FLOOD INSURANCE STUDY

CITY OF SLIDELL, LOUISIANA
ST. TAMMANY PARISH

REVISED: APRIL 21,1999

Federal Emergency Management Agency

COMMUNITY NUMBER - 220204

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.

This preliminary revised Flood Insurance Study contains only profiles added or revised as part of the restudy. These profiles are presented in a reduced scale to minimize reproduction costs. All profiles will be included and printed at full scale in the final published report.

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FLOOD INSURANCE STUDY
CITY OF SLIDELL, LOUISIANA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Slidell, St. Tammany Parish, Louisiana, 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 City of Slidell to the regular program of flood insurance by the Federal Insurance Administration (FIA). 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 24 CFR, 1910.1 (d). 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 the New Orleans District, U.S. Army Corps of Engineers (COE), for the FIA, under Interagency Agreement No. (IAA)-H-7-76, Project Order No. 10. This study was completed in February 1979.

1.3 Coordination

Community base map selection and identification of potential flooding sources requiring detailed study were determined in meetings attended by personnel of the COE, FIA, and officials of the City of Slidell in January 1976. On December 11, 1979, the results of the work by the COE were reviewed at a final coordination meeting attended by personnel of the COE, FIA and city officials.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Slidell, St. Tammany Parish, Louisiana. The area of study is shown on the Vicinity Map (Figure 1).

This area is subject to overflows from Bayou Bonfouca-Bayou Vincent (W-13), the Diversion Canal (W-14 main) and hurricane surges from Lake Pontchartrain. The entire area of the City of Slidell was studied in detail.

2.2 Community Description

The City of Slidell is located near the northeast shores of Lake Pontchartrain, approximately 33 miles north of New Orleans, Louisiana. The total land area within the city limits is about 6.7 square miles. According to U.S. Census Bureau figures, the city's population for 1970 is 16,101, an increase of 9,745 from the 1960 census (Reference 1). Major transportation routes traverse the study area in many directions. Interstate Route 12 and 10 generally form the north and east boundary of the study area. Other transportation routes which pass through the area are U.S. Route 190, 11, and State Route 433.

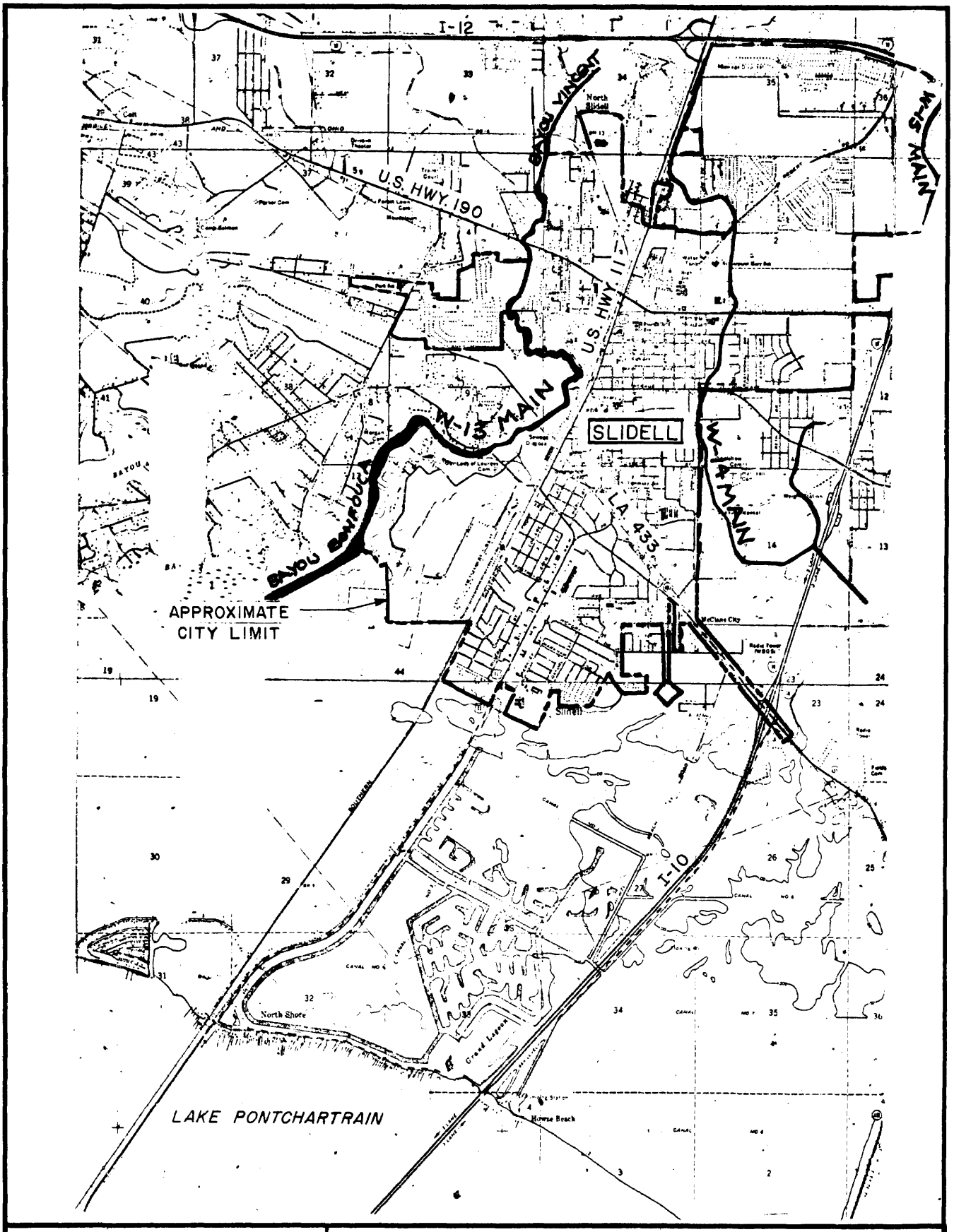
Due to the close proximity of the area to metropolitan New Orleans, ease of transportation and the availability of the developable land, the Slidell area offers good potential for commercial and residential development.

Three major streams originating in the relatively flat rural areas flow through the study area in a southerly direction and discharge into Lake Pontchartrain. These streams are Bayou Bonfouca-Bayou Vincent (W-13 main), and the Diversion Canal (W-14 main). The Doubloon-French Branch (W-15) which generally flows outside the incorporated city limits has no impact on the flooding situation in Slidell.

Bayou Vincent, which flows about 3.6 miles from Interstate 12 to the junction of Bayou Bonfouca, traverses through the swampy area southwest of Slidell and empties into Lake Pontchartrain. The average slope of the stream is 0.001 foot per foor and its flood plain is relatively flat.

The Diversion Canal (W-14) spans about 6 miles from the northern boundary of the study area at I-12 to the flat marshy area in the south. The average slope of this stream is about 0.0005 foot per foot. The flood plain of W-14 is relatively flat particularly on the western bank of the stream, where the principal commercial and residential developments of the city are located. The ground elevation in this area is generally lower than the top of the stream banks.

The study area has several small industries such as ship yards, lumber companies, fabricated metal products, food processing, roofing, concrete products and industrial gases. Most of the study area is urban in nature comprised of shopping centers, small commercial establishments and residential areas.



APPROXIMATE SCALE
1000 0 2000 4000 FEET

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA
(ST. TAMMANY PARISH)

VICINITY MAP

FIGURE 1

The climate of the area is generally influenced by the Gulf of Mexico, giving it a semitropical marine character. Major rainfall can occur due to tropical storms moving inland, intense convective storms triggered by southerly gulf winds and frontal storms resulting from the interaction of warm moist air with cold dry air. Annual average rainfall for the study area is 62 inches. The average annual temperature ranges from 52 degrees F in the winter and 82 degrees F in the summer.

2.3 Principal Flood Problems

Flooding in the City of Slidell and vicinity is relatively frequent. It is caused by both headwater flooding due to intense rainfall in the upper reaches of the streams as well as high stages in Lake Pontchartrain caused by hurricanes.

The principal causes of flooding are the inadequacy of the existing channel system to convey the storm runoff, relatively low flat flood plain areas which are easily inundated, and high stages in Lake Pontchartrain created by hurricane.

One of the critical flood prone areas is the residential and commercial areas concentrated between the west bank of W-14 Diversion Canal and U.S. Route 11. Much of this area is below W-14's west bank elevation and slopes west towards U.S. Route 11. In addition to the overfrow from W-14, local storm runoff from this residential and business district between East Hall Avenue and Route 433 drains westerly through a small drainage channel, which passes under U.S. Route 11 and is pumped into W-13 main. This pumping station is presently inadequate to handle high intensity runoff and causes water to backup in the channel. This backup further adds to the flooding problems of this area.

The residential area on the eastern bank of W-14 is relatively high (varying in elevation from 15 to 20 feet) and is safer from headwater or hurricane flooding.

The flooding problem along W-13 is less severe. Much of the channel upstream from Route 433, however, is inadequate to carry a 100-year discharge. Residential and commercial areas on both sides of W-13 around West Hall Avenue are susceptible to flooding.

In the lower reaches of both W-13 and W-14 Mains, high lake stages and the flat terrain are responsible for flooding problems. A rise of stage in Lake Pontchartrain is rapidly experienced in the lower reaches of these canals and in the southern portion of the City of Slidell.

The flooding problem in the study area is compounded when high lake stages are accompanied by intense rainfall.

The greatest flood of record for Slidell, Louisiana, and vicinity occurred on Sunday, May 18, 1958, when 13.2 inches of rainfall in a 24-hour period was recorded at the Central Fire Station in Slidell. At Bayou Liberty (a stream west of Slidell), 10.85 inches of rainfall was recorded. A high water stage of 7.1 feet above the National Geodetic Vertical Datum of 1929 (NGVD) was recorded in the center of Slidell. Flood waters caused considerable damage to the stocks of merchandise in the commercial areas. More than 40 families were forced to evacuate their homes while flooding in outlying areas caused highways and streets to be closed. Assuming that this storm was distributed over the entire drainage area of Slidell, it is estimated that it would be equivalent to a 100-year flood for headwater discharges.

Another large flood occurred on January 3-5, 1966. It was associated with a 3-day rainfall of 4.87 inches recorded at the Slidell Central Fire Station and caused a stage of 7.4 feet NGVD at Bayou Vincent, just upstream of U.S. Highway 190. In recent years, the flood of March 25, 1973 with a rainfall of 4.35 inches crested to 7.0 feet NGVD at Bayou Vincent upstream of Highway 190. The May 21-22, 1974 flood, a rainfall of 7.9 inches caused a stage of 8.0 feet NGVD at this gage location.

Other significant floods in the study area were those of July 22-23, 1946; June 12-13, 1956; September 23-24, 1956; September 30 and October 1, 1956; July 21-22, 1958; and March 17-18, 1961.

Flooding in the lower part of the study area has resulted from high stages in Lake Pontchartrain caused by hurricanes. Some of the significant hurricanes in recent times affecting Slidell are as follows: September-October 1915; "Hurricane Flossy" September 1956; "Hurricane Hilda" October 1964; "Hurricane Betsy" September 1965; "Hurricane Camille" August 1969; and "Hurricane Carmen" September 1974.

2.4 Flood Protection Measures

There are no Federal projects to provide flood protection measures for the City of Slidell.

Several drainage improvement projects are being undertaken by the City of Slidell. The projects consist of the expansion and improvement of the Diversion Canal (W-14) in the lower reaches; increasing pumping capacity of the main pump station at the W-13 main and providing a new pump station at Lee Street.

The Diversion Canal channel improvement project calls for the enlargement and deepening the channel from the marshy area south of Slidell to the Daney Street Bridge. This project is expected to be completed within the next two years.

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 discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

The City of Slidell lies within a coastal area and is subject to flooding from two natural causes: all-season rainfall and hurricanes accompanied by above normal high tides with rainfall. To properly evaluate the flooding problem, consideration was given to both rainfall and hurricane criteria. The frequency of flooding, regardless of the source of flood, was considered as the basis for final selection of the base flood. Detailed investigations were made of each of the two types of flood conditions and the flood which caused the greater crest height was selected as the flood to be used for the delineation of the flood plain limits.

Headwater discharges due to intense rainfalls are more critical in the upper reaches of the study area while the high lake stages resulting from hurricane surges cause critical flooding problems in the lower reaches of both W-13 and W-14 mains and in southern portion of the City of Slidell.

No flow records exist for any stream in the study area. Flood hydrographs for different storm frequencies were developed by synthetic methods utilizing the basin characteristics and the associated 10-, 50-, 100-, and 500-year frequency rainfall in the study area. The basin characteristics such as the size of the drainage area, mean basin length, slope factor, lag time, etc., were determined from U.S. Geological Survey (USGS) quad (Scale 1" = 2,000 feet, contour interval 5 feet). The synthetic unit hydrographs

were developed by the procedures developed for small urban and rural drainage basins by the Texas Water Development Board (Reference 2). The resulting peak discharges were also verified by other hydrograph techniques (References 3 and 4). Generalized rainfall frequency-depth-duration data (Reference 5) were used with the synthetic unit hydrographs to develop runoff hydrographs for the study area. The resultant discharge hydrographs were assumed to have the same frequencies of occurrences as their associated storms. The 500-year frequency rainfall was extrapolated from the 10-, 50-, and 100-year rainfall plot on log-probability paper.

The peak discharge-drainage area relationships for the selected recurrence intervals are presented in Table 1, "Summary of Discharges."

The hurricane surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for Lake Pontchartrain. The analyses reported herein reflect the stillwater elevations caused by tidal surges which propagate inshore from Lake Pontchartrain, but do not include any local wind setup or wave action effects at Slidell because depths are too small to support their generation.

The hurricane surge elevations for Slidell (W-13 and W-14 lower reaches) for the 10-, 50-, 100-, and 500-year frequencies are shown on the Flood Profiles (Exhibit 1). These elevations are computed assuming that an inland travelling hurricane surge drops a foot every 2.75 miles.

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Diversion Canal (W-14 Main)					
At mouth	8.0	3,200	4,300	4,900	6,100
At Station 11,0000 (near Interstate 10, excluding eastern branch)	4.5	2,200	2,800	3,200	4,000
At Fremaux Avenue	3.36	555	725	828	925
At Gause Boulevard (U.S. Highway 190)	2.98	479	578	658	744
At Robert Road	2.26	230	352	434	497
At Interstate Highway 12	1.00	303	384	418	452
Bayou Vincent (W-13 Main)					
At junction of Bayous Vincent and Bonfouca, near main pumping station	17.3	5,500	6,700	7,700	9,600
At Gause Boulevard (U.S. Highway 190)	13.78	1,976	2,624	2,939	3,244
At Illinois Gulf Central Railroad	9.51	1,376	1,832	2,050	2,262
West Diversion Canal					
At mouth	0.41	478	584	629	688
Reine Canal East					
At mouth	0.36	118	149	168	190
Reine Canal West					
At mouth	0.22	70	94	105	113

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the City of Slidell were carried out to provide estimates of floods of the selected recurrence intervals along each flooding source. As previously stated, the southern portion of the City of Slidell is subject to flooding due to hurricane surges from Lake Pontchartrain. Flood levels were predicted for both hurricane and non-hurricane conditions, and were determined for each location or area. The higher stages were selected for use in each case.

Topography of the flood plains were obtained by field measurements, and existing topographic maps and the channel cross sections for W-13 and W-14 mains were obtained from the Louisiana Office of Public Works. Included in the hydraulic analysis were the effects of bridges, culverts and pumping stations.

Roughness coefficients (Manning's "n") for the channels and flood plains were estimated on the basis of field reconnaissance and engineering judgment. In general, roughness coefficients of 0.04 and 0.07 were used for channel flow and flood plain flow, respectively. For the proposed new channel expansion in the lower reaches of W-14 main, a channel roughness of 0.03 was used.

Water-surface elevations of floods for the selected recurrence intervals were computed through use of COE, HEC-2 computer program (Reference 6). Flood profiles were drawn showing computed water-surface elevations for floods of selected recurrence intervals. Starting elevations for the backwater profiles for W-13 and W-14 main were calculated using the slope-area method. Since hurricane surges from Lake Pontchartrain are critical in the lower portion of the study area, the water-surface profiles, show only the higher elevations for the headwater and hurricane flooding. All elevations are referenced from NGVD.

The frequency-elevation relationships for the hurricane flooding areas in the community are presented in Table 2, "Summary of Elevations.

TABLE 2 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION ABOVE NGVD (feet) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
LAKE PONTCHARTRAIN				
Hurricane Flooding Area 1	5.0	8.1	9.0	10.6
Hurricane Flooding Area 2	6.5	8.1	9.0	10.6
Hurricane Flooding Area 3	7.0	8.1	9.0	10.6
Hurricane Flooding Area 4	5.4	8.1	9.0	10.6

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Locations of the selected cross sections used in the hydraulic analysis are shown on the Flood Profiles (Exhibit 1).

There are three pump stations in the City of Slidell for discharging the storm water from the urban areas. The total combined capacity of these stations, including additional planned expansion, is about 475 cfs. Since the hurricane surge elevations are critical in the southern part of Slidell, these pumping stations have no appreciable impact on the base flood elevations.

Bayou Vincent (W-13) and the Diversion Canal (W-14 main) are separated by the Southern Railroad embankment. Water elevations for hurricane flooding will be the same on both sides of the railroad embankment in the lower half of the study area. The drainage systems are not entirely independent and limited crossflow in the upper reaches of the study area could occur.

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 the FIA 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. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using a topographic map at a scale of 1:24,000 with a contour interval of five feet. In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Insurance Rate Map (Exhibit 2). 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

The concept of a floodway, wherein the channel of a stream plus a portion of the adjacent flood plain would be kept free of encroachment, is not applicable to Slidell. Neither Bayou Bonfouca - Bayou Vincent (W-13 main) nor the Diversion Canal (W-14 main) have fully confined flood plains. A fully encroached flood plain, under these circumstances, would increase the flood heights only by insignificant amounts. Minimum water levels would be practically limited by the tendency of flood waters to flow across lower watershed boundaries. Also, since the lower reach of each stream within the city limits is characterized by hurricane flooding, the floodway concept would not be applicable to those reaches.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA 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 City of Slidell.

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

For the areas subject to hurricane flooding, reaches are limited to the distance for which the 100-year flood elevation does not vary more than 1.0 foot.

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.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire study area of the City of Slidell was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zones A1, A2, A4, A5, A7, A8:	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 B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-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; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map (Exhibit 2) for the City of Slidell is, for insurance purposes, the principal result of the Flood Insurance Study. This map 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 the FIA.

6.0 OTHER STUDIES

A Type 5 Flood Insurance Study of the Louisiana Gulf Coast was completed by the COE for the Department of Housing and Urban Development in May 1970 (Interagency Agreement No. AA-H-8-70, Project Order No. 4). The portion of the above study pertaining to Slidell was an update of data contained in the "Interim Survey Report, Lake Pontchartrain, Louisiana and Vicinity," prepared by the COE in November 1962.

A Flood Plain Information Report for the City of Slidell was prepared by the COE in December 1971.

This study is authoritative for the purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

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, Room 206, 800 North Loop 288, Denton, Texas 76201-3698.

8.0 BIBLIOGRAPHY AND REFERENCES

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10. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, May 1991.

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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 City of Slidell Planning Department, 2056 Second Street, P.O. Box 828, Slidell, Louisiana 70459.

9.1 First Revision

This study was revised on April 21, 1999, to show modifications to flood hazards along Diversion Canal (W-14 Main), Bayou Vincent (W-13 Main), West Diversion Canal, and Reine Canals East and West. Diversion Canal (W-14 Main) was studied from Daney Street to 700 feet upstream of Pawns Boulevard, a distance of approximately 3.75 miles. Bayou Vincent (W-13 Main) was studied from 1,500 feet downstream of West Hall Road to 1,000 feet downstream of Interstate 12, a distance of approximately 2.36 miles. West Diversion Canal was studied from its confluence with Bayou Vincent (W-13 Main) to its confluence with Diversion Canal (W-14 Main), a distance of approximately 0.85 mile. Reine Canal East was studied from its confluence with French Branch to its confluence with Reine Canal West, a distance of approximately 0.80 mile. Reine Canal West was studied from

its confluence with Diversion Canal (W-14 Main) to its confluence with Reine Canal East, a distance of approximately 0.85 mile. All flooding sources were studied by detailed methods.

The hydrologic and hydraulic analyses for the restudy were performed for the Federal Emergency Management Agency (FEMA) by Owen and White, Inc., under Contract No. EMT-96-CO-0023. This restudy was completed on November 12, 1997.

The results of the restudy were reviewed at the final Consultation Coordination Officer meeting held on January 21, 1998, and attended by representatives of the City of Slidell; the Louisiana Department of Transportation; Owen and White, Inc.; and FEMA. All problems raised at that meeting have been addressed in this restudy.

There was a major flood in the City of Slidell in 1995. Between Monday evening, May 8, 1995, and Wednesday morning, May 10, 1995, 23.9 inches of rain fell in the City of Slidell. The 100-year, 2-day storm is 14 inches.

There are various flood-protection measures in place along some of the studied streams and within the study area. A storage basin has been constructed along Diversion Canal (W-14 Main) north of Robert Road. A detention basin is being constructed on West Diversion Canal downstream of U.S. Highway 11. An improved drainage-outlet system is being constructed for the Belvedere area to Bayou Bonfouca. Several pumping stations in the "Hurricane Flood Effects" area are being expanded.

Discharge-drainage area relationships for Diversion Canal (W-14 Main), Bayou Vincent (W-13 Main), West Diversion Canal, and Reine Canals East and West were determined using the U.S. Army Corps of Engineers (USACE) HEC-1 computer program (Reference 7). Due to the topography of the detailed study area, hydrologic analyses need to emphasize slope in overbank and channel, flow diversion, and storage and ponding. Times of concentration and storage coefficients were computed for overland flow using the Espey Huston model (Reference 8). Clark unit hydrographs were computed for all streams and converted to runoff hydrographs using rainfall from isopluvial maps (References 5 and 9) and initial uniform loss rates. These computations and those for routing and combining the hydrograph ordinate using the modified-Puls routing method were performed using the USACE HEC-1 computer program (Reference 7).

After computation of the peak discharges, an array of decision combinations was made. Diversion occurs from Diversion Canal (W-14 Main) through West Diversion Canal to Bayou Vincent (W-13 Main). Also, Reine Canal West flow is divided between Diversion Canal (W-14 Main) and French Branch. In addition, downstream split flow occurs from Diversion Canal (W-14 Main) to Bayou Bonfouca (W-13 Main). Diversion combinations concluded when equally calculated water- surface elevations were obtained on Diversion Canal (W-14 Main) upstream of West Diversion Canal and at a common point in Reine Canal West. The discharges for the streams studied using detailed methods are shown in Table 1, "Summary of Discharges."

Water-surface elevations for detailed studied streams were computed using the USACE HEC-2 computer program (Reference 10).

Roughness coefficients (Manning's "n" values) used in the hydraulic computations were estimated from field observations, aerial photography, and photographs. Roughness coefficients for the streams studied by detailed methods are shown in Table 3, "Manning's "n" Values."

Special flood hazard area boundaries were interpolated using topographic maps with a contour interval of 2 feet, developed for the restudy. For areas beyond the limits of these contour maps, the flood boundaries were determined using USGS 7.5-minute series topographic maps at a scale of 1:24,000, with a contour interval of 5 feet (Reference 11).

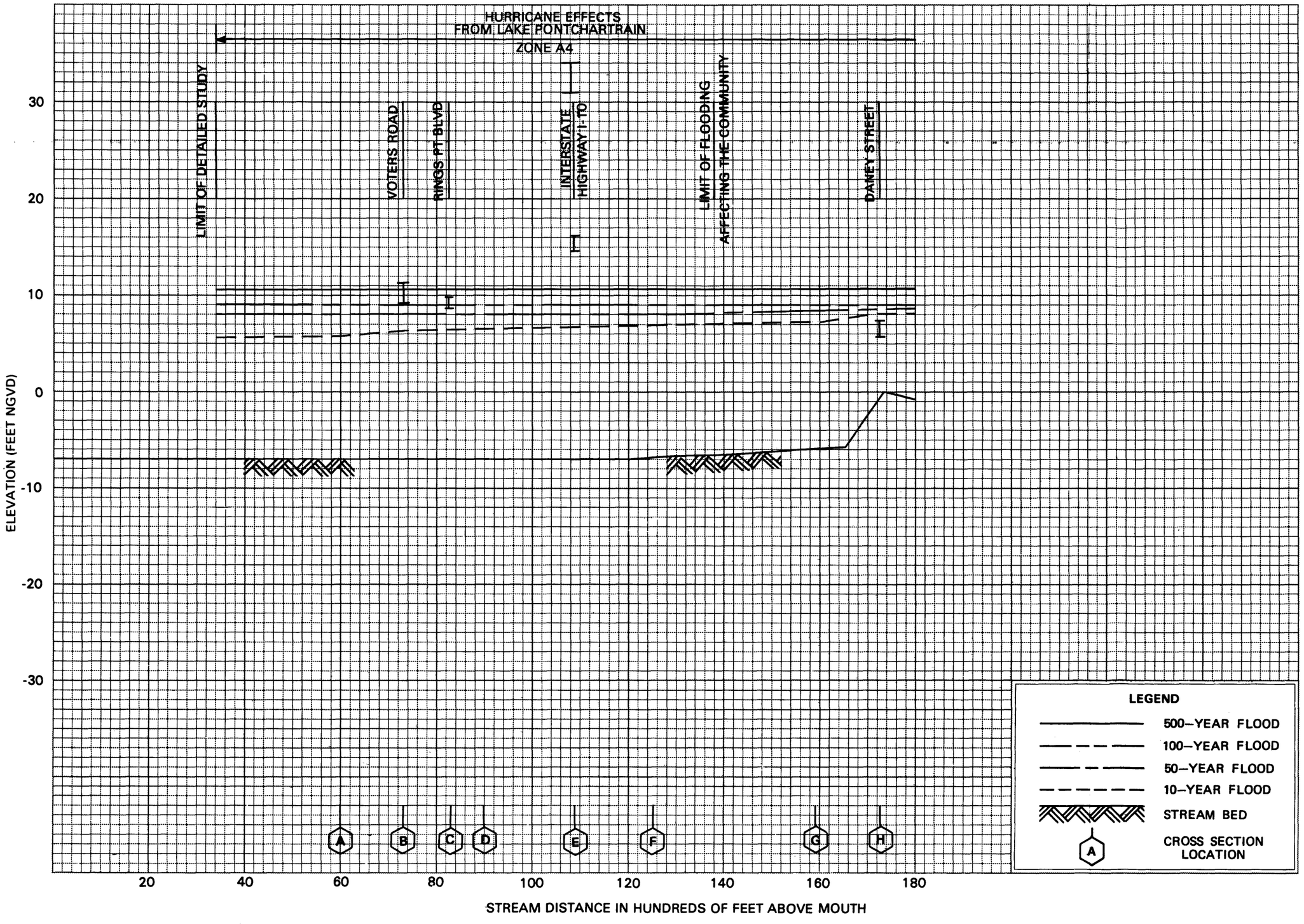
All elevations are referenced to the NGVD. Elevation reference marks and their descriptions are shown on the maps.

No floodways were computed for the streams studied by detailed methods. All streams and overbanks are relatively flat. There is ample storage available and there are numerous diversion canals. Minor fluctuations in water surface can cause diversion to adjacent basins. Streams are more affected by changes in storage than encroachment.

Exhibit 1, "Flood Profiles," was revised to reflect changes as a result of the restudy.

Table 3. Manning's "n" Values

Flooding Source	Roughness Coefficients	
	Channel	Overbanks
Diversion Canal (W-14 Main)	0.04 to 0.12	0.04 to 0.20
Bayou Vincent (W-13 Main)	0.04 to 0.12	0.04 to 0.20
West Diversion Canal	0.04 to 0.12	0.04 to 0.20
Reine Canal East	0.04 to 0.12	0.04 to 0.20
Reine Canal West	0.04 to 0.12	0.04 to 0.20



FLOOD PROFILES

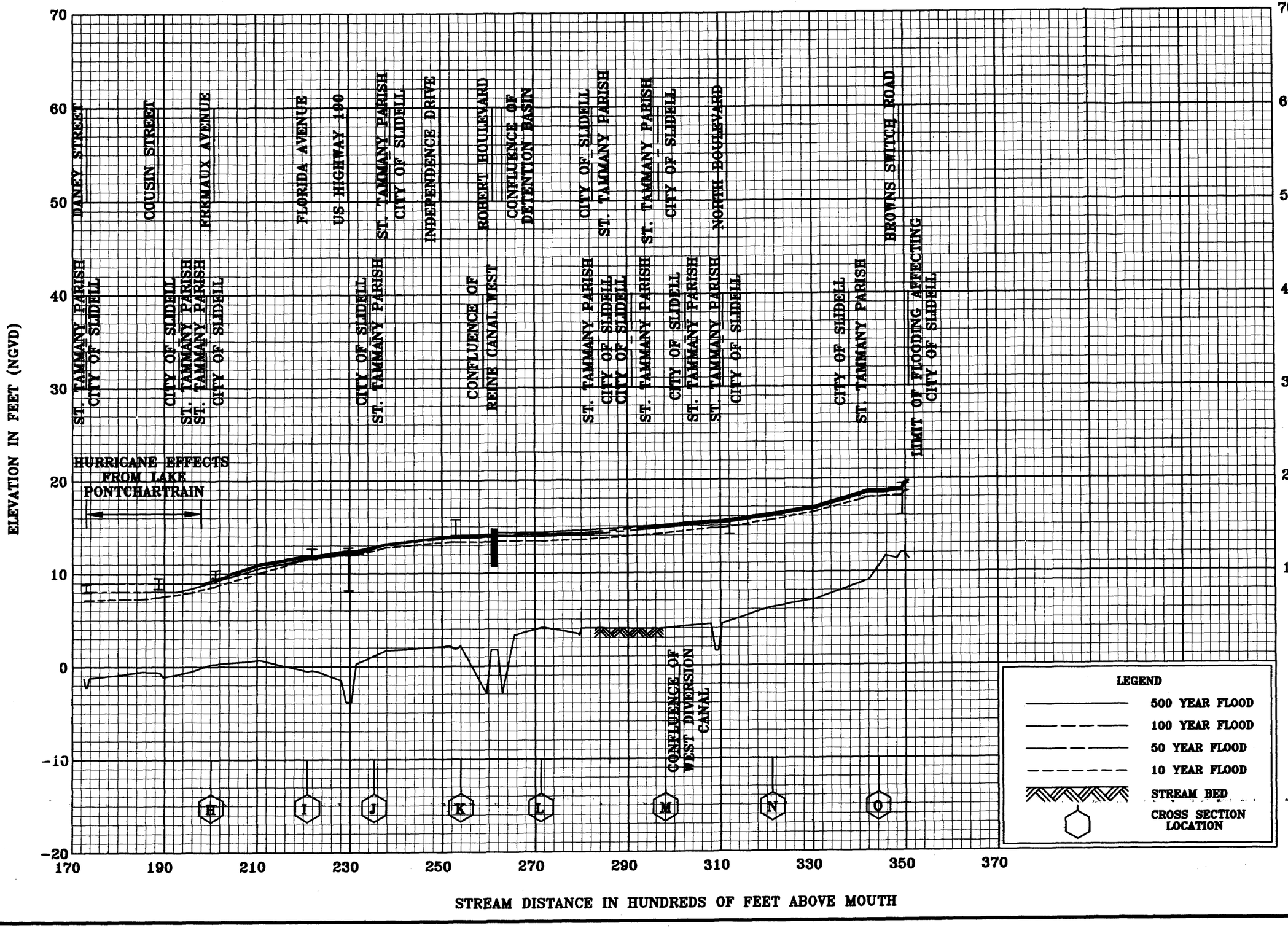
DIVERSION CANAL (W14 MAIN)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA

(ST. TAMMANY PARISH)

01P



FLOOD PROFILES

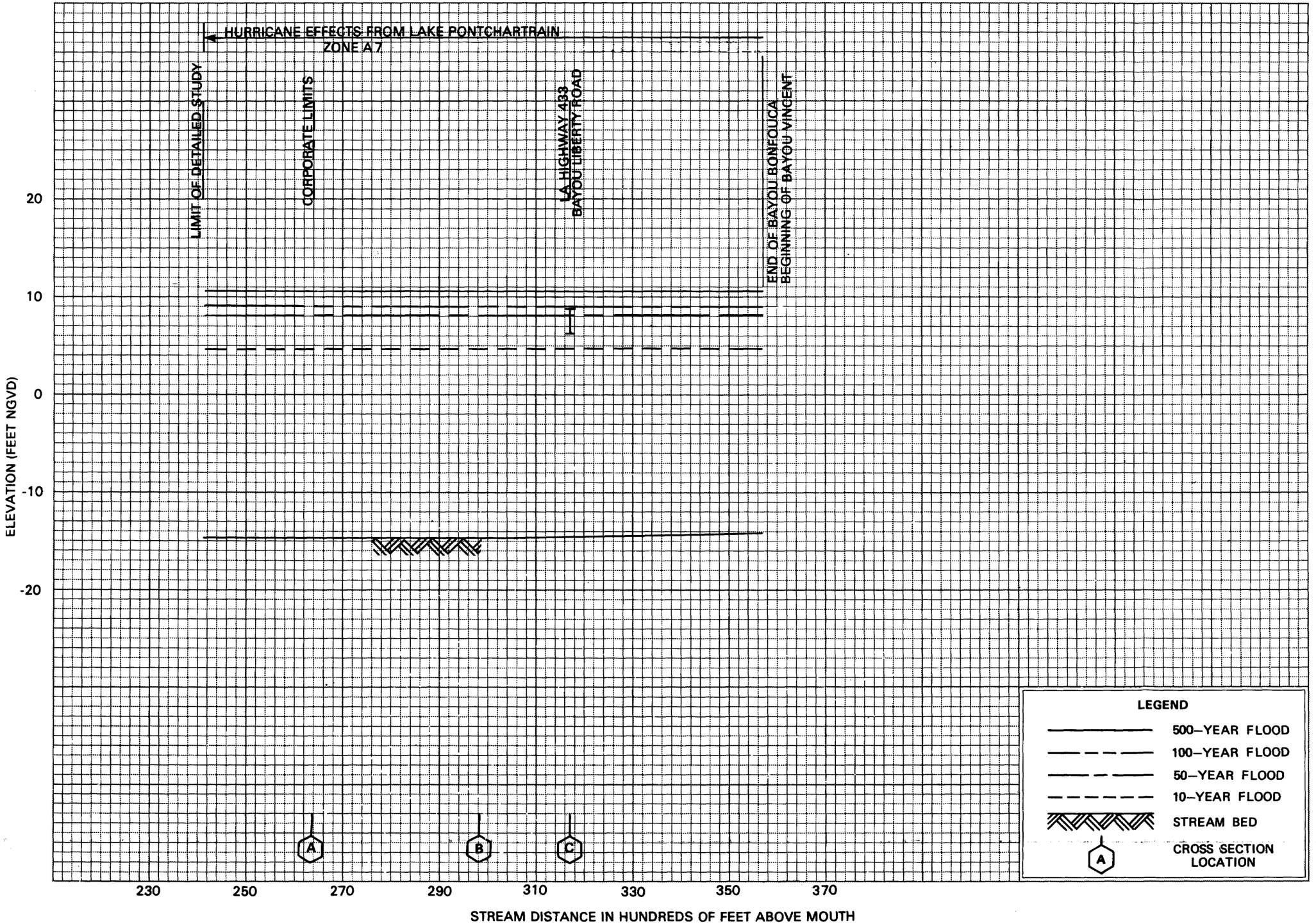
DIVERSION CANAL (W-14 MAIN)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA

(ST. TAMMANY PARISH)

02P



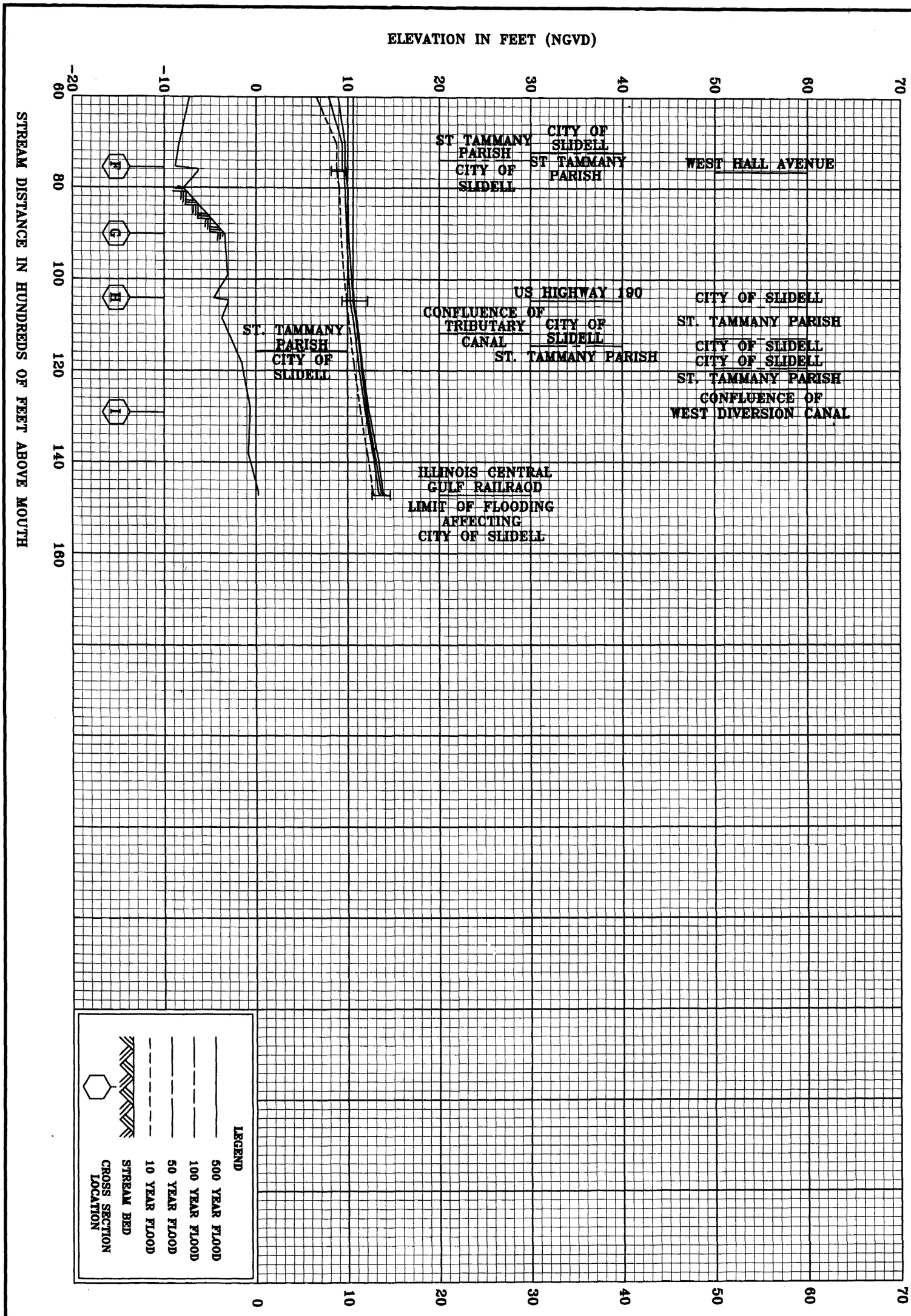
FLOOD PROFILES

BAYOU BONFOUCA (W13 MAIN)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA
(ST. TAMMANY PARISH)

03P



04P

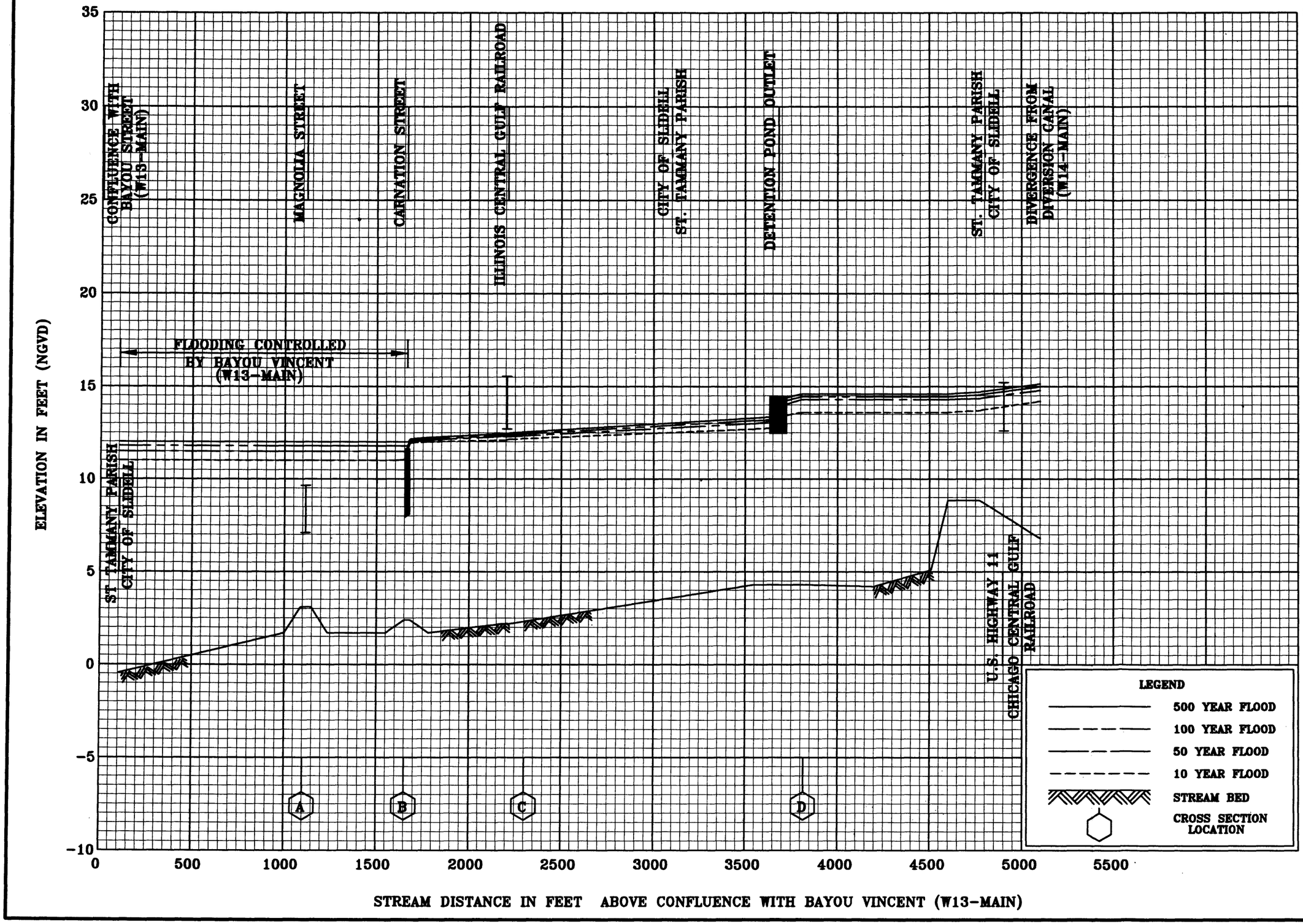
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA

(ST. TAMMANY PARISH)

FLOOD PROFILES

BAYOU VINCENT (W-13 MAIN)



FLOOD PROFILES

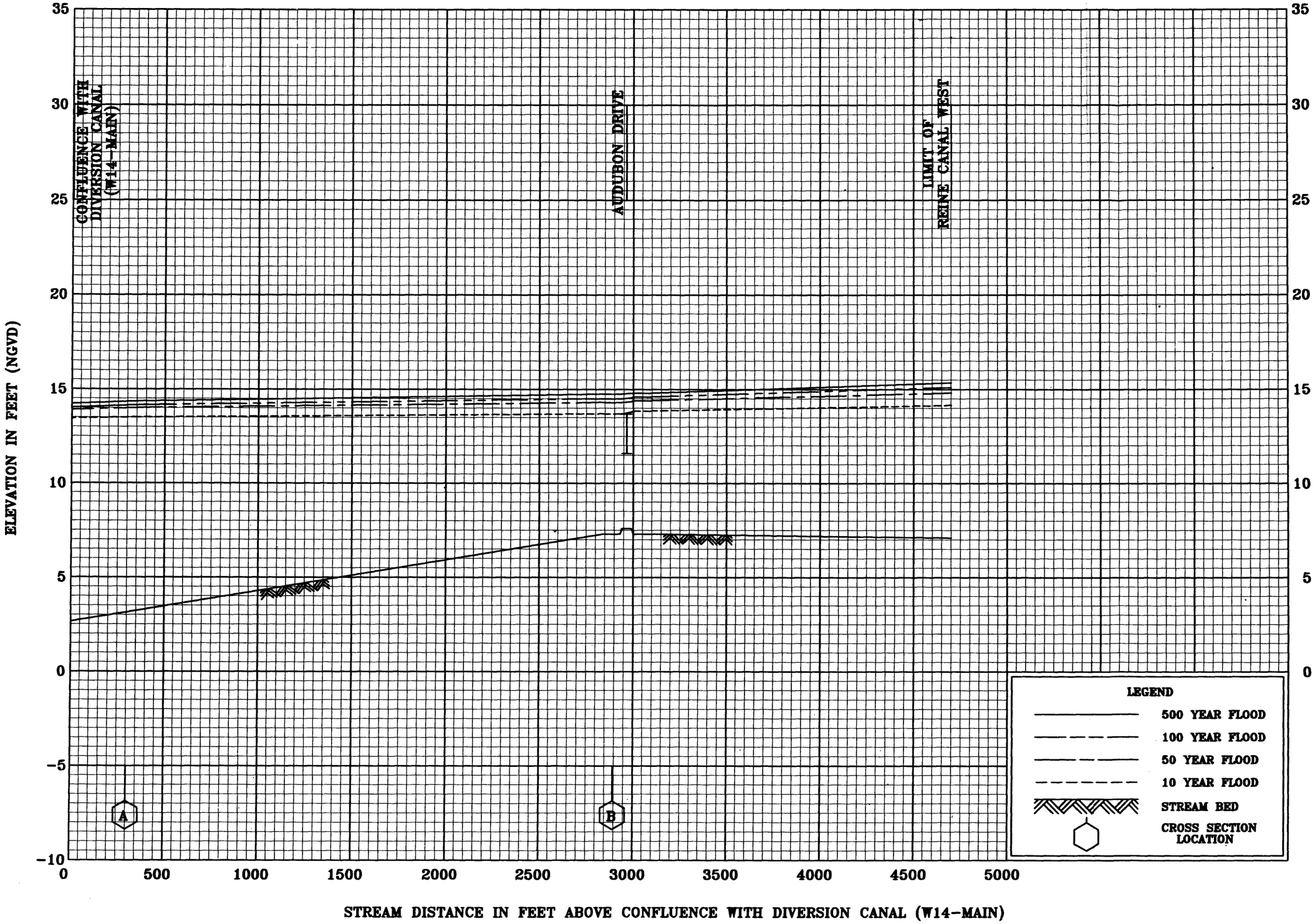
WEST DIVERSION CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA

(ST. TAMMANY PARISH)

05P



FLOOD PROFILES

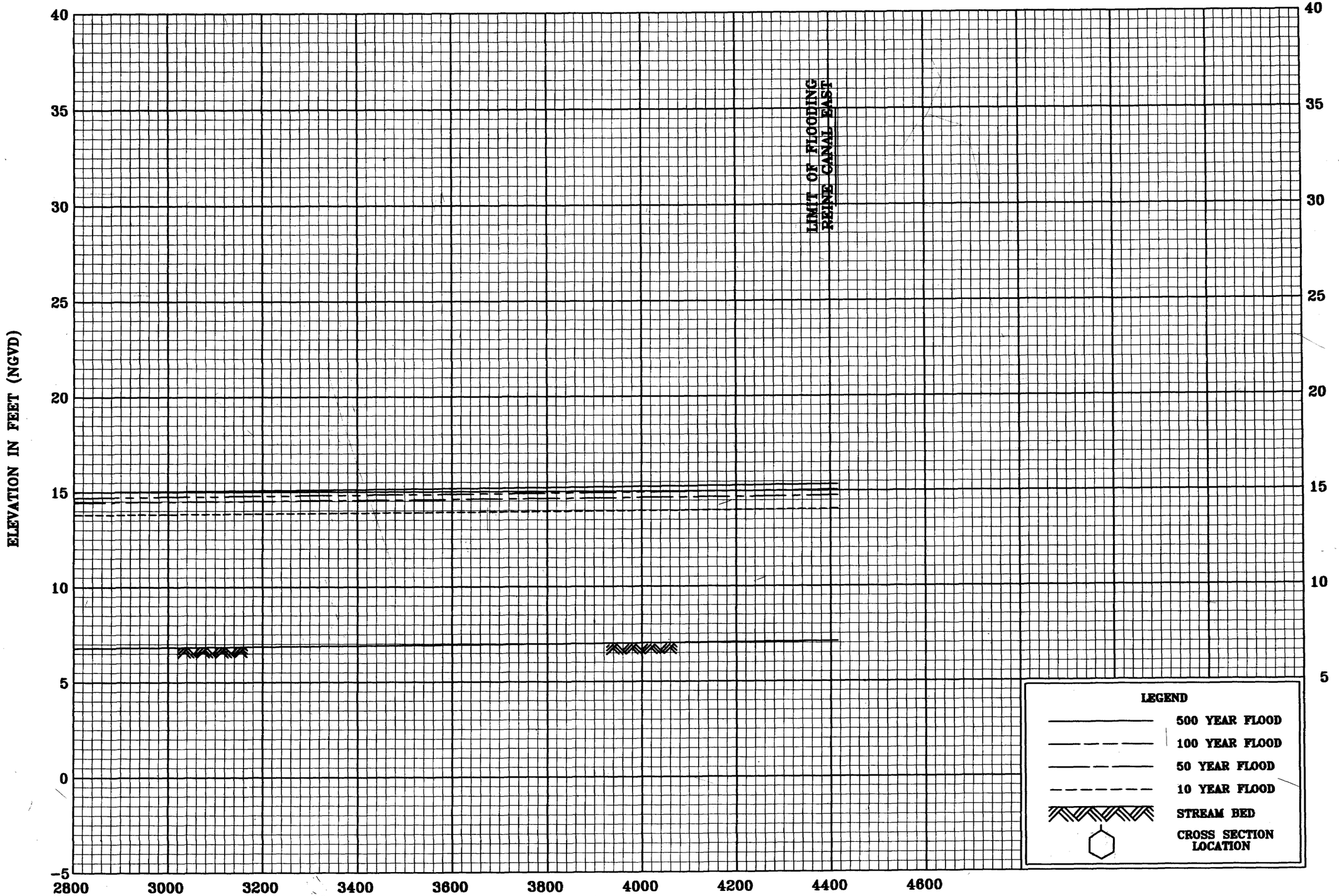
REINE CANAL WEST

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA

(ST. TAMMANY PARISH)

06P



FLOOD PROFILES

REINE CANAL EAST

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF SLIDELL, LA

(ST. TAMMANY PARISH)

07P