FLOOD INSURANCE STUDY

WASHINGTON COUNTY, TEXAS

AND INCORPORATED AREAS

Community Name	Community Number
WASHINGTON COUNTY UNINCORPORATED AREAS	481188
BRENHAM, CITY OF	480648
BURTON, CITY OF	480649

Effective Date: August 16, 2011

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
48477CV000A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain 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.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial Countywide Date: August 16, 2011

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FLOOD INSURANCE STUDY
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1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Washington County, including the Cities of Brenham and Burton, and the unincorporated areas of Washington County (referred to collectively herein as Washington County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

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

1.2 Authority and Acknowledgments

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

The communities and their respective community FIS report data are listed below:

City of Brenham

The hydrologic and hydraulic analyses for this study were performed by the United States Department of Agriculture, Soil Conservation Service, Temple, Texas, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-8-77, Project Order No. 7. This study was completed in February 1980 (Reference 1).

Authority and acknowledgements for the City of Burton or Washington County were not available because no FIS report texts were ever published for the communities.

1.3 Coordination

The initial Consultation Coordination Officer (CCO) meeting was held on May 9, 2008 and attended by representatives of FEMA, Halff Associates, Inc., City of Brenham, Washington County, Brazos River Authority, and the Texas Water Development Board.

The results of the study were reviewed at the final CCO meeting held on June 18, 2009, and attended by representatives of Washington County, City of Brenham, City of Burton, Texas Water Development Board, FEMA, and Halff Associates. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Washington County, Texas, including the incorporated communities listed in Section 1.1.

The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction through May 2008.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by Federal Emergency Management Agency (FEMA) and community officials.

The flooding sources studied by Detailed Methods along with the limits of study are shown in Table 1, "Scope of Study."

Table 1 – Scope Of Study
Stream Reaches Studied by Detailed Methods

Stream Name	Downstream Limit	Upstream Limit	Length (Mi)
Redelineation Detailed Study Streams			
Higgins Branch	Confluence with Little Sandy Creek	U.S. Loop 290	2.6
Higgins Tributary	Confluence with Higgins Branch	Southern Pacific Railroad	0.9
Hog Branch	3,000 feet upstream from confluence with Little Sandy Creek	Jackson Street	2.6
Little Sandy Creek	County Road 60	Dixie Street	
Ralston Creek	Horton Street	South Market Street	2.6
South Fork of Ralston Creek	Confluence with Ralston Creek	South Market Street	
Unnamed Tributary of Woodard Creek	U.S. Loop 290		0.5

2.2 Community Description

Washington County is located in southeast Texas, covering an area of 621 square miles. It is bordered by the unincorporated areas of Grimes and Brazos County to the east; Waller County

to the southeast; Austin County to the south, Fayette County to the southwest; Lee County to the northwest, and Burleson County to the north. The county seat is located in the City of Brenham. The major north-south route in Washington County is State Highway 36. The major west-east route is Highway 290 and Highway 90.

The City of Brenham is located in the southeastern portion of Texas in the south central portion of Washington County. The total land area contained within the city limits is 12 square miles. It is situated approximately 72 miles west of Houston, Texas and 93 miles east of Austin, Texas.

According to the United States Census 2000 figures, the population of Coryell County was 30,373. This represents an increase in population of 16% since the 1990 census. The 2007 estimate of Washington County population was 32,034. There are two incorporated communities in the county; their 2007 population estimates are as follows: City of Brenham (15,098) and City of Burton (369) (Reference 2).

All streams within the City of Branham are part of the New Year Creek Watershed, which is part of the Brazos River Basin. The portion of Little Sandy Creek that was studied heads near U. S. 290 east of Brenham and flows northeast to Park Street and then turns east-southeast to its confluence with New Year Creek. Higgins Branch is a part of the Little Sandy Creek drainage area and flows northeast across the City of Branham and has a length of 2.6 miles and a drainage are of 2.4 square miles at its confluence with Little Sandy Creek. Hog Branch, another tributary of Little Sandy Creek, heads in the southwestern portion of the city and flows northeast to Little Sandy Creek encompassing a drainage area of 2.6 square miles and a length of 2.6 miles. Ralston Creek heads in the south central part of Brenham and flows east 2.6 miles to Woodward Creek where the drainage area is 2.1 square miles. The Unnamed Tributary of Woodward Creek heads in the south central part of the City of Brenham and flows south to Woodward Creek. This tributary has a length of 0.5 mile and a drainage area of 0.3 square mile within the City of Brenham.

Generally, the soils in the area are deep, medium to fine textured, with moderate to very slow permeability.

The City of Brenham is located in a warm, moist, sub humid climate. Temperatures range from a mean maximum of 95 degrees F in July to a mean minimum of 43 degrees F in January. The heaviest precipitation usually occurs in April, May, and September. The average annual precipitation is 39.9 inches (Reference 3).

2.3 Principal Flood Problems

The City of Brenham has experienced frequent flooding in the past. Rapid runoff and high peak discharges result from the rolling upland area and relatively steep stream gradients.

The most disastrous flood in recent years occurred on April 27, 1972, when 6 inches of rainfall fell in 2hours. This storm resulted in excessive damages to property within the Hog Branch flood plain. Since this flood, the City of Brenham has taken measures to reduce their flooding problem. These measures will be discussed in detail in the next section of this report.

2.4 Flood Protection Measures

The City of Brenham has modified portions of Higgins Branch and Hog Branch to improve hydraulic characteristics of these channels.

Two reaches of Higgins Branch were realigned and excavation was performed to provide a channel bottom width of 20 feet. The first reach extends Horton Street upstream for a distance of approximately 1,400 feet and the second reach extends from the Atchison, Topeka and Santa Fe Railway upstream to Burleson Street.

Hog Branch was modified from Market Street upstream to Jackson Street. New bridges were constructed at Market and Austin Streets. Restrictions were also removed from the channel just upstream m from these two streets. Concrete channel lining was installed form Market Street to Jackson Street in conjunction with minor channel realignment.

3.0 ENGINEERING METHODS

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

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

3.1.1 Redelineated Detailed Study Streams

The redelineated streams were initially studied by detailed methods. These flooding sources include all those listed in Table 1 unless identified otherwise below.

Hydrologic evaluations in the previous FIS reports for the City of Brenham were based on the following methods:

Topographic data and drainage areas were obtained from U.S. Geological Survey (USGS) topographic maps (Reference 4), aerial photographs and field surveyed cross sections.

U.S. Weather Bureau rainfall frequency-duration data (Reference 5) was used to determine storm rainfall for the 10-, 2-, and 1-percent annual discharges frequency storm. A plot rainfall versus storm frequency was extrapolated to obtain storm rainfall for the 0.2-percent annual

discharges frequency storm. The Soil Conservation Service's (SCS) Project Formulation-Hydrology computer program (Reference 6) was used to determine peak discharges for the selected recurrence intervals. This program uses rainfall-runoff relationships and the Convex Method or routing through stream channels developed by the SCS (Reference 7). Input data for these computations include land use and treatment, soil classifications, and other pertinent basin characteristics as determined from previous studies and field reconnaissance.

The Atchison, Topeka, and Santa Fe Railway where it crosses Hog Branch has detention storage affecting peak discharges downstream. The reinforced concrete pipes under the railway fill were rated and a stage storage table was developed for impoundment above the railway. This information was entered into the SCS's Project Formulation-Hydrology computer program in calculating peak discharges for Hog Branch.

Peak discharge-drainage area relationships for Washington County are shown in Table 2, "Summary of Discharges."

Table 2 – Summary Of Discharges

Flooding Source And Location	Drainage Area (Sq. Mile)	Peak Discharges (cfs) 10% Annual Chance	2 % Annual Chance	1% Annual Chance	0.2% Annual Chance
Redelineation Detailed Study Streams					
HIGGINS BRANCH					
Upstream of FM 2935	2.12	1906	2766	3255	3941
Upstream of Burleson Street	1.31	1210	1833	2215	2748
Upstream of Main Street	0.98	885	1381	1684	2106
Downstream of U.S. Loop 290	0.14	212	310	369	451
HIGGINS TRIBUTARY					
Upstream of Seager Street	0.30	251	397	495	636
HOG BRANCH					
Downstream of Sewer Plant	2.79	2174	3191	3807	4669
Upstream of Southern Pacific Railroad	1.63	1849	2616	3074	3708
Upstream of Market Street	0.79	1009	1421	1665	2003
Upstream of Jackson Street	0.44	525	724	838	997
LITTLE SANDY CREEK					
Upstream of County Road 60	7.54	4908	6972	8375	10489
Upstream of Loop 283	4.33	3692	5308	6233	7524
Downstream of Dixie Street	0.43	600	879	1047	1282
RALSTON CREEK					
Upstream of Horton Street	1.36	1599	2142	2500	2949
Upstream of Gun and Rod Road	0.89	1076	1422	1693	2143
Upstream of Chappel Hill Street	0.19	282	413	492	602

Table 2 – Summary Of Discharges (con't)

Flooding Source And Location	Drainage Area (Sq. Mile)	Peak Discharges (cfs) 10% Annual Chance	2 % Annual Chance	1% Annual Chance	0.2% Annual Chance
SOUTH FORK OF RALSTON CREEK					
Downstream of South Market Street	0.11	169	248	295	360
UNNAMED TRIBUTARY OF WOODWARD CREEK					
Upstream of U.S. Loop 290	0.28	390	577	691	851

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance Rate Maps (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Locations of select cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computer (Section 4.2), selected cross sections locations are also shown on the FIRM.

The hydraulic analyses for these studies were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.2.1. Redelineated Detailed Study Streams

The analyses for the redelineated study streams were taken from the prior FIS for the City of Brenham. The base flood elevations (BFEs) from the profiles were plotted on the best available topographic data to define the special flood hazard areas. The redelineated streams are identified in Table 1.

Cross sections for the backwater analysis of the streams studied were obtained from field surveys. All bridges and culverts were surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic computation are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Maps (FIRM) (Exhibit 2).

Channel roughness factors (Manning's "n") used in hydraulic analyses were based on observations. Table 3, "Summary of Roughness Coefficients," lists channel and overbank "n" values for the streams studied by detailed methods.

Table 3 – Summary Of Roughness Coefficients
Stream Reaches Studied by Detailed Methods

Stream Name	Channel "N" Value	Overbank "N" Value
Higgins Branch	0.065-0.150	0.015-0.080
Higgins Tributary	0.065-0.150	0.015-0.080
Hog Branch	0.065-0.150	0.015-0.080
Little Sandy Creek	0.065-0.150	0.015-0.080
Ralston Creek	0.065-0.150	0.015-0.080
South Fork of Ralston Creek	0.065-0.150	0.015-0.080
Unnamed Tributary of Woodward Creek	0.065-0.150	0.015-0.080

Water-surface elevations of floods of the selected recurrence intervals were computed using the U.S. Army Corps of Engineers (COE) HEC-2 step-backwater computer program (Reference 8). Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Starting water-surface elevations for hydraulic calculations were determined by the slope-area method.

The hydraulic analyses for this study are based on unobstructed flow. The flood elevations as shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed and do not fail and if channel conditions and overbank conditions remain essentially the same as ascertained during this study.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. Some of the data used in this revision were taken from the prior effective FIS reports and FIRMS and adjusted to NAVD88. The datum conversion factor from NGVD29 to NAVD88 in Washington County is 0.11 feet.

For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services, NOAA, N/NGS12
National Geodetic Survey SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282
(301) 713-3242

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent annual chance flood elevations; delineations of the 1- and 0.2-percent annual chance floodplains; and a 1-percent annual chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1" = 2000' (1:24,000), with a contour interval of 10 feet (Reference 19).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent annual chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent annual chance floodplain boundaries are close together, only the 1-percent annual chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of

floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 4, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and 1-percent annual chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

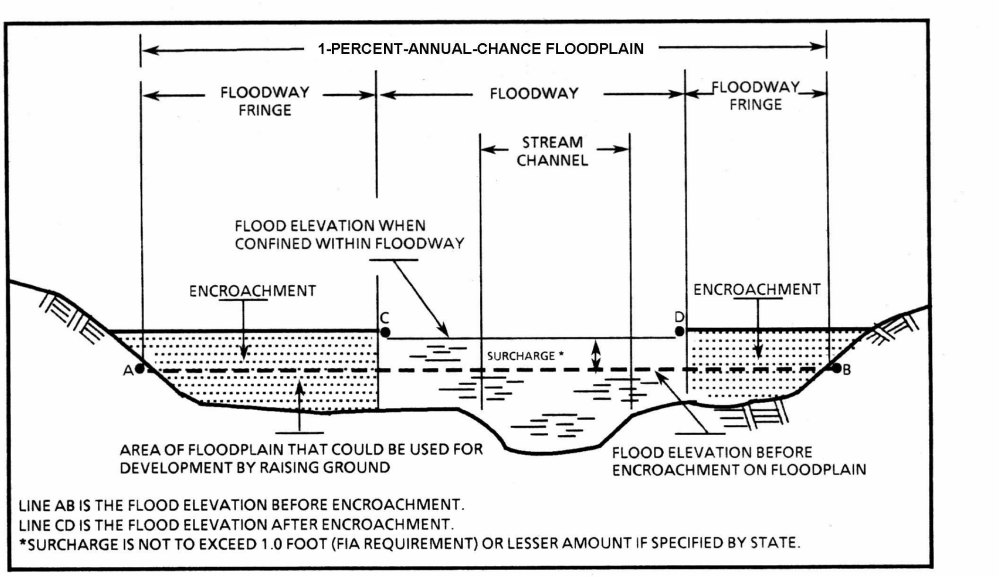

Figure 1. Floodway Schematic

In the case of redelineation, effort was made to maintain the prior effective regulatory floodway width and shape. However, due to updated topographic data, some modifications were made to contain the floodway within the limits of the 1-percent-annual-chance floodplain. Most modifications to the prior effective regulatory floodway boundaries are due to topographic changes that have occurred along the streams.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Higgins Branch								
A	1,020[1]	259	1,175	2.9	243.4	243.4	244.4	1.0
B	3,560[1]	112	453	7.2	253.2	253.2	253.7	0.5
C	3,750[1]	231	1,196	2.7	257.9	257.9	258.0	0.1
D	4,727[1]	73	440	7.3	259.6	259.6	260.0	0.4
E	4,950[1]	225	1,286	2.5	263.2	263.2	263.8	0.6
F	6,170[1]	30	263	12.1	264.7	264.7	264.8	0.1
G	7,060[1]	126	392	7.7	271.3	271.3	271.3	0.0
H	7,315[1]	150	509	5.9	273.5	273.5	273.5	0.0
I	7,595[1]	187	592	4.9	276.5	276.5	276.8	0.3
J	8,040[1]	102	505	5.6	277.9	277.9	278.8	0.9
K	9,045[1]	61	359	7.0	281.6	281.6	281.6	0.0
L	9,500[1]	69	464	4.8	283.6	283.6	283.8	0.2
M	9,590[1]	80	335	6.6	288.7	288.7	288.7	0.0
N	11,375[1]	80	485	3.8	301.1	301.1	301.1	0.0
O	11,655[1]	55	251	7.3	301.3	301.4	302.0	0.6
P	11,965[1]	55	340	5.0	303.3	303.3	304.1	0.8
Q	12,005[1]	80	388	4.3	304.1	304.1	304.1	0.0
R	12,865[1]	55	191	6.4	306.5	306.5	306.8	0.3
S	13,085[1]	63	267	4.6	311.0	311.0	311.5	0.5
T	13,180[1]	65	204	4.8	311.6	311.6	311.9	0.3
U	16,300[1]	46	58	6.4	338.8	338.8	338.8	0.0
V	17,050[1]	75	96	3.8	354.7	354.7	354.7	0.0
Higgins Tributary								
A	780[2]	26	119	4.4	311.7	311.7	312.7	1.0
B	851[2]	78	527	1.0	315.6	315.6	316.6	1.0
C	1,539[2]	37	116	4.5	320.3	320.3	320.4	0.1

[1]Stream distance in feet above confluence with Little Sandy Creek
[2]Stream distance in feet above confluence with Higgins Branch

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX
AND INCORPORATED AREAS

FLOODWAY DATA

HIGGINS BRANCH and HIGGINS TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Hog Branch								
A	3,000	290	1,566	2.5	239.1	239.1	239.9	0.8
B	4,900	100	681	5.7	248.9	248.9	249.7	0.8
C	5,787	167	1,033	3.8	254.4	254.4	255.3	0.9
D	5,910	115	814	4.8	255.1	255.1	255.8	0.7
E	6,601	85	666	5.1	257.9	257.9	258.8	0.9
F	6,659	83	727	4.6	260.4	260.4	261.4	1.0
G	8,035	66	346	8.9	264.3	264.3	264.4	0.1
H	9,211	44	335	7.9	270.6	270.6	271.5	0.9
I	9,874	85	534	4.3	276.9	276.9	277.7	0.8
J	9,965	136	1,144	2.0	283.9	283.9	284.7	0.8
K	10,785	130	898	2.5	284.5	284.5	285.3	0.8
L	11,330	22	146	13.5	285.6	285.6	285.6	0.0
M	11,455	93	768	2.6	294.5	294.5	295.4	0.9
N	12,110	74	584	3.3	294.9	294.9	295.8	0.9
O	12,833	36	187	8.9	298.3	298.3	299.2	0.9
P	12,937	68	516	3.2	301.1	301.1	301.6	0.5
Q	13,680	18	90	12.8	301.8	301.8	301.8	0.0
R	14,095	19	86	12.2	305.9	305.9	305.9	0.0
S	14,205	38	236	4.5	309.0	309.0	309.0	0.0
T	14,732	18	144	6.9	315.5	315.5	315.7	0.2
U	15,132	20	85	9.9	316.0	316.0	316.4	0.4
V	15,228	30	144	5.9	320.4	320.4	320.4	0.0
W	15,634	10	60	14.0	321.4	321.4	321.7	0.3
X	15,776	43	191	4.4	325.6	325.6	326.6	1.0

[1]Stream distance in feet above confluence with Little Sandy Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX
AND INCORPORATED AREAS

FLOODWAY DATA

HOG BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Little Sandy Creek								
A	3,000[1]	277	1,541	5.4	238.2	238.2	239.1	0.9
B	3,240[1]	330	1,773	4.7	239.9	239.9	240.9	1.0
C	6,040[1]	372	2,104	3.0	249.1	249.1	250.1	1.0
D	6,131[1]	420	3,018	2.1	251.4	251.4	251.5	0.1
E	9,950[1]	226	1,252	5.0	261.2	261.2	261.5	0.3
F	10,032[1]	360	2,395	2.6	262.5	262.5	262.9	0.4
G	11,754[1]	230	1,072	2.7	268.4	268.4	269.2	0.8
H	12,994[1]	100	469	6.3	274.9	274.9	275.9	1.0
I	13,096[1]	58	361	8.1	277.4	277.4	277.4	0.0
J	15,640[1]	250	1,264	2.0	292.4	292.4	293.4	1.0
K	16,690[1]	46	274	8.3	296.9	296.9	297.0	0.1
L	18,030[1]	160	567	2.4	308.5	308.5	309.4	0.9
M	19,413[1]	86	309	3.4	315.8	315.8	316.4	0.6
Ralston Creek								
A	6,300[2]	95	514	4.9	259.1	259.1	260.1	1.0
B	6,510[2]	197	1,573	1.6	266.3	266.3	266.3	0.0
C	8,480[2]	57	354	4.8	270.1	270.1	270.9	0.8
D	8,640[2]	118	940	1.8	276.8	276.8	276.8	0.0
E	10,030[2]	38	214	6.2	282.3	282.3	282.3	0.0
F	11,640[2]	50	72	6.8	301.1	301.1	301.5	0.4
G	11,891[2]	80	311	1.6	305.3	305.3	306.2	0.9
H	13,571[2]	20	26	6.0	325.6	325.6	326.0	0.4

[1]Stream distance in feet above State Highway 105

[2]Stream distance in feet above confluence with Woodward Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

FLOODWAY DATA

LITTLE SANDY CREEK and RALSTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
South Fork of Ralston Creek								
A	1,210[1]	30	43	6.9	299.4	299.4	299.9	0.5
Unnamed Tributary of Woodward Creek								
A	100[2]	58	170	4.1	312.5	312.5	313.5	1.0
B	450[2]	49	119	4.3	316.6	316.6	317.2	0.6
C	1,550[2]	48	68	4.8	333.6	333.6	334.1	0.5

[1]Stream distance in feet above confluence with Ralston Creek
[2]Stream distance in feet above U.S. Highway 290

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX
AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH FORK OF RALSTON CREEK and UNNAMED TRIBUTARY OF WOODWARD CREEK

5.0 INSURANCE APPLICATION

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

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent annual chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2-percent annual chance floodplain, areas of 1-percent annual chance flooding where average depths are less than 1 foot, areas of 1-percent annual chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent annual chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Washington County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 5, "Community Map History."

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE (S)	FIRM EFFECTIVE DATE	FIRM REVISION DATE (S)
Brenham, City of	May 24, 1974	March 5, 1976	August 17, 1981	January 19, 2011
Burton, City of	December 20, 1974	None	April 1, 2007	January 19, 2011
Washington County (Unincorporated Areas)	May 24, 1977	None	December 1 ,2007	January 19, 2011

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

The SCS studied the Hog Branch Watershed for several purposes including flood protection and recreational development. The SCS suspended planning because no alternative to meet these needs could be developed that was economically feasible. Basic data developed in the SCS study was used in this FIS report.

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region VI, Federal Regional Center, FRC 800 North Loop 288, Denton, Texas 76209-3698.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Flood Insurance Study, City of Brenham, Washington County, Texas. Washington, D.C., February 17, 1981.

2. U.S. Census Bureau; Population Finder, Anderson County, Texas; using American Factfinder; http://factfinder.census.gov/; Accessed December 18, 2008.

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5. U.S. Department of Commerce, Weather Bureau, "Rainfall Frequency Atlas of the Untied States for Duration from 30 minutes to 24 Hours and Return Periods from 1 to 100 Years," Technical Paper No. 40, May 1961.

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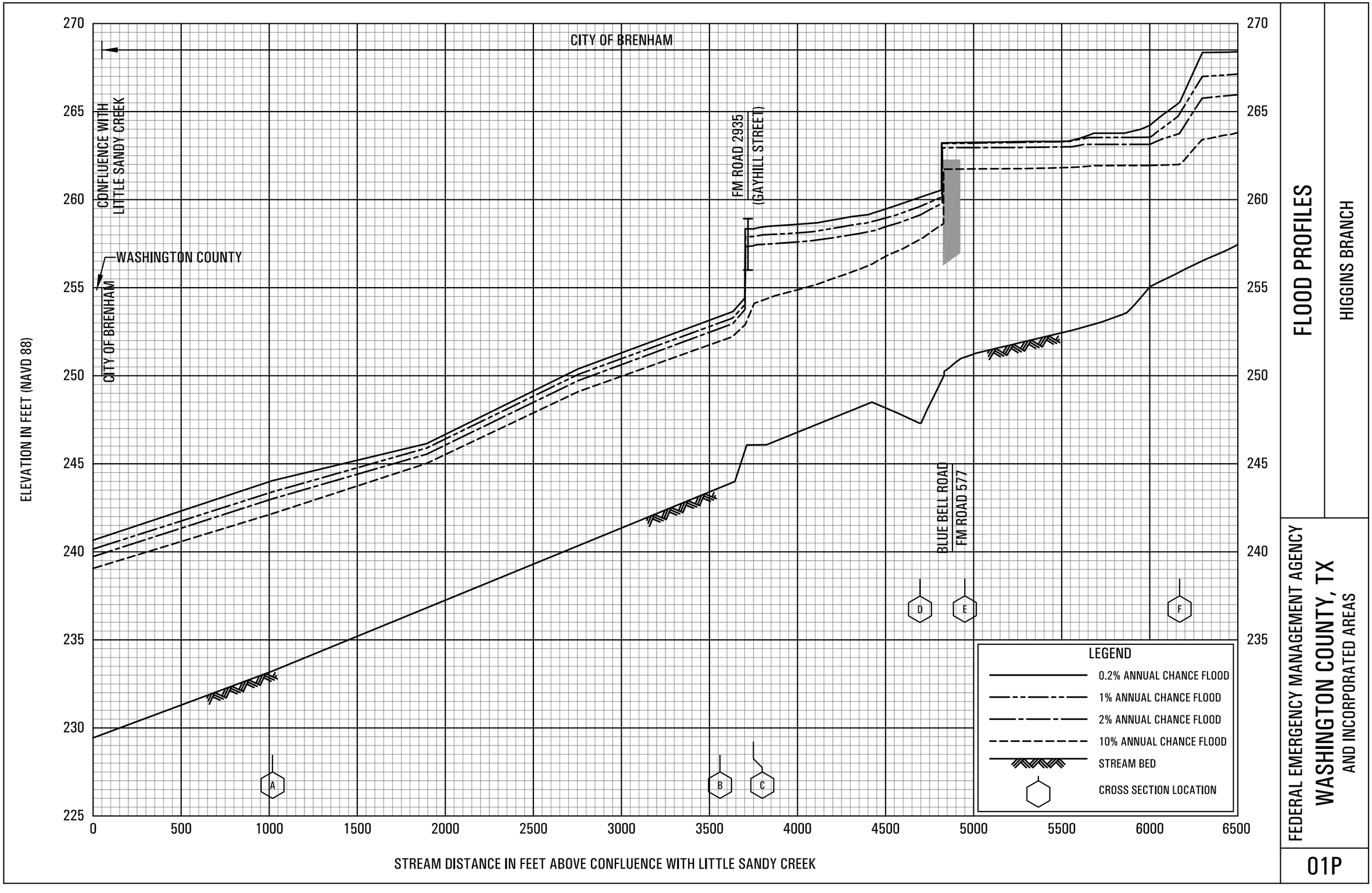


FLOOD PROFILES

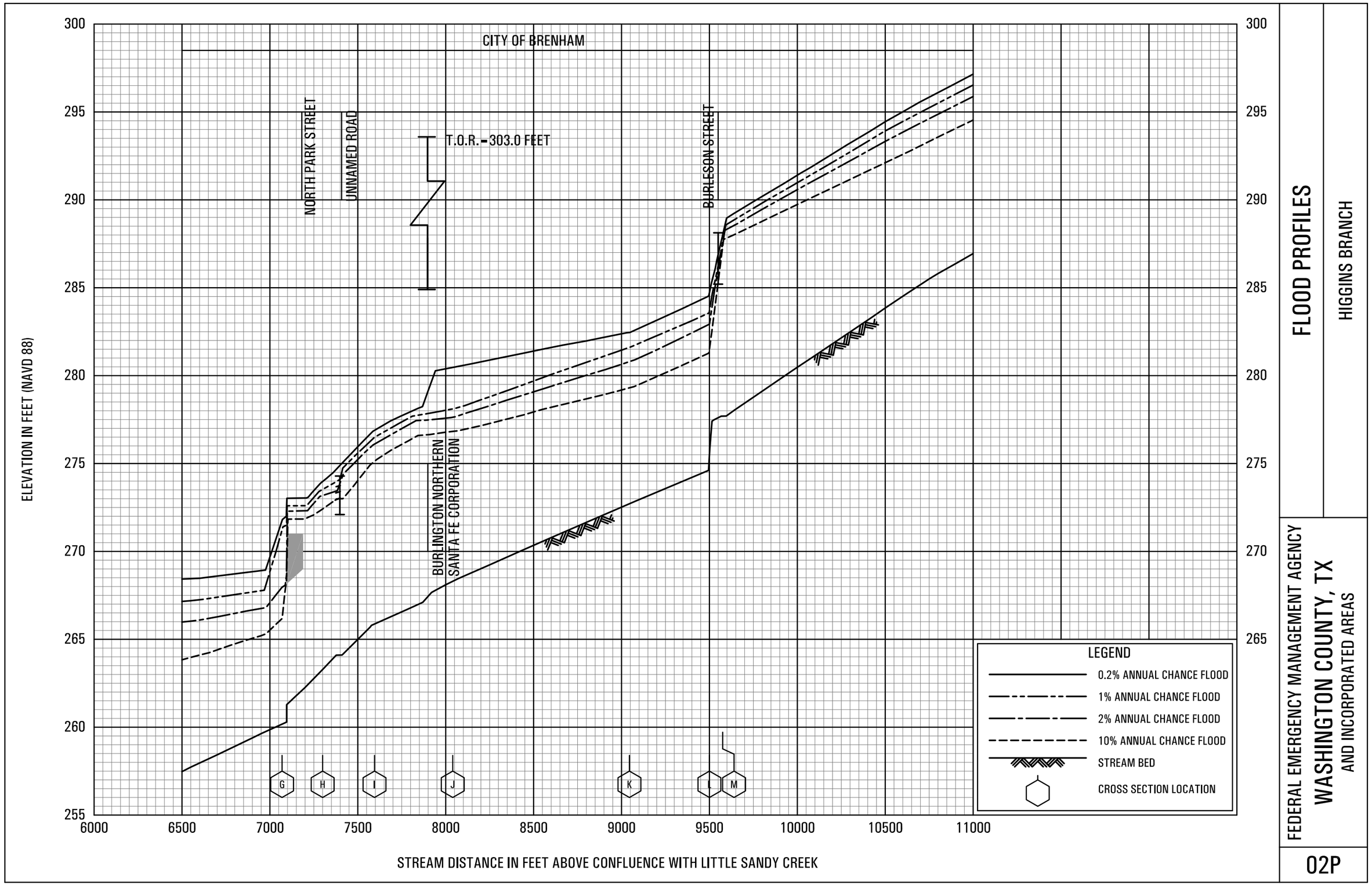
HIGGINS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

01P



FLOOD PROFILES

HIGGINS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

02P

CITY OF BRENHAM

JEFFERSON STREET

MAIN STREET

CONFLUENCE OF HIGGINS TRIBUTARY

OLD MILL CREEK ROAD

ELEVATION IN FEET (NAVD 88)

330
325
320
315
310
305
300
295
290
285

11000
11500
12000
12500
13000
13500
14000
14500
15000

N
O
P
Q
R
S
T

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE SANDY CREEK

FLOOD PROFILES

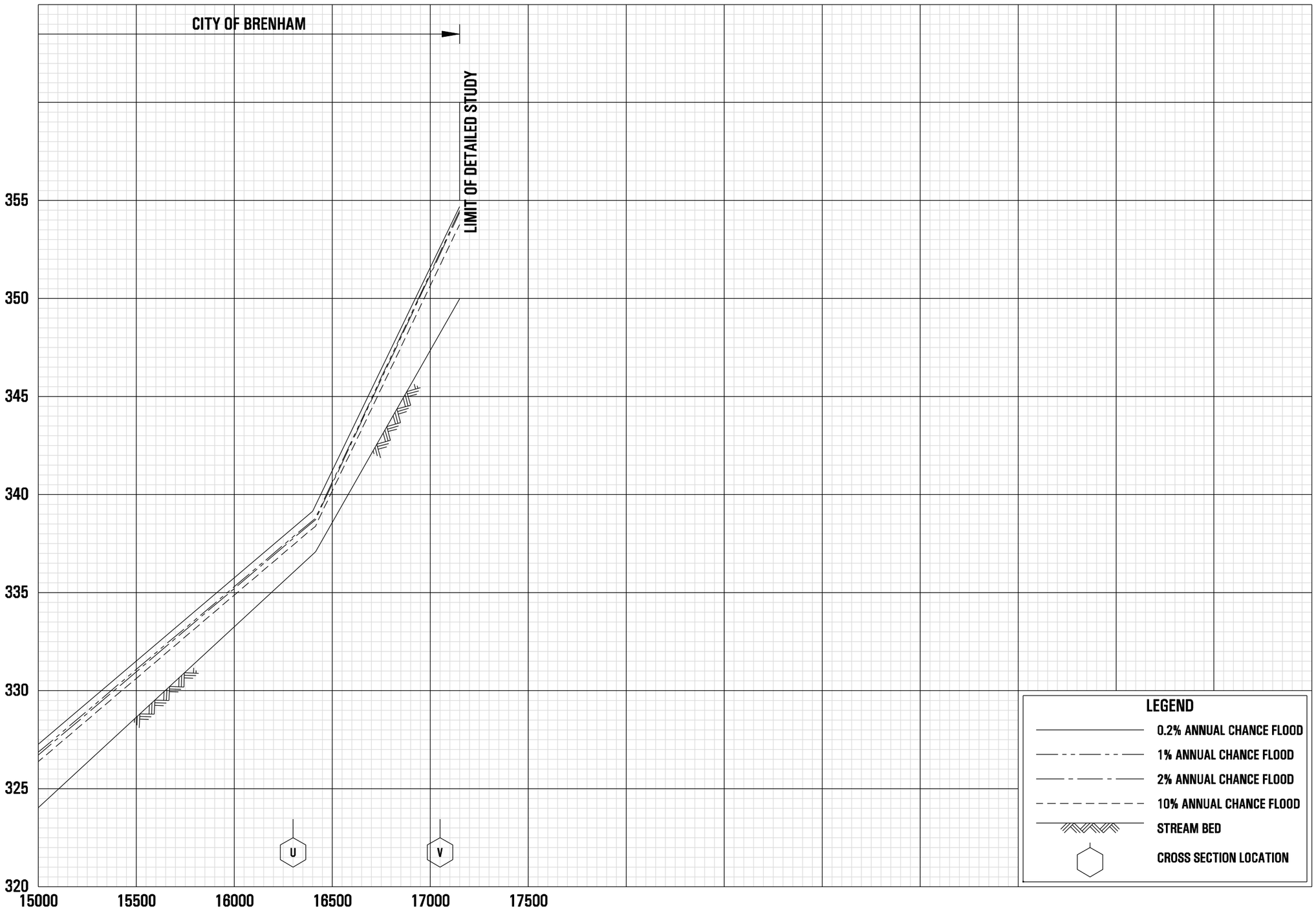
HIGGINS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

03P



FLOOD PROFILES

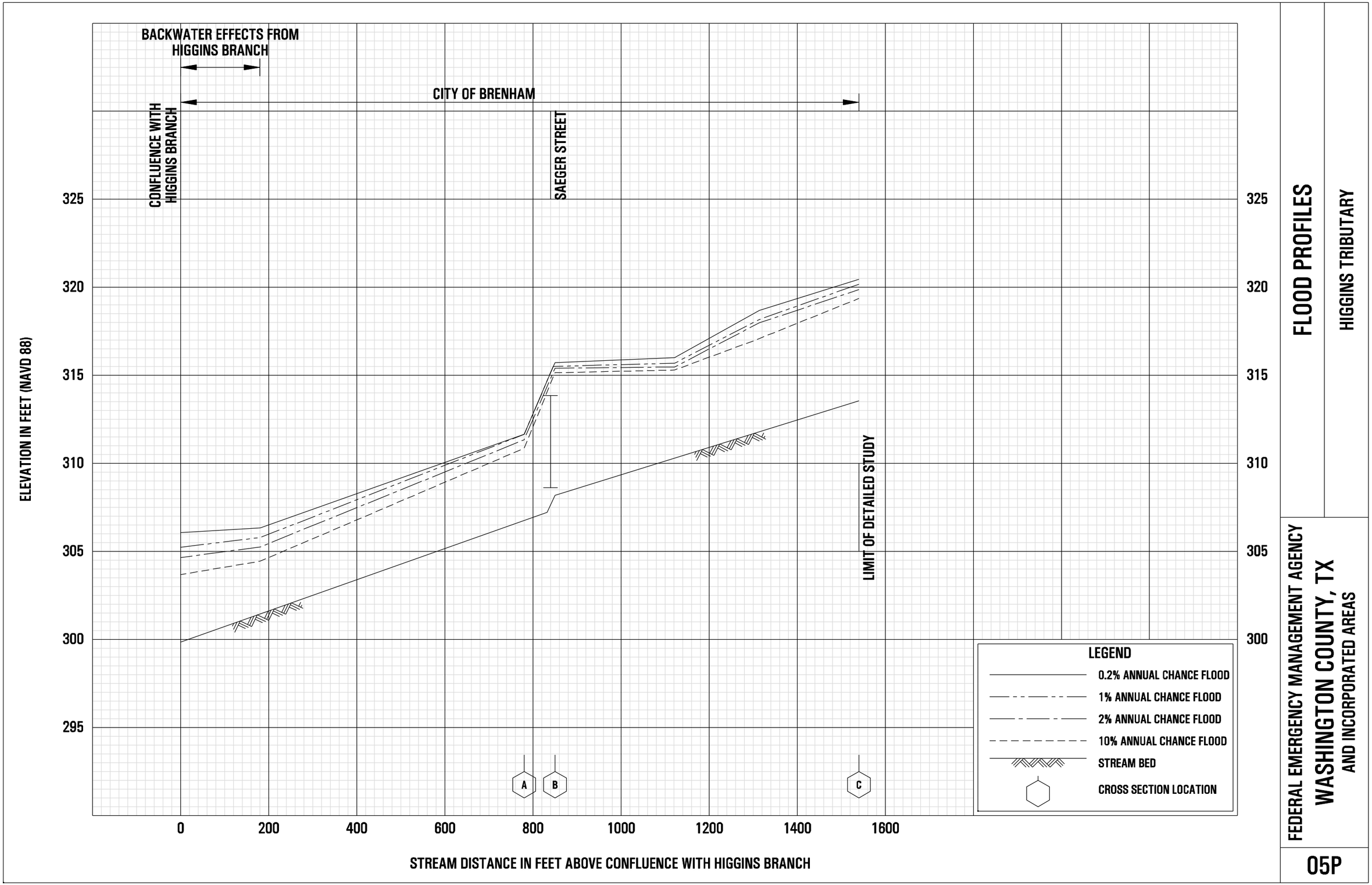
HIGGINS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

04P



FLOOD PROFILES

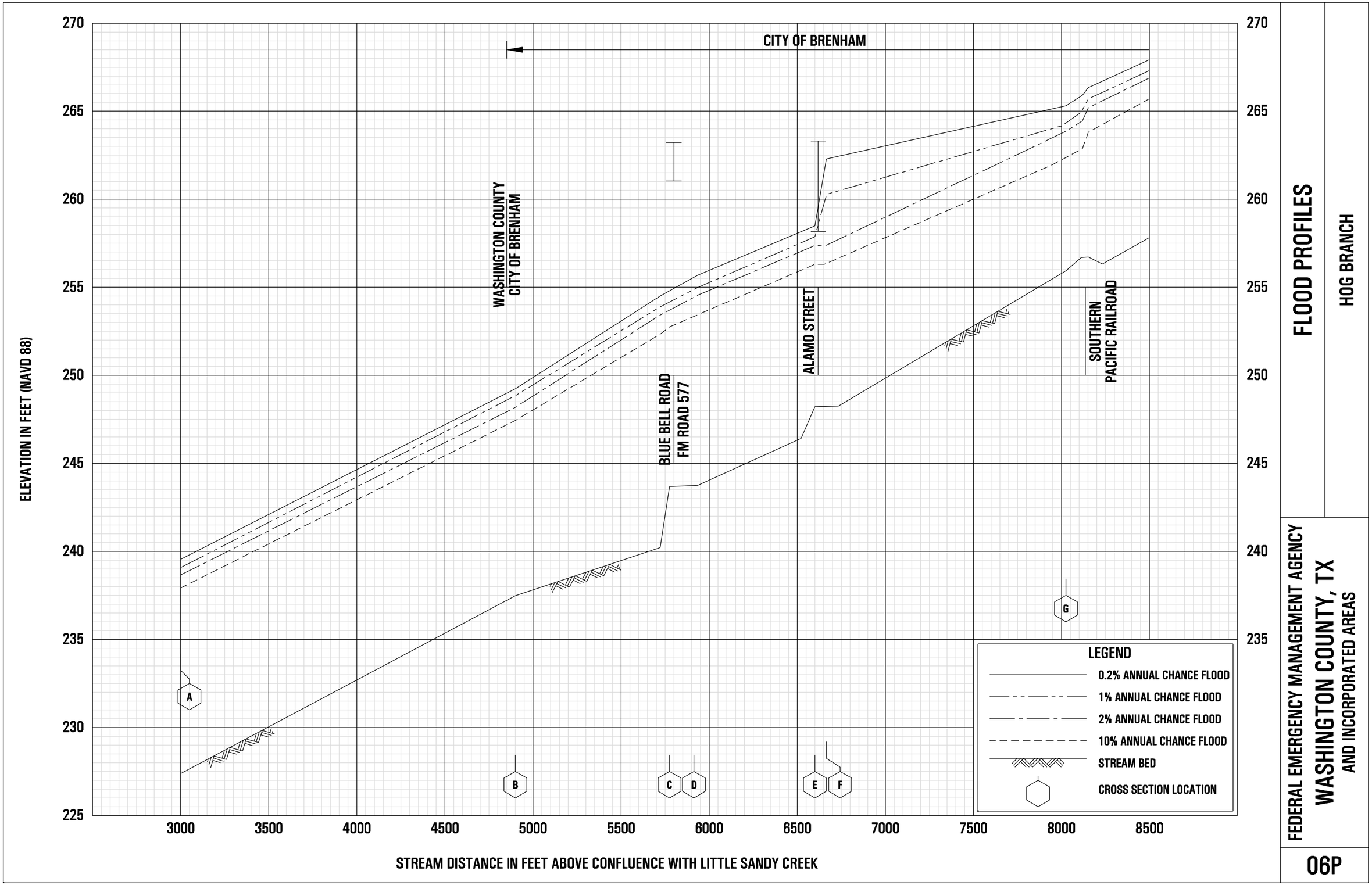
HIGGINS TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

05P



FLOOD PROFILES

HOG BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

06P

CITY OF BRENHAM

KERR STREET

CHAPPELL HILL STREET

PECAN STREET

ELEVATION IN FEET (NAVD 88)

300
295
290
285
280
275
270
265
260
255

8500 9000 9500 10000 10500 11000 11500 12000 12500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE SANDY CREEK

H I J K L M N

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

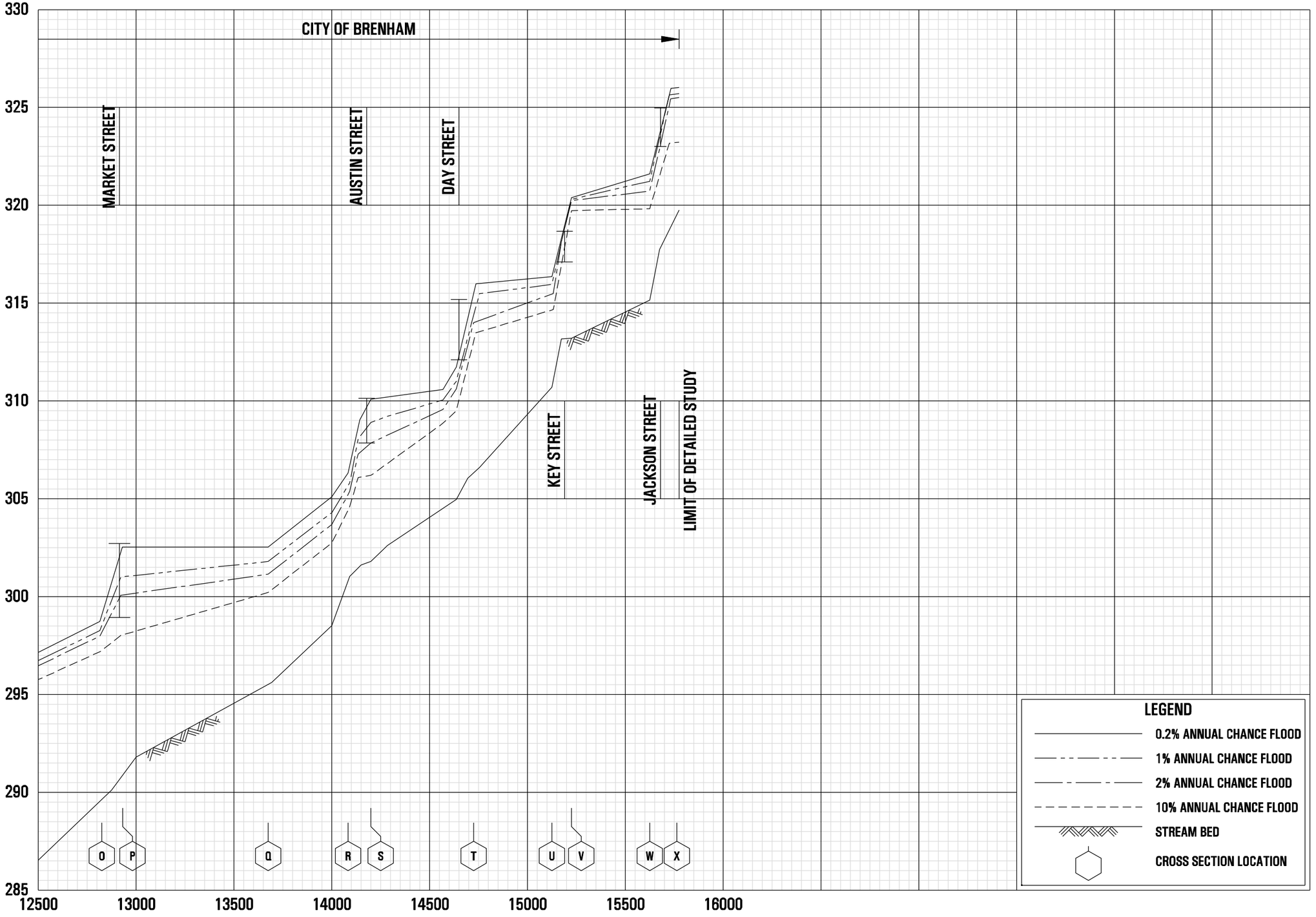
FLOOD PROFILES

HOG BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX
AND INCORPORATED AREAS

07P



FLOOD PROFILES

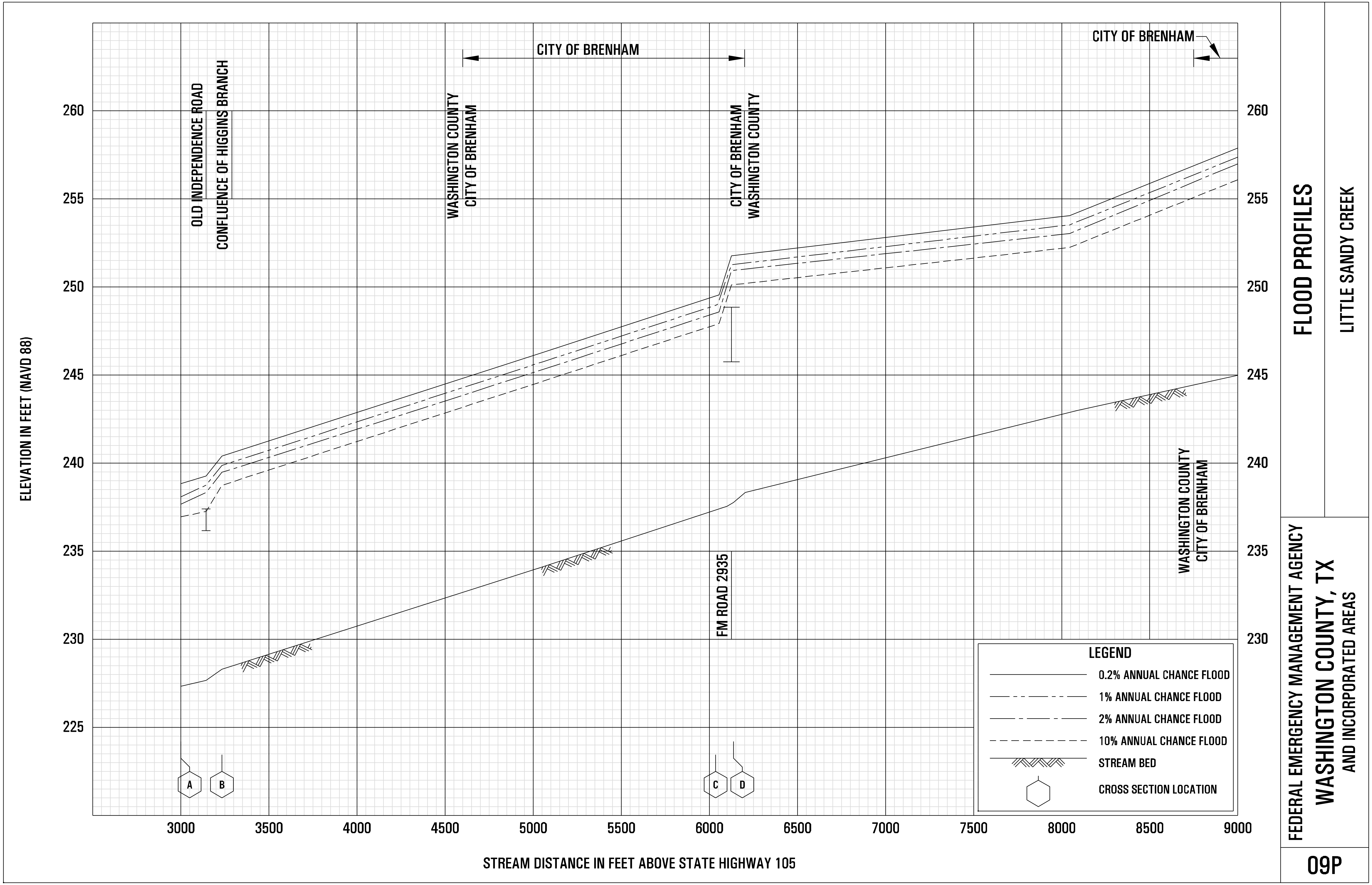
HOG BRANCH

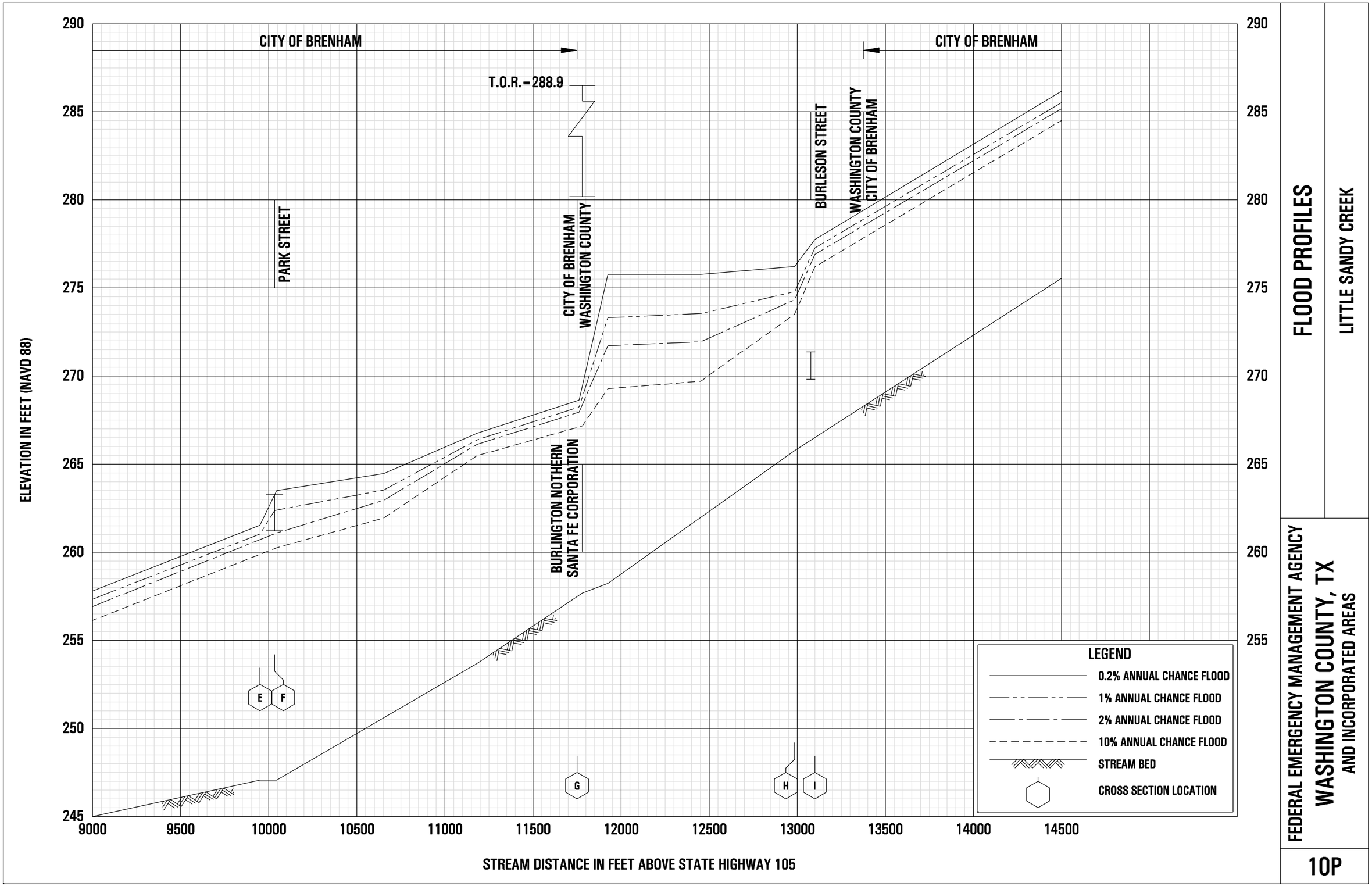
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

08P


CITY OF BRENHAM
CITY OF BRENHAM
OLD INDEPENDENCE ROAD
CONFLUENCE OF HIGGINS BRANCH
WASHINGTON COUNTY
CITY OF BRENHAM
CITY OF BRENHAM
WASHINGTON COUNTY
FM ROAD 2935
WASHINGTON COUNTY
CITY OF BRENHAM
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE STATE HIGHWAY 105
225
230
235
240
245
250
255
260
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
9000
A
B
C
D
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
LITTLE SANDY CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, TX
AND INCORPORATED AREAS
09P



FLOOD PROFILES

LITTLE SANDY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

10P

CITY OF BRENHAM

ELEVATION IN FEET (NAVD 88)

310
305
300
295
290
285
280
275

14500 15000 15500 16000 16500 17000 17500 18000

STREAM DISTANCE IN FEET ABOVE STATE HIGHWAY 105

J

K

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

LITTLE SANDY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX
AND INCORPORATED AREAS

11P

CITY OF BRENHAM

LIMIT OF DETAILED STUDY

ELEVATION IN FEET (NAVD 88)

320
315
310
305
300

L
M

17500
18000
18500
19000
19500

STREAM DISTANCE IN FEET ABOVE STATE HIGHWAY 105

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

LITTLE SANDY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

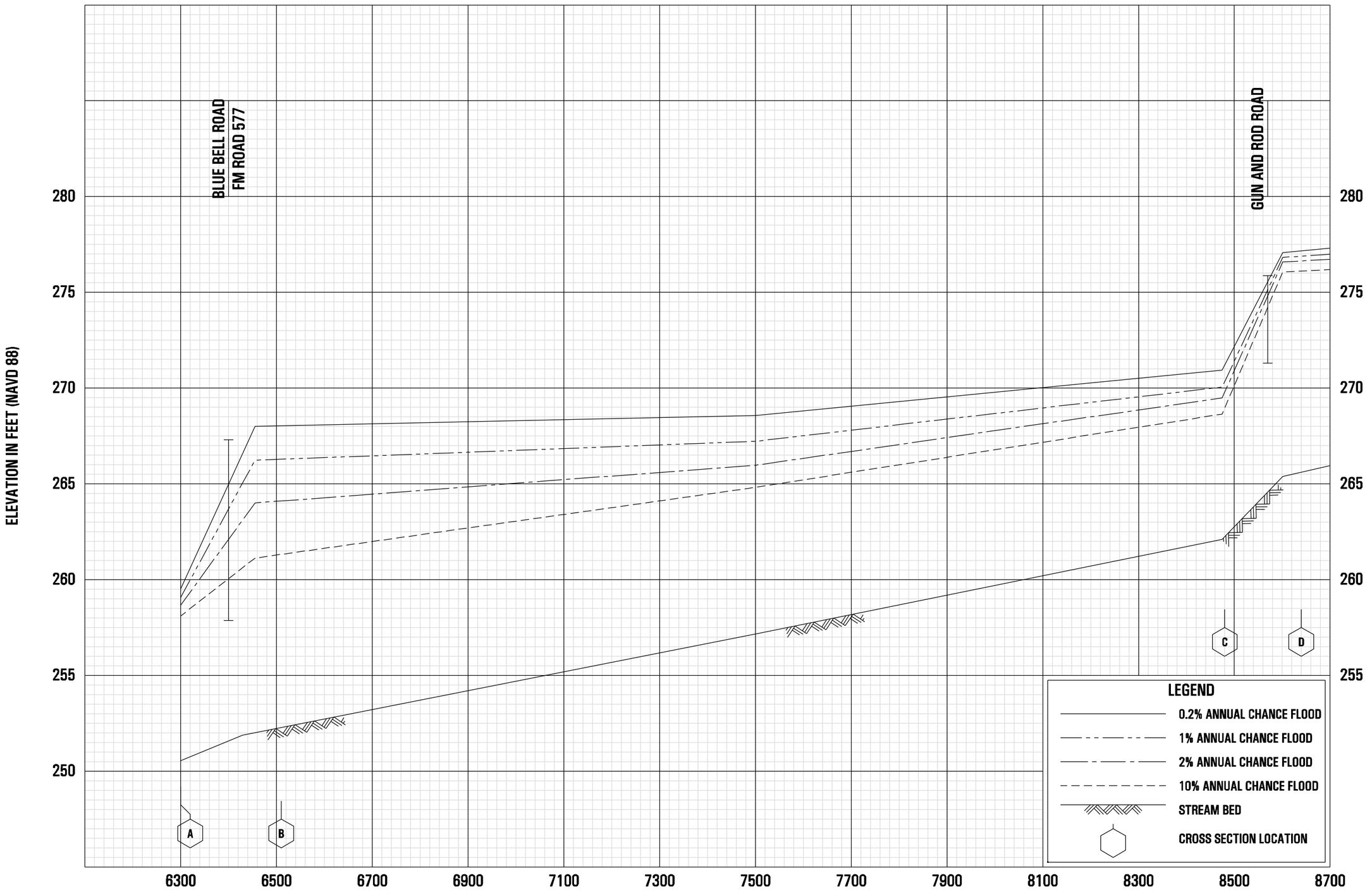
WASHINGTON COUNTY, TX

AND INCORPORATED AREAS

12P

FLOOD PROFILES

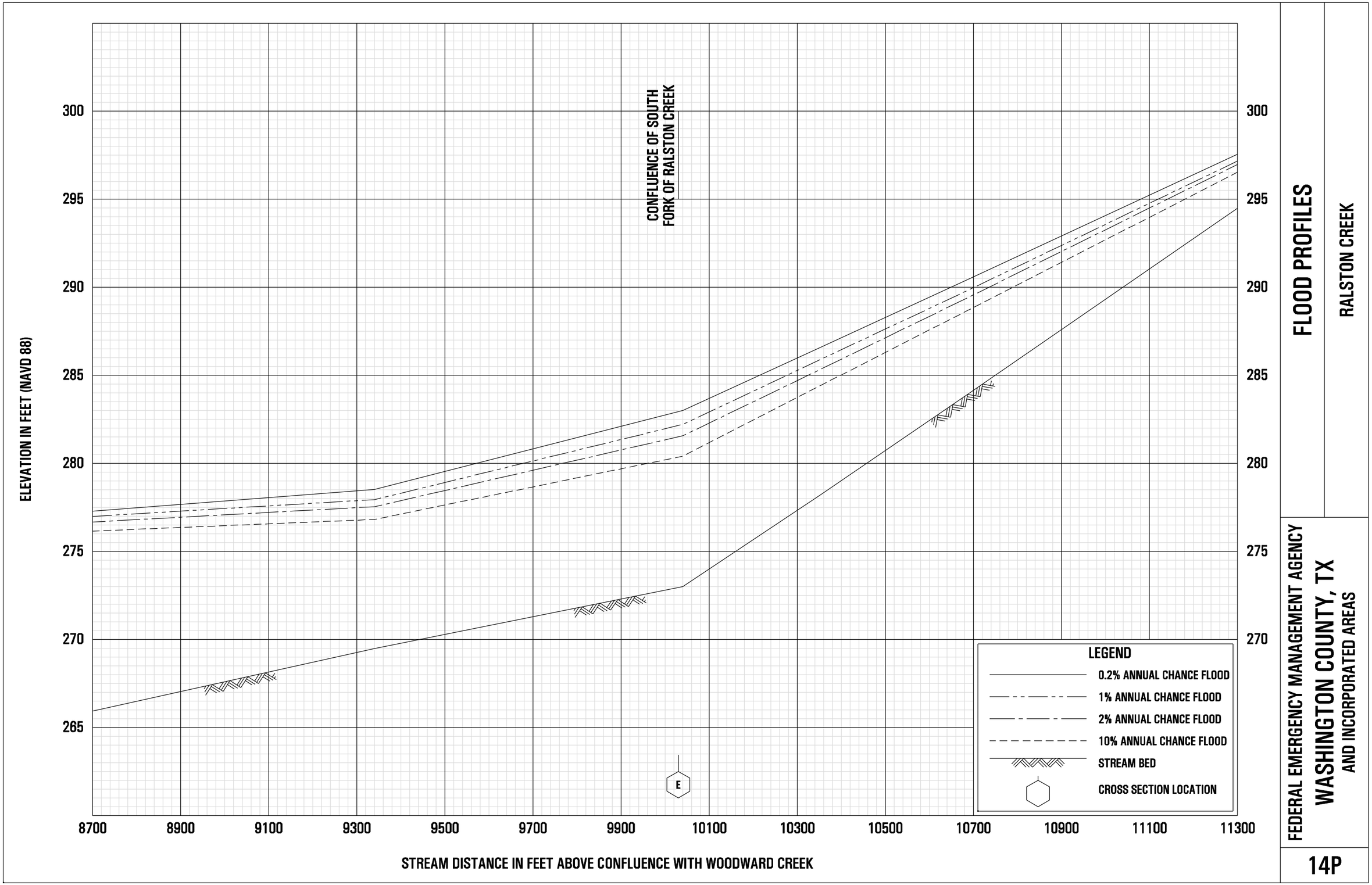
RALSTON CREEK



FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS



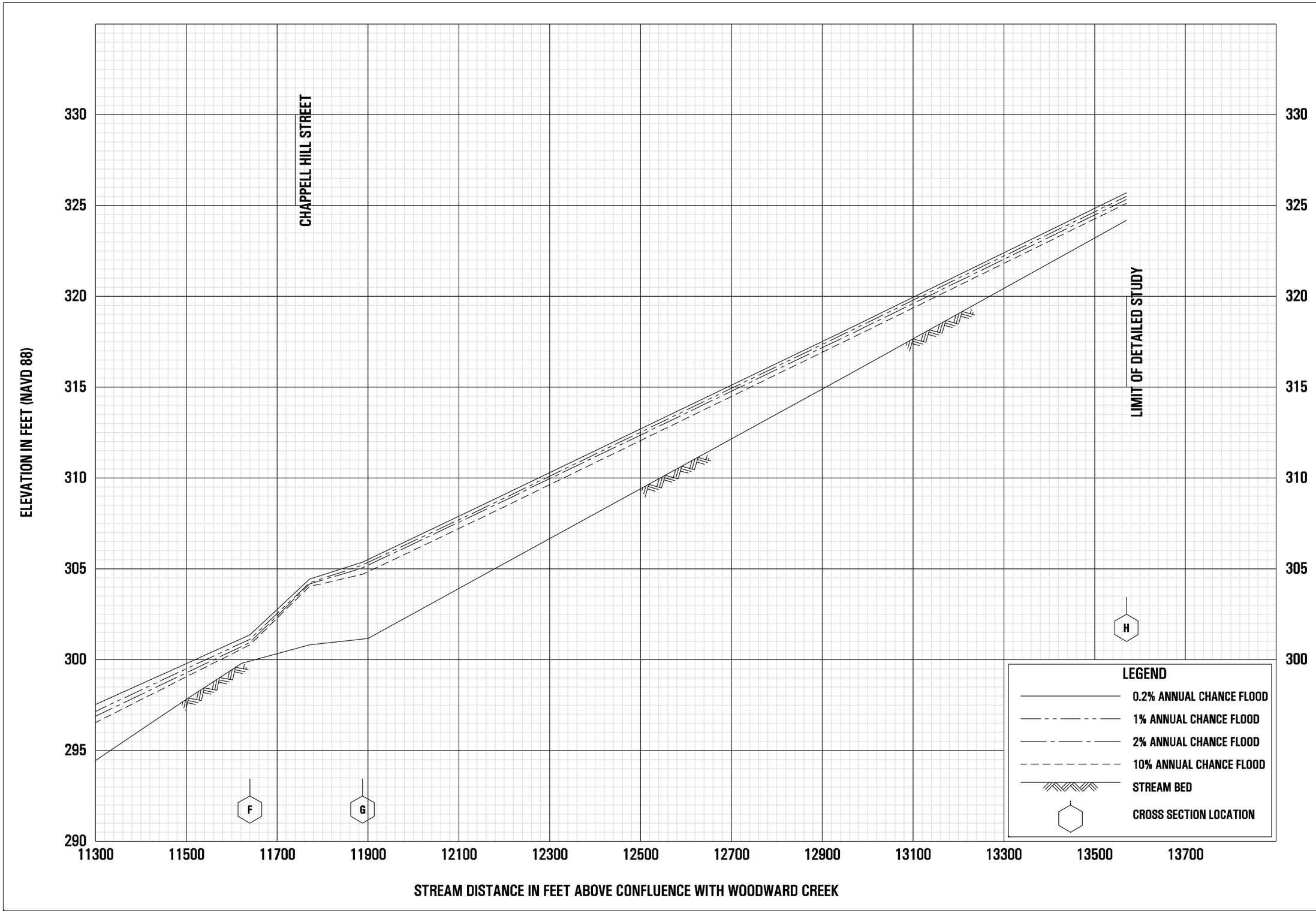
FLOOD PROFILES

RALSTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX
AND INCORPORATED AREAS

14P



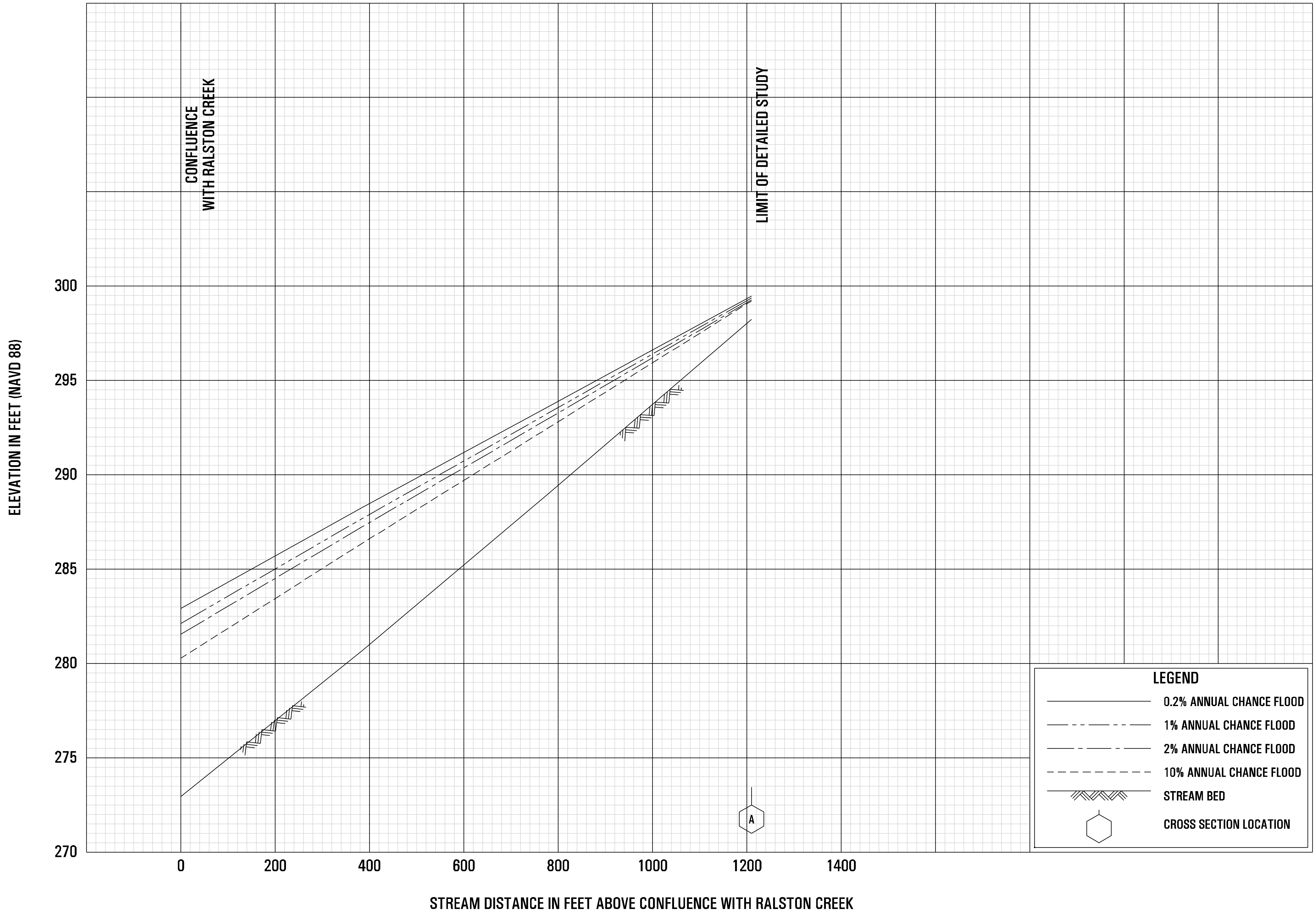
FLOOD PROFILES

RALSTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS



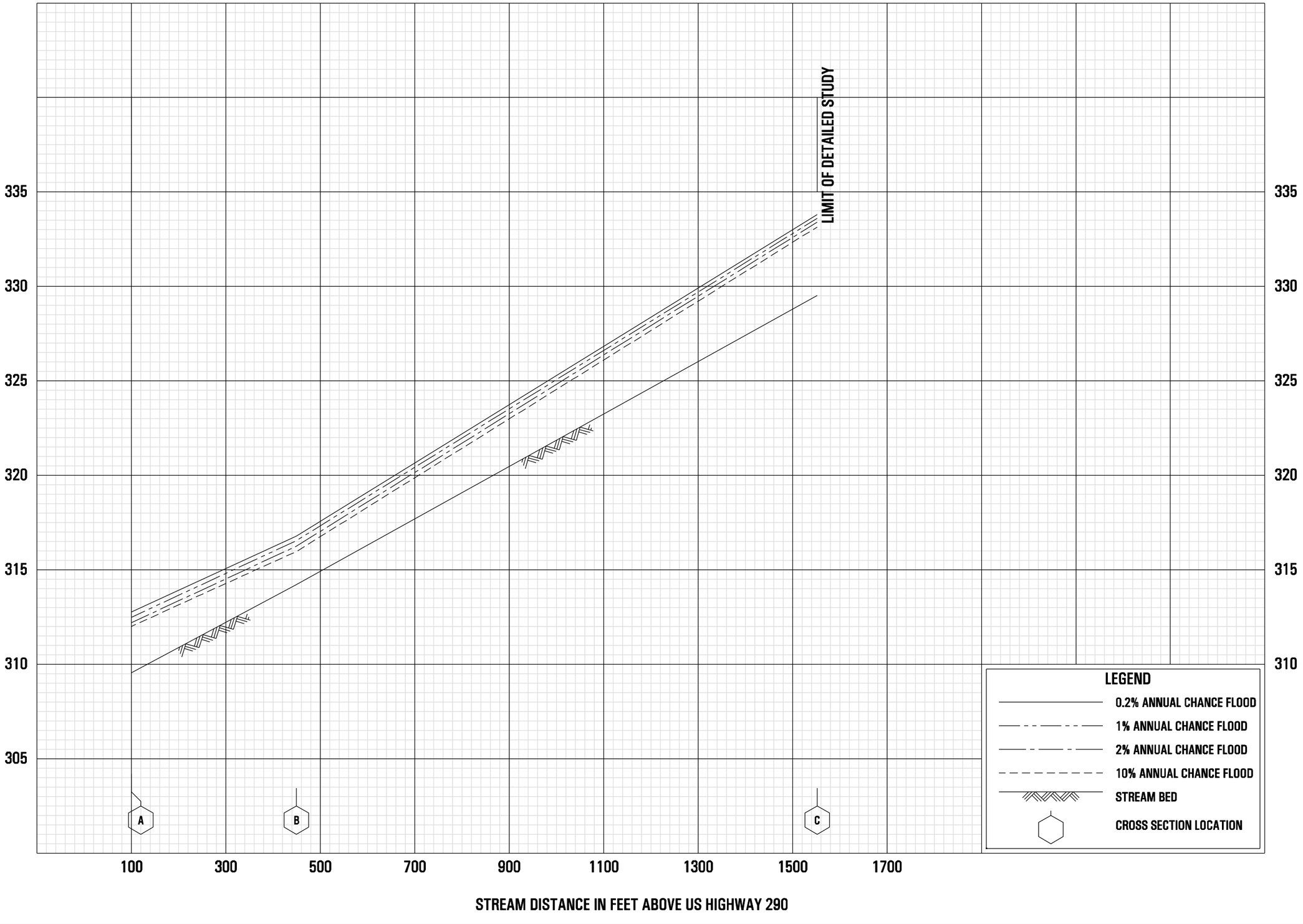
FLOOD PROFILES

SOUTH FORK OF RALSTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX

AND INCORPORATED AREAS



FLOOD PROFILES

UNNAMED TRIBUTARY OF WOODWARD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, TX
AND INCORPORATED AREAS