are generally maximum at the normal open shoreline. These elevations generally decrease in a landward direction at a rate dependent on the presence of obstructions capable of dissipating the wave energy. Where possible, changes in base flood elevations have been shown in 1-foot increments on the FIRMs. However, where the scale did not permit, 2- or 3-foot increments were sometimes used. Base flood elevations shown in the wave action areas present the average elevation within the zone. These elevations vary from 7 to 12 feet abvoe NGVD in the unincorporated areas of Orange County and are shown on the Flood Insurance Rate Map. Current program regulations generally require that all new construction be elevated such that the first floor, including basement, is above the base flood elevation in A and V Zones.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE
Adams Bayou								
A	47,340	453	3,070	1.8	10.2	10.2	11.1	0.9
B	49,840	865	5,440	1.0	10.9	10.9	11.8	0.9
C	54,040	516	3,552	1.5	14.5	14.5	14.5	0.0
Anderson Gully								
A	0	45	347	5.3	17.3	17.3	18.1	0.8
B	922	518	1,968	0.9	18.3	18.3	19.0	0.7
C	5,700	905	5,026	0.4	19.4	19.4	20.2	0.8
D	8,840	1,424	6,648	0.3	19.4	19.4	20.2	0.8
E	11,140	116	571	3.2	20.4	20.4	21.3	0.9
F	12,790	237	918	1.4	21.2	21.2	22.2	1.0
G	14,370	511	1,489	0.8	21.6	21.6	22.6	1.0
H	16,240	449	2,130	0.5	21.8	21.8	22.8	1.0
I	19,020	433	1,911	0.4	21.9	21.9	22.9	1.0
Caney Creek								
A	1,470	609	4,024	0.9	12.5	12.3[2]	13.3[2]	1.0
B	4,170	558	3,765	1.0	14.5	14.5	15.5	1.0
C	5,520	207	1,394	2.4	16.2	16.2	17.2	1.0
D	6,650	270	1,751	1.9	19.3	19.3	20.2	0.9
E	7,890	354	2,080	1.6	21.7	21.7	22.6	0.9
F	8,810	986	6,666	0.5	22.3	22.3	23.2	0.9
G	9,910	559	2,624	1.3	23.2	23.2	24.0	0.8
H	11,210	829	4,479	0.7	24.8	24.8	25.6	0.8
I	13,940	835	4,672	0.7	27.2	27.2	28.0	0.8

[1] Feet above mouth for Adams Bayou and Caney Creek; feet above Southern Pacific Railroad for Anderson Gully.
[2] Elevations computed without consideration of backwater effects.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

ADAMS BAYOU-ANDERSON GULLY-CANEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Coon Bayou								
A	400	768	2,997	0.9	7.6	4.5[2]	5.5[2]	1.0
B	4,800	328	2,087	1.3	7.6	5.2[2]	6.2[2]	1.0
C	10,170	451	1,590	1.7	8.2	8.2	9.1	0.9
D	14,312	771	3,306	0.8	9.3	9.3	10.3	1.0
E	16,970	748	3,111	0.9	9.8	9.8	10.7	0.9
Cow Bayou								
A	15,952	323	3,374	3.7	7.6	3.5[2]	4.5[2]	1.0
B	18,902	605	4,906	2.6	7.6	4.2[2]	5.1[2]	0.9
C	21,987	582	4,259	2.9	7.6	4.8[2]	5.7[2]	0.9
D	24,652	752/250[3]	5,311	2.4	7.6	5.4[2]	6.2[2]	0.8
E	26,352	800	6,676	1.9	7.6	5.6[2]	6.5[2]	0.9
F	27,732	1,870	9,775	1.3	7.6	5.6[2]	6.5[2]	0.9
G	28,832	1,950	9,243	0.7	7.6	5.8[2]	6.7[2]	0.9
H	30,032	2,557	11,257	1.1	7.6	6.1[2]	7.0[2]	0.9
I	32,082	2,200	13,068	1.0	7.6	6.2[2]	7.1[2]	0.9
J	35,332	1,910	13,270	0.9	7.6	6.3[2]	7.3[2]	1.0
K	38,717	840	3,968	3.0	7.6	7.2[2]	8.2[2]	1.0
L	45,499	1,316	9,057	1.3	9.2	9.2	10.2	1.0
M	55,049	751	7,839	1.5	10.9	10.9	11.8	0.9
N	61,299	2,009	16,521	0.7	11.7	11.7	12.7	1.0
O	66,507	600	6,837	1.7	12.3	12.3	13.2	0.9
P	69,857	1,962	19,113	0.6	12.6	12.6	13.4	0.8
Q	76,857	1,073	11,465	1.0	13.4	13.4	14.2	0.8
R	79,257	982	13,064	0.9	13.7	13.7	14.5	0.8

[1]Feet above mouth
[2]Elevations computed without consideration of Coastal Flooding effects from Sabine Lake/Sabine River
[3]Total width/width within county limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

COON BAYOU-COW BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Cow Bayou Tributary								
A	3,320	692	4,473	2.7	17.6	17.6	18.4	0.8
Gum Gully								
A	1,040	1,262/600[2]	5,529	0.4	9.5	7.4[3]	8.3[3]	0.9
B	3,792	958	2,119	1.2	10.5	10.1[3]	10.5[3]	0.4
C	9,106	104	576	4.3	18.5	18.5	19.5	1.0
Little Cypress Bayou								
A	11,000	502	2,744	1.4	9.8	5.0[3]	6.0[3]	1.0
B	16,200	346[4]	2,056	1.8	9.8	6.3[3]	7.3[3]	1.0
C	17,364	134[4]	966	3.9	9.8	7.5[3]	8.5[3]	1.0
D	18,289	120	1,029	3.6	9.8	8.2[3]	9.1[3]	0.9
E	20,853	125	1,100	3.4	9.8	9.2[3]	10.2[3]	1.0
F	22,103	461	2,504	1.5	9.8	9.7[3]	10.7[3]	1.0
G	24,933	100	1,085	3.5	10.6	10.6	11.6	1.0
H	26,658	90	678	4.8	12.6	12.6	13.3	0.7
I	28,758	297	1,554	2.1	13.9	13.9	14.7	0.8
J	29,908	783	3,701	0.9	14.3	14.3	15.2	0.9
K	32,574	1,044	1,612	1.4	16.1	16.1	16.4	0.3
L	35,274	1,486	3,849	0.6	16.8	16.8	17.2	0.4
M	37,074	941	2,539	0.9	17.4	17.4	17.8	0.4
N	43,399	856	2,054	1.1	21.6	21.6	22.2	0.6

[1] Feet above mouth
[2] Total width/width within county limits
[3] Elevations computed without consideration of backwater effects
[4] Cross section not shown on maps; floodway lies outside county limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX
(UNINCORPORATED AREAS)

FLOODWAY DATA

COW BAYOU TRIBUTARY-GUM GULLY-LITTLE CYPRESS BAYOU

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE
Neches River (cont.)								
K	185,900	18800/200	205,543	0.7	18.7	18.7	19.6	0.9
L	191,900	18600/1100	202,646	0.7	19.7	19.7	20.6	0.9
M	192,800	22070/1400	217,020	0.6	19.8	19.8	20.7	0.9
N	197,800	18851/1200	216,881	0.6	20.5	20.5	21.3	0.8

[1] Feet above mouth
[2] Total width/width within county limits.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

NECHES RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Sabine River								
A	80,750	21,000/14,000 [2]	150,742	0.8	9.1	9.1	9.8	0.7
B	91,450	12,300/1,100 [2]	48,644	2.3	9.8	9.8	10.5	0.7
C	91,500	12,300/1,100 [2]	46,557	2.4	9.8	9.8	10.5	0.7
D	96,620	22,100/8,100 [2]	190,919	0.6	11.1	11.1	11.8	0.7
E	108,120	16,400/3,500 [2]	142,009	0.8	12.1	12.1	12.9	0.8
F	115,120	12,800/2,100 [2]	122,581	0.9	13.0	13.0	13.9	0.9
G	126,320	15,200/2,400 [2]	154,278	0.7	14.0	14.0	15.0	1.0
H	132,820	17,400/5,600 [2]	171,972	0.7	14.5	14.5	15.5	1.0
I	138,920	18,200/7,400 [2]	157,277	0.7	15.0	15.0	15.9	0.9
J	150,820	17,300/8,200 [2]	132,075	0.9	15.9	15.9	16.9	1.0
Sandy Creek								
A	0	1,254	7,904	0.4	8.9	8.9	9.9	1.0
B	814	890	7,252	0.4	8.9	8.9	9.9	1.0
C	5,533	420	2,888	1.0	9.2	9.2	10.2	1.0
D	9,899	514	2,651	1.1	10.1	10.1	11.1	1.0
E	11,324	131	909	3.1	11.0	11.0	12.0	1.0

[1] Feet above mouth
[2] Total width/width within county limits

TABLE 3	FEDERAL EMERGENCY MANAGEMENT AGENCY **ORANGE COUNTY, TX** **(UNINCORPORATED AREAS)**	**FLOODWAY DATA** **SABINE RIVER-SANDY CREEK**

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Ten Mile Creek								
A	200	1401/800[3]	10,693	0.6	14.9	14.9	15.9	1.0
B	3,000	863/650[3]	7,048	0.9	16.0	16.0	16.9	0.9
C	5,000	1120/1050[3]	8,958	0.7	16.6	16.6	17.5	0.9
D	6,820	1196	10,597	0.6	17.4	17.4	18.2	0.8
E	9,120	704	5,020	1.3	18.4	18.4	19.2	0.8
F	11,520	1029	6,959	0.9	20.0	20.0	20.8	0.8
G	14,320	603	5,032	1.3	21.7	21.7	22.5	0.8
Ten Mile Creek West Fork								
A	500	323	1,734	0.9	15.7	10.0[2]	11.0[2]	1.0
B	1,900	512	2,794	0.6	15.7	11.0[2]	12.0[2]	1.0
C	3,900	211	582	2.7	15.7	13.4[2]	13.9[2]	0.5
D	4,715	347	1,143	1.4	15.7	14.8[2]	15.2[2]	0.4
E	5,250	330	1,459	1.1	15.7	15.7[2]	16.6[2]	0.9
F	6,790	312	1,595	1.0	17.5	17.5	18.5	1.0
G	8,590	885	3,934	0.4	18.5	18.5	19.4	0.9

[1] Feet above Lakeview Road for Ten Mile Creek; feet above mouth for Ten Mile Creek West Fork.
[2] Elevations computed without consideration of backwater effects.
[3] Total width/width within county limits.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

FLOODWAY DATA

TEN MILE CREEK-TEN MILE CREEK WEST FORK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tiger Creek								
A	0	600	3,601	1.4	12.5	10.2[2]	11.2[2]	1.0
B	3,600	777	5,294	1.0	12.5	11.6[2]	12.6[2]	1.0
C	7,600	1,200	7,878	0.5	12.8	12.8	13.8	1.0
D	16,353	120	1,042	3.0	18.7	18.7	19.3	0.6
E	19,253	415	2,199	1.4	21.9	21.9	22.6	0.7
F	21,453	455	2,902	1.1	23.7	23.7	24.6	0.9
G	23,153	673	3,509	0.9	25.0	25.0	26.0	1.0
H	24,576	511	3,483	0.9	26.0	26.0	27.0	1.0
Walnut Run								
A	100	387	2,344	0.9	16.2	15.6[2]	16.5[2]	0.9
B	1,300	263	1,790	1.2	16.6	16.6	17.4	0.8
C	2,300	379	2,935	0.7	17.4	17.4	18.2	0.8
D	3,100	376	2,207	1.0	18.0	18.0	18.8	0.8
E	4,426	558	3,232	0.7	19.3	19.3	20.3	1.0
F	6,426	578	3,231	0.7	20.6	20.6	21.6	1.0

[1] Feet above cross section A for Tiger Creek; feet above F.M. 1131 for Walnut Run.
[2] Elevations computed without consideration of backwater effects.

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

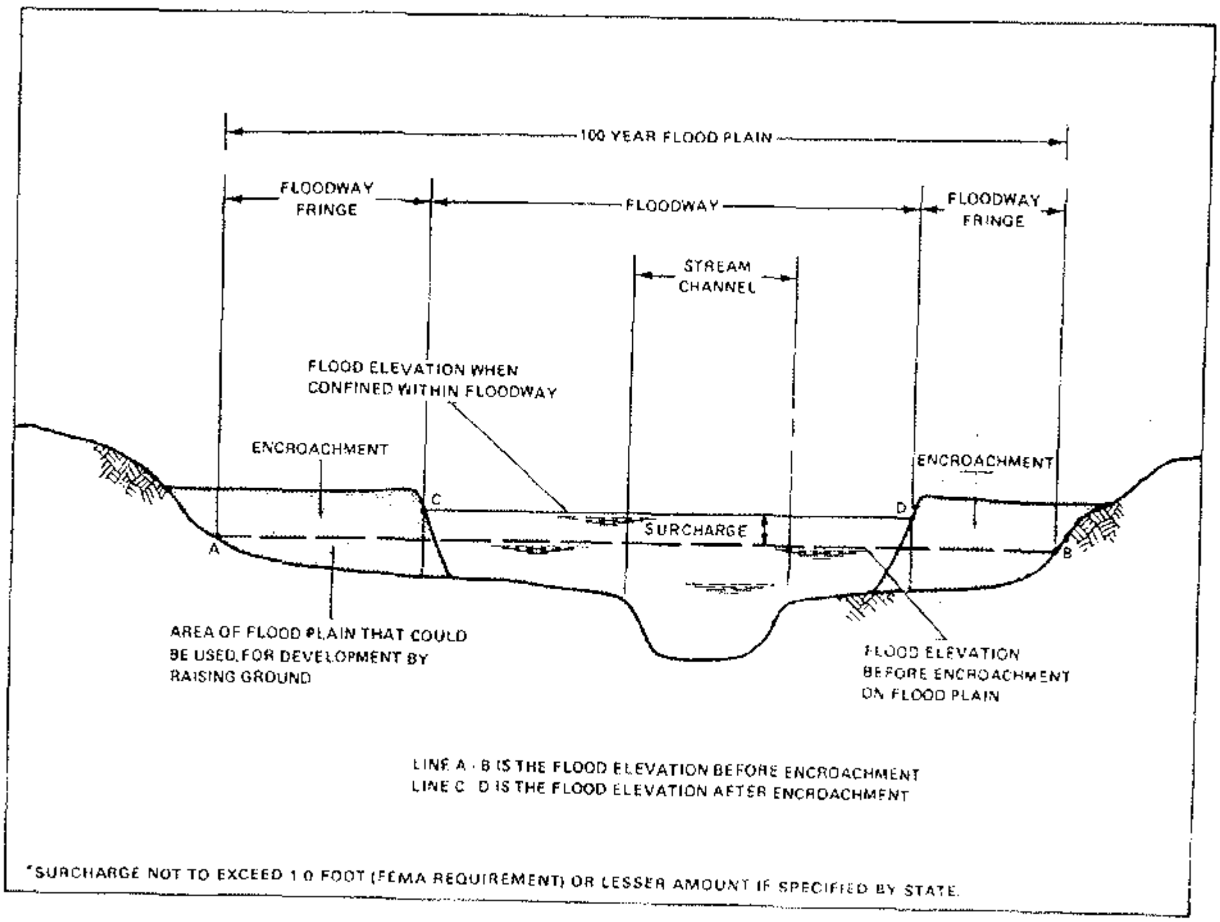
FLOODWAY DATA

TIGER CREEK-WALNUT RUN

4.4 Velocity Zones

The U.S. Army Corps of Engineers (Reference 38) has established the 3-foot wave as the criterion for identifying coastal high hazard zones. This was based on a study of wave action effects on structures. This criterion has been adopted by FEMA for the determination of V Zones. Because of the additional hazards associated with high-energy waves, the National Flood Insurance Program regulations require much more stringent flood plain management measures in these areas, such as elevating structures on piles or piers. In addition, insurance rates in V Zones are higher than those in A Zones with similar numerical designations.

The location of the V Zone is determined by the 3-foot wave as discussed previously. The detailed analysis of wave heights performed in this study allowed a much more accurate location of the V Zone to be established. The V Zone generally extends inland to the point where the 100-year flood depth is insufficient to support a 3-foot wave.



FLOODWAY SCHEMATIC Figure 5

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the unincorporated areas of Orange County.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The location of reaches determined for the flooding sources of Orange County are shown on the Flood Profiles (Exhibit 1), and summarized in the Flood Insurance Zone Data Table (See Section 5.3).

Coastal flood plains are divided into areas having relatively the same flood hazard based upon the 100-year wave height, and the average weighted difference in water-surface elevations between the 10-year and 100-year floods. These flood hazard areas are shown on the Flood Insurance Rate Map.

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

In coastal areas subject to wave action (wave heights greater than 3 feet), the FHF is determined using the difference between the 10-year and 100-year wave crest elevations. This difference is estimated as the difference between the 10- and 100-year stillwater elevations multiplied by 1.55. For areas where wave heights are less than three feet, the FHF is determined using the difference between the 10-year stillwater elevation and the 100-year wave crest elevation. For areas protected from wave action, the FHF is determined using the difference between the 10- and 100-year stillwater elevations.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire unincorporated areas of Orange County were divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A1, A2, A3, A4, A6, A7, A8, and A12:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone V12:	Special Flood Hazard Areas along coasts inundated by the 100-year flood, as determined by detailed methods, and that have additional hazards due to velocity (3 feet or more of wave action); base flood elevations shown, and zones subdivided according to Flood Hazard Factors.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood; areas that are protected from the 100-year or 500-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding form sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 4, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each riverine flooding source studied in detail in Orange County.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Adams Bayou Reach 1	0075	-2.1	-0.9	+1.5	020	A4	Varies
Anderson Gully Reach 1	0150	-0.5	-0.2	+0.3	005	A1	Varies
Caney Creek Reach 1	0025,0050	-1.0	-0.3	+0.5	010	A2	Varies
Coon Bayou Reach 1	0175	-0.6	-0.4	+0.6	005	A1	Varies
Cow Bayou Reach 1	0050,0150, 0175	-2.0	-0.7	+1.1	020	A4	Varies
Cow Bayou Tributary Reach 1	0050,0150	-1.8	-0.6	+0.9	020	A4	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

ADAMS BAYOU-ANDERSON GULLY-CANEY CREEK-COON BAYOU-COW BAYOU-COW BAYOU TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Gum Gully							
Reach 1	0075	-1.0	-0.3	+0.5	010	A2	Varies
Little Cypress Bayou							
Reach 1	0075	-1.3	-0.4	+0.7	015	A3	Varies
Reach 2	0075	-0.6	-0.2	+0.3	005	A1	Varies
Little Cypress Bayou Tributary							
Reach 1	0075	-0.6	-0.3	+0.3	005	A1	Varies
Neches River							
Reach 1	0025,0125	-6.1	-2.0	+6.0	060	A12	Varies
Reach 2	0025	-4.2	-1.6	+5.0	040	A8	Varies
Sabine River							
Reach 1	0075,0100, 0200	-2.9	-0.8	+2.5	030	A6	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

GUM GULLY-LITTLE CYPRESS BAYOU-LITTLE CYPRESS BAYOU TRIBUTARY NECHES RIVER-SABINE RIVER

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Sandy Creek Reach 1	0175	-1.5	-0.5	+1.2	015	A3	Varies
Ten Mile Creek Reach 1	0025	-1.8	-0.6	+2.5	020	A4	Varies
Ten Mile Creek West Fork Reach 1	0025	-0.5	-0.1	+1.8	005	A1	Varies
Tiger Creek Reach 1	0025	-1.1	-0.2	+0.7	010	A2	Varies
Walnut Run Reach 1	0025	-0.6	-0.1	+2.0	005	A1	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

SANDY CREEK-TEN MILE CREEK-TEN MILE CREEK WEST FORK TIGER CREEK-WALNUT RUN

Table 5, "Coastal Flood Insurance Zone Data Table " summarizes the stillwater flood elevations, FHFs, flood insurance zones, and base flood elevations by transect for each coastal flooding source studied in detail in Orange County.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the unincorporated areas of Orange County is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

A Type 15 Flood Insurance Study for Orange County was prepared by the Corps of Engineers, Galveston District, in 1970, revised in 1973 (Reference 39). Other flood related studies that concentrate on portions of the study area include the preliminary Flood Insurance Studies for the area from Sabine Lake to Matagorda Bay (Reference 40), for the cities of Orange and West Orange (Reference 5), Bridge City (Reference 27), and Pinehurst (Reference 41), Flood Plain and Flood Hazard Information Reports on Sabine River and Adams Bayou (Reference 7), and on Tiger and Caney Creeks, Meyers Bayou, and Anderson and Terry Gullies (Reference 42), a comprehensive basin study on the Sabine River (Reference 43), the National Shoreline Study and the Texas Coast Hurricane Study (References 8 and 44), the Flood Insurance Studies for neighboring Jefferson County, Texas, Cameron and Calcasieu Parishes, Louisiana (References 45, 46 and 47), and the Hurricane Surge Frequency Study by the U.S. Army Corps of Engineers, Coastal Engineering Research Center (Reference 48). A number of other information sources were also used for background purposes.

The 100-year hurricane surge elevations for the open Gulf Coast at Sabine were published by the Corps of Engineers, Coastal Engineering Research Center in 1969 (Reference 48) and by the Galveston District in 1979 (Reference 8). The 100-year elevations in both references are higher than those in this report. Discrepancies are the result of differences in the hydrodynamic models and in the statistical analysis, wherein the results provided herein follow the present Federal Emergency Management Agency methodology.

This study is authoritative for the purposes of the National Flood Insurance Program, and data presented in this report either supersedes, or are compatible with all previous determinations.

FLOODING SOURCE	TRANSECTS	PANELS	STILLWATER ELEVATIONS				FLOOD HAZARD FACTOR[1]	ZONE[1]	BASE FLOOD ELEVATION[2] (FEET NGVD)
			10-YR	50-YR	100-YR	500-YR			
Sabine Lake/Neches River	1-3	0125,0150,0175, 0225	3.8	6.3	7.3	9.5	040	A8	7-9
Sabine Lake	4-7	0250	4.1	6.8	7.8	10.1	060	V12	10-12
	4-7	0150,0175,0225, 0250	4.1	5.8	7.8	10.1	040	A8	9
	8-10	0175,0250	4.1	6.8	7.9	10.3	060	V12	10-12
	8-10	0175,0200,0250	4.1	6.8	7.9	10.3	040	A8	8-9
Sabine Lake/	11-12	0175,0200	4.9	6.5	7.6	10.0	040	A8	9-10
Sabine River	13-15	0175,0200	5.2	7.0	7.8	10.2	035	A7	8 9

1-Includes the effects of Wave Action, where applicable.

2-Due to map scale limitations, Base Flood Elevations (BFEs) shown on the Flood Insurance Rate Map may represent average elevation for the zone depicted.

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX

(UNINCORPORATED AREAS)

COASTAL FLOOD INSURANCE ZONE DATA

SABINE LAKE/NECHES RIVER, SABINE LAKE-SABINE RIVER

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Federal Emergency Management Agency, Mitigation Division, Federal Regional Center, 800 North Loop 288, Room 206, Denton, Texas 76201-3698.

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9.0 REVISION DESCRIPTIONS

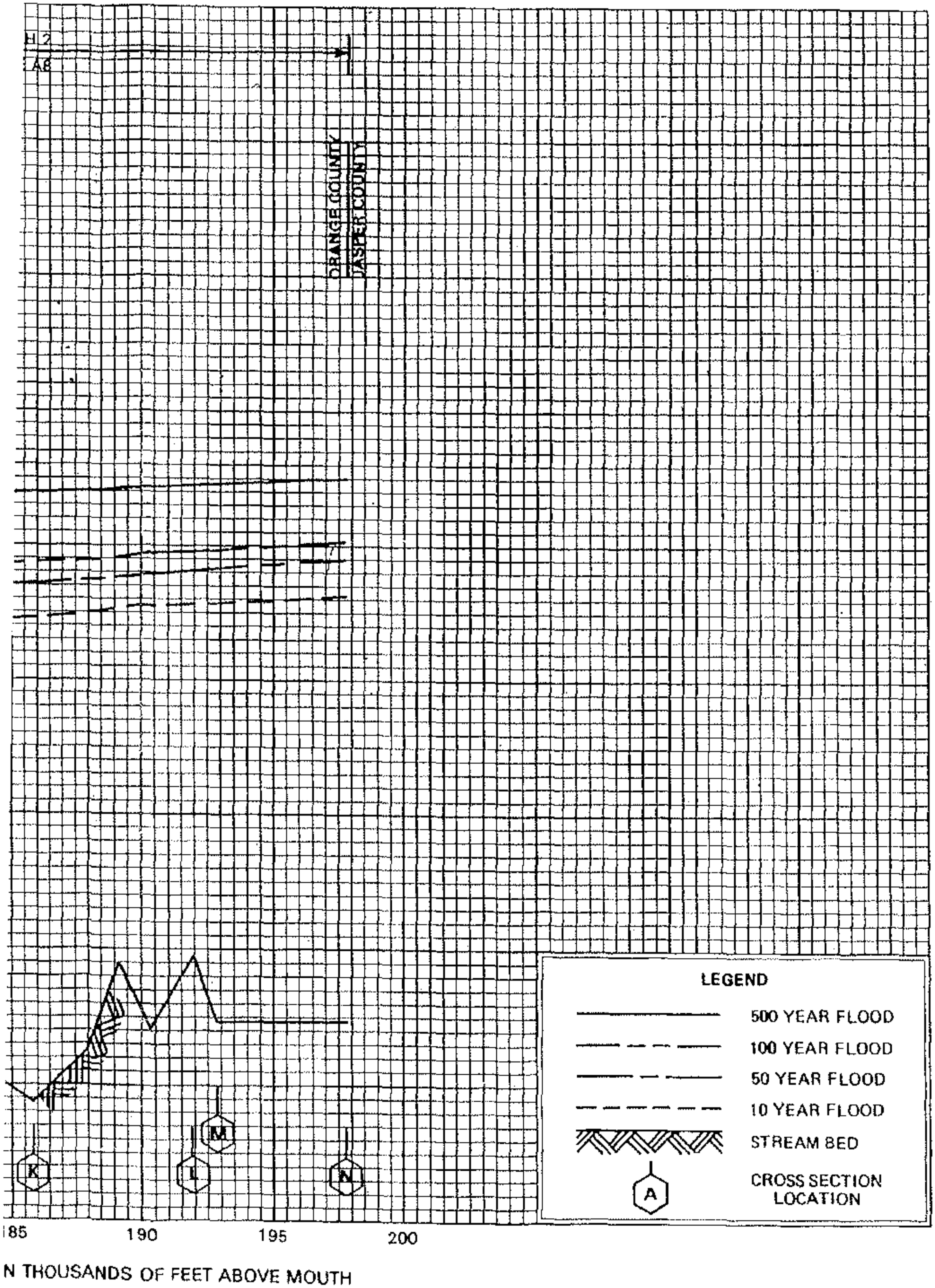
This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood hazard data located at the Precinct 1 Community Center, North Highway 87, Orange, Texas 77630.

9.1 First Revision

This study was revised to incorporate data from a detailed restudy along the Sabine River, from approximately 34,500 feet above its mouth to approximately 46,500 feet above its mouth (City of Orange corporate limit) and from profile station 70,000 to profile station 150,820 (boundary of Newton County), prepared for Calcasieu Parish, Louisiana (Reference 49). The discharges through the reaches are based on the log-Pearson Type III analysis of USGS Gage No. 08030500 at Ruliff, Texas. The Manning's "n" value is 0.035 for the channel and ranges from 0.10 to 0.12 for the overbanks.

The elevations of a flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) decreased through the revised reach. The maximum base flood elevation (BFE) decrease, 4.2 feet, occurred approximately 96,620 feet above its mouth. The BFEs along Little Cypress Bayou decreased because of the lower backwater conditions induced by the Sabine River. The maximum BFE decrease, 3.5 feet, occurred at its confluence with the Sabine River. The width of the Special Flood Hazard Area (SFHA), the area inundated by the base flood, has also decreased along the Sabine River and Little Cypress Bayou. Along the Sabine River, the maximum decrease in SFHA width, approximately 2,000 feet, occurred approximately 122,000 feet above its mouth. Along Little Cypress Bayou, the maximum decrease in SFHA width, approximately 400 feet, occurred approximately 15,200 feet upstream of its confluence with the Sabine River. The floodway widths along the Sabine River, from approximately 70,000 feet to approximately 108,000 feet above its mouth and from approximately 132,000 feet to approximately 140,000 feet above its mouth, as reported in Table 3, "Floodway Data," have been updated to correspond to the widths delineated on the effective Flood Insurance Rate Map. The floodway width along the Sabine River from approximately 108,000 feet to approximately 132,000 feet above its mouth increased to produce a HEC-2 hydraulic model with surcharges less than or equal to 1.00 foot. The floodway width along the Sabine River from approximately 140,000 feet to approximately 150,820 feet above its mouth also increased to match the floodway boundary of Newton County. The maximum increase in floodway width, approximately 1,200 feet, occurred approximately 126,320 feet above the mouth of the Sabine River.

The revisions described above have been incorporated onto Flood Insurance Rate Map Panels 0075 B, 0100 B, and 0200 B and Profile Panels 09P, 10P, 13P, and 14P and into Table 2, "Summary of Discharges," and Table 3, "Floodway Data," of this Flood Insurance Study report.



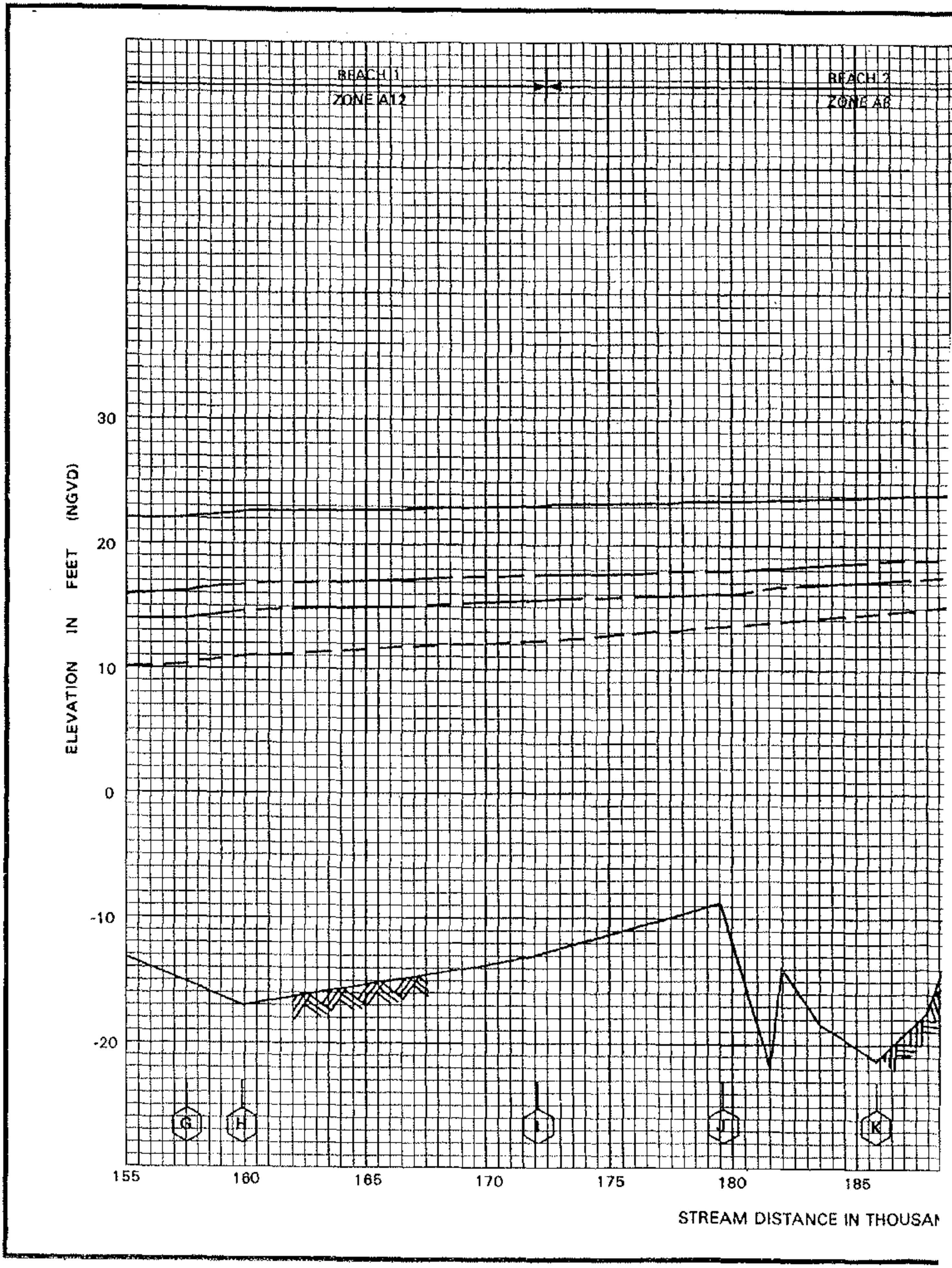
FLOOD PROFILES

NECHES RIVER

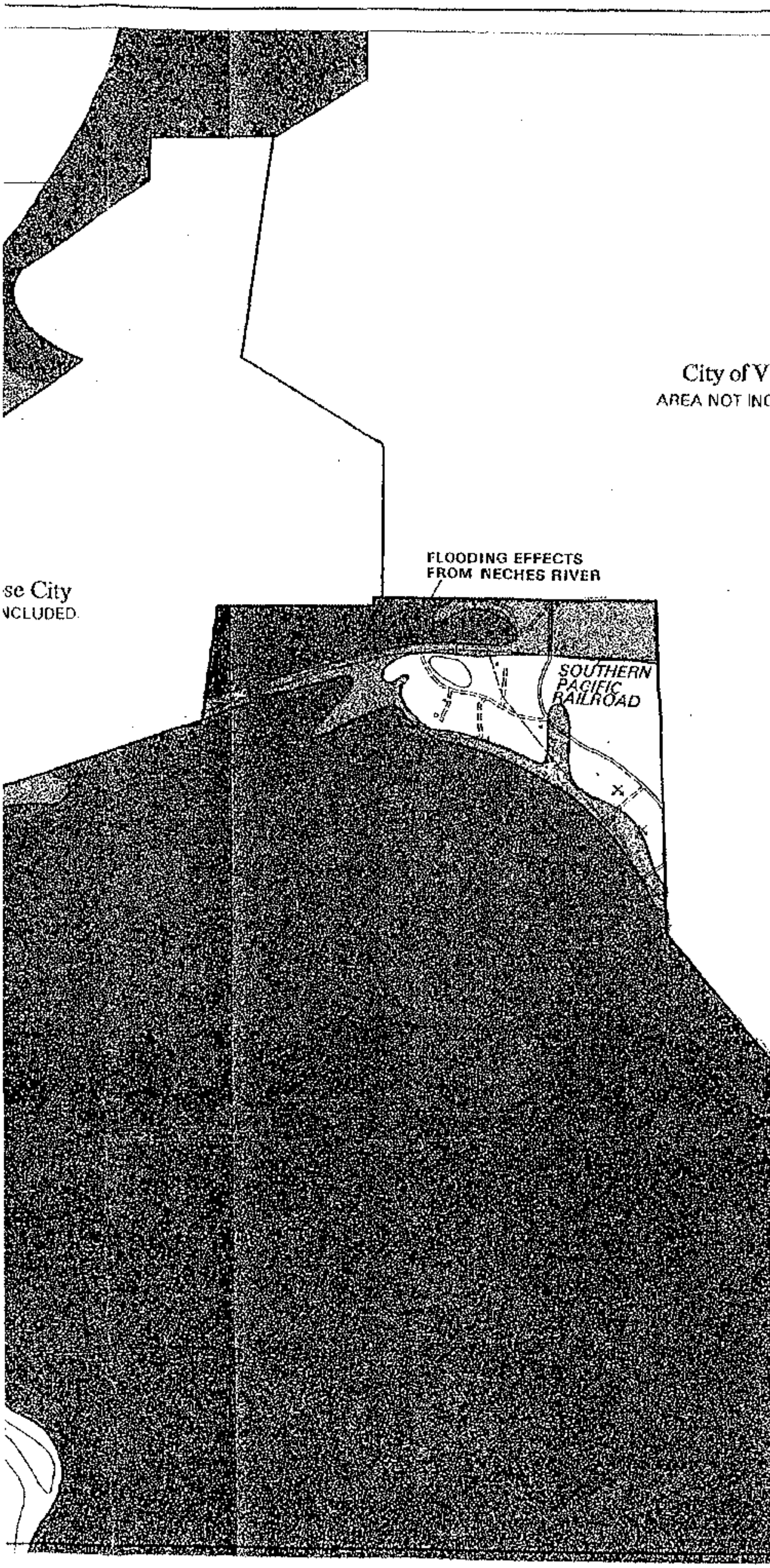
FEDERAL EMERGENCY MANAGEMENT AGENCY

ORANGE COUNTY, TX
(UNINCORPORATED AREAS)

12P



REACH 1
ZONE A12
REACH 2
ZONE A8
30
20
10
0
-10
-20
ELEVATION IN FEET (NGVD)
G
H
I
J
K
155
160
165
170
175
180
185
STREAM DISTANCE IN THOUSAN



APPROXIMATE SCALE

2000 0 2000 FT

NATIONAL FLOOD INSURANCE PROGRAM

FLOODWAY

FLOOD BOUNDARY AND FLOODWAY MAP

ORANGE COUNTY, TEXAS

(UNINCORPORATED AREAS)

PANEL 125 OF 250

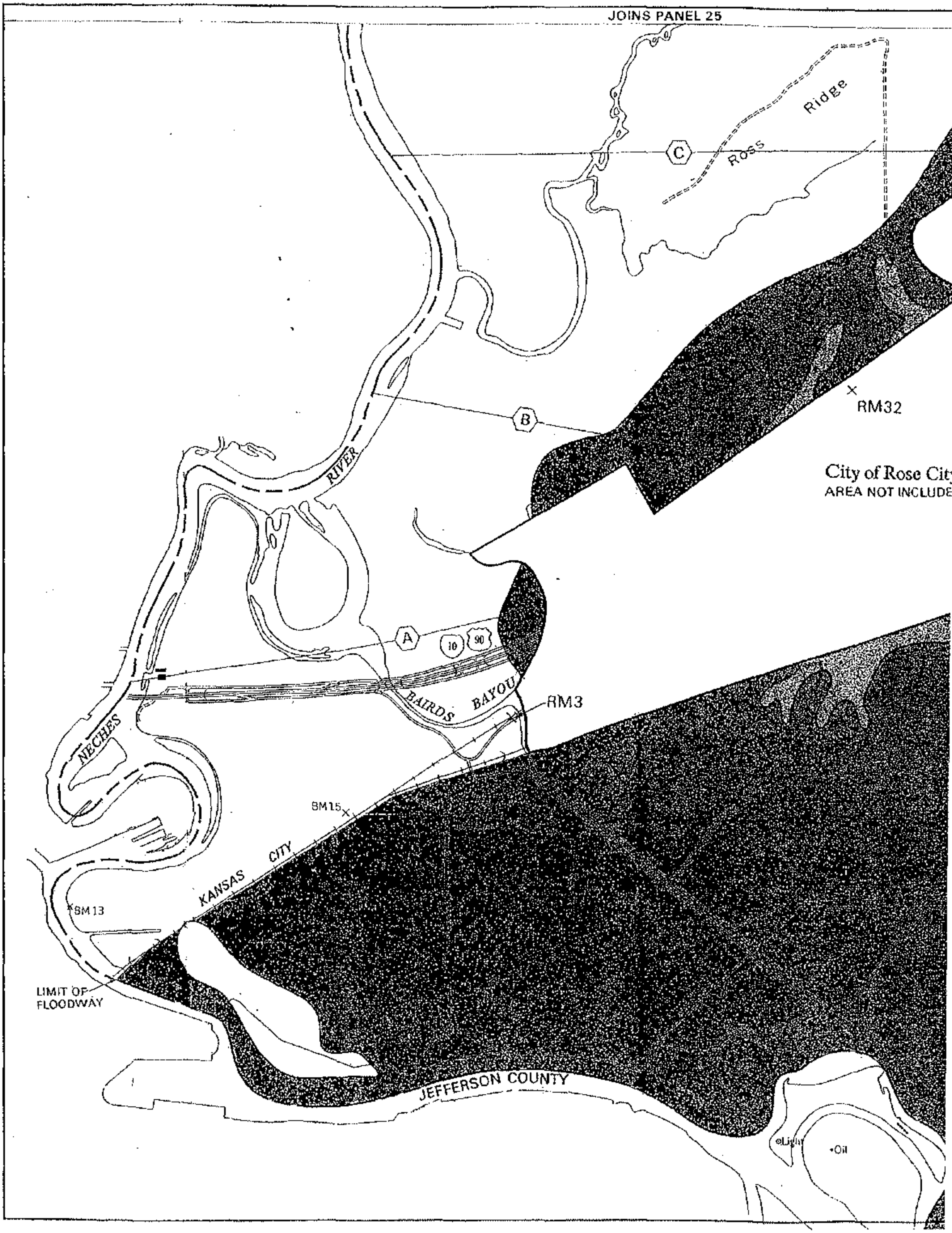
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
480510 0125

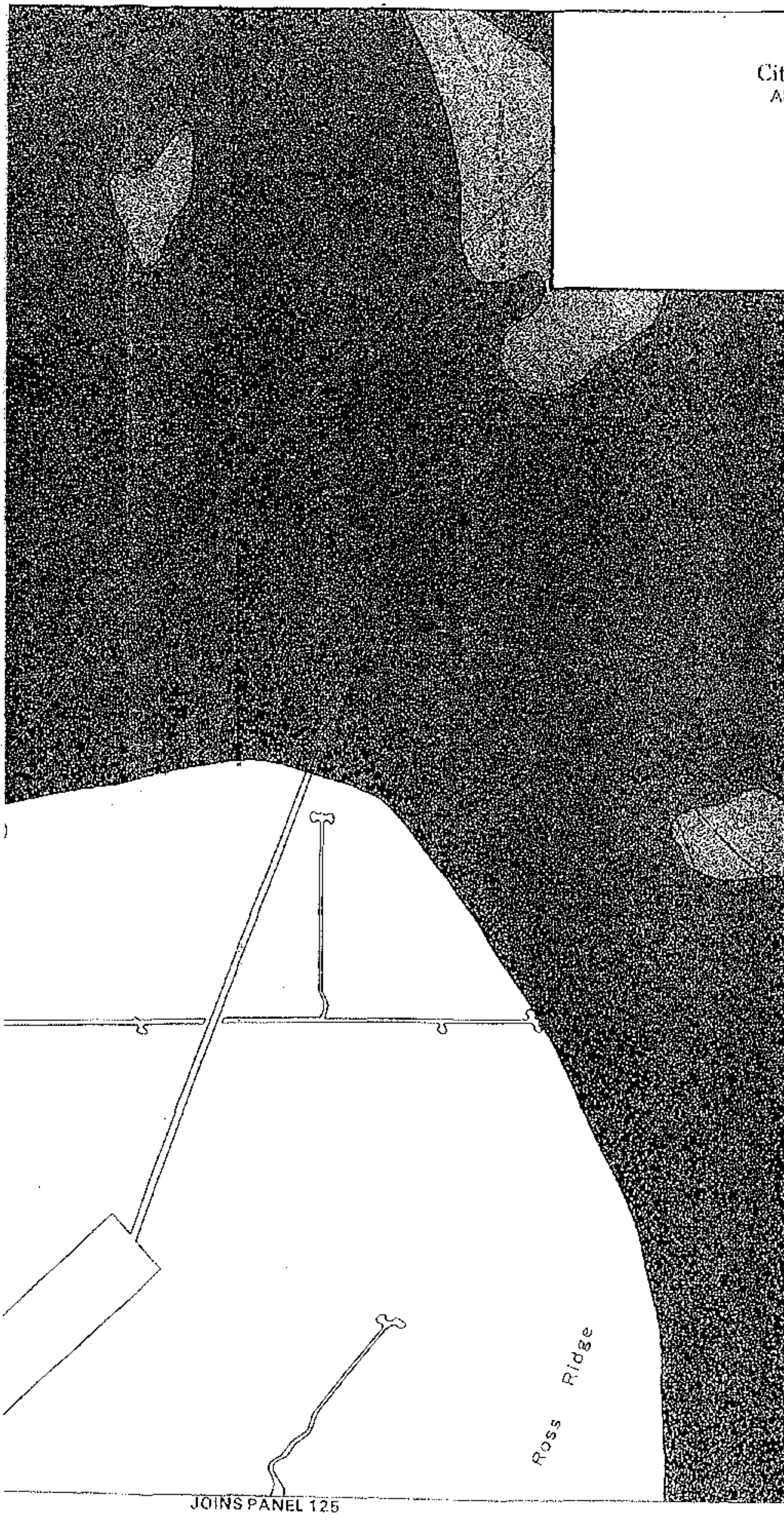
EFFECTIVE DATE:
JANUARY 6, 1983

FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Emergency Management Agency



JOINS PANEL 25
Ross Ridge
C
B
A
RM32
City of Rose Cit
AREA NOT INCLUDE
NECHES RIVER
BAIRDS BAYOU
RM3
10
90
BM15
KANSAS CITY
BM13
LIMIT OF FLOODWAY
JEFFERSON COUNTY
Oil



APPROXIMATE SCALE

2000 0 2000 FEE

NATIONAL FLOOD INSURANCE PROGRAM

FLOODWAY

FLOOD BOUNDARY AND FLOODWAY MAP

ORANGE COUNTY, TEXAS (UNINCORPORATED AREAS)

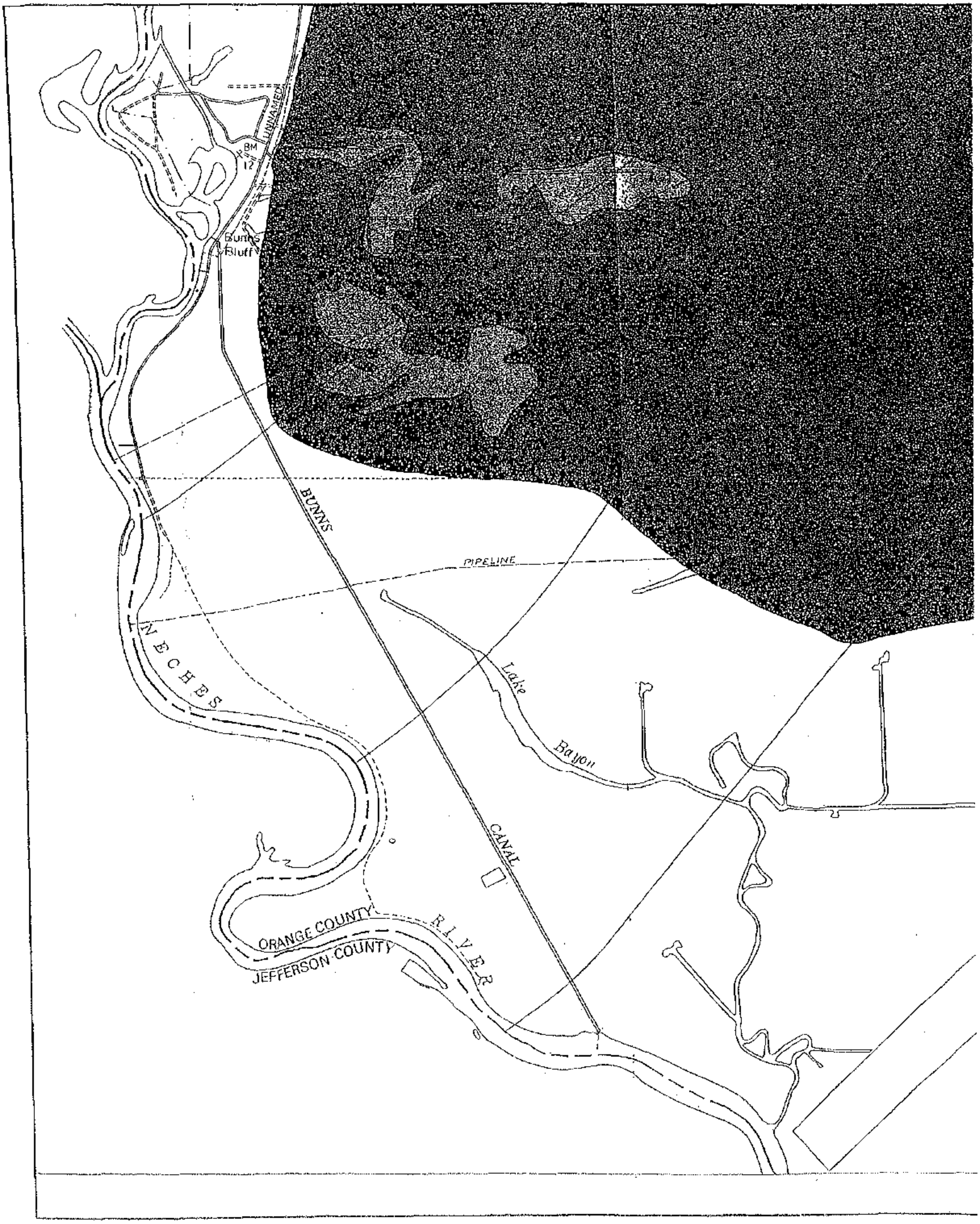
PANEL 25 OF 250

(SEE MAP INDEX FOR PANELS NOT PRINTED)

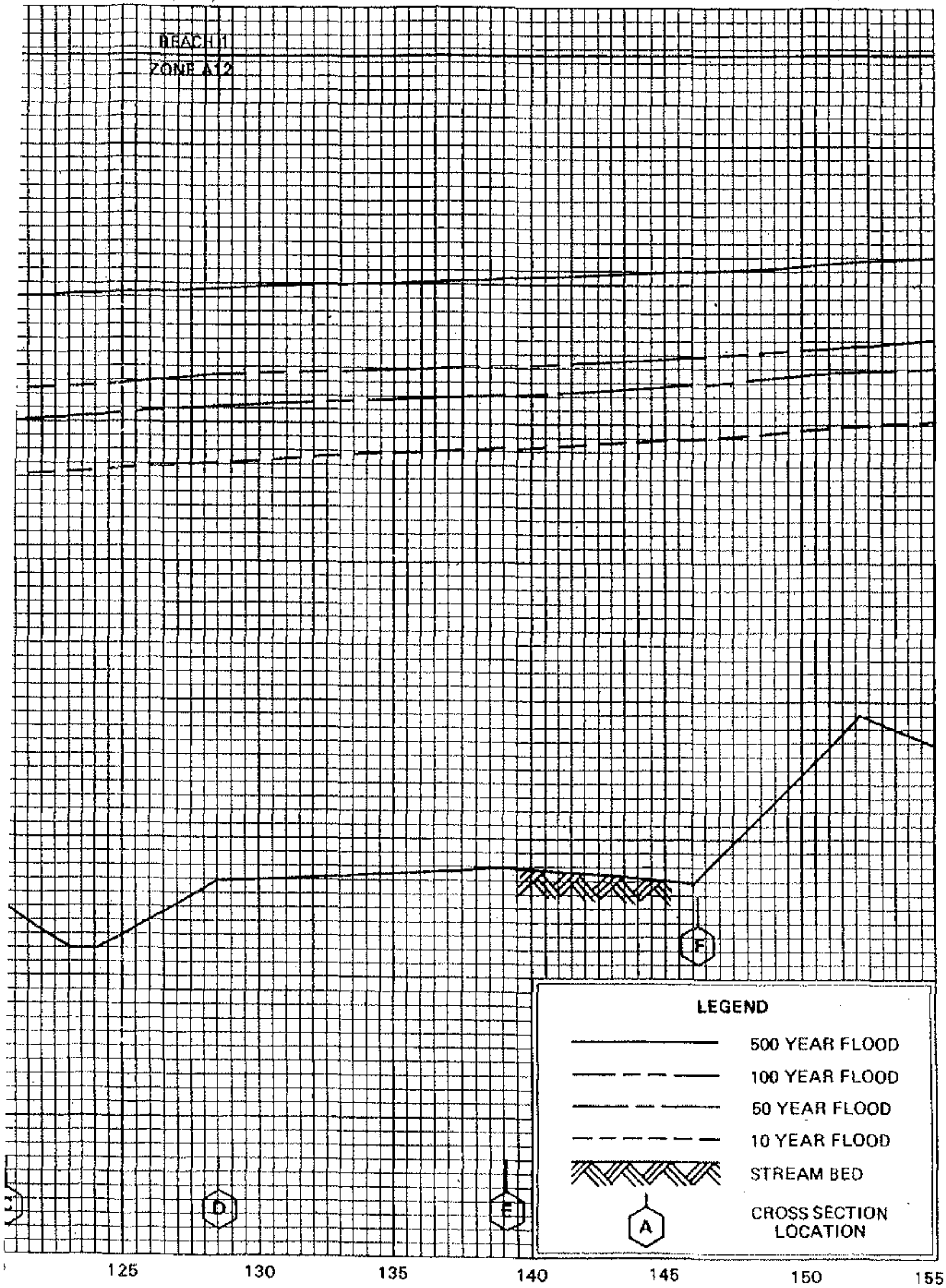
COMMUNITY-PANEL NUMBER
480510 0025

EFFECTIVE DATE:
JANUARY 6, 1983

Federal Emergency Management Agency



UNNAMED
BM
12
Bunns
Bluff
BUNNS
CANAL
PIPELINE
NECHES
RIVER
Lake
Bayou
ORANGE COUNTY
JEFFERSON COUNTY



N THOUSANDS OF FEET ABOVE MOUTH

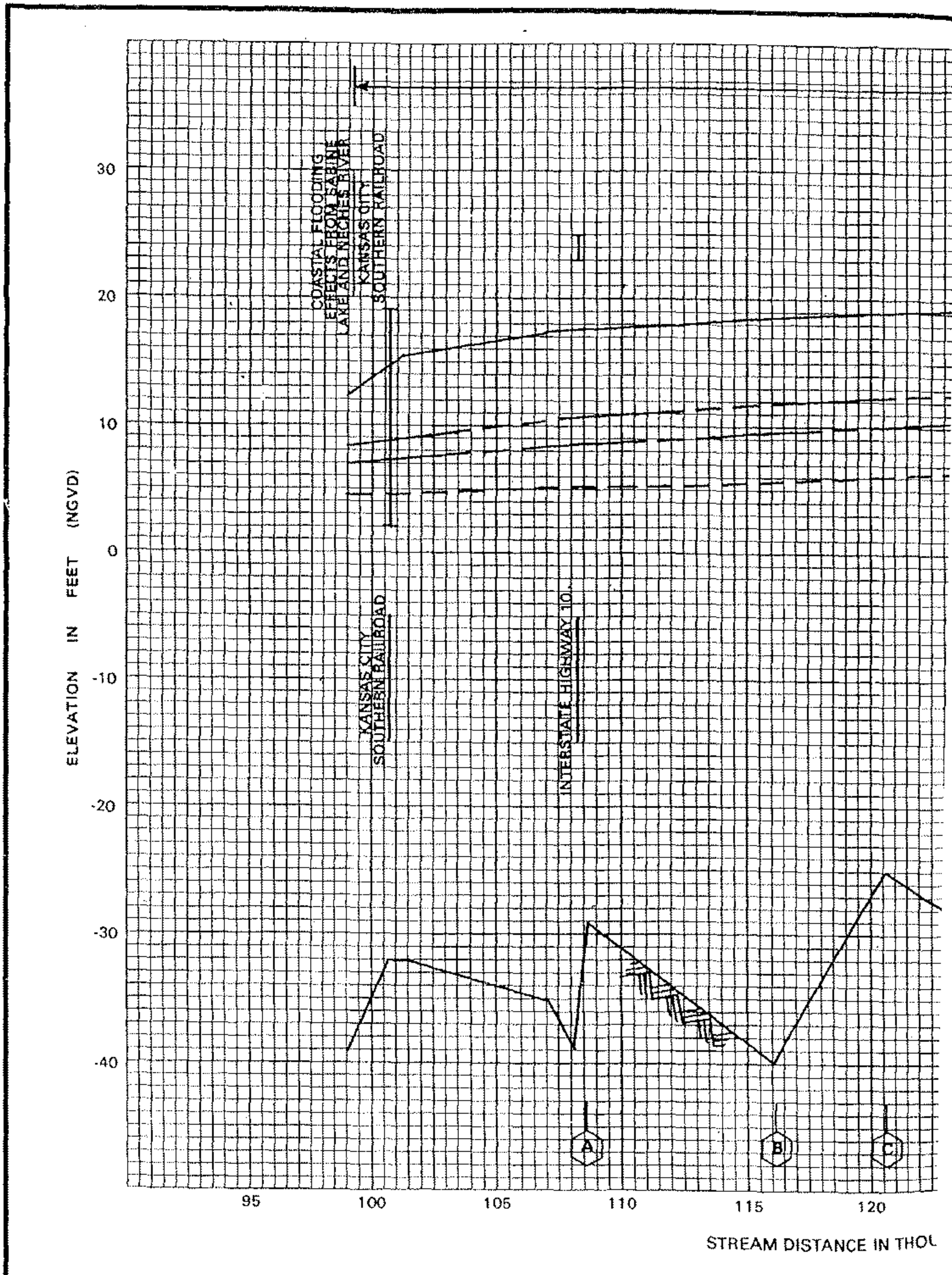
FLOOD PROFILES

NECHES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

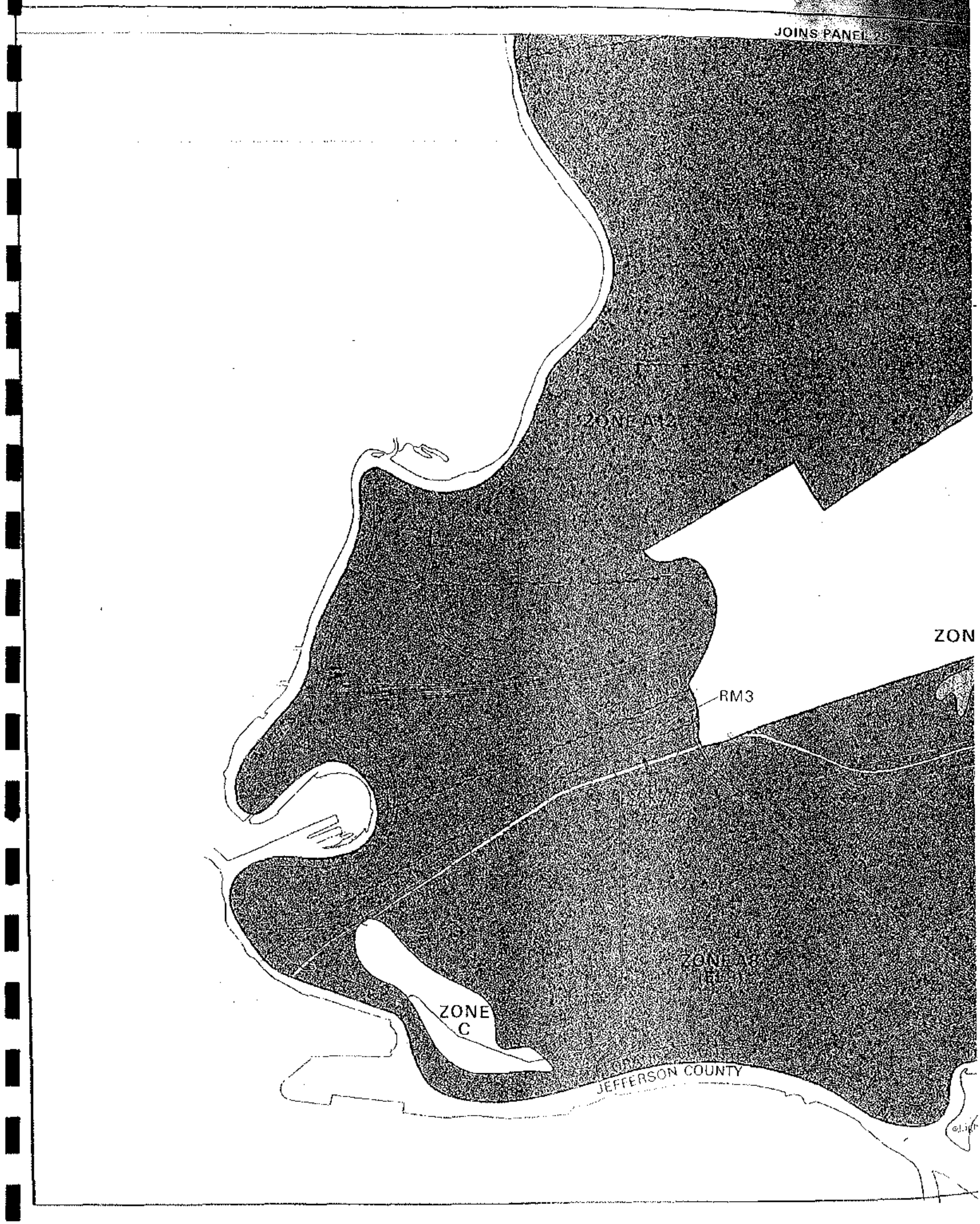
ORANGE COUNTY, TX
(UNINCORPORATED AREAS)

11P

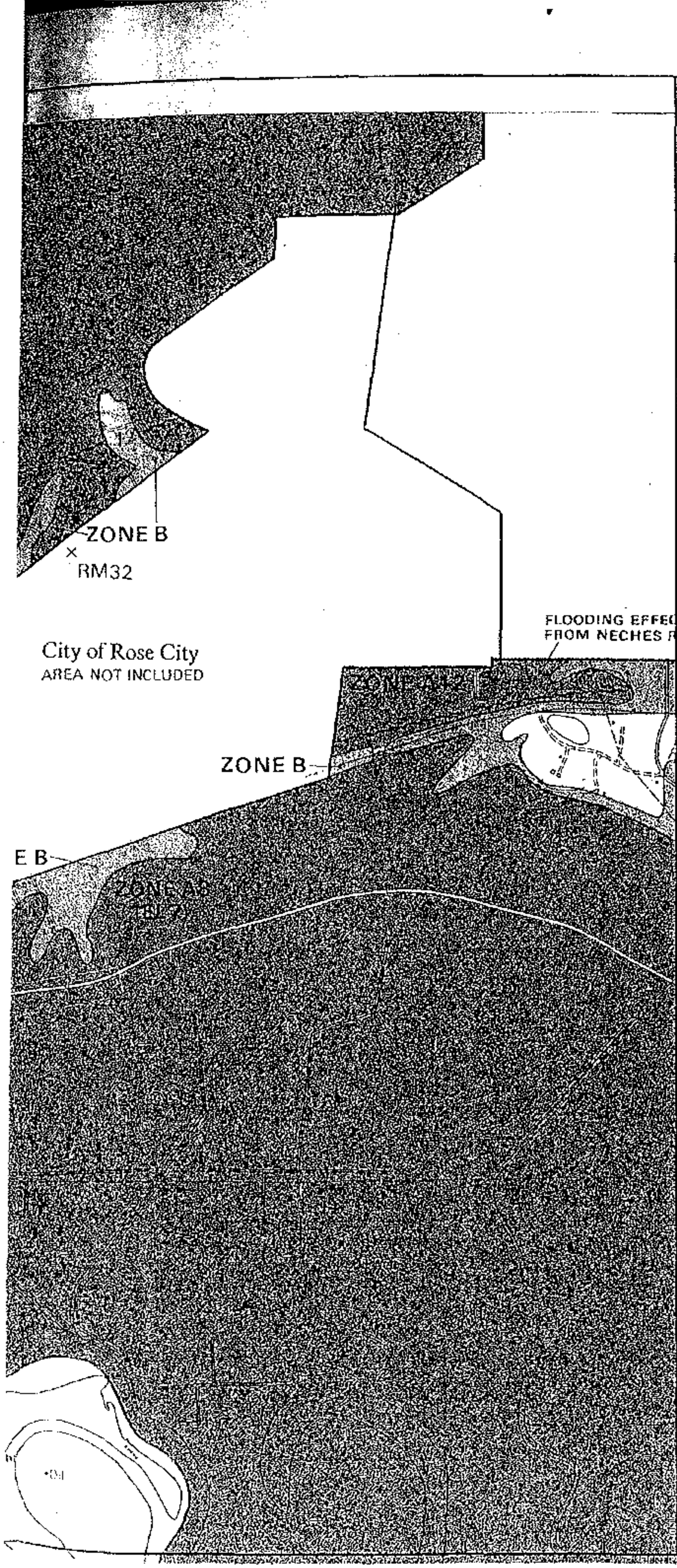


ELEVATION IN FEET (NGVD)
30
20
10
0
-10
-20
-30
-40
COASTAL FLOODING EFFECTS FROM SABINE LAKE AND NECHES RIVER
KANSAS CITY SOUTHERN RAILROAD
KANSAS CITY SOUTHERN RAILROAD
INTERSTATE HIGHWAY 10
A
B
C
95
100
105
110
115
120
STREAM DISTANCE IN THOU

Exhibit S



JOINS PANEL
ZONE A12
ZON
RM3
ZONE C
JEFFERSON COUNTY



APPROXIMATE SCALE

2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

ORANGE COUNTY, TEXAS
(UNINCORPORATED AREAS)

PANEL 125 OF 250

COMMUNITY-PANEL NUMBER
480510 0125 B

EFFECTIVE DATE:
JANUARY 6, 1983

Federal Emergency Management Agency

Exhibit 6

NECHES River

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
28000.000	60000.00	2.00	0.	0.	0.	1219.05	28000.00
28000.000	107000.00	2.00	0.	0.	0.	1219.05	28000.00
28000.000	136000.00	2.00	0.	0.	0.	1219.05	28000.00
28000.000	240000.00	2.00	0.	0.	0.	1219.05	28000.00
38000.000	60000.00	2.17	0.	.17	0.	1240.50	10000.00
38000.000	107000.00	2.52	.36	.52	0.	1363.97	10000.00
38000.000	136000.00	2.84	.32	.84	0.	1471.31	10000.00
38000.000	240000.00	4.55	1.71	2.55	0.	2048.88	10000.00
42000.000	60000.00	2.23	0.	.07	0.	11102.45	4000.00
42000.000	107000.00	2.74	.50	.21	0.	15263.35	4000.00
42000.000	136000.00	3.19	.45	.34	0.	17564.69	4000.00
42000.000	240000.00	5.70	2.52	1.15	0.	19046.36	4000.00
49000.000	60000.00	2.31	0.	.08	0.	8951.11	7000.00
49000.000	107000.00	2.96	.65	.23	0.	12570.32	7000.00
49000.000	136000.00	3.53	.56	.34	0.	14330.90	7000.00
49000.000	240000.00	6.33	2.80	.63	0.	17746.09	7000.00
64000.000	60000.00	2.62	0.	.31	0.	7422.79	15000.00
64000.000	107000.00	3.81	1.19	.64	0.	8611.96	15000.00
64000.000	136000.00	4.71	.91	1.19	0.	10010.88	15000.00
64000.000	240000.00	8.23	3.51	1.89	0.	22188.82	15000.00
6.000	60000.00	2.98	0.	.36	0.	11787.99	12300.00
6.000	107000.00	4.79	1.72	.99	0.	24407.40	12300.00
6.000	136000.00	5.89	1.19	1.18	0.	26653.57	12300.00
6.000	240000.00	9.60	3.71	1.37	0.	26875.86	12300.00
7.000	60000.00	3.32	0.	.34	0.	6240.10	13000.00
7.000	107000.00	5.51	2.19	.21	0.	13507.48	13000.00
7.000	136000.00	6.91	1.40	1.02	0.	13801.11	13000.00
7.000	240000.00	10.98	4.07	1.39	0.	14558.09	13000.00
8.000	60000.00	3.58	0.	.26	0.	4409.56	9500.00
8.000	107000.00	6.13	2.55	.62	0.	4765.81	9500.00
8.000	136000.00	7.71	1.58	.60	0.	4973.78	9500.00
8.000	240000.00	12.25	4.54	1.27	0.	5571.62	9500.00
8.100	60000.00	3.60	0.	.02	0.	1186.34	1900.00
8.100	107000.00	6.16	2.56	.02	0.	5557.79	1900.00
8.100	136000.00	7.76	1.60	.04	0.	5637.81	1900.00
8.100	240000.00	12.45	4.69	.20	0.	5872.43	1900.00
8.200	60000.00	3.62	0.	.02	0.	986.78	100.00
8.200	107000.00	6.14	2.52	-.01	0.	5533.75	100.00
8.200	136000.00	7.65	1.48	-.13	0.	5631.30	100.00
8.200	240000.00	11.48	3.86	-.97	0.	5824.23	100.00
8.300	60000.00	3.69	0.	.08	0.	1127.93	400.00
8.300	107000.00	6.46	2.77	.32	0.	5573.23	400.00
8.300	136000.00	8.42	1.95	.79	0.	5671.12	400.00
8.300	240000.00	15.38	6.96	3.90	0.	6000.00	400.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
9.000	60000.00	4.54	0.	.84	0.	5276.24	6000.00
9.000	107000.00	8.32	3.78	1.85	0.	10905.61	6000.00
9.000	136000.00	10.57	2.26	2.15	0.	24942.85	6000.00
9.000	240000.00	17.35	6.78	1.97	0.	124561.77	6000.00
9.100	60000.00	4.56	0.	.02	0.	2101.94	1000.00
9.100	107000.00	8.35	3.78	.03	0.	6057.23	1000.00
9.100	136000.00	10.59	2.25	.02	0.	6422.94	1000.00
9.100	240000.00	17.21	6.62	-.14	0.	7435.25	1000.00
9.200	60000.00	4.57	0.	.01	0.	2137.06	100.00
9.200	107000.00	8.34	3.77	-.00	0.	6057.66	100.00
9.200	136000.00	10.57	2.23	-.02	0.	6415.73	100.00
9.200	240000.00	17.10	6.53	-.11	0.	7427.97	100.00
9.300	60000.00	4.53	0.	-.04	0.	8728.62	300.00
9.300	107000.00	8.38	3.85	.04	0.	11079.85	300.00
9.300	136000.00	10.78	2.40	.21	0.	11519.44	300.00
9.300	240000.00	17.81	7.03	.71	0.	11790.50	300.00
10.000	60000.00	5.68	0.	1.15	0.	12124.69	7500.00
10.000	107000.00	9.67	3.99	1.29	0.	12530.49	7500.00
10.000	136000.00	11.93	2.26	1.15	0.	12760.72	7500.00
10.000	240000.00	18.68	6.75	.87	0.	12931.34	7500.00
10.100	60000.00	6.10	0.	.42	0.	14362.04	4500.00
10.100	107000.00	10.13	4.02	.46	0.	20578.93	4500.00
10.100	136000.00	12.37	2.24	.44	0.	21009.94	4500.00
10.100	240000.00	19.06	6.70	.38	0.	22000.00	4500.00
10.200	60000.00	6.30	0.	.20	0.	18909.89	2500.00
10.200	107000.00	10.32	4.02	.29	0.	20268.31	2500.00
10.200	136000.00	12.55	2.22	.16	0.	20964.61	2500.00
10.200	240000.00	19.21	6.66	.15	0.	21789.45	2500.00
10.300	60000.00	6.31	0.	.02	0.	18911.14	500.00
10.300	107000.00	10.27	3.97	-.05	0.	20251.88	500.00
10.300	136000.00	12.50	2.23	-.04	0.	20951.32	500.00
10.300	240000.00	19.20	6.70	-.03	0.	21789.34	500.00
10.400	60000.00	6.54	0.	.23	0.	18988.91	500.00
10.400	107000.00	10.64	4.11	.37	0.	20368.03	500.00
10.400	136000.00	12.81	2.17	.31	0.	21048.64	500.00
10.400	240000.00	19.35	6.54	.15	0.	21791.36	500.00
11.000	60000.00	6.99	0.	.46	0.	11605.51	4400.00
11.000	107000.00	11.04	4.05	.40	0.	13680.50	4400.00
11.000	136000.00	13.18	2.14	.36	0.	17001.70	4400.00
11.000	240000.00	19.62	6.45	.27	0.	25329.08	4400.00
11.100	60000.00	8.00	0.	1.01	0.	17756.94	10500.00
11.100	107000.00	11.97	3.96	.94	0.	19839.49	10500.00
11.100	136000.00	14.04	2.07	.86	0.	19880.83	10500.00
11.100	240000.00	20.26	6.22	.63	0.	26128.33	[illegible]

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
12.000	60000.00	8.71	0.	.71	0.	10946.15	7200.00
12.000	107000.00	12.68	3.97	.71	0.	10827.03	7200.00
12.000	136000.00	14.72	2.04	.68	0.	11038.23	7200.00
12.000	240000.00	20.85	6.12	.59	0.	18497.32	7200.00
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12.100	136000.00	15.73	2.01	1.00	0.	19616.28	6000.00
12.100	240000.00	21.72	5.99	.67	0.	16764.90	6000.00
12.200	60000.00	10.46	0.	.67	0.	14436.37	5300.00
12.200	107000.00	14.27	3.82	.56	0.	15767.85	5300.00
12.200	136000.00	16.25	1.98	.52	0.	15813.45	5300.00
12.200	240000.00	22.17	5.92	.46	0.	17421.10	5300.00
13.000	60000.00	11.06	0.	.61	0.	11263.76	2400.00
13.000	107000.00	14.77	3.71	.50	0.	11486.42	2400.00
13.000	136000.00	16.71	1.94	.46	0.	13842.02	2400.00
13.000	240000.00	22.65	5.94	.38	0.	17167.32	2400.00
14.000	60000.00	12.24	0.	1.18	0.	16596.48	12200.00
14.000	107000.00	15.73	3.48	.95	0.	22495.12	12200.00
14.000	136000.00	17.58	1.85	.67	0.	22821.47	12200.00
14.000	240000.00	23.22	5.64	.67	0.	23732.98	12200.00
15.000	60000.00	13.22	0.	.57	0.	21037.55	7500.00
15.000	107000.00	16.27	3.05	.54	0.	21215.51	7500.00
15.000	136000.00	18.02	1.75	.44	0.	21317.57	7500.00
15.000	240000.00	23.53	5.51	.31	0.	36333.07	7500.00
15.100	60000.00	13.64	0.	.42	0.	31272.74	1400.00
15.100	107000.00	16.48	2.84	.21	0.	31391.57	1400.00
15.100	136000.00	18.18	1.70	.16	0.	31463.30	1400.00
15.100	240000.00	23.62	5.44	.09	0.	35628.53	1400.00
16.000	60000.00	13.73	0.	.09	0.	29304.80	500.00
16.000	107000.00	16.54	2.82	.07	0.	29253.66	500.00
16.000	136000.00	18.23	1.69	.06	0.	30982.17	500.00
16.000	240000.00	23.66	5.42	.04	0.	34901.66	500.00
17.000	60000.00	13.99	0.	.27	0.	25532.91	500.00
17.000	107000.00	16.70	2.70	.15	0.	29758.05	500.00
17.000	136000.00	18.35	1.65	.12	0.	29895.79	500.00
17.000	240000.00	23.72	5.37	.06	0.	34720.46	500.00
18.000	60000.00	14.28	0.	.26	0.	28578.71	1400.00
18.000	107000.00	16.90	2.62	.20	0.	28675.95	1400.00
18.000	136000.00	18.52	1.62	.17	0.	28740.64	1400.00
18.000	240000.00	23.82	5.31	.10	0.	34257.76	1400.00
19.000	60000.00	14.52	0.	.24	0.	22999.00	2500.00
19.000	107000.00	17.09	2.57	.19	0.	26560.86	2500.00
19.000	136000.00	18.67	1.59	.16	0.	26874.44	2500.00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.	[illegible]	[illegible]

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
20.000	60000.00	14.93	0.	.42	0.	27955.62	2000.00
20.000	107000.00	17.45	2.52	.37	0.	29864.15	2000.00
20.000	136000.00	18.98	1.53	.31	0.	29145.72	2000.00
20.000	240000.00	24.10	5.12	.18	0.	31776.59	2000.00
21.000	60000.00	15.37	0.	.43	0.	21580.88	1300.00
21.000	107000.00	17.82	2.45	.36	0.	24525.71	1300.00
21.000	136000.00	19.28	1.47	.30	0.	24586.86	1300.00
21.000	240000.00	24.28	4.99	.18	0.	26486.76	1300.00
22.000	60000.00	15.58	0.	.21	0.	21376.28	1200.00
22.000	107000.00	18.01	2.43	.19	0.	21776.14	1200.00
22.000	136000.00	19.46	1.45	.17	0.	22132.96	1200.00
22.000	240000.00	24.49	4.94	.12	0.	25789.25	1200.00
23.000	60000.00	15.80	0.	.22	0.	21088.59	1500.00
23.000	107000.00	18.25	2.46	.24	0.	21465.61	1500.00
23.000	136000.00	19.70	1.44	.24	0.	21696.81	1500.00
23.000	240000.00	24.59	4.90	.20	0.	23510.18	1500.00
24.000	60000.00	15.87	0.	.68	0.	20895.83	900.00
24.000	107000.00	18.34	2.47	.69	0.	20976.14	900.00
24.000	136000.00	19.79	1.44	.59	0.	21026.20	900.00
24.000	240000.00	24.67	4.88	.68	0.	22403.40	900.00
25.000	60000.00	16.41	0.	.54	0.	20513.76	5000.00
25.000	107000.00	19.00	2.58	.65	0.	20999.85	5000.00
25.000	136000.00	20.45	1.46	.67	0.	21166.10	5000.00
25.000	240000.00	25.29	4.84	.62	0.	22500.00	5000.00

SUMMARY OF ERRORS

THIS RUN EXECUTED 14 FEB 80 14.19.23

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED JULY 1979
 ERROR CORR - 01,02,03
 MODIFICATION - 50,51,52,53
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

EAR FLOOD

SUMMARY PRINTOUT TABLE 110

SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	FERENC	STENCL	STCHL	STCHR	STENCR
28000.000	2.00	0.	2.44	1215.05	6.49	135991.61	1.89	0.	0.	2100.00	2950.00	0.
28000.000	2.00	0.	2.44	850.00	0.	136000.00	0.	.00	2100.00	2100.00	2950.00	2950.00
38000.000	2.64	0.	3.23	1471.31	67.06	135866.84	46.10	0.	0.	900.00	1750.00	0.
38000.000	2.64	.65	3.23	850.00	0.	136000.00	0.	.00	900.00	900.00	1750.00	1750.00
42000.000	3.19	0.	7.47	17584.69	196.39	132338.27	3465.34	0.	0.	2000.00	2800.00	0.
42500.000	3.37	.02	3.45	650.00	0.	136000.00	0.	.07	2000.00	2000.00	2800.00	2800.00
45000.000	3.57	0.	3.64	14234.90	62.21	131222.69	4715.03	0.	0.	1950.00	2850.00	0.
49000.000	3.54	.01	3.58	900.00	0.	136000.00	0.	.06	1950.00	1950.00	2850.00	2850.00
64000.000	4.71	0.	5.16	10919.66	6.52	117723.19	18270.29	0.	0.	1000.00	1700.00	0.
64000.000	4.83	.11	5.79	3179.55	0.	126707.36	9292.64	.11	1000.00	1000.00	1700.00	4179.95
6.000	5.89	0.	6.22	26653.57	4505.03	116180.50	14990.47	0.	0.	12400.00	13000.00	0.
6.000	6.22	.33	6.61	7655.74	838.41	122568.47	11593.12	.11	11695.88	12400.00	13000.00	19551.62
7.000	6.91	0.	7.27	13801.11	1196.39	123406.95	11896.66	0.	0.	3700.00	4300.00	0.
7.100	7.34	.42	7.75	3027.16	0.	128471.63	7526.37	.06	3700.00	3700.00	4300.00	7327.16
8.000	7.71	0.	8.13	4977.76	314.51	130043.99	5651.50	0.	0.	400.00	1000.00	0.
8.000	8.20	.49	8.66	1024.89	0.	135478.25	521.75	.05	400.00	400.00	1000.00	2165.53
8.100	7.76	0.	9.20	5637.61	343.67	125266.06	10390.27	0.	0.	600.00	1000.00	0.
8.100	8.21	.45	9.87	1291.30	0.	132511.35	3488.65	.06	600.00	600.00	1000.00	1891.21
8.200	7.63	0.	9.44	5631.30	346.94	128754.20	896.86	0.	0.	600.00	1000.00	0.
8.200	8.20	.57	9.99	[illegible]	0.	136000.00	0.	.01	600.00	600.00	1000.00	1000.00
8.300	8.42	0.	9.78	5671.12	449.25	124489.36	11061.42	0.	0.	600.00	1900.00	0.
8.300	8.69	.27	10.27	1946.20	0.	131801.07	4198.93	.06	600.00	600.00	1900.00	2646.21
9.000	10.57	0.	16.79	24542.65	6572.31	112753.28	16272.61	0.	0.	1500.00	2300.00	0.
9.000	11.16	.59	11.41	6971.69	1028.76	119385.32	15581.92	.09	1366.90	1500.00	2300.00	8278.59
9.100	12.59	0.	16.94	6422.54	5762.65	122211.99	8025.13	0.	0.	1800.00	3300.00	0.
9.100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.09	[illegible]	[illegible]	[illegible]	[illegible]

SECNO	CUSTL	DIFKLS	LG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
9.200	10.57	0.	11.03	6415.73	6179.36	129727.70	162.54	0.	0.	2500.00	3300.00	0.
9.200	11.16	.59	11.67	879.11	0.	136000.00	0.	.06	2500.00	2500.00	3300.00	3300.00
9.300	10.76	0.	11.12	15519.44	8470.75	92333.21	35596.03	0.	0.	3000.00	3600.00	0.
9.300	11.34	.55	11.76	7268.36	1946.76	99737.84	34315.40	.11	2451.54	3000.00	3600.00	9719.32
10.[illegible]	11.93	0.	12.70	12760.72	32185.05	79149.35	24665.60	0.	0.	6800.00	7450.00	0.
10.[illegible]	12.63	.70	12.61	7664.27	29995.82	84650.14	21404.04	.16	1432.97	6800.00	7450.00	11697.17
10.100	12.37	0.	12.45	21079.54	24940.81	72343.21	38715.98	0.	0.	6900.00	5750.00	0.
10.100	13.11	.74	13.29	13926.15	21219.09	77674.40	27106.51	.11	4234.92	6900.00	5750.00	18161.08
10.200	12.55	0.	12.63	20964.61	25779.80	55902.76	54317.41	0.	0.	6300.00	6850.00	0.
10.250	13.37	.75	13.40	15333.14	21156.99	60617.73	54825.20	.12	2120.78	6300.00	6850.00	17453.52
10.300	12.51	0.	12.72	2[illegible]951.32	38456.56	63766.79	13756.23	0.	0.	6300.00	6850.00	0.
10.300	13.21	.71	13.61	6595.69	37777.57	56297.66	2324.77	.13	1662.15	6300.00	6850.00	6652.64
10.400	12.61	0.	12.89	21048.64	26664.53	54899.49	55033.98	0.	0.	6300.00	6850.00	0.
10.400	13.67	.86	13.76	15457.56	21623.76	56560.45	55815.75	.11	2078.85	6300.00	6850.00	17536.44
11.300	13.17	0.	13.37	17901.70	1113.05	77684.71	57612.24	0.	0.	1800.00	2400.00	0.
11.500	14.05	.87	14.26	5144.63	0.	62525.70	57474.30	.11	1800.00	1800.00	2400.00	10544.83
11.100	14.14	0.	14.17	1966[illegible].63	53437.11	46965.21	35577.79	0.	0.	10600.00	11310.00	0.
11.100	14.96	.92	15.03	14711.06	52566.02	45508.04	33521.94	.11	2466.23	10600.00	11310.00	11175.22
12.000	14.72	0.	15.01	31138.23	38820.87	72745.60	24433.73	0.	0.	7300.00	7700.00	0.
12.000	15.65	.93	15.97	7897.55	38147.52	76542.54	20909.94	.10	2376.89	7300.00	7700.00	10276.49
12.100	15.03	0.	15.76	14016.28	81444.49	26580.96	27974.55	0.	0.	11000.00	11400.00	0.
12.100	16.71	.98	16.75	10348.10	84168.37	28759.62	23172.01	.11	1636.56	11000.00	11400.00	13486.66
12.290	16.25	0.	16.35	15613.45	72473.54	42323.57	21272.89	0.	0.	13700.00	14100.00	0.
12.290	17.23	.98	17.34	11619.73	74177.54	45312.92	16559.54	.12	4991.65	13700.00	14100.00	16601.43
13.000	16.71	0.	16.82	13542.02	79189.71	29380.68	27430.01	0.	0.	11000.00	11000.00	0.
13.000	17.70	.99	17.83	9654.23	81565.44	31295.44	23119.12	.12	3416.07	11000.00	11000.00	13022.30
14.000	17.55	0.	17.61	22221.47	93170.19	13552.59	29577.22	0.	0.	14750.00	14900.00	0.
14.000	18.55	1.01	18.62	14637.43	96405.33	14756.54	24754.12	.12	3026.92	14750.00	14900.00	17664.35
15.000	17.59	0.	18.72	31916.10	96756.49	26625.30	10418.21	0.	0.	28450.00	29250.00	0.
15.000	18.55	1.00	19.67	25676.01	103781.28	32218.72	0.	.16	3573.39	28450.00	29250.00	29250.00
15.100	18.13	0.	18.15	31461.42	104908.71	15959.96	15132.24	0.	0.	27900.00	28150.00	0.
15.100	19.13	1.00	19.15	25627.36	113924.17	17779.24	4696.59	.16	3664.18	27900.00	28150.00	28891.48
16.000	18.19	0.	18.24	37962.43	112708.43	17594.28	5997.28	0.	0.	27610.00	27755.00	0.
16.100	19.15	1.00	19.23	23821.59	117908.55	18091.45	0.	.16	3953.41	27610.00	27755.00	27759.66
17.000	18.31	0.	18.33	29092.42	114478.47	13263.15	6326.34	0.	0.	27060.00	27365.00	0.
17.000	19.31	1.00	19.33	23269.72	121740.41	14251.60	0.	.17	3435.28	27060.00	27365.00	27205.00
18.000	18.48	0.	18.51	26739.12	107032.07	15456.53	13511.44	0.	0.	25820.00	28[illegible]00.00	0.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

K

SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
19.000	18.64	0.	18.71	26866.91	99293.41	32832.13	3874.46	0.	0.	22780.00	23070.00	0.
19.000	19.65	1.01	19.73	19460.32	101511.59	34098.41	0.	.15	3669.68	22780.00	23070.00	22070.00
20.000	18.92	0.	18.99	25142.39	145012.87	20941.15	10045.98	0.	0.	19640.00	19760.00	0.
20.000	19.94	1.02	20.02	17718.21	112337.64	22180.77	1481.58	.17	2265.15	19640.00	19760.00	15903.26
21.000	19.25	0.	19.30	24565.55	106836.30	16682.97	12480.73	0.	0.	18900.00	19080.00	0.
21.000	20.26	1.03	20.34	17558.18	114756.96	16189.22	3153.82	.17	1996.16	18900.00	19080.00	15554.34
22.000	19.42	0.	19.48	22123.72	95539.69	22251.01	13209.30	0.	0.	18300.00	18500.00	0.
22.000	20.45	1.03	20.52	17525.92	106399.17	24716.68	4884.15	.14	1842.13	18350.00	18500.00	19366.05
23.000	19.69	0.	19.72	21685.27	95367.65	17419.08	23213.76	0.	0.	17410.00	17610.00	0.
23.000	20.72	1.03	20.76	17599.92	101265.73	16726.93	16004.26	.14	1857.01	17410.00	17610.00	15456.53
24.000	19.77	0.	19.84	21025.77	94276.12	22649.90	19072.99	0.	0.	17710.00	17870.00	0.
24.000	20.80	1.02	20.87	17516.15	100475.67	23667.83	11836.29	.13	1697.55	17710.00	17870.00	15312.71
25.000	20.46	0.	20.51	21166.53	95536.94	21276.69	19166.16	0.	0.	17710.00	17870.00	0.
25.000	21.46	1.02	21.54	17714.21	101391.62	22418.33	12169.85	.13	1707.15	17710.00	17870.00	15421.26

SUMMARY OF ERRORS

Exhibit 7

Federal Emergency Management Agency
Washington, D.C. 20472

Flood Insurance Study (FIS) Data Requests

The Federal Emergency Management Agency (FEMA) has identified five categories into which requests for FIS data are separated. These categories are:

Category 1 - Paper copies, diskettes, or microfiche of hydrologic and hydraulic backup data for current or historical FISs
Category 2 - Paper or Mylar copies of topographic mapping developed during the FIS process
Category 3 - Paper copies or microfiche of survey notes developed during FIS process
Category 4 - Paper copies of individual Letters of Map Change
Category 5 - Paper copies of void map panels
Category 6 - Computer tapes or CD-ROMs of Digital Line Graph files, Digital Flood Insurance Rate Map files, or Digital LOMR attachment files.

A <u>non-refundable</u> fee of $150 will be required to initiate requests for data from categories 1, 2, and 3 from non-exempt requestors. This fee will cover the preliminary costs of research and retrieval. The costs of processing requests in categories 1, 2, and 3 will vary based on the complexity of the research involved in retrieving the data and the volume and medium of the data to be reproduced and distributed. The initial fee will be applied against the total costs to process the data request, and the requestor will be invoiced for the remainder of the fee. No data will be provided to a requestor until the entire fee has been paid.

The final fees for processing FIS data requests for Categories 1, 2, and 3 are calculated by adding labor charges (actual hours times $33 per hour); reproduction costs of materials used; and a standard charge of $93.00 to cover the costs related to library maintenance.

No initial fee will be required to initiate requests for data from categories 4 through 6. Each requestor will be contacted regarding the availability of the materials and the fee associated with obtaining the requested materials. No data will be provided to a requestor until the fee has been paid.

The costs of processing requests under categories 4 through 5 will not vary. Therefore, FEMA has established the flat user fees shown below for these categories of requests.

Category 4 - $40 for first letter; $10 for each additional letter
Category 5 - $35 for first panel; $2 for each additional panel
Category 6 - $150 (per county/digital LOMR attachment shape files)

Requestors must submit the user fees shown above with requests for FIS technical and administrative support data. We will charge all entities except the following for requests for FIS technical and administrative support data:

- Private architectural-engineering firms under contract to us to perform or evaluate studies and restudies;
- Federal agencies that perform or contract for studies and restudies for us (i.e., U.S. Army Corps of Engineers, U.S. Geological Survey, Natural Resources Conservation Service, and Tennessee Valley Authority);
- Communities that request data during the statutory 90-day appeal period for an initial or revised FIS for that community;
- Mapped participating communities that request data at any time other than during the statutory 90-day appeal period, provided that the community requests the data for its use and not for a third-party user; and
- State NFIP Coordinators, provided that the data that they request are for use by the State NFIP Coordinators and not for use by a third-party user.

To initiate your request, please complete page 3 of this form.

The average request takes 2 to 3 weeks to fill.

You will be contacted after we have determined whether the requested data are available and the final fee is assessed.

Payments can be made by Checks, Money Order or Credit Card. Checks or money orders should be made payable to:

NATIONAL FLOOD INSURANCE PROGRAM.

If paying by credit card, please complete the Payment Information Form and mail it or send a facsimile of it with your request.

Data will be released upon receipt of final payment.

Please include your check, if applicable, with your written request and mail to:

FEMA Engineering Library
847 South Pickett St.
Alexandria, Virginia 22304
Fax (703) 212-4090

SESCO

SKINNER ENGINEERING
SERVICES COMPANY
P.O. BOX 67
SILSBEE, TEXAS 77656
409-385-2074

August 25, 2011

Federal Emergency Management Agency
Region IV
303 Chamblee-Tucker Road
Atlanta, GA. 30341

RE: "NO-RISE/NO-IMPACT" CERTIFICATION

I am requesting the step-backwater hydraulic model for the Neches River Reach 1 in Orange County, Texas, community number 480510. The flood profile of the river is shown in the Flood Insurance Study, for community number 480510, revised June 5, 1997, on exhibit 11P. I am requesting the information from Station 95,000 to Station 130,000.

I understand there will be a fee for this information, please let me know the cost and I will pay immediately.

Your prompt assistance with this matter would be greatly appreciated.

If you need any addition information, please advise.

Respectfully Submitted,
Skinner Engineering Services Company

J. Scott Skinner, P.E.
President

Federal Emergency Management Agency

Washington, D.C. 20472

Flood Insurance Study (FIS) Data Request

Please provide the following information as applicable for the area where you require data:

- Complete community name (including county and state)

Orange County, Texas

- Community identification number, if known

480510

- Name(s) of flooding source(s) and specific location(s) for which data are needed (Attach FIRM panel showing subject area if available)

Neches River Reach 1 in Orange County Flood Insurance Study, revised June 5, 1997.

Requesting information from Station 95,000 to Station 130,000

FIRM - Community-Panel Number 480510 0125 B

- Specific data needed (see list of available categories on page 1)

Category 1 in electronic format. step-backwater hydraulic model for Neches River

Reach 1, including cross sections taken in the above referenced area.

- Effective date of FIRM for which data are requested (enclose an annotated copy of FIRM/FBFM, if available, identifying area of interest)

Effectiv date of FIRM January , 1983.

- Contact person's name

J. Scott Skinner

- Firm Name

Skinner Engineering Services Company

- Email Address

jscottskinner@yahoo.com

- Daytime Phone/fax number:

ph (409) 385-2074

fax (409) 385-0263

- Mailing Address

P.O. Box 67

Silsbee, Texas 77656

- I am employed by (choose one):

☒ Private Firm ☐ State Agency ☐ Federal Agency ☐ Local Gov't ☐ FEMA Study Contractor* ☐ Other

* Please provide contract number

409-385-2074 ext. 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

PAYMENT INFORMATION FORM

Community Name: ORANGE COUNTY, TEXAS

Project Identifier: COMMUNITY No. 480510

THIS FORM MUST BE MAILED, ALONG WITH THE APPROPRIATE FEE, TO THE ADDRESS BELOW OR FAXED TO THE FAX NUMBER BELOW.

Type of Request:

☐ MT-1 application
☐ MT-2 application

FEMA
Fee Charge System Administrator
6730 Santa Barbara Court
Elkridge, MD 21075

☒ EDR application

FEMA Project Library
847 South Pickett St.
Alexandria, VA 22304
FAX (703) 212-4090

Request No.: ______________ (if known)

Amount: 150.00

☐ INITIAL FEE* ☐ FINAL FEE ☐ FEE BALANCE** ☐ MASTER CARD ☐ VISA ☐ CHECK ☐ MONEY ORDER

*Note: Check only for EDR and/or Alluvial Fan requests (as appropriate).

**Note: Check only if submitting a corrected fee for an ongoing request.

COMPLETE THIS SECTION ONLY IF PAYING BY CREDIT CARD

CARD NUMBER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

EXP. DATE

Month — Year

____
Date

____
Signature

NAME *(AS IT APPEARS ON CARD)*: ______________
(please print or type)

ADDRESS:
(for your credit card receipt-please print or type) ______________

DAYTIME PHONE: ______________

Subject: FEMA Data Request

From: Susan Greene (Susan.Greene@riskmapcds.com)

To: jscottskinner@yahoo.com;

Date: Friday, August 26, 2011 5:35 AM

We have received your request for FEMA data in Orange County Texas. This type of request requires an initial fee of $150.00. I have attached a credit card form for your use. You may also send in a check or money order made payable to FEMA. If you have any additional questions please let me know.

Thank you,

Susan

Susan Greene EDR Lead

Zimmerman Associates, Inc.

FEMA Engineering Library

Lead Request Specialist

703-212-4023

(CK#16031)

ZAI

Zimmerman Associates, Inc.
FEMA Engineering Library
847 S. Pickett St.
Alexandria, Virginia 22304
(877) 336-2627

Thursday, September 01, 2011
3:16 PM
Two Pages Transmitted

Please deliver this facsimile to:

Name:	**J. Scott Skinner**
Representing:	**Skinner Engineering Services Company**
Telecopier Number:	**(409) 385-0263**
Phone Number:	**(409) 385-2074**
Topic:	**Payment Procedures Form for FEMA Data Request Number Z1106397**
This Telecopy is from	**ZAI - FIS Information Specialist**
	Christopher Stewart at 703-212-4032

The additional cost to fill your data request will be: **$105**

(Please see Page 2 for payment procedures.)

Please sign and return this sheet to us by fax at (703) 212-4090, if you agree to pay the above costs. If we do not receive your written agreement within two weeks, your case will be automatically dropped from our system. If you need the data after that time, you must resubmit your request AND the initial fee, wait your turn, and you may incur additional labor costs for relocating the requested data. Please note that the cost shown above is in addition to the $135 initial fee already received. Materials will be released following receipt of the final fee.

Data will include the original study HEC-2 hydraulic model for Neches River. Only the summary output printouts were availble, no input could be located for this model. File is in PDF format and will be sent via email.

I agree to pay the above-noted costs to fill my request.

Signature: [signature] Date: Sept. 1, 2011

Remember to include your Request Identification Number, Z1106397, on your payment!

Subject: Re: FIS Data Request Z1106397

From: Scott Skinner (jscottskinner@yahoo.com)

To: Chris.Stewart@riskmapcds.com;

Date: Wednesday, September 7, 2011 11:40 AM

Chris,
This information is useless for what I need, this data is in the Flood Insurance Sturdy book for Orange County. I need the cross section data for the areas along the Neches river discussed in my previous request. FEMA requires the that an engineer use the original cross section data to compare to new cross sections for an area if the area is applying for a no rise certificate. If FEMA does not have the info, maybe the corp of engineers still has the data. The cross sections have to be somewhere. Your assistance is appreciated.

J. Scott Skinner, P.E.
President
Skinner Engineering
Services Company
P.O. Box 67
Silsbee, Texas 77656
Office: 409-385-2074
Fax: 409-385-0263
Cell: 409-893-6551

From: Chris Stewart <Chris.Stewart@riskmapcds.com>
To: Scott Skinner <jscottskinner@yahoo.com>
Sent: Wednesday, September 7, 2011 8:52 AM
Subject: FW: FIS Data Request Z1106397

I have attached one zipped file to this email. This contains the output modeling files. Please contact me if you have any questions concerning this data.

Chris Stewart
Chris.stewart@riskmapcds.com
703-212-4032

From: Chris Stewart
Sent: Friday, September 02, 2011 9:41 AM
To: 'Scott Skinner'
Subject: RE: FIS Data Request Z1106397

Thanks for your prompt response; the 135 fee is from an old template. The current fee is for the 150 that you already submitted sorry for any confusion.

Chris Stewart

From: Scott Skinner [mailto:jscottskinner@yahoo.com]
Sent: Thursday, September 01, 2011 4:12 PM
To: Chris Stewart
Subject: Re: FIS Data Request Z1106397

Chris,
Here is the signed sheet to pay for the info, I will be sending the check in tomorrow ofr $105.00. My initial fee that I sent in was $150.00, not $135 as stated in the sheet.

J. Scott Skinner, P.E.
President
Skinner Engineering
Services Company
P.O. Box 67
Silsbee, Texas 77656
Office: 409-385-2074
Fax: 409-385-0263
Cell: 409-893-6551

From: Chris Stewart <Chris.Stewart@riskmapcds.com>
To: "jscottskinner@yahoo.com" <jscottskinner@yahoo.com>
Sent: Thursday, September 1, 2011 2:23 PM
Subject: FIS Data Request Z1106397

Scott, I have attached the final agreement to pay forms to this email for the release of the Neches River HEC2 output file. If you could fill them out and email or fax back I will be able to release the data to you via email.

Chris Stewart
Chris.stewart@riskmapcds.com
70-212-4032

ZAI

Zimmerman Associates, Inc.
FEMA Engineering Library
847 South Pickett Street
Alexandria, Virginia 22304

September 14, 2011

IN REPLY REFER TO:
Request No.: Z1106397

Mr. J. Scott Skinner, P.E.
President
Skinner Engineering
Services Company
P.O. Box 67
Silsbee, Texas 77656

Dear Mr. **Skinner,**

This is in response to your **September 1, 2011** letter requesting FEMA back up data for **Neches River** in **Orange County, Texas.** After an extensive search, we are unable to locate the requested data.
We thank you for your request and look forward to serving you again in the future. If you have any questions regarding your request or we may be of further assistance, please contact me by telephone at **703-212-4032**, or by electronic mail, **chris.stewart@riskmapcds.com**

Sincerely,

Chris Stewart
FEMA Engineering Library

Subject: RE: information along Neches River between Orange and Jefferson Counties

From: Voice, Larry (larry.d.voice@dhs.gov)

To: jscottskinner@yahoo.com;

Date: Wednesday, October 19, 2011 4:58 PM

Scott:

Sorry I didn't get back to you with confirmation quicker. I evidently missed something during our last call and did not realize you were waiting for a written confirmation.

As we discussed in our phone conversation, the official repository for models, cross-section and other historic FEMA flood data is the FEMA project library:

FEMA Project Library
847 S. Pickett Street
Alexandria, VA 22304
Phone: 1-877- 336-2627
Facsimile: 1-703- 212-4090

That data is not stored at Region 6. I did check with engineers who have worked here longer than me to see if they were aware of any "unofficial" copies here at the region, but they were not aware of any. In addition, I checked with our mapping contractor in that county to see if they had a copy, but they did not.

Hopefully this satisfies your need for a written confirmation. If you need an actual letter, I will need to discuss it with my supervisor and route it through our letter review process (which usually takes a few days). Let me know if you do need a letter – my supervisor will be back in the office tomorrow and I will discuss with him.

Larry Voice

FEMA Region 6

940-898-5419

From: Scott Skinner [mailto:jscottskinner@yahoo.com]
Sent: Thursday, October 13, 2011 1:30 PM
To: Larry Voice
Subject: information along Neches River between Orange and Jefferson Counties

Mr. Voice,

I have not received conformation from you that there is not any data,cross section and calculation information, available in the regional FEMA office on the Neches River between Orange and Jefferson Counties in Texas . You had said you would send me a letter last week. Your assistance in this matter is appreciated.

J. Scott Skinner, P.E.
President
Skinner Engineering
Services Company
P.O. Box 67
Silsbee , Texas 77656
Office: 409-385-2074
Fax: 409-385-0263
Cell: 409-893-6551