FLOOD INSURANCE STUDY

KERR COUNTY, TEXAS
AND INCORPORATED AREAS

Community Name	Community Number
INGRAM, CITY OF	481592
KERR COUNTY (UNINCORPORATED AREAS)	480419
KERRVILLE, CITY OF	480420

REVISED:
May 15, 2020

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
48265CV000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

Selected Flood Insurance Rate Map (FIRM) panels for this 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(s)	New Zone
A1 through A30	AE
B	X
C	X

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

This FIS was revised on May 15, 2020. Users should refer to Section 10.0, Revision Descriptions, for further information. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this FIS report should be aware that the information presented in Section 10.0 supersedes information in Section 1.0 through 9.0 of this FIS report.

Initial Countywide FIS Effective Date: July 19, 2000

First Revised Countywide FIS Date: March 3, 2011

Second Revised Countywide FIS Date: May 15, 2020

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FLOOD INSURANCE STUDY
KERR COUNTY, TEXAS, AND INCORPORATED AREAS

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 Kerr County, including the Cities of Ingram and Kerrville, and the unincorporated areas of Kerr County (referred to collectively herein as Kerr 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.

For this revision of the countywide FIS, new hydrologic and hydraulic analyses were prepared by AECOM for the San Antonio River Authority (SARA) under a Mapping Activity Statement (MAS) through their Cooperating Technical Partner (CTP) agreement with FEMA. This study was completed on November 30, 2017.

Base map information shown on this Flood Insurance Rate Map (FIRM) was derived from multiple sources. Base map information for Kerr County and all incorporated communities within Kerr County was obtained from the U.S. Census Bureau TIGER files dated 2017 and the National Flood Hazard Layer (NFHL) dated 2011.

The hydrologic and hydraulic analyses for the original study of the unincorporated areas of Kerr County were performed by Turner Collie & Braden, for the Federal Insurance Administration (FIA), under Contract No. H-3937. This study, which was completed in August 1977, covered all significant flooding sources.

The hydrologic and hydraulic analyses for the original study of the City of Kerrville were performed by Turner Collie & Braden, for the FIA, under Contract No. H-3937. This work, which was completed in July 1977, covered all significant flooding sources.

For both studies, the Upper Guadalupe River Authority, U.S. Army Corps of Engineers (USACE), U.S. Geological Survey (USGS), Natural Resources Conservation Service (NRCS) (formerly the Soil Conservation Service), Agricultural Stabilization and

Transportation were contacted to obtain information pertinent to the evaluation of flood hazards within the unincorporated areas of Kerr County and the City of Kerrville.

During the course of the work performed by Turner Collie & Braden, flood elevations and boundaries and floodway delineations were reviewed with community officials. On September 8, 1977, the results of the work performed by Turner Collie & Braden were reviewed at a final Consultation Coordination Officer (CCO) meeting attended by representatives of the FIA, Kerr County, the City of Kerrville, and Turner Collie & Braden.

The hydrologic and hydraulic analyses for the restudy were performed by the USACE, Fort Worth District, for the Federal Emergency Management Agency (FEMA), under Interagency Agreement No. EMW-93-E-4115, Project Order No. 1. This work was completed in September 1997.

In addition, the results of a Letter of Map Revision (LOMR) issued on April 29, 1997, and Letters of Map Amendment issued on June 17 and August 28, 1997, were incorporated in the restudy.

For the first countywide revision, MAPVI compiled existing data to convert the previous Kerr County FIS into digital format. MAPVI completed this work in August 2008, under Contract No. EMT-2002-CO-0052.

Base map information used to develop the Flood Insurance Rate Maps (FIRMs) that correspond to this FIS was derived from multiple sources. This information was compiled from the USGS, 1989 and 1999, the National Geodetic Survey, 2004, the U.S. Census Bureau, 2003 and 2006, and Kerr County, 2008.

The projection used in the preparation of the FIRMs was Texas State Plane Coordinate Grid System, South Central Zone (FIPS 4204), North American Datum 83 (NAD83), and North American Vertical Datum 88 (NAVD88). Differences in datum, projection or State Plane zones used in the production of the FIRMs for adjacent jurisdictions may result in slight positional differences across jurisdictional boundaries. These differences do not affect the accuracy of these FIRMs.

1.3 Coordination

An initial Consultation Coordination Officer (CCO) meeting (also occasionally referred to as the Scoping meeting) is held with representatives of the communities, FEMA, and the study contractors to explain the nature and purpose of the FIS and to identify the streams to be studied by detailed methods. A final CCO (often referred to as the Preliminary DFIRM Community Coordination, or PDCC meeting) is held with representatives of the communities, FEMA, and the study contractors to review the results of the study.

For this revision of the countywide FIS, the discovery meeting was held on November 20, 2014, and attended by representatives of USDA, SARA, AECOM, Halff and Texas Agrilife Extension. A flood risk review meeting was held on July 11, 2017, and attended by representatives from SARA.

The final CCO meeting was held on August 22, 2018 to review and accept the results of this FIS. Those who attended this meeting included FEMA, Texas Water Development

Board, SARA and Compass PTS. All problems raised at that meeting have been addressed in this study.

The dates of the historical initial and final CCO meetings held for the communities within the boundaries of Kerr County are shown in Table 1, "Historical CCO Meeting Dates."

Table 1: Historical CCO Meeting Dates

Community Name	Initial CCO Date	Final CCO Date
Ingram, City of	May 31, 2007 *	December 15, 2008 April 9, 1998
Kerr County, Unincorporated Areas	May 31, 2007 * September 8, 1977	December 15, 2008 April 9, 1998 June 6, 1978
Kerrville, City of	May 31, 2007 June 9, 1992 September 8, 1977	December 15, 2008 April 9, 1998 September 8, 1977

*Date not available

2.0 AREA STUDIED

2.1 Scope of Study

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

The areas studied by detailed methods are listed in Table 2, "Flooding Sources Studied by Detailed Methods (Redelineated Flooding Sources)." All or portions of the flooding sources listed in Table 2 were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRMs (Published Separately). 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 October 1999.

Table 2: Flooding Sources Studied by Detailed Methods (Redelineated Flooding Sources)

Camp Meeting Creek	Quinlan Creek
East Town Creek	South Fork Guadalupe River
Elm Creek	Stream QC-1

Table 2: Flooding Sources Studied by Detailed Methods (Redelineated Flooding Sources) (continued)

Guadalupe River	Stream QC-2
Johnson Creek	Stream TC-1
North Fork Guadalupe River	Town Creek

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The areas studied by approximate methods are listed in Table 3: Flooding Sources Studied by Approximate Methods (Refined Flooding Sources)." Table 4: Letters of Map Change" indicates LOMCs that have been incorporated into this countywide revision.

Table 3: Flooding Sources Studied by Approximate Methods (Refined Flooding Sources)

Allen Creek	Mico Creek
Apple Valley	Middle Creek
Bear Creek	Narly Creek
Bee Caves Creek	North Fork Guadalupe River
Bluff Creek	North Fork Turkey Bottom Creek
Bonevard Draw	Nowlin Hollow
Bruins Creek	Palmer Creek
Buffalo Creek	Pass Creek
Burr Oak Creek	Peterson Creek
Bush Wack Creek	Previledge Creek
Byas Branch	Prison Canyon
Cherry Draw	Quinlan Creek
Cline Branch	Rattlesnake Creek
Cloud Hollow Creek	Rough Creek
Contrary Creek	Rough Hollow
Dry Branch	Second Creek
East Town Creek	Silver Creek
Edmondson Creek	South Fork Guadalupe River
Elm Creek	Spring Creek
Fall Branch	Spur Branch
Fall Creek	Steel Creek
Fessend Branch	Sycamore Draw
Flat Rock Creek	Sycamore Spring
Fork Creek	Tegener Creek
Goat Creek	Third Creek
Hasenwinkel Creek	Tomas Creek
Henderson Branch	Town Creek
Honey Creek	Turkey Bottom Creek

Table 3: Flooding Sources Studied by Approximate Methods (Refined Flooding Sources) (continued)

Indian Creek
Johnson Creek
Kelley Creek
Klein Hollow
Lambs Creek
Little Lamb Creek
Little Mason Creek
Marshall Creek
Turtle Creek
Verde Creek
West Creek
West Dry Branch
White Oak Creek
Wilson Creek
Wolf Creek

Table 4: Letters of Map Change

Case Number	Community	Old Panel	New Panel
07-06-0995A	Kerr County (Unincorporated Areas)	48265C0150E	48265C0150F
06-06-0079A	Kerr County (Unincorporated Areas)	48265C0150E	48265C0150F
06-06-BE14A	City of Kerrville	48265C0170E	48265C0470F
05-06-0920P	City of Kerrville/Kerr County	48265C0165E 48265C0170E	48265C0460F
00-06-1746A	Kerr County (Unincorporated Areas)	48265C0165E	48265C0455F
02-06-819A	City of Kerrville	48265C0165E	48265C0460F
01-06-819A	City of Kerrville	48265C0165E	48265C0455F
04-06-003A	City of Kerrville	48265C0170E	48265C0470F
02-06-1563A	Kerr County (Unincorporated Areas)	48265C0170E	48265C0470F
02-06-1330A	Kerr County (Unincorporated Areas)	48265C0170E	48265C0480F
05-06-1895A	City of Kerrville	48265C0170E	48265C0470F
05-06-1650A	City of Kerrville	48265C0170E	48265C0460F
05-06-1453A	City of Kerrville	48265C0170E	48265C0460F
02-06-1886A	City of Kerrville	48265C0170E	48265C0460F

2.2 Community Description

Kerr County is located in the hill country of south-central Texas. The City of Kerrville is located 68 miles northwest of the City of San Antonio, also in the hill country of south-central Texas. The City of Ingram is located immediately northwest of the City of Kerrville.

According to the U.S. Bureau of the Census, the 2010 populations of Kerr County, the City of Kerrville, and the City of Ingram were 49,625, 22,347, and 1,804, respectively (Reference 1).

Residential development has concentrated in the extreme western portion of the City of Kerrville and in the floodplain of Quinlan Creek, while commercial development has occurred primarily along State Highway 16, south of the Guadalupe River and north to Interstate Highway 10.

Topography within Kerr County ranges from gently sloping areas adjacent to natural watercourses to rolling hills along drainage divides. Predominant topsoils are stoney to gravelly-clayey soils, which are underlain by Cretaceous Age beds of limestones, marl, shale, and sandstone. Native vegetation comprises primarily of short grasses intermixed with juniper, oak, and mesquite trees. Cypress, sycamore, and willow trees are found adjoining streambeds. The climate is semiarid, with average annual precipitation of 30 inches.

The headwaters of the Guadalupe River rise in western Kerr County, and the river is formed by the confluence of the North and South Forks at the Town of Hunt. Johnson Creek, a major tributary in Kerr County, enters the river at the City of Ingram. Camp Meeting, Elm, Quinlan, and Town Creeks are smaller tributary streams that drain the City of Kerrville area. All creeks flow into the Guadalupe River.

2.3 Principal Flood Problems

Low-lying areas of the stream valleys in Kerr County are subject to periodic flooding caused by overflow of the Guadalupe River and its tributaries. Overflow of Quinlan Creek is more frequent than that of Town Creek or the Guadalupe River. The flood of record on the Guadalupe River and its tributaries in Kerr County occurred in July 1932. The 1932 flood produced a peak discharge at the City of Kerrville estimated to be 196,000 cubic feet per second (cfs) and reached an elevation at State Highway 16 of 1,620 feet National Geodetic Vertical Datum of 1929 (NGVD). This flood is the largest known to have occurred since Kerr County was first settled in 1848. The 1932 flood caused damages within the Guadalupe River basin estimated at that time to be $250,000. The return period of the 1932 flood is estimated to vary from approximately 60 years, near the City of Comfort, to approximately 125 years, near the Town of Hunt. The return period of this flood at the City of Kerrville is approximately 80 years.

2.4 Flood Protection Measures

There are no known flood protection measures in place within Kerr County.

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 FIS. 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 New Detailed Study Streams

New hydrologic analysis was not performed for this countywide FIS.

3.1.2 Detailed Study Streams from Previous Revisions

For the original studies, peak discharges for the Guadalupe River, Johnson Creek, and the North and South Fork Guadalupe Rivers were estimated by regional correlation of flood discharge frequency with drainage area. Frequency analyses of flood records at 15 streamflow gaging stations were performed by the USGS following recommended procedures in the U.S. Water Resources Council Bulletin No. 17, “Guidelines for Determining Flood Flow Frequency” (Reference 2). These gaging stations include those located in the upper segment of the Guadalupe River basin and in nearby basins having similar hydrologic characteristics. The length of flood record available at individual gaging stations varied from 10 to 60 years, with the median record length being 34 years. Computed flood-frequency curves were evaluated to establish relative reliability, and curves of peak discharge versus drainage area were developed for the 10-, 2-, 1-, and 0.2-percent chance floods.

Peak discharges for East Town, Quinlan, and Town Creeks for the 10-, 2-, 1-percent chance floods were computed using the USACE HEC-1 computer program (Reference 3). Computations considered rainfall depth-duration-frequency data, rainfall losses, unit- hydrograph parameters, and other pertinent watershed characteristics as determined from published documents and field and

office investigations. Rainfall data developed by the U.S. Weather Bureau (USWB) were used (Reference 4). Rainfall loss values and unit-hydrograph parameters were established through examination of results of previous studies in nearby, hydrologically similar areas (References 5 through 10). Peak discharges for the 0.2-percent chance floods were determined by straight-line extrapolation of log-probability plots of the 10-, 2-, 1-percent chance floods.

For the restudy, the hydrologic analyses for Camp Meeting, Elm, Quinlan, and Town Creeks and Streams QC-1, QC-2, and TC-1 affecting the study areas were performed using the USACE HEC-1 computer program (Reference 3).

Rainfall depths for the 100-year, 24-hour storm were obtained from USWB Technical Paper No. 40, "Rainfall Frequency Atlas of the United States" (Reference 11), and National Weather Service Technical Memorandum NWS Hydro-35, "Five- to 60-Minute Precipitation Frequency for the Eastern and Central United States" (Reference 12).

The NRCS soil surveys for Kerr County were consulted to determine specific soil types within the study area. Existing-conditions urbanization and imperviousness percentage were based on field inspections of the study area and aerial photography. Snyder's unit-hydrograph parameters were obtained by calibrating from available stream gages in the vicinity. Modified- Puls channel routing was used to route runoff hydrographs through downstream subbasins.

Peak discharge-drainage area relationships for the flooding sources studied by detailed methods are shown in Table 5: Summary of Discharges.

Table 5: Summary of Discharges

Flooding Source and Location	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Camp Meeting Creek					
At confluence with Guadalupe River	10.24	5,400	8,760	10,120	12,900
At Loop 534 (State Highway 173)	9.96	5,360	8,660	10,000	12,740
At Golf Course Dam	9.64	5,270	8,430	9,700	12,300
At Highway 16	9.29	5,000	8,000	9,230	11,070
Downstream of confluence of an unnamed small left-bank tributary located approximately 2,700 feet upstream of Highway 16	8.47	4,520	7,110	8,220	10,450
Downstream of confluence of an unnamed right- bank tributary located approximately 3,700 feet upstream of Highway 16	8.11	4,370	6,860	7,920	10,090
Upstream of the above-described unnamed right-bank tributary	5.16	2,890	4,600	5,290	6,730
At Ranchero Road	5.04	2,790	4,450	5,120	6,510
Downstream of small left- and right-bank tributaries located approximately 2,100 feet upstream of Ranchero Road	4.65	2,550	4,000	4,620	5,880
Downstream of confluence of a small unnamed left-bank tributary located approximately 3,900 feet upstream of Ranchero Road and on the outside of a curve in Camp Meeting Creek	4.1	2,380	3,700	4,260	5,420
East Town Creek					
At mouth of East Town Creek	5.9	6,300	9,200	10,600	14,000
Elm Creek					
At confluence with Guadalupe River	1.02	1,272	1,781	1,996	2,560
Upstream of an unnamed right-bank tributary located approximately 1,100 feet downstream of Louis Street	0.73	1,025	1,435	1,609	2,084
At Glen Road	0.45	694	973	1,130	1,488
Upstream of Laurelwood Drive	0.21	315	445	498	647

Table 5: Summary of Discharges, continued

Flooding Source and Location	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Guadalupe River					
Upstream of confluence with Verde Creek	651	48,700	125,000	175,000	343,000
Upstream of confluence with Turtle Creek	550	45,800	116,000	164,000	321,000
Upstream of Flat Rock Dam	524	67,300	164,000	216,000	363,000
Upstream of UGRA Dam	510	67,200	163,000	215,000	360,000
Upstream of confluence with Nichols Creek	460	66,820	159,250	213,000	348,800
Upstream of confluence with Johnson Creek	323	65,540	147,000	199,000	313,000
Upstream of Ingram Dam	322	36,000	91,500	129,000	251,000
Johnson Creek					
At State Highway 39	126	23,700	60,700	85,800	167,000
At State Highway 41	49.9	15,900	40,500	56,500	110,000
North Fork Guadalupe River At mouth	190	28,300	73,000	102,000	199,000
Quinlan Creek					
At confluence with Guadalupe River	12.09	5,920	9,520	11,070	14,470
At Travis Street	11.71	5,750	9,350	10,830	14,140
At First Street	11.3	5,560	8,980	10,400	13,660
At Fourth Street	10.38	5,110	8,080	9,350	12,520
At Farm-to-Market Road (FM) 1341	10.18	5,050	7,980	9,250	12,350
Approximately 1,000 feet upstream of FM 1341	9.91	4,990	7,880	9,130	12,120
Downstream of Stream QC-1	9.13	4,780	7,540	8,700	11,350
Upstream of Stream QC-1 to Stream QC-2	8.73	4,630	7,310	8,410	10,930
Upstream of Stream QC-2	7.96	4,340	6,800	7,820	10,070
Downstream of Interstate Highway 10	7.3	4,170	6,490	7,430	9,470
South Fork Guadalupe River					
At mouth	97.4	21,200	54,000	76,000	148,000

Table 5: Summary of Discharges, continued

Flooding Source and Location	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Stream QC-1					
At confluence with Quinlan Creek	0.4	530	745	865	1,260
Downstream of Interstate Highway 10	0.16	300	410	455	600
Stream QC-2					
At confluence with Quinlan Creek	0.6	640	965	1,090	1,380
At State Highway 16	0.58	715	1,025	1,150	1,460
At Interstate Highway 10	0.48	610	865	970	1,240
Stream TC-1					
At confluence with Town Creek	1.8	830	2,370	3,150	3,830
At Interstate Highway 10	0.16	825	2,330	3,060	3,620
Town Creek					
At confluence with Guadalupe River	23.29	5,060	12,300	18,210	23,730
Approximately 1,000 feet upstream of Schreiner Road	22.07	5,070	12,340	18,180	23,680
Downstream of an unnamed left-bank tributary located approximately 1,400 feet upstream of Dam No. 1 and 1,600 feet downstream of confluence of Stream TC-1	21.61	5,080	12,380	18,150	23,610
Downstream of Stream TC-1	21.01	5,140	12,400	18,050	23,460
Upstream of Stream TC-1	19.21	5,140	12,360	17,660	22,860
At Interstate Highway 10 and downstream of East Town Creek	18.21	5,250	12,510	17,640	22,770

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 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.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed, selected cross section locations are always shown on the FIRM (Published Separately).

3.2.1 Methods for Flooding Sources with New or Revised Analyses in This Revision

Hydraulic analyses were performed as a part of Medina Watershed Study. The streams studied by approximate methods within Kerr County included all or portions of Bear Creek, Brewington Creek, Cloud Hollow River, Johnson Creek, Little Mason Creek, Mason Creek, Privilege Creek, Robinson Creek, Rocky Creek, Wallace Creek, and unnamed tributaries. The analyses consisted of determining the water-surface elevations for the 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood events.

The hydraulic models were developed using HEC-RAS Version 4.1 (Reference 26) and WISE (Reference 27). Cross sections were generated using WISE and terrain data processed in 2014, 2012, and 2011 (References 22, 23, and 24). The streamlines were generated using 10-foot DEM data and were corrected using aerial photography. Manning's "n" values were created using the aerial imagery and different land use values were determined using Manning's "n" values published by Chow V.T. in 1959 and field reconnaissance (Reference 25).

The downstream boundary conditions were set using the normal depth method unless the stream tied directly into an effective detailed study of the same stream, in which case the known WSEL downstream boundary condition was used.

3.2.2 Methods for Flooding Sources Incorporated from Previous Revisions

For the original studies, water-surface elevations for the 10-, 2-, 1-, and 0.2-percent chance floods were computed using the USACE HEC-2 computer program (Reference 13).

Channel and valley cross sections and streams studied in detail were obtained by field surveys. Additional cross sections were obtained from the USACE and the Texas Water Rights Commission. Cross sections at several bridges were obtained from the Texas State Department of Highways and Public Transportation. Average spacing of cross sections used in hydraulic computations is 2,800 feet.

Starting water-surface elevations for the Guadalupe River flood profiles were determined from a rating curve established at the USGS streamflow gaging station at the City of Comfort. Starting water-surface elevations for the Johnson Creek flood profiles were based on normal- depth computations. Starting conditions for the North and South Fork Guadalupe Rivers profiles were based on the Guadalupe River water-surface elevations. Flood profiles for Quinlan and Town Creeks were started at water-surface elevations established in the original Flood Insurance Study for the City of Kerrville (Reference 14).

The hydraulic analyses for the streams are based on existing conditions. Calculated flood elevations are valid only if waterway structure and channel and overbank characteristics remain in essentially the same condition as ascertained for the time period covered under the scope of this study.

For the restudy, water-surface elevations for the streams studied were computed using the USACE HEC-2 computer program (Reference 13).

Cross sections used for the backwater analysis were obtained by field surveys and data taken from the previous Flood Insurance Study for the City of Kerrville dated January 19, 1982 (Reference 14).

Roughness coefficients (Manning's "n" values) used for the hydraulic computations are shown in Table 6: Manning's "n" Values."

Starting water-surface elevations for all streams were computed by the slope-area method.

Locations of selected cross sections used in the hydraulic analyses 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 FIRM (Published Separately).

The hydraulic analyses for this study 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.

Table 6: Manning's "n" Values

	Roughness Coefficients	
Flooding Source	Channel	Overbanks
Camp Meeting Creek	0.040 to 0.070	0.070 to 0.090
East Town Creek	0.025 to 0.050	0.050 to 0.110
Elm Creek	0.025 to 0.080	0.055 to 0.110
Guadalupe River	0.025 to 0.050	0.050 to 0.110
Johnson Creek	0.025 to 0.050	0.050 to 0.110
North Fork Guadalupe River	0.025 to 0.050	0.050 to 0.110
Quinlan Creek	0.050 to 0.060	0.065 to 0.085
South Fork Guadalupe River	0.025 to 0.050	0.050 to 0.110
Stream QC-1	0.035 to 0.070	0.070 to 0.090
Stream QC-2	0.020 to 0.065	0.065 to 0.085

Table 6: Manning's "n" Values, continued

Flooding Source	Channel	Overbanks
Stream TC-1	0.075	0.090
Town Creek	0.045 to 0.065	0.075 to 0.100

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 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), 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 NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. It is important to note that adjacent counties may be referenced to NGVD29. This may result in differences in base flood elevations (BFEs) across the county boundaries between the counties.

For this countywide revision, the Flood Profiles and BFEs were revised to reflect the new datum values. Prior versions of the FIS report and FIRMs for Kerr County were referenced to NGVD29 (References 15 and 16). An average conversion factor of +0.2715 feet was established for the entire county.

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD29 should apply the stated conversion factor to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown, at a minimum, to the nearest 0.1 foot.

For information regarding conversion between the NGVD29 and NAVD88, 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

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.

For the May 15, 2020 revision, floodplain boundaries for approximate studies were interpolated using LiDAR DEMs. The LiDAR datasets used during this revision include the 2014 TNRIS 50cm Bandera & Lampasas, 2012 TNRIS 50cm TCEQ Dam Safety Sites, and 2011 TNRIS 50cm Blanco, Caldwell, Gonzales, Kendall, Kerr datasets. (References 22, 23, and 24)

For the streams studied by approximate methods, the 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM.

In all other areas under the March 3, 2011 revision, the boundaries were interpolated between cross-sections using topographic maps at a scale of 1:12,000, and 1:24,000, with a contour interval of 20 feet (References 17 and 18).

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Published Separately). 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.

Approximate 1-percent annual chance floodplain boundaries in some portions of the study area were taken directly from the previous FIRMs for the unincorporated areas of Kerr County and the City of Kerrville (References 19 and 20).

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 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.

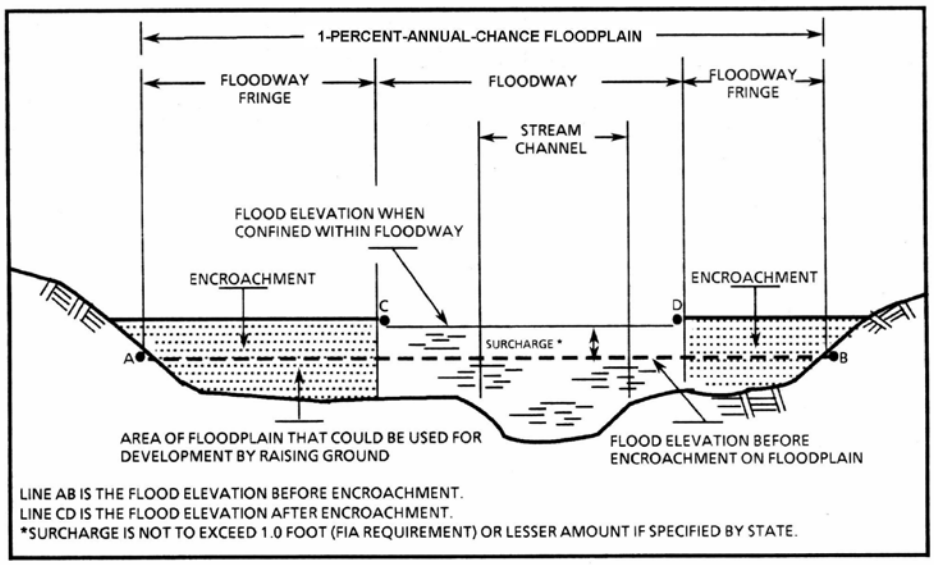


Figure 1: Floodway Schematic

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 7: 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.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 7: Floodway Data. To reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplains will not cause more than a 1.0-foot increase in the BFEs at any point within the county.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Camp Meeting Creek								
A	1,470	120	1,488	6.8	1,591.5	1,582.9[2]	1,583.8	0.9
B	2,380	116	1,265	7.9	1,591.5	1,586.8[2]	1,587.5	0.7
C	4,120	140	1,636	6.1	1,597.0	1,597.0	1,597.9	0.9
D	5,605	668	2,701	3.6	1,616.6	1,616.6	1,617.5	0.9
E	6,350	392	5,878	1.7	1,618.3	1,618.3	1,619.2	0.9
F	7,440	114	1,858	5.2	1,618.4	1,618.4	1,619.2	0.8
G	8,300	175	1,238	7.5	1,621.1	1,621.1	1,621.4	0.3
H	9,690	88	1,001	9.2	1,630.9	1,630.9	1,631.6	0.7
I	10,910	136	1,644	5.0	1,638.3	1,638.3	1,638.9	0.6
J	11,400	78	954	8.3	1,639.7	1,639.7	1,640.4	0.7
K	12,690	131	1,464	3.6	1,649.2	1,649.2	1,650.2	1.0
L	13,790	97	917	5.6	1,656.3	1,656.3	1,656.8	0.5
M	15,220	72	608	7.6	1,663.6	1,663.6	1,664.2	0.6
N	15,950	60	722	6.4	1,668.6	1,668.6	1,669.3	0.7
O	17,300	95	598	7.1	1,681.8	1,681.8	1,682.1	0.3
P	18,420	45	392	10.9	1,688.2	1,688.2	1,688.3	0.1
Q	19,480	42	336	12.6	1,699.6	1,699.6	1,700.0	0.4

[1] Feet above confluence with Guadalupe River

[2] Elevations computed without consideration of backwater effects from Guadalupe River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Elm Creek								
A	3,118	78	397	5.0	1,650.9	1,650.9	1,651.6	0.7
B	3,600	68	353	4.6	1,652.8	1,652.8	1,653.7	0.9
C	3,915	33	173	9.3	1,656.8	1,656.8	1,657.4	0.6
D	4,215	34	174	9.2	1,662.0	1,662.0	1,662.7	0.7
E	4,756	50	220	7.3	1,672.0	1,672.0	1,673.0	1.0
F	5,100	61	202	8.0	1,674.3	1,674.3	1,674.5	0.2
G	5,500	53	173	9.3	1,680.1	1,680.1	1,680.1	0.0
H	5,975	50	327	4.9	1,688.4	1,688.4	1,689.0	0.6
I	6,111	56	213	7.5	1,689.8	1,689.8	1,690.7	0.9
J	6,278	60	190	8.5	1,691.7	1,691.7	1,691.8	0.1
K	6,571	36	158	10.2	1,693.6	1,693.6	1,693.8	0.2
L	6,936	77	332	4.8	1,705.8	1,705.8	1,706.6	0.8
M	7,376	99	282	5.7	1,711.6	1,711.6	1,711.9	0.3
N	7,780	95	169	6.7	1,718.3	1,718.3	1,718.4	0.1
O	8,343	177	221	5.1	1,732.9	1,732.9	1,732.9	0.0
P	8,677	210	589	1.9	1,743.0	1,743.0	1,743.0	0.0
Q	8,859	61	137	3.6	1,746.5	1,746.5	1,746.5	0.0
R	9,264	32	90	5.5	1,760.4	1,760.4	1,760.8	0.4
S	9,584	30	88	5.7	1,764.6	1,764.6	1,765.3	0.7

[1] Feet above confluence with Guadalupe River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[2]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Guadalupe River								
A[1]								
B	399.81	2,280	29,536	6.4	1,431.5	1,431.5	1,431.6	0.1
C	400.73	1,180/798[3]	8,978/13,516[3]	5.2/10.4[3]	1,438.3	1,438.3	1,438.8	0.5
D	401.68	1,020	20.925	9.0	1,448.9	1,448.9	1,449.3	0.4
E	402.42	1,410	20,561	8.9	1,455.7	1,455.7	1,456.0	0.3
F	403.09	760	17,156	10.7	1,462.3	1,462.3	1,462.4	0.1
G	403.98	1,820	27,319	6.7	1,472.2	1,472.2	1,472.2	0.0
H	404.74	1,313	21,425	8.5	1,476.3	1,476.3	1,476.3	0.0
I	405.45	1,098	20,344	9.0	1,482.9	1,482.9	1,482.9	0.0
J	405.95	1,076	21,024	8.3	1,486.6	1,486.6	1,487.3	0.7
K	406.67	874	15,462	11.3	1,493.0	1,493.0	1,493.2	0.2
L	407.13	965	17,213	10.2	1,497.4	1,497.4	1,497.6	0.2
M	407.62	965	19,990	8.8	1,502.0	1,502.0	1,502.1	0.1
N	408.13	1,320	22,411	7.8	1,506.9	1,506.9	1,506.9	0.0
O	408.24	1,450	20,582	8.5	1,506.7	1,506.7	1,506.7	0.0
P	408.62	1,059	18,759	9.3	1,510.7	1,510.7	1,510.7	0.0
Q	409.17	1,099	19,671	8.9	1,515.7	1,515.7	1,515.7	0.0
R	409.81	797	20,404	8.6	1,522.0	1,522.0	1,522.0	0.0
S	410.51	1,690	22,791	7.7	1,529.4	1,529.4	1,529.5	0.1
T	411.04	1,456	21,453	7.6	1,534.7	1,534.7	1,534.7	0.0
U	411.82	1,105	19,621	8.4	1,540.7	1,540.7	1,540.8	0.1
V	412.43	900	15,179	10.8	1,546.8	1,546.8	1,546.8	0.0
W	412.96	1,190	22,502	7.3	1,554.0	1,554.0	1,554.1	0.1
X	413.44	993	18,591	8.8	1,558.5	1,558.5	1,558.5	0.0
Y	413.97	836	17,036	9.6	1,564.5	1,564.5	1,564.5	0.0
Z	414.61	775	18,861	8.7	1,572.5	1,572.5	1,572.5	0.0

[1] Cross section not computed

[2] Miles above mouth

[3] Left channel/right channel

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Guadalupe River (continued)								
AA	414.96	1,750	30,513	7.1	1,581.9	1,581.9	1,581.9	0.0
AB	415.90	650	15,961	13.5	1,583.9	1,583.9	1,583.9	0.0
AC	416.35	746	15,994	13.5	1,588.1	1,588.1	1,588.3	0.2
AD	417.00	600	15,559	13.9	1,597.4	1,597.4	1,598.0	0.6
AE	417.45	1,070	26,657	8.1	1,605.0	1,605.0	1,605.9	0.9
AF	417.84	850	18,731	11.5	1,607.8	1,607.8	1,608.5	0.7
AG	418.23	760	20,060	10.8	1,612.2	1,612.2	1,613.0	0.8
AH	419.05	800	20,627	10.5	1,620.3	1,620.3	1,621.1	0.8
AI	419.47	1,000	26,035	8.3	1,624.2	1,624.2	1,624.5	0.3
AJ	420.04	700	16.673	13.0	1,627.8	1,627.8	1,628.1	0.3
AK	420.55	742	15,326	14.0	1,644.3	1,644.3	1,644.4	0.1
AL	420.91	767	22,770	9.4	1,647.3	1,647.3	1,647.3	0.0
AM	421.36	707	22,590	9.5	1,648.6	1,648.6	1,648.9	0.3
AN	421.81	492	14,966	14.4	1,649.4	1,649.4	1,649.6	0.2
AO	422.62	534	15,134	14.2	1,656.1	1,656.1	1,656.8	0.7
AP	423.42	540	13,607	15.8	1,663.2	1,663.2	1,664.0	0.8
AQ	423.85	750	14,907	14.3	1,668.7	1,668.7	1,669.7	1.0
AR	424.37	1,000	18,618	11.4	1,680.7	1,680.7	1,681.7	1.0
AS	425.54	1,300	25,095	8.5	1,694.7	1,694.7	1,694.9	0.2
AT	425.79	850	15,312	13.0	1,695.2	1,695.2	1,695.3	0.1
AU	426.10	450	11,250	17.7	1,699.0	1,699.0	1,699.0	0.0
AV	426.52	600	15,947	12.5	1,705.6	1,705.6	1,705.8	0.2
AW	427.23	710	12,460	10.4	1,709.3	1,709.3	1,710.1	0.8
AX	427.74	806	14,015	9.0	1,714.6	1,714.6	1,714.8	0.2
AY	428.27	670	10,473	12.0	1,718.9	1,718.9	1,719.0	0.1
AZ	429.05	524	8,826	14.3	1,727.5	1,727.5	1,727.5	0.0

[1] Miles above mouth

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Guadalupe River (continued)								
BA	429.73	1,218	18,706	6.6	1,737.4	1,737.4	1,737.4	0.0
BB	430.32	499	9,121	13.5	1,741.7	1,741.7	1,741.7	0.0
BC	430.90	1,090	11,021	11.2	1,750.5	1,750.5	1,750.5	0.0
BD	431.52	1,010	12,976	9.5	1,756.6	1,756.6	1,756.6	0.0

[1] Miles above mouth

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Johnson Creek								
A	0.19	340	6,658	12.9	1,696.3	1,693.6[2]	1,693.6	0.0
B	0.59	946	8,930	9.6	1,700.3	1,700.3	1,700.3	0.0
C	1.05	718	7,972	10.8	1,708.4	1,708.4	1,708.5	0.1
D	1.54	600	8,614	10.0	1,715.0	1,715.0	1,715.1	0.1
E	2.12	540	7,578	11.3	1,721.5	1,721.5	1,721.7	0.2
F	2.81	813	10,300	8.1	1,731.3	1,731.3	1,731.3	0.0
G	3.30	540	7,774	10.7	1,736.2	1,736.2	1,736.2	0.0
H	3.89	342	5,204	15.9	1,744.3	1,744.3	1,744.3	0.0
I	4.55	886	9,977	8.1	1,757.4	1,757.4	1,757.4	0.0
J	5.36	423	5,727	13.8	1,766.0	1,766.0	1,766.0	0.0
K	6.18	500	6,837	11.3	1,780.1	1,780.1	1,780.2	0.1
L	6.97	520	7,187	10.7	1,791.0	1,791.0	1,791.1	0.1
M	7.48	652	8,405	8.9	1,798.2	1,798.2	1,799.0	0.8
N	7.96	936	11,286	6.4	1,805.7	1,805.7	1,805.8	0.1
O	8.34	1,445	13,636	5.3	1,808.9	1,808.9	1,809.0	0.1
P	8.74	939	7,327	9.9	1,813.6	1,813.6	1,813.6	0.0
Q	9.37	1,262	10,974	6.4	1,824.8	1,824.8	1,824.8	0.0
R	9.85	319	4,732	14.4	1,828.7	1,828.7	1,828.7	0.0
S	10.22	374	5,107	13.3	1,837.3	1,837.3	1,837.3	0.0
T	10.54	359	5,515	12.1	1,843.9	1,843.9	1,843.9	0.0
U	11.30	305	4,785	13.5	1,855.1	1,855.1	1,855.1	0.0
V	11.74	606	10,253	6.3	1,877.7	1,877.7	1,878.6	0.9
W	12.18	863	11,492	5.4	1,880.0	1,880.0	1,880.7	0.7
X	12.90	438	4,635	12.9	1,887.0	1,887.0	1,887.0	0.0
Y	13.47	611	6,560	8.8	1,903.0	1,903.0	1,903.1	0.1
Z	14.03	577	4,657	12.1	1,914.6	1,914.6	1,915.0	0.4
AA	14.32	537	6,149	9.2	1,917.8	1,917.8	1,917.9	0.1
AB	14.39	194	2,760	20.5	1,917.7	1,917.7	1,918.3	0.6

[1] Miles above confluence with Guadalupe River

[2] Elevation computed without consideration of backwater effects from Guadalupe River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
North Fork Guadalupe River								
A	0.24	379	5,898	17.3	1,758.5	1,758.5	1,758.5	0.0
B	0.61	900	13,813	7.4	1,769.1	1,769.1	1,769.1	0.0
C	1.23	891	12,971	7.9	1,774.3	1,774.3	1,774.3	0.0
D	1.61	484	6,734	15.1	1,778.1	1,778.1	1,778.1	0.0
E	2.29	959	12,543	8.1	1,789.6	1,789.6	1,790.1	0.5
F	2.72	994	12,264	8.1	1,793.7	1,793.7	1,793.8	0.1
G	3.22	301	6,264	15.8	1,798.3	1,798.3	1,798.4	0.1
H	3.77	946	12,292	8.1	1,807.5	1,807.5	1,807.6	0.1
I	4.12	920	12,769	7.8	1,810.5	1,810.5	1,811.0	0.5
J	4.52	714	9,282	10.7	1,814.9	1,814.9	1,814.9	0.0
K	5.00	1,040	12,403	8.0	1,821.6	1,821.6	1,821.6	0.0
L	5.41	992	10,596	9.3	1,827.3	1,827.3	1,827.3	0.0
M	5.83	926	12,654	7.8	1,832.6	1,832.6	1,832.6	0.0

[1] Miles above confluence with Guadalupe River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Quinlan Creek								
A	5,000	133	1,178	9.4	1,606.7	1,602.2[2]	1,602.7	0.5
B	6,100	129	1,400	7.7	1,606.7	1,606.7	1,607.5	0.8
C	6,750	194	1,617	6.7	1,611.5	1,611.5	1,612.3	0.8
D	7,650	179	1,358	8.0	1,618.4	1,618.4	1,619.3	0.9
E	8,450	175	1,777	6.1	1,622.9	1,622.9	1,623.8	0.9
F	9,400	289	2,032	5.1	1,628.0	1,628.0	1,628.8	0.8
G	10,400	167	1,436	7.2	1,632.8	1,632.8	1,633.6	0.8
H	11,350	138	1,215	7.7	1,638.1	1,638.1	1,638.6	0.5
I	12,050	150	1,464	6.4	1,640.3	1,640.3	1,640.8	0.5
J	13,150	146	1,308	7.1	1,645.2	1,645.2	1,646.2	1.0
K	13,650	208	1,748	5.3	1,652.0	1,652.0	1,652.9	0.9
L	15,300	211	1,663	5.5	1,656.4	1,656.4	1,657.2	0.8
M	16,250	107	934	9.8	1,662.1	1,662.1	1,662.9	0.8
N	16,700	139	904	10.1	1,667.4	1,667.4	1,667.7	0.3
O	18,430	217	1,677	5.2	1,678.0	1,678.0	1,678.9	0.9
P	19,350	137	1,121	7.5	1,682.2	1,682.2	1,683.1	0.9
Q	20,150	139	1,093	7.7	1,687.9	1,687.9	1,688.8	0.9
R	20,500	160	1,489	5.6	1,690.4	1,690.4	1,691.1	0.7
S	21,800	154	1,546	5.1	1,700.5	1,700.5	1,701.0	0.5
T	23,400	119	1,099	6.8	1,708.2	1,708.2	1,708.5	0.3
U	23,910	206	2,586	2.9	1,716.0	1,716.0	1,716.0	0.0
V	24,760	102	731	10.2	1,719.6	1,719.6	1,720.0	0.4

[1] Feet above confluence with Guadalupe River

[2] Elevations computed without consideration of backwater effects from Guadalupe River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
South Fork Guadalupe River								
A	0.40	*	*	*	1,762.5	1,762.5	*	*
B	1.79	*	*	*	1,786.0	1,786.0	*	*
C	4.34	*	*	*	1,820.0	1,820.0	*	*
D	5.86	*	*	*	1,842.2	1,842.2	*	*
E	7.85	*	*	*	1,880.2	1,880.2	*	*
F	8.38	*	*	*	1,884.4	1,884.4	*	*

[1] Miles above confluence with Guadalupe River

* Data not available

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Stream QC-1								
A	400	54	332	2.6	1,687.8	1,687.8	1,688.4	0.6
B	790	29	104	8.3	1,691.1	1,691.1	1,691.1	0.0
C	1,490	53	221	3.9	1,715.1	1,715.1	1,715.5	0.4
D	1,970	55	135	6.4	1,722.6	1,722.6	1,722.6	0.0
E	2,310	50	111	7.8	1,730.8	1,730.8	1,731.0	0.2
F	3,000	95	270	3.2	1,749.2	1,749.2	1,749.7	0.5
G	3,470	95	363	2.4	1,758.4	1,758.4	1,759.3	0.9
H	3,920	57	404	2.1	1,768.8	1,768.8	1,769.7	0.9
I	4,970	62	77	5.9	1,801.6	1,801.6	1,801.6	0.0
Stream QC-2								
A	145	50	174	6.3	1,692.1	1,692.1	1,692.5	0.4
B	565	51	173	6.3	1,696.5	1,696.5	1,696.5	0.0
C	850	62	162	7.1	1,706.1	1,706.1	1,706.4	0.3
D	1,265	58	229	5.0	1,714.5	1,714.5	1,715.0	0.5
E	1,520	44	153	7.5	1,719.3	1,719.3	1,719.5	0.2
F	1,785	42	158	7.3	1,724.3	1,724.3	1,724.7	0.4
G	2,050	105	190	5.1	1,730.0	1,730.0	1,730.4	0.4

[1] Feet above confluence with Quinlan Creek

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Stream TC-1								
A	230	40	420	7.5	1,661.4	1,657.5[2]	1,658.5	1.0
B	810	52	362	8.7	1,664.6	1,664.6	1,665.0	0.4
C	1,590	61	425	7.4	1,674.0	1,674.0	1,674.2	0.2
D	2,360	54	438	7.2	1,681.7	1,681.7	1,681.8	0.1
E	2,760	38	305	10.0	1,687.0	1,687.0	1,687.1	0.1
F	3,310	63	2,177	1.4	1,718.5	1,718.5	1,718.8	0.3

[1] Feet above confluence with Town Creek

[2] Elevation computed without consideration of backwater effects from Town Creek

FLOODING SOURCE		FLOODWAY			(FEET NAVD)			
CROSS-SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Town Creek								
A	890	182	3,507	5.2	1,624.1	1,619.5[2]	1,620.5	1.0
B	1,840	148	2,947	6.2	1,624.1	1,621.4[2]	1,622.3	0.9
C	2,270	179	3,061	5.9	1,624.1	1,623.0[2]	1,623.6	0.6
D	3,190	149	2,115	8.6	1,624.9	1,624.9	1,625.7	0.8
E	4,200	240	3,571	5.1	1,629.6	1,629.6	1,630.6	1.0
F	4,630	250	2,697	6.8	1,630.5	1,630.5	1,631.3	0.8
G	5,570	186	2,316	7.9	1,634.5	1,634.5	1,635.0	0.5
H	6,320	134	1,828	9.9	1,637.7	1,637.7	1,638.3	0.6
I	7,450	220	2,100	8.7	1,642.4	1,642.4	1,643.3	0.9
J	8,190	166	2,194	8.3	1,644.2	1,644.2	1,645.0	0.8
K	9,040	191	2,226	8.2	1,647.7	1,647.7	1,648.6	0.9
L	9,970	174	2,231	8.1	1,652.2	1,652.2	1,653.2	1.0
M	10,830	150	2,069	8.7	1,656.6	1,656.6	1,657.6	1.0
N	11,500	200	3,116	5.8	1,661.5	1,661.5	1,662.3	0.8
O	12,780	237	2,355	7.5	1,664.8	1,664.8	1,665.3	0.5
P	13,240	150	1,825	9.7	1,666.0	1,666.0	1,666.5	0.5
Q	14,000	207	3,162	5.6	1,672.0	1,672.0	1,672.8	0.8
R	14,640	166	1,887	9.4	1,672.9	1,672.9	1,673.5	0.6
S	15,600	202	2,647	6.7	1,677.4	1,677.4	1,678.3	0.9
T	16,320	190	2,474	7.1	1,679.3	1,679.3	1,680.0	0.7
U	16,995	204	2,290	7.7	1,681.5	1,681.5	1,682.3	0.8
V	18,100	268	3,087	5.7	1,688.4	1,688.4	1,688.7	0.3

[1] Feet above confluence with Guadalupe River

[2] Elevation computed without consideration of backwater effects from Guadalupe River

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 (FIRM)

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 current countywide FIRM presents flooding information for the entire geographic area of Kerr County. 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 8, “Community Map History.”

Table 8: Community Map History

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Ingram, City of*	December 13, 1977	None	May 1, 1979	None
Kerrville, City of	June 28, 1974	November 5, 1976 March 5, 1976	September 29, 1978	January 19, 1982
Kerr County (Unincorporated Areas)	December 13, 1977	None	May 1, 1979	None

*Dates for this community were taken from Kerr County, Unincorporated Areas

TABLE 7	FEDERAL EMERGENCY MANAGEMENT AGENCY KERR COUNTY, TX AND INCORPORATED AREAS	COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Flood Insurance Studies and FIRMs have been published for the unincorporated areas of Kerr County and the City of Kerrville (References 14, 19, 20, and 21). Flood Insurance Studies and FIRMs have also been published for Kerr County and the incorporated areas of Kerr County (References 15 and 16).

No previous studies have been prepared for the City of Ingram.

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:

FEMA, Federal Insurance and Mitigation Division,
Federal Regional Center
800 North Loop 288
Denton, Texas 76209.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of Commerce, Bureau of the Census, https://www.census.gov/quickfacts/; (28 February 2018).

2. U.S. Water Resources Council, Hydrology Committee, Bulletin No. 17, Guidelines for Determining Flood Flow Frequency, Washington, D.C., March 1976.

3. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package. Generalized Computer Program, Davis, California, January 1973 and September 1990.

4. U.S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, May 1961.

5. U.S. Department of the Army, Corps of Engineers, Fort Worth District, Hydrologic and Hydraulic Data Files, Comfort Reservoir Study, 1962.

6. U.S. Department of the Army, Corps of Engineers, Fort Worth District, 205 Reconnaissance Study of Llano River near Junction, 1975.

7. U.S. Department of the Army, Corps of Engineers, Fort Worth and Galveston Districts, Comprehensive Survey Report on Colorado River and Tributaries, March 1966.

8. U.S. Department of the Army, Corps of Engineers, Fort Worth District, Flood Plain Investigation - Cibolo Creek, 1973.

9. U.S. Department of the Army, Corps of Engineers, Fort Worth District, Hydrology Files, Flood Plain Investigation Report, San Antonio River above Bexar-Wilson County Line, 1975.

10. U.S. Department of the Army, Corps of Engineers, Fort Worth District, Flood Plain Investigation – Huebner Creek, 1975.

11. U.S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Washington, D.C., 1972.

12. U.S. Department of Commerce, National Weather Service, Technical Memorandum NWS Hydro-35, Five- to 60-Minute Precipitation Frequency for the Eastern and Central United States, Silver Spring, Maryland, June 1977.

13. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, October 1973 and September 1990.

14. Federal Emergency Management Agency, Flood Insurance Study. City of Kerrville. Kerr County, Texas, Washington, D.C., March 1978, Revised January 19, 1982.

15. Federal Emergency Management Agency, Flood Insurance Rate Map, Kerr County, Texas and Incorporated Areas, Washington, D.C., July 19, 2000.

16. Federal Emergency Management Agency, Flood Insurance Study, Kerr County, Texas and Incorporated Areas, Washington, D.C., July 19, 2000.

17. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Quadrangle Maps: Comfort, Center Point, Legion, Kerrville, Hunt, Bee Caves, Mountain Home, Contrary Creek, 1964.

18. U.S. Department of the Army, Corps of Engineers, Fort Worth District, Kerrville, Texas (Kerr County). Preliminary Flood Insurance Study, October 7, 1997.

19. Federal Emergency Management Agency, Flood Insurance Rate Map, Kerr County, Texas (Unincorporated Areas), Washington, D.C., May 1, 1979.

20. Federal Emergency Management Agency, Flood Insurance Rate Map, City of Kerrville, Kerr County, Texas, Washington, D.C., January 19, 1982.

21. Federal Emergency Management Agency, Flood Insurance Study, Kerr County, Texas (Unincorporated Areas), Washington, D.C., January 1979.

22. Texas Natural Resources Information System, TNRIS 2014 50cm Bandera and Lampasas LiDAR, November 2014

23. Texas Natural Resources Information System, TNRIS 2012 50cm TCEQ Dam Safety Sites LiDAR, August 2012

24. Texas Natural Resources Information System, TNRIS 2011 50cm Blanco, Caldwell, Gonzales, Kerr LiDAR, November 2011

25. Chow, Ven T. Open Channel Hydraulics. Caldwell, NJ: Blackburn, 1959. Print

26. U.S Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS Version 4.1.0, Davis, California, January 2010

27. Watershed Concepts, a Division of Hayes, Seay, Mattern & Mattern. Watershed Information System (WISE), Version 4.1.0, 2008

10.0 REVISION DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS was printed. Future revisions may be made that do not result in the republishing of the FIS report. To assure that user is aware of all revisions, it is advisable to contact the community repository for any additional data.

10.1 First Revision (March 3, 2011)

As part of this revision, the format of the map panels has changed. Some of the flood insurance zone designations were changed to reflect the new format. Areas previously shown as numbered Zone A were changed to Zone AE, Zone B was revised to Zone X (shaded), and Zone C was revised to Zone X (unshaded).

For this countywide revision, all flooding sources that had been previously studied by detailed methods and not subsequently restudied were redelineated. This process consisted of updating the floodplain boundaries based on the most current topographic data. New hydrologic and hydraulic analyses were not performed on the redelineated flooding sources. All flooding sources that had been previously studied by approximate methods and not subsequently restudied were refined. This process consisted of digitizing the Zone A floodplain boundaries from the previous FIRMs and then further refining the boundaries based on the most recent contour data.

10-meter Digital Elevation Model (DEM) topographic data provided by the USGS was used to perform the redelineation and refinement of the previously studied flooding sources. 2009 two-foot contour topographic data provided by the City of Kerrville was also used to perform the redelineation and refinement of the previously studied flooding sources within the limits of Kerrville and a 2-mile buffer along the city limits.

10.2 Second Revision (May 15, 2020)

The May 15, 2020 revision was initiated by a Physical Map Revision (PMR) request submitted to FEMA by SARA.

This revision involved a watershed wide study in the Medina Watershed within the counties of Bandera, Kendall, Kerr, and Medina. In Kerr County, approximate study was performed totaling approximately 36.8 miles. Zone A analysis was performed using WISE and HEC-RAS Version 4.1 in Kerr County.

APPENDIX A

Table 9: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Ingram, City of	481592	12100201	48265C0455F	
Kerr County, Unincorporated Areas	480419	12090203 12090204 12090206 12100201 12100302 12110106	48265C0025F[1] 48265C0050F 48265C0075F 48265C0100F 48265C0125F 48265C0150F[1] 48265C0175F 48265C0200F 48265C0225F 48265C0250F 48265C0275F 48265C0300F 48265C0325F 48265C0350F[1] 48265C0375F 48265C0400F 48265C0425F 48265C0435F 48265C0450F 48265C0455F 48265C0460F 48265C0465F 48265C0470F 48265C0480F 48265C0490F 48265C0500F 48265C0525F 48265C0550F[1] 48265C0575F 48265C0600G 48265C0625G 48265C0635F 48265C0650G 48265C0655F 48265C0675F 48265C0700F 48265C0725F[1] 48265C0750G 48265C0775G	

Table 9: Listing of NFIP Jurisdictions, continued

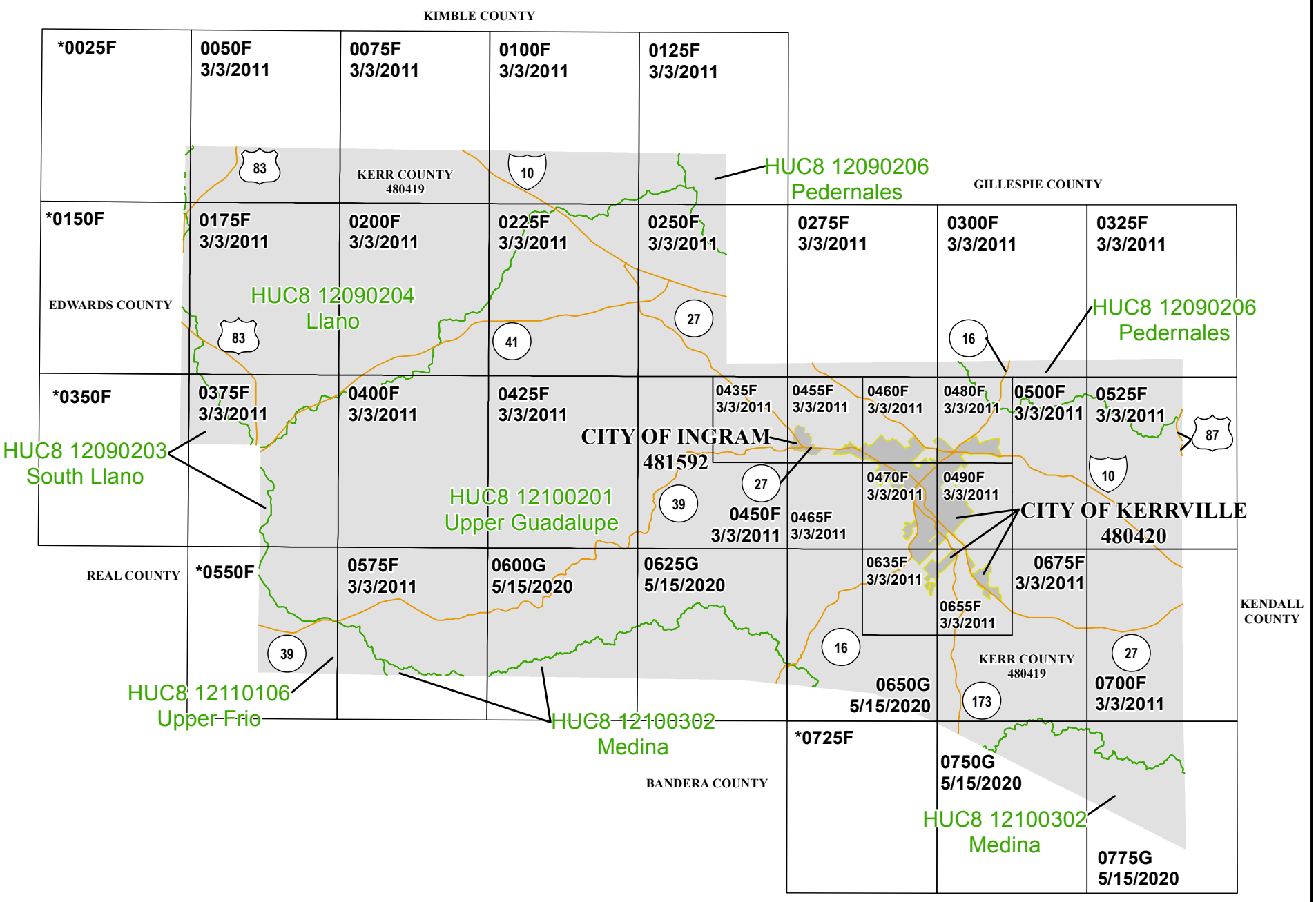
Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Kerrville, City of	480420	12100201	48265C0455F 48265C0460F 48265C0470F 48265C0480F 48265C0490F 48265C0635F 48265C0655F	

[1]Panel Not Printed

Table 10: Map Repositories

Community	Address	City	State	Zip Code
Ingram, City of	City Office 230 Highway 39	Ingram	TX	78025
Kerr County, Unincorporated Areas	Kerr County Engineering Office 3766 State Highway 27	Kerrville	TX	78028
Kerrville, City of	City Hall 701 Main Street	Kerrville	TX	78028

Figure 2: FIRM Panel Index



ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before 05/15/2020.

N

1 inch = 35,000 feet 1:420,000

0 9,500 19,000 38,000 57,000 76,000 feet

Map Projection:
State Plane Lambert Conformal Conic, Texas South Central Zone FIPS 4204; North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

COUNTY LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

KERR COUNTY, TEXAS and Incorporated Areas

PANELS PRINTED:
0050, 0075, 0100, 0125, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0375, 0400, 0425, 0435, 0450, 0455, 0460, 0465, 0470, 0480, 0490, 0500, 0525, 0575, 0600, 0625, 0635, 0650, 0655, 0675, 0700, 0750, 0775

FEMA

MAP NUMBER
48265CIND0B

MAP REVISED
MAY 15, 2020

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 3 contains the full list of these notes.

Figure 3: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates, refer to the Notice to Flood Insurance Study Users and Table 8 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations and/or Transect Data tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to “Section 2.4: Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

Figure 3: FIRM Notes to Users, continued

PROJECTION INFORMATION: The projection used in the preparation of the map was State Plane Lambert Conformal Conic, Texas South Central Zone FIPS 4204; North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://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, Maryland 20910-3282
(301) 713-3242

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed on the FIRM Index.

BASE MAP INFORMATION: Base map information shown on this FIRM was derived from digital data obtained from U.S. Census Bureau TIGER files dated 2017 and the National Flood Hazard Layer (NFHL) dated 2011.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Kerr County, Texas, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to the FIRM Index to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before May 15, 2020.

Figure 3: FIRM Notes to Users, continued

SPECIAL NOTES FOR SPECIFIC FIRM PANELS
This Notes to Users section was created specifically for Kerr County, Texas, effective May 15, 2020.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 4 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Kerr County.

Figure 4: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

	Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.
	Regulatory Floodway determined in Zone AE.

OTHER AREAS OF FLOOD HAZARD

	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.

Figure 4: Map Legend for FIRM, continued

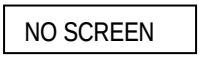
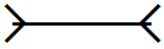
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood.
	Area with Flood Risk due to Levee: Areas where a non-accredited levee, dike, or other flood control structure is shown as providing protection to less than the 1% annual chance flood.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
Aqueduct *Channel* *Culvert* *Storm Sewer*	Channel, Culvert, Aqueduct, or Storm Sewer
Dam *Jetty* *Weir*	Dam, Jetty, Weir
	Levee, Dike, or Floodwall
 *Bridge*	Bridge
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.*	
 **CBRS AREA** **09/30/2009**	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.

Figure 4: Map Legend for FIRM, continued

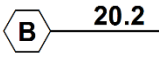
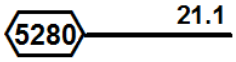
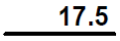
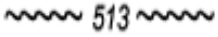
	Otherwise Protected Area
REFERENCE MARKERS	
	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
	Base Flood Elevation Line
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity
BASE MAP FEATURES	
	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway
	County Highway
	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile

Figure 4: Map Legend for FIRM, continued

 *RAILROAD*	Railroad
———————	Horizontal Reference Grid Line
⎯⎯	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}$E	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

1% ANNUAL CHANCE BACKWATER FROM GUADALUPE RIVER

STATE HIGHWAY 173 (LOOP 534)

GOLF CART CROSSING

GOLF CART BRIDGE

GOLF COURSE DAM

ELEVATION IN FEET (NAVD)

1,630
1,620
1,610
1,600
1,590
1,580
1,570
1,560
1,550
1,540

0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH GUADALUPE RIVER

A
B
C
D
E

LEGEND

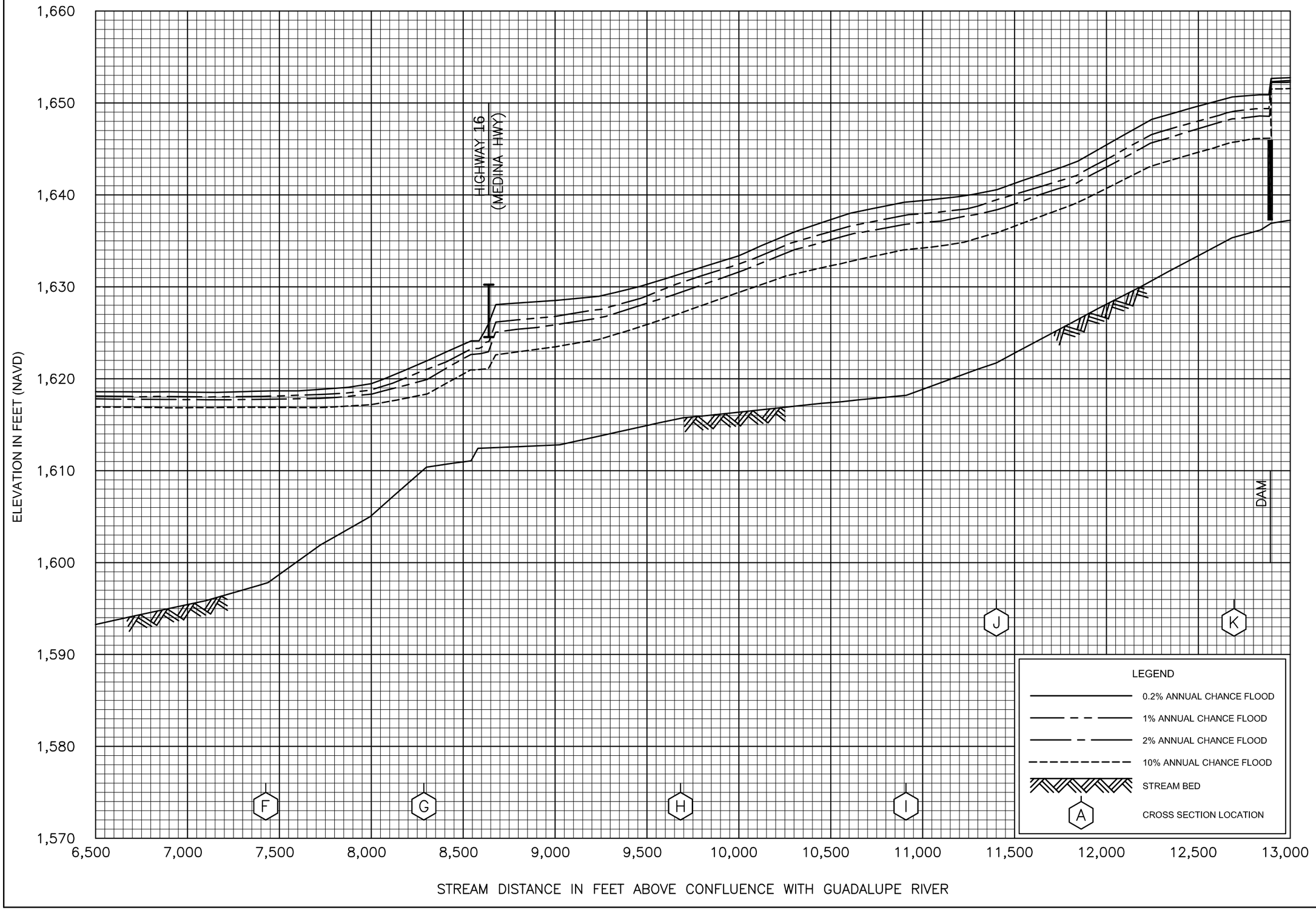
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

FLOOD PROFILES

CAMP MEETING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



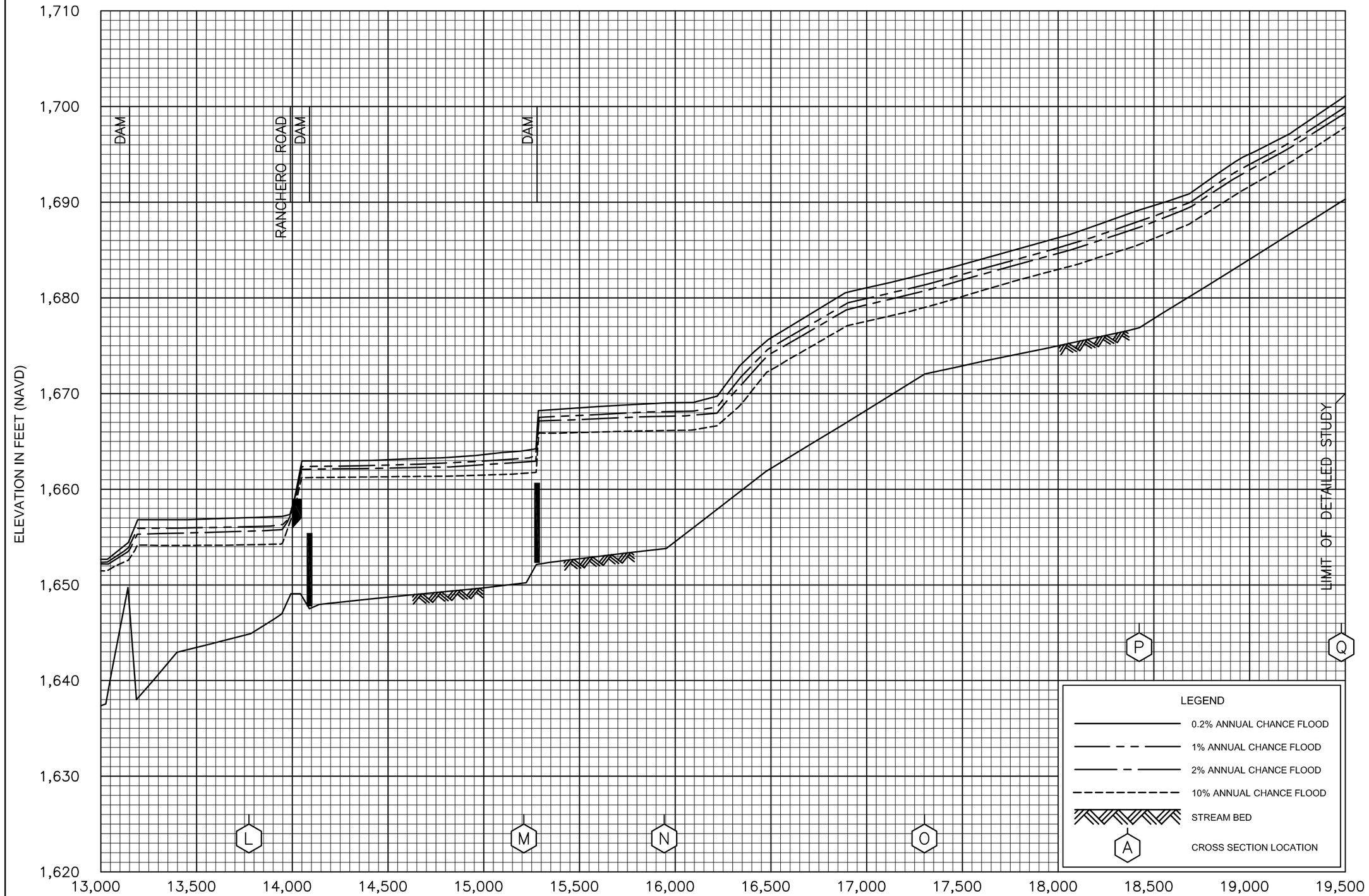
FLOOD PROFILES

CAMP MEETING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

02P



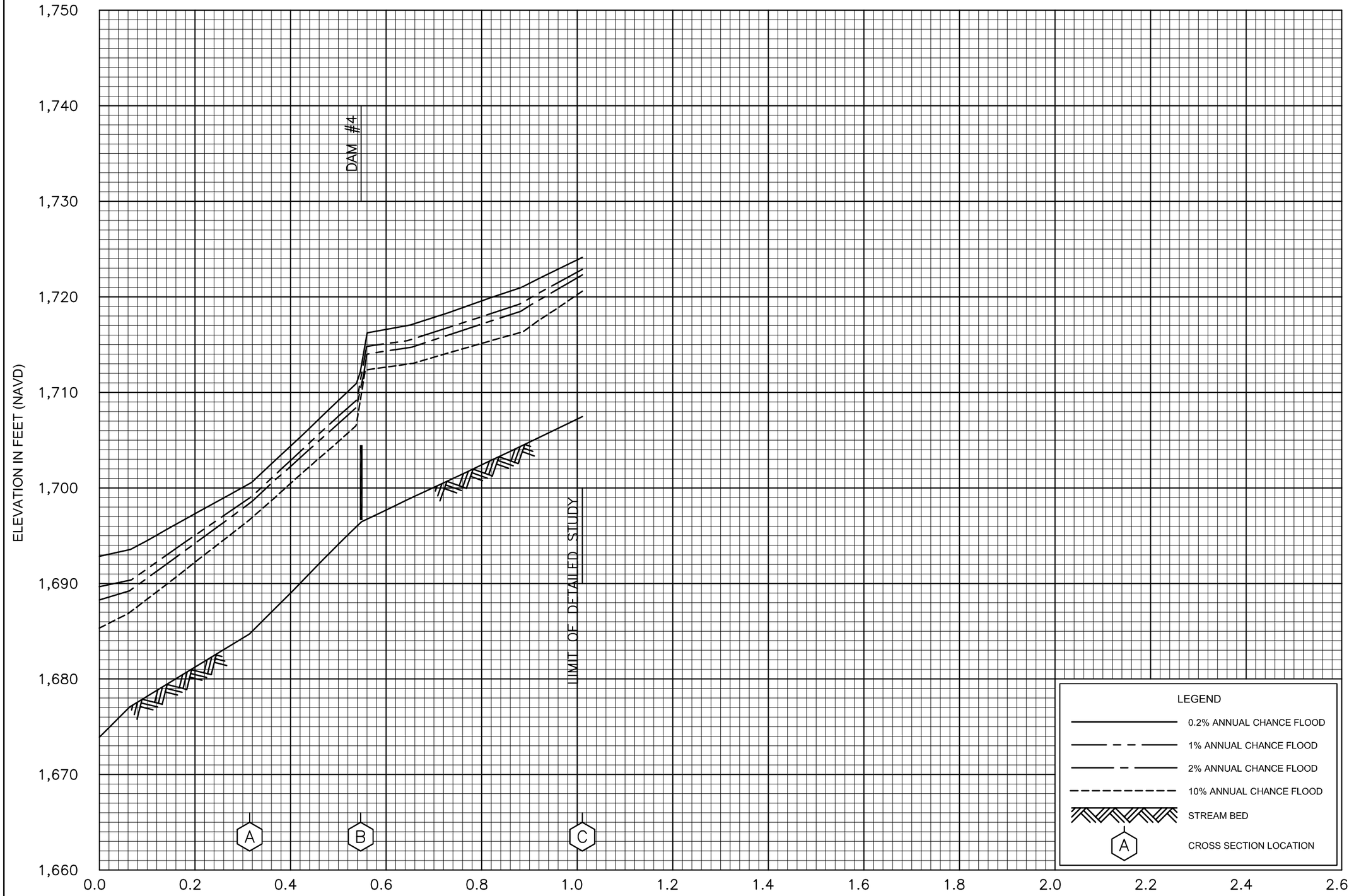
FLOOD PROFILES

CAMP MEETING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

03P



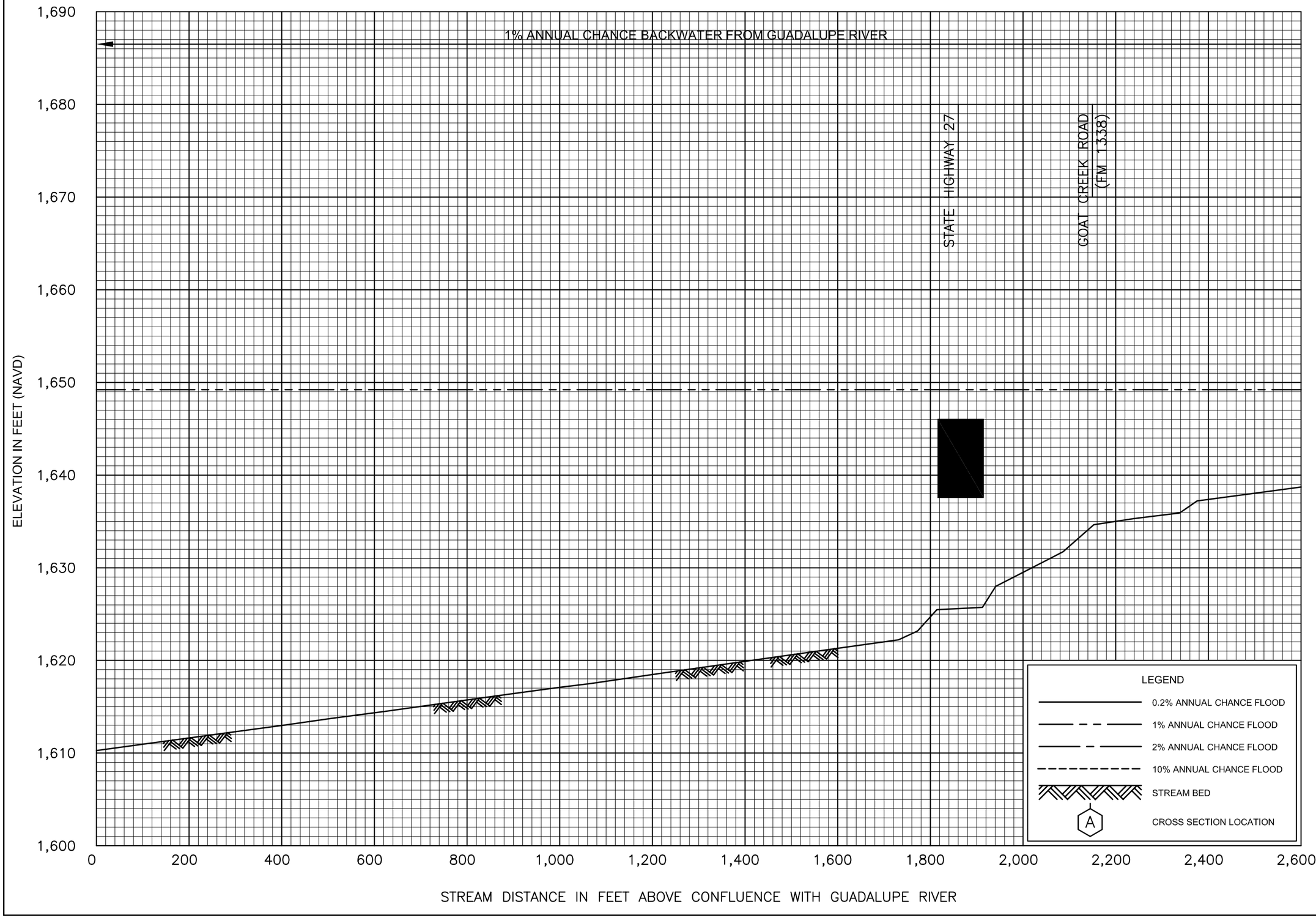
FLOOD PROFILES

EAST TOWN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

04P



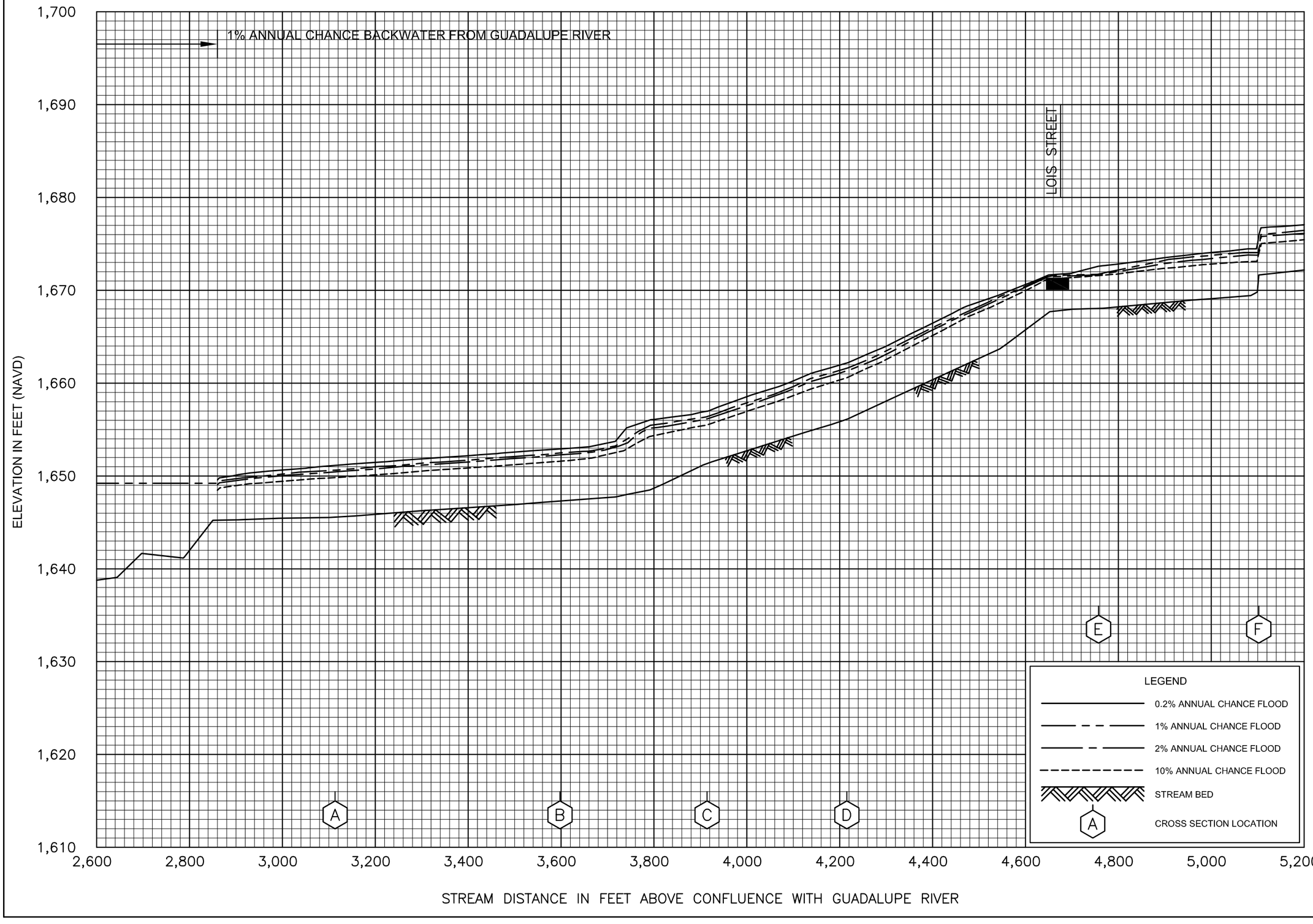
FLOOD PROFILES

ELM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

05P



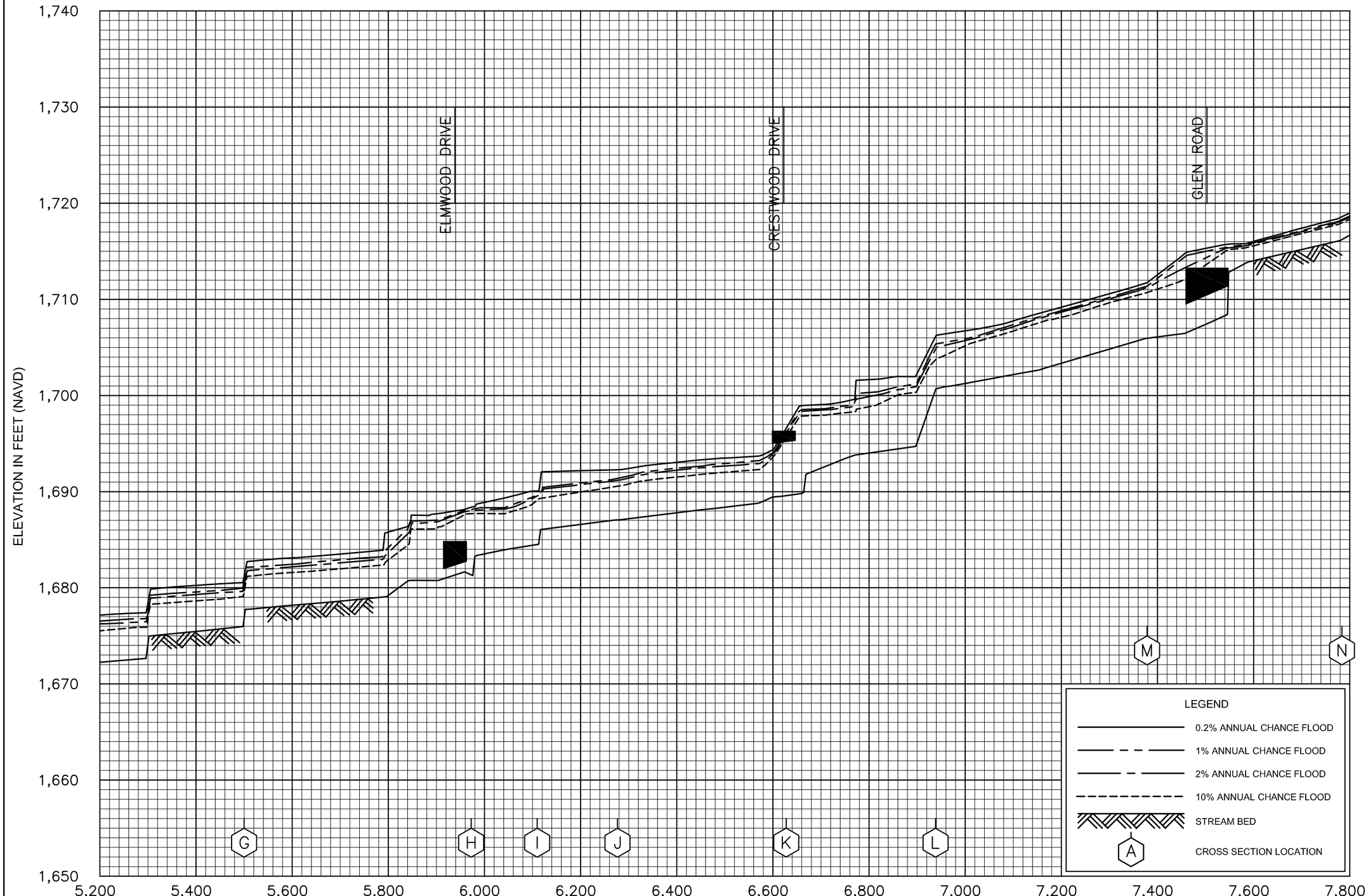
FLOOD PROFILES

ELM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

06P



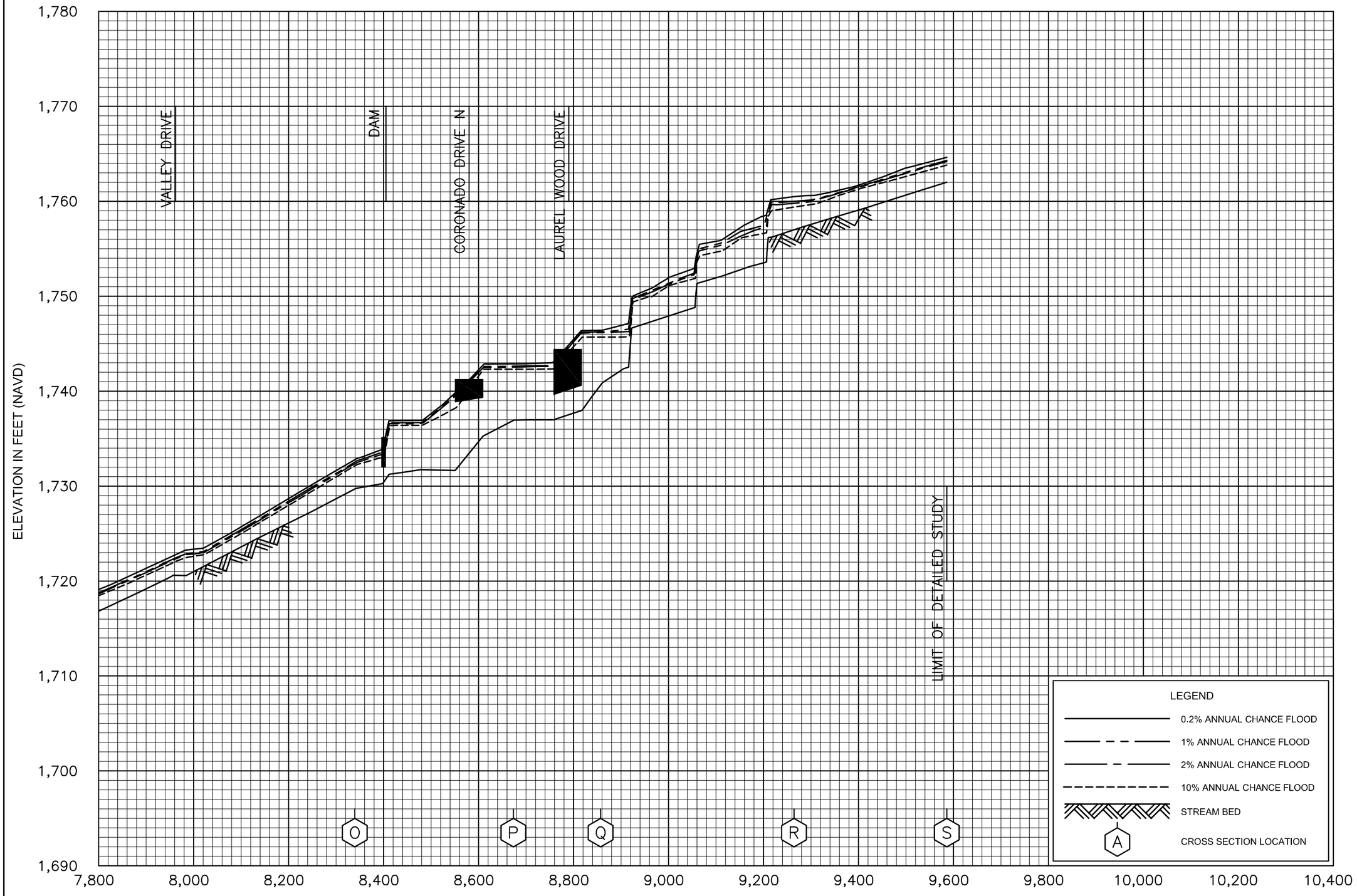
FLOOD PROFILES

ELM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

07P



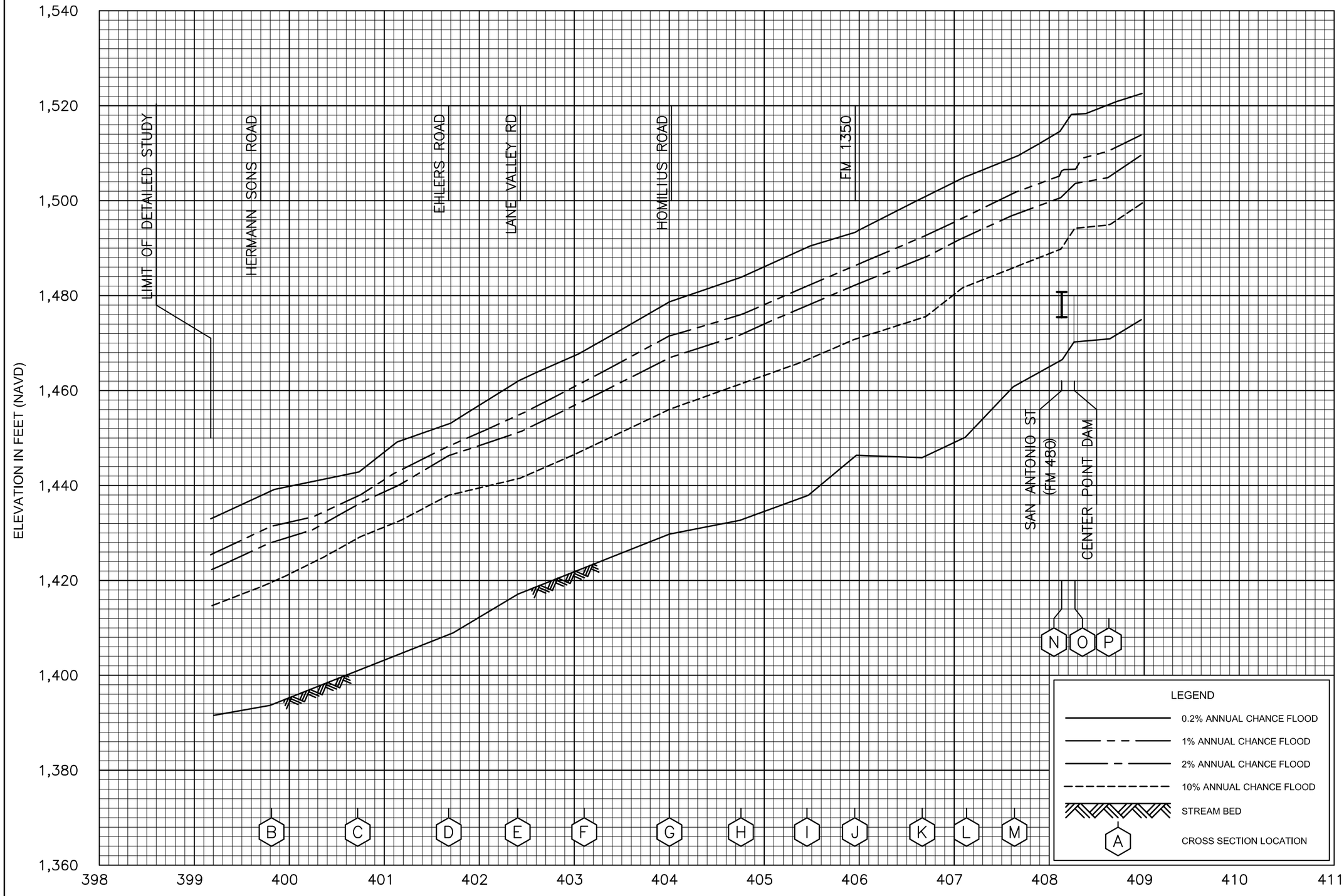
FLOOD PROFILES

ELM CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

08P



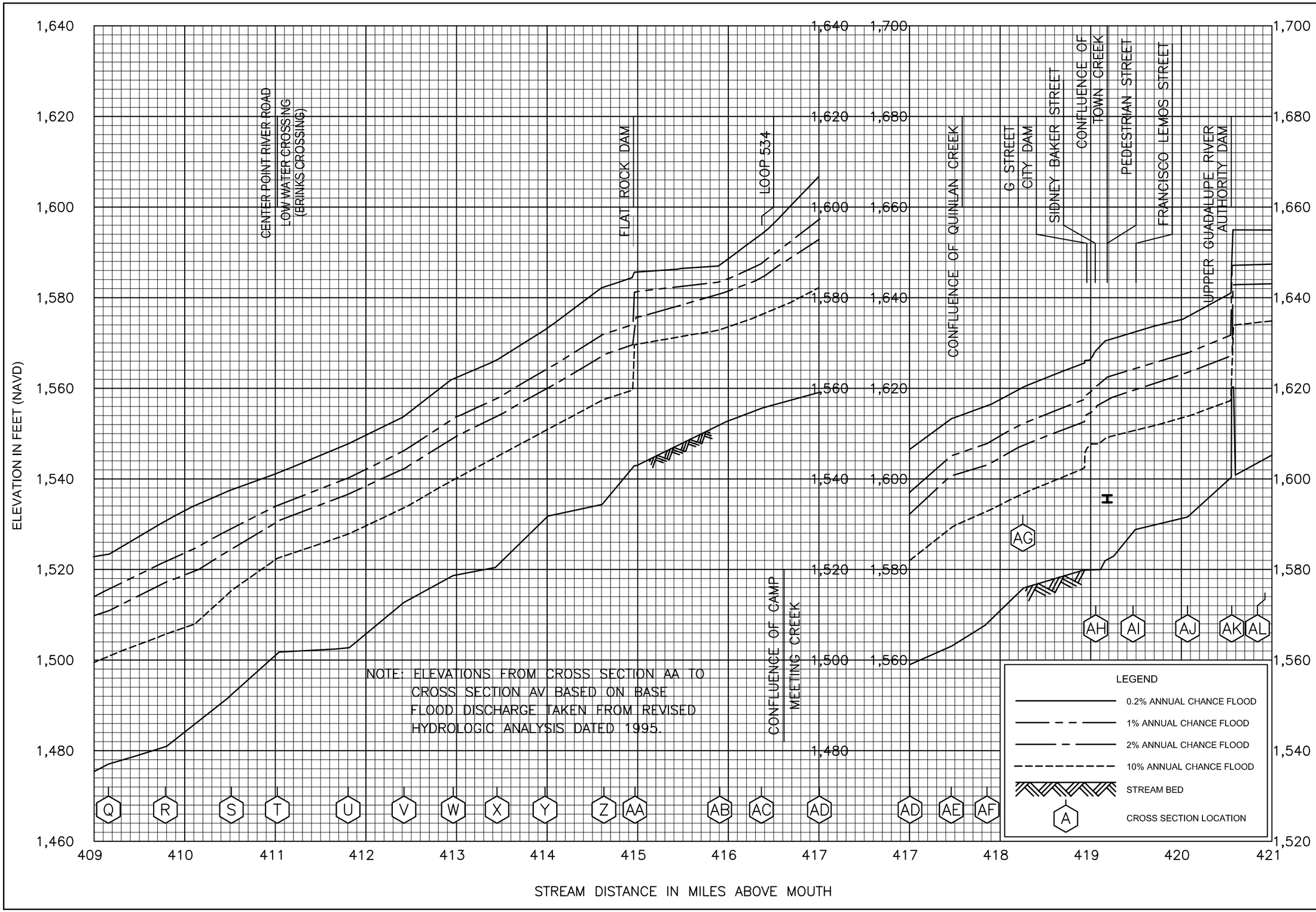
FLOOD PROFILES

GUADALUPE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

09P



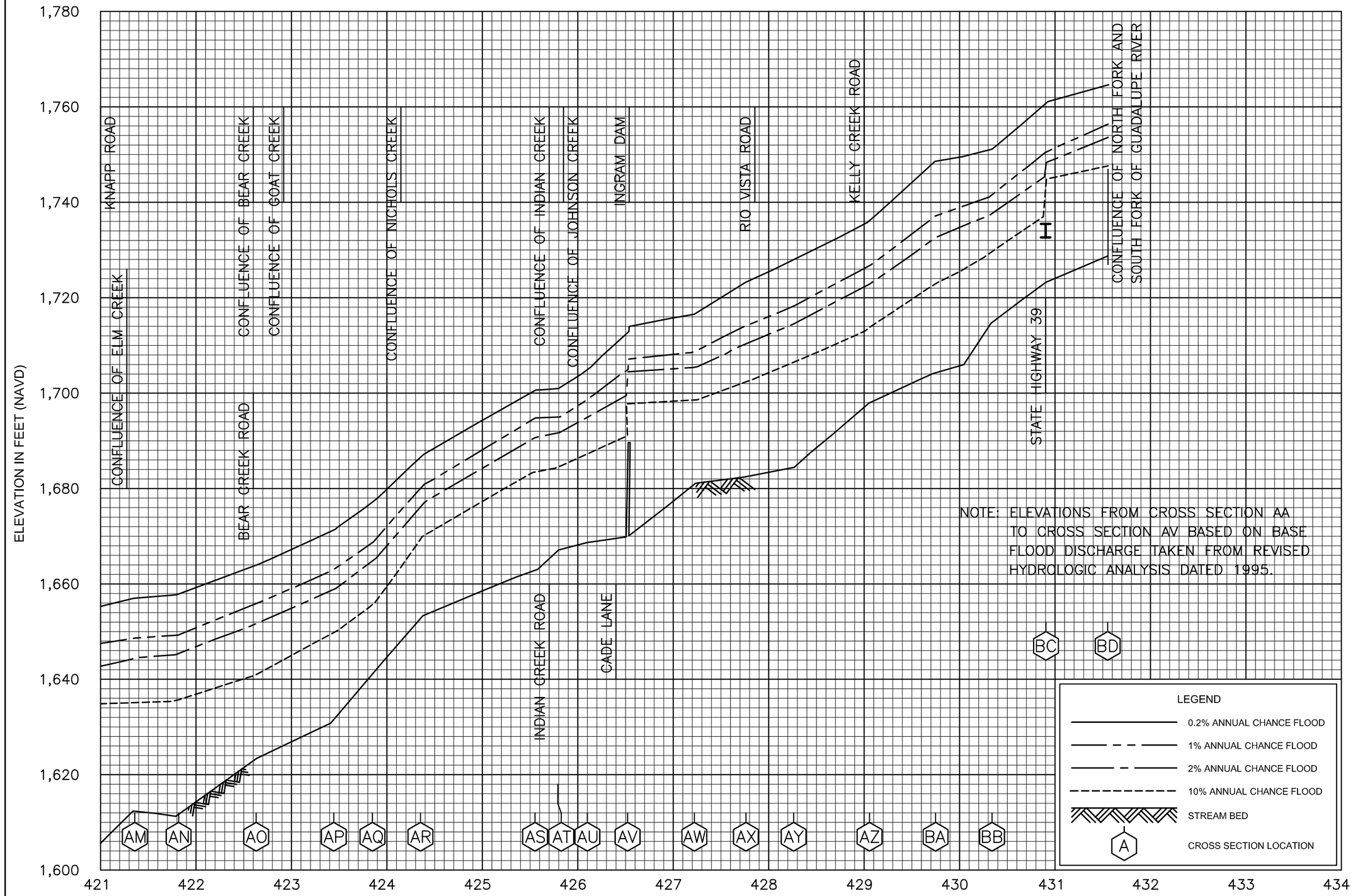
FLOOD PROFILES

GUADALUPE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

10P



FLOOD PROFILES

GUADALUPE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

11P

1% ANNUAL CHANCE BACKWATER FROM GUADALUPE RIVER

LITTLE FIELD DRIVE

DOWDY ROAD

HOOT OWL HOLLOW ROAD

UNNAMED ROAD

2216 W ROAD

BLUFF TRAIL ROAD

ANDERSON ROAD W

STATE HIGHWAY 39

USGS GAGING STATION

ELEVATION IN FEET (NAVD)

1,820
1,800
1,780
1,760
1,740
1,720
1,700
1,680
1,660
1,640

0 1 2 3 4 5 6 7 8 9 10 11 12 13

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH GUADALUPE RIVER

A B C D E F G H I J K L M N

LEGEND

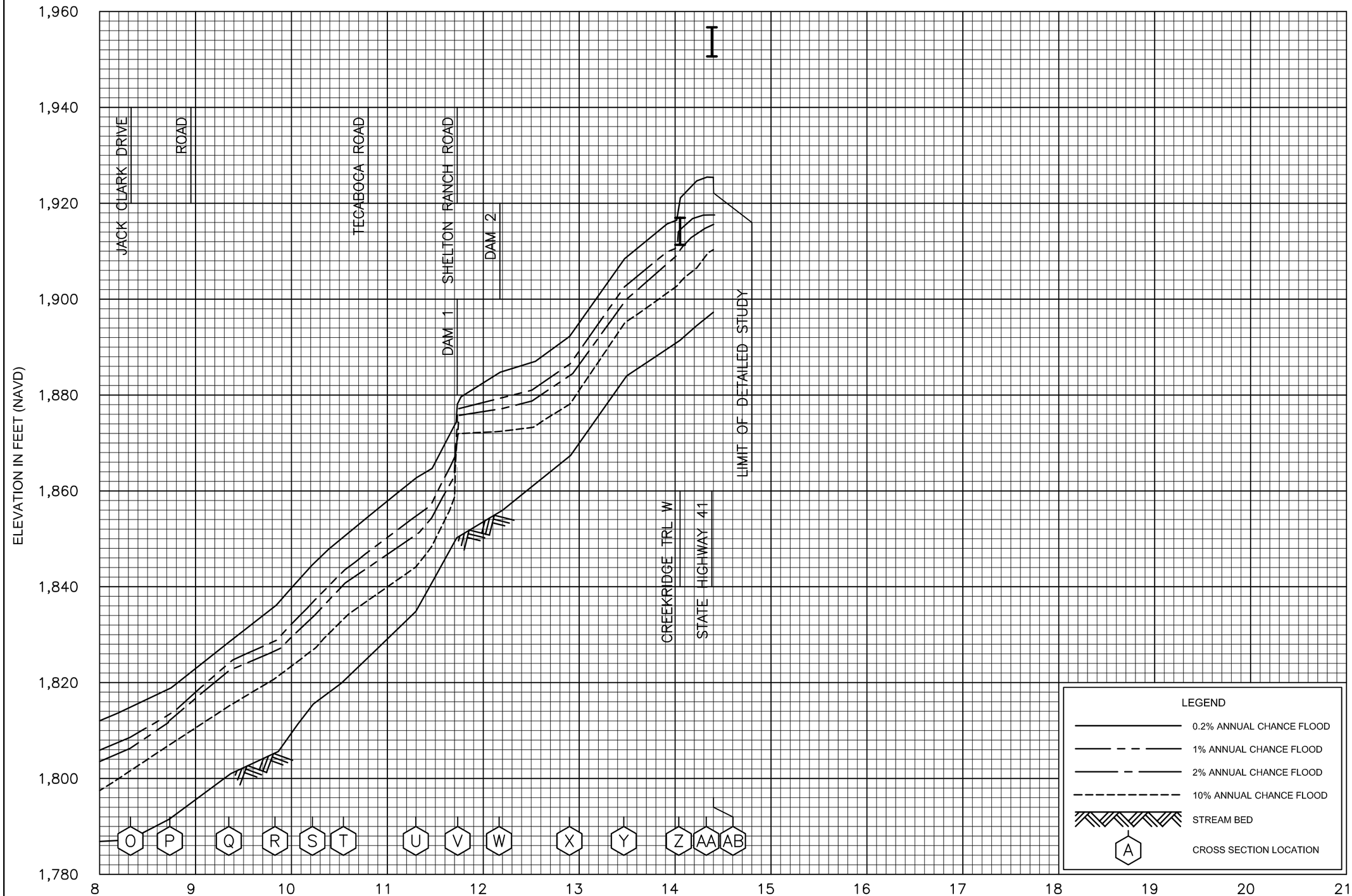
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- A CROSS SECTION LOCATION

FLOOD PROFILES

JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



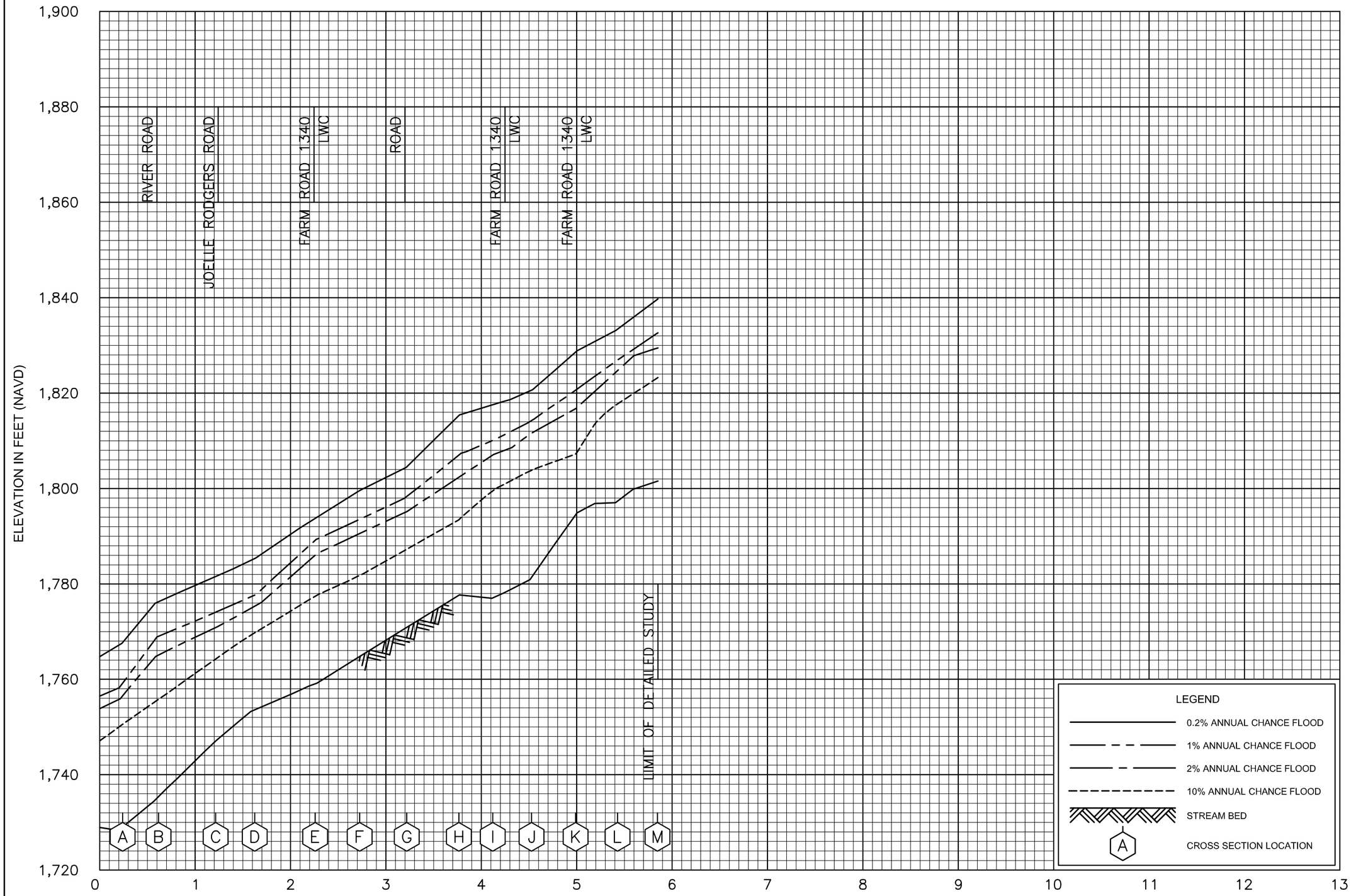
FLOOD PROFILES

JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

13P

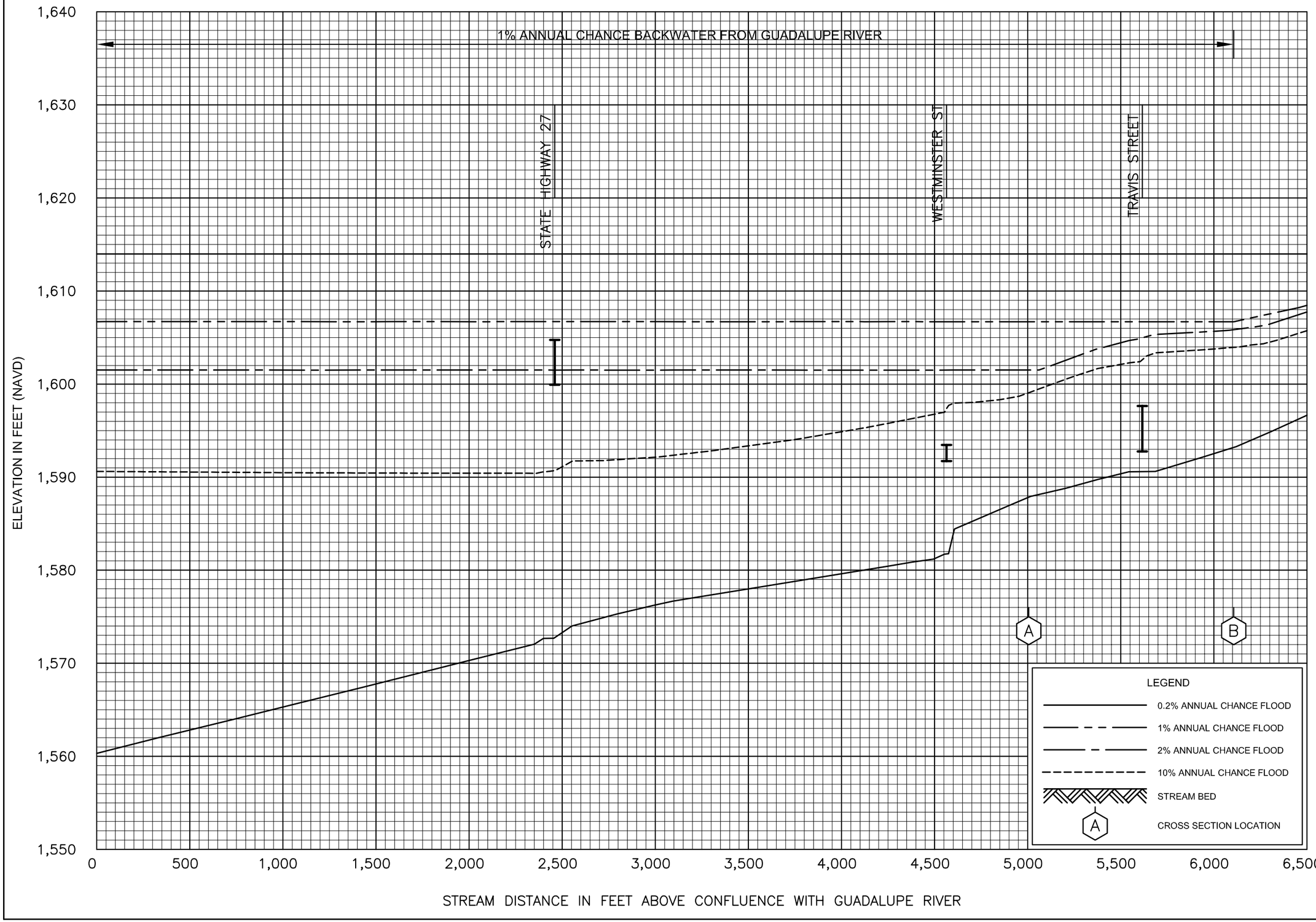


FLOOD PROFILES

NORTH FORK GUADALUPE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



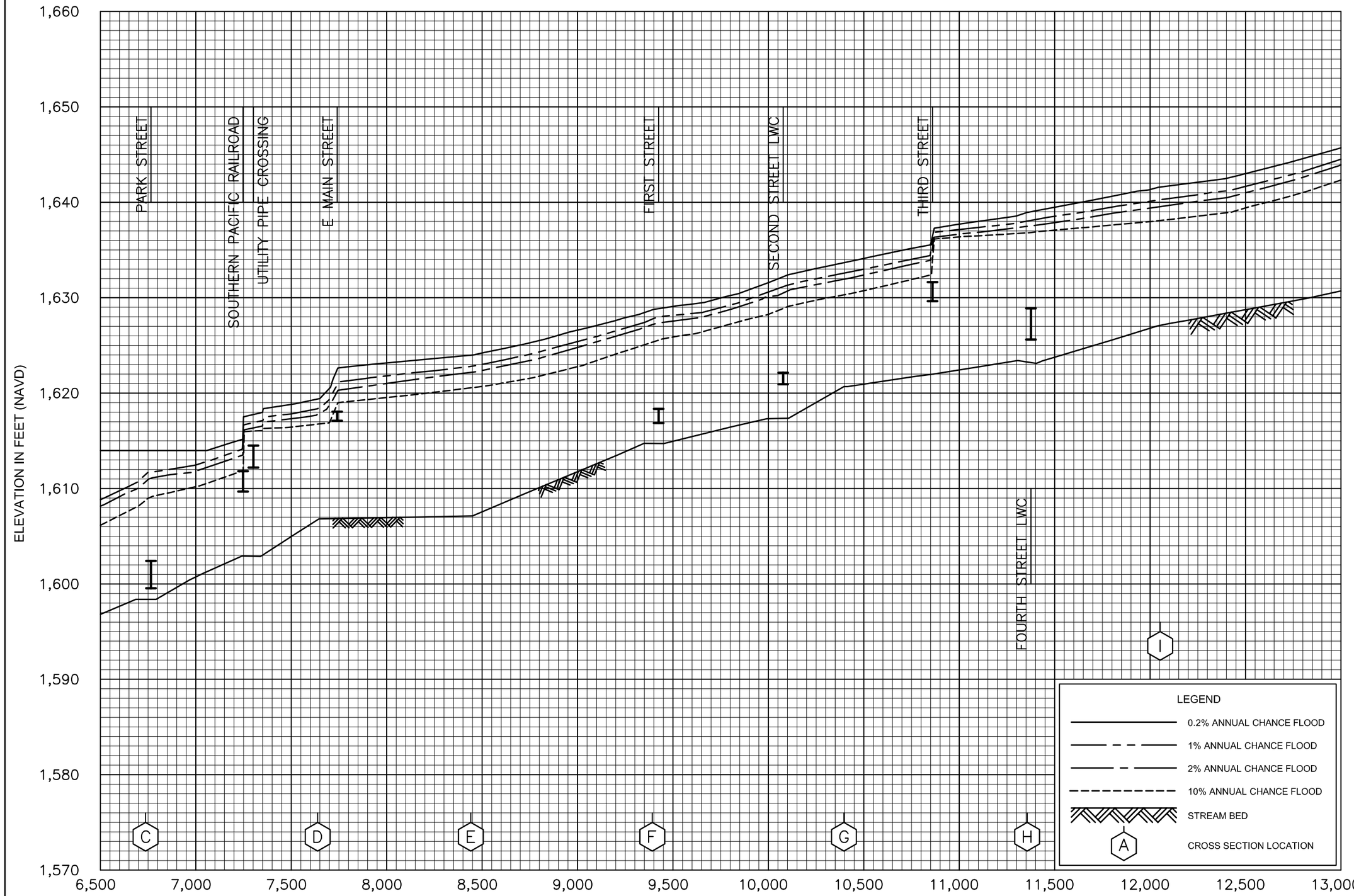
FLOOD PROFILES

QUINLAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

15P

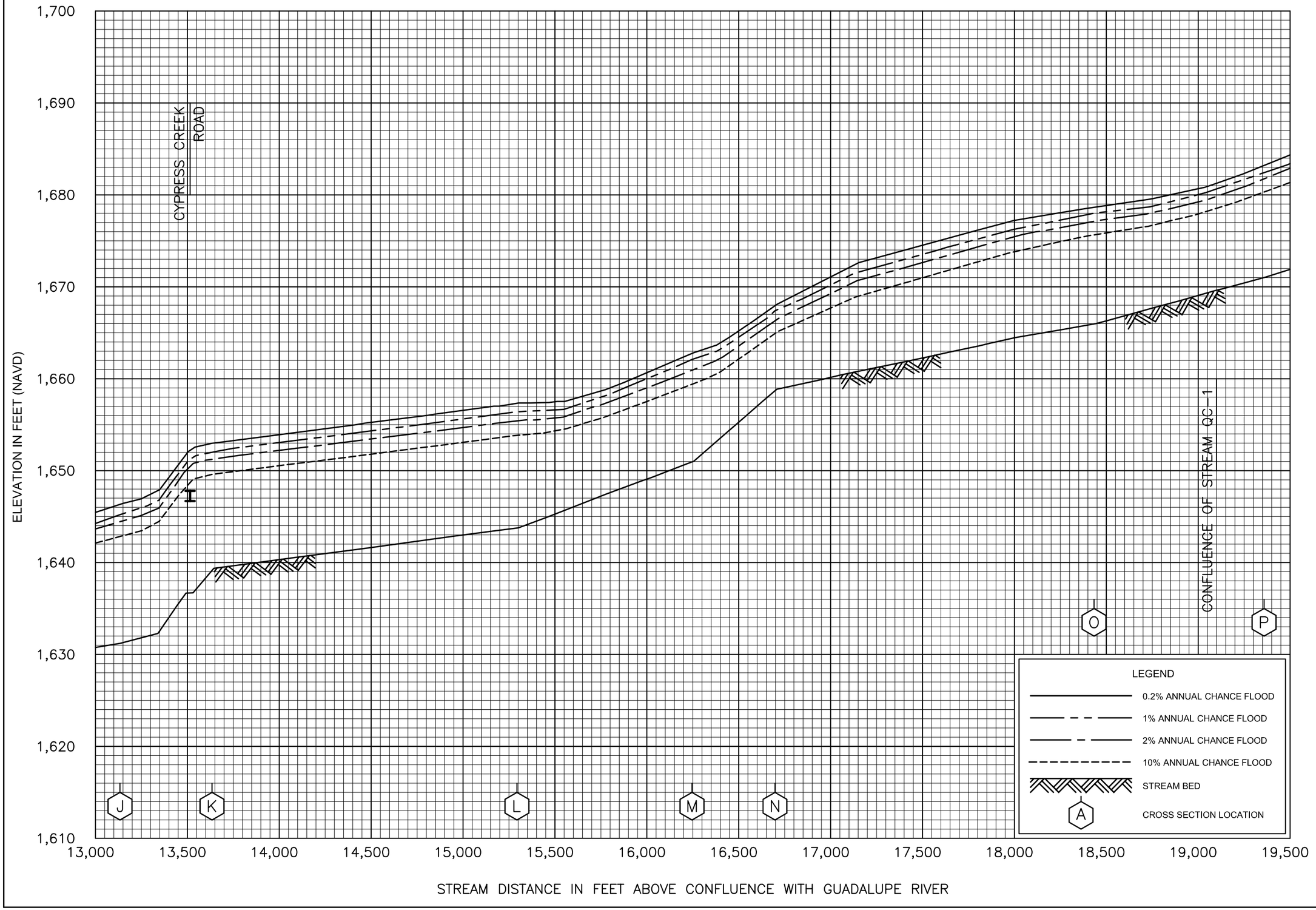


FLOOD PROFILES

QUINLAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



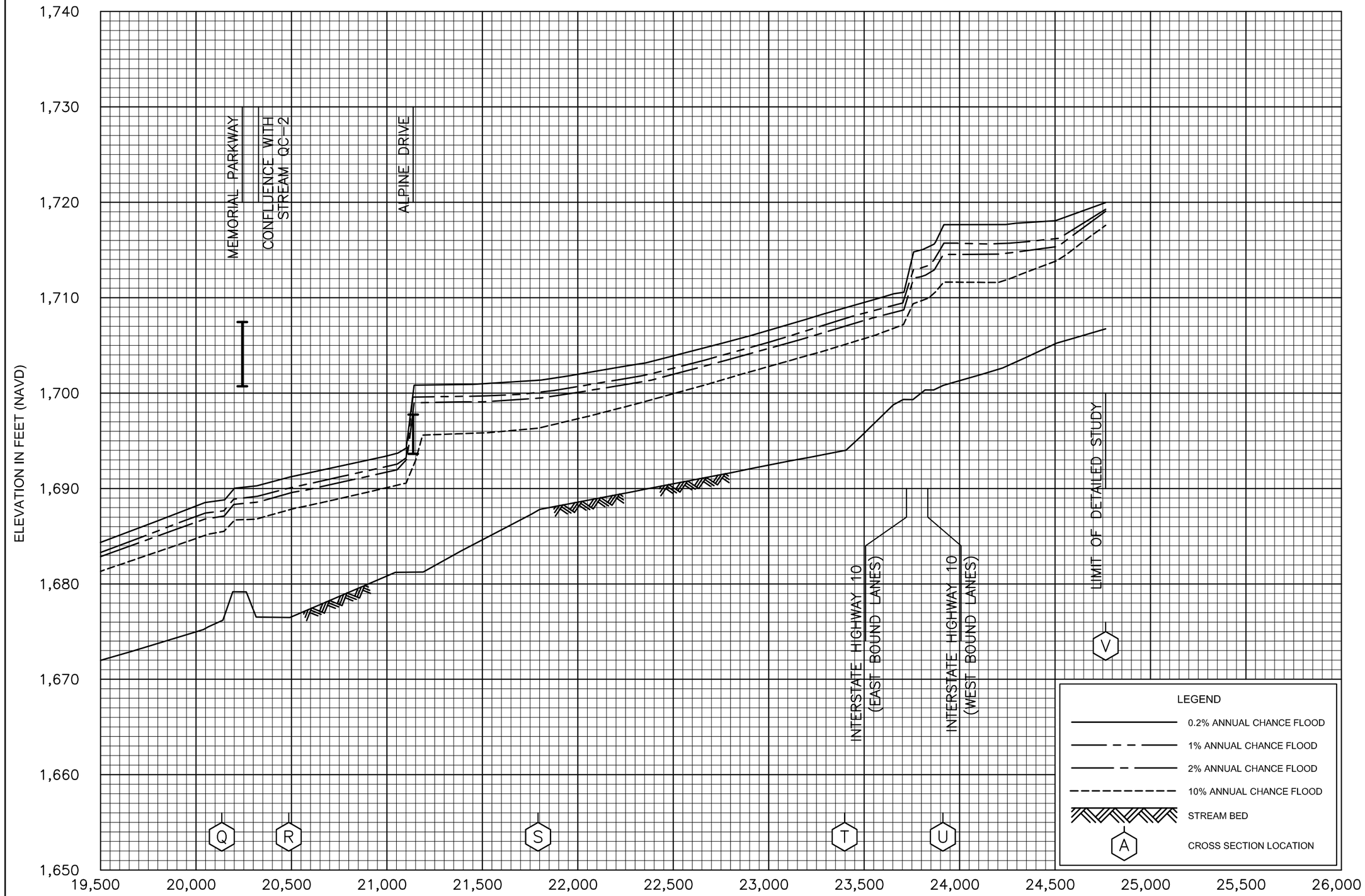
FLOOD PROFILES

QUINLAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

17P

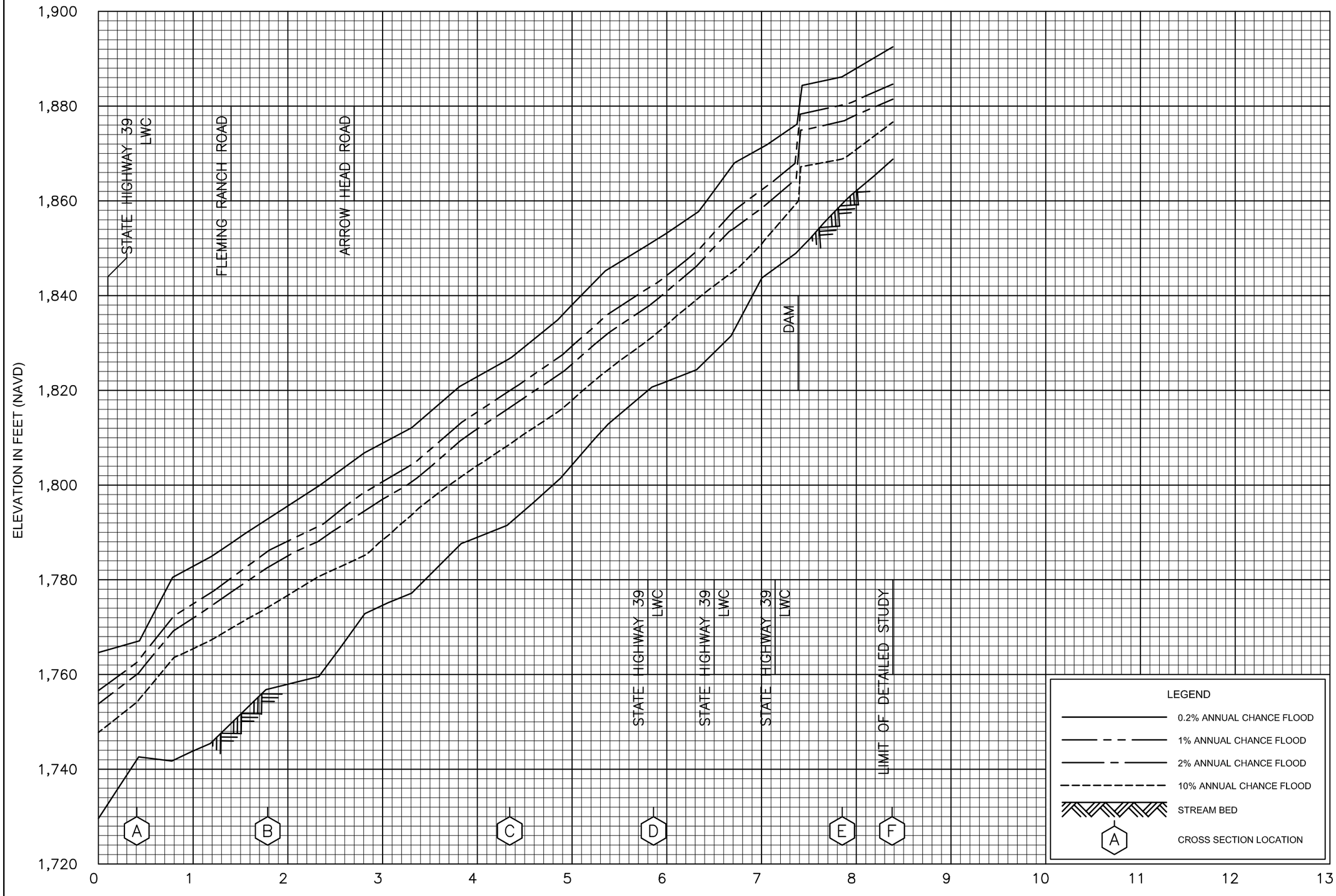


FLOOD PROFILES

QUINLAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

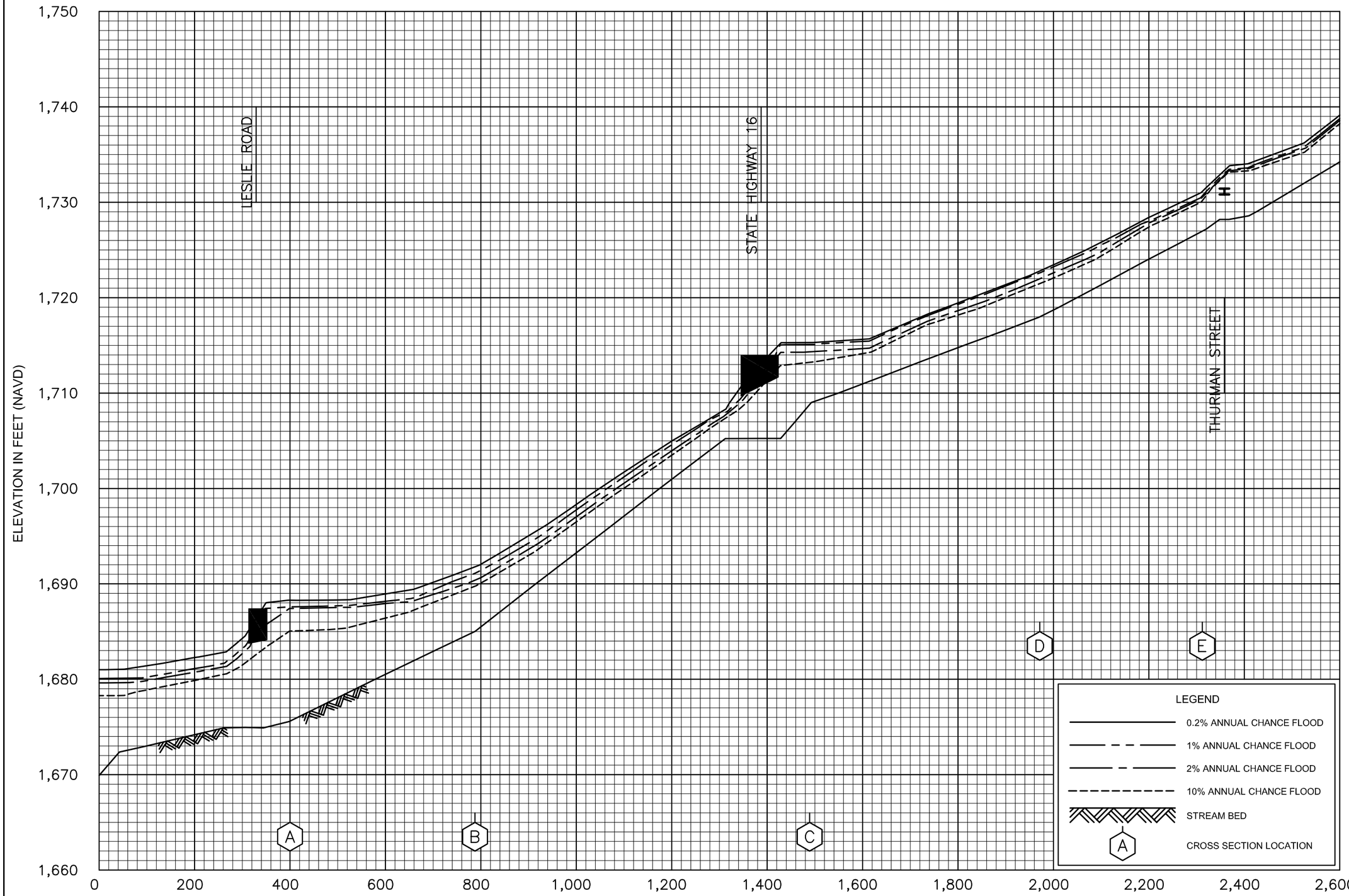


FLOOD PROFILES

SOUTH FORK GUADALUPE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



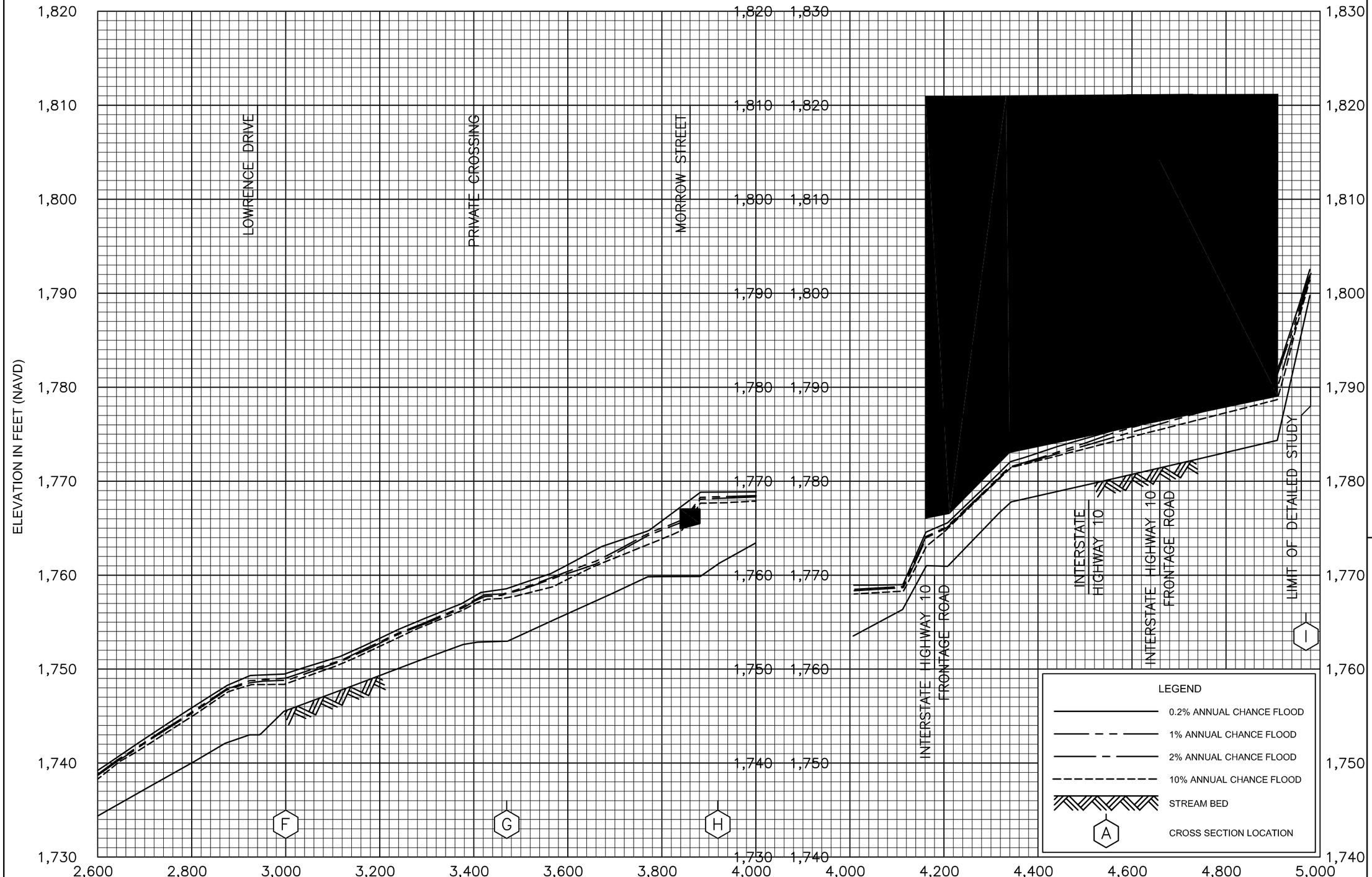
FLOOD PROFILES

STREAM QC – 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

20P

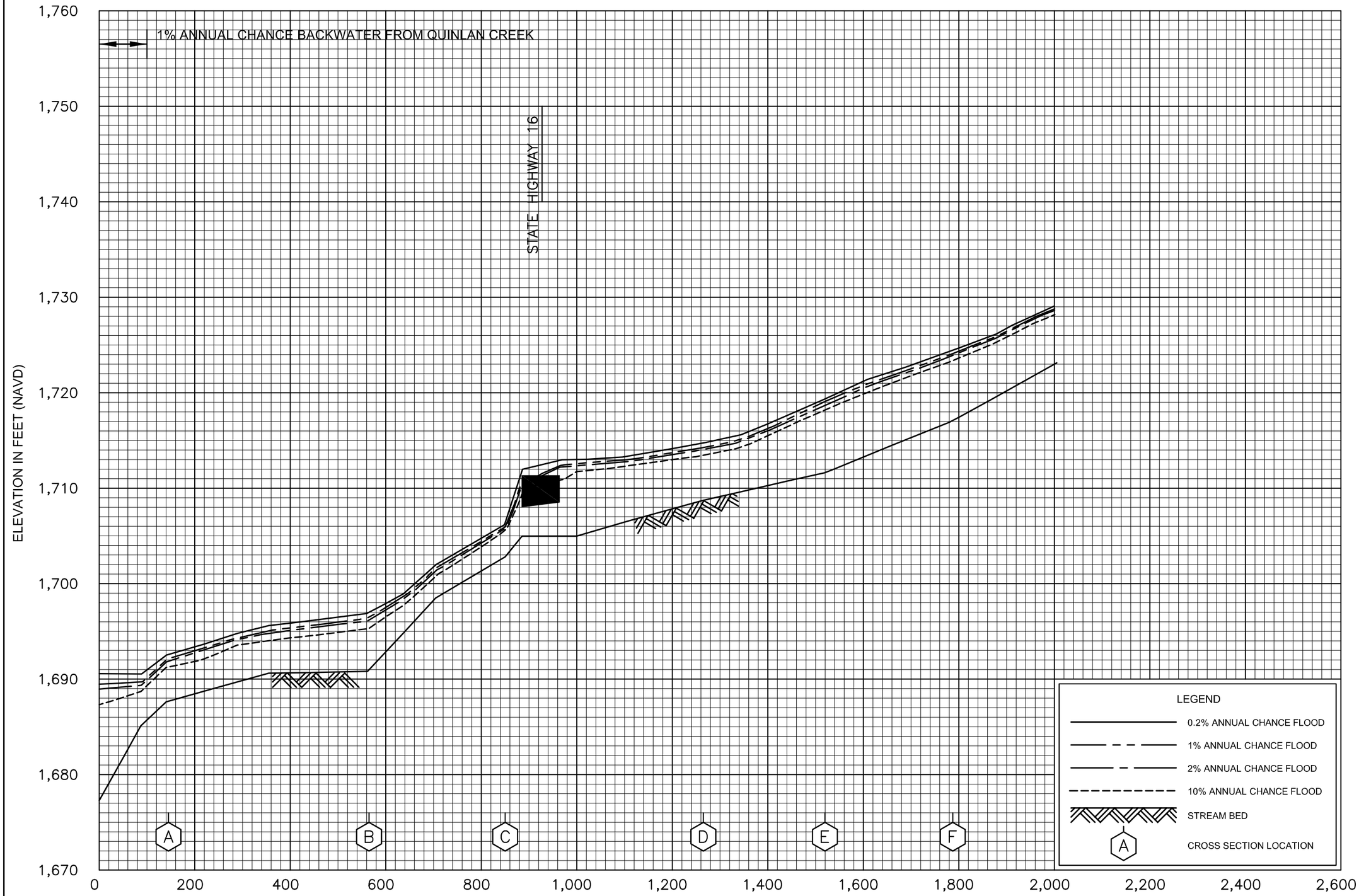


FLOOD PROFILES

STREAM QC–1

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



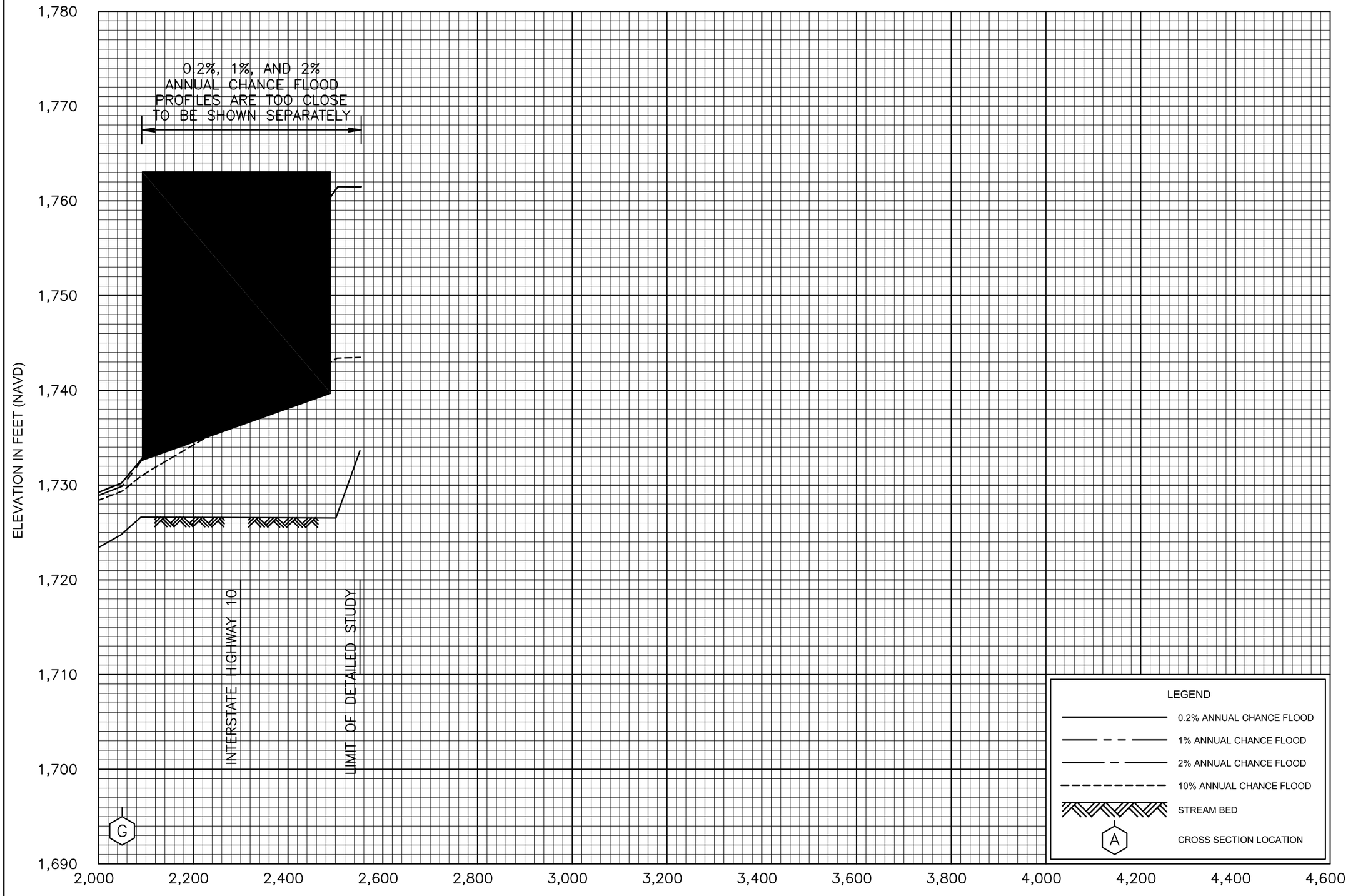
FLOOD PROFILES

STREAM QC–2

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

22P

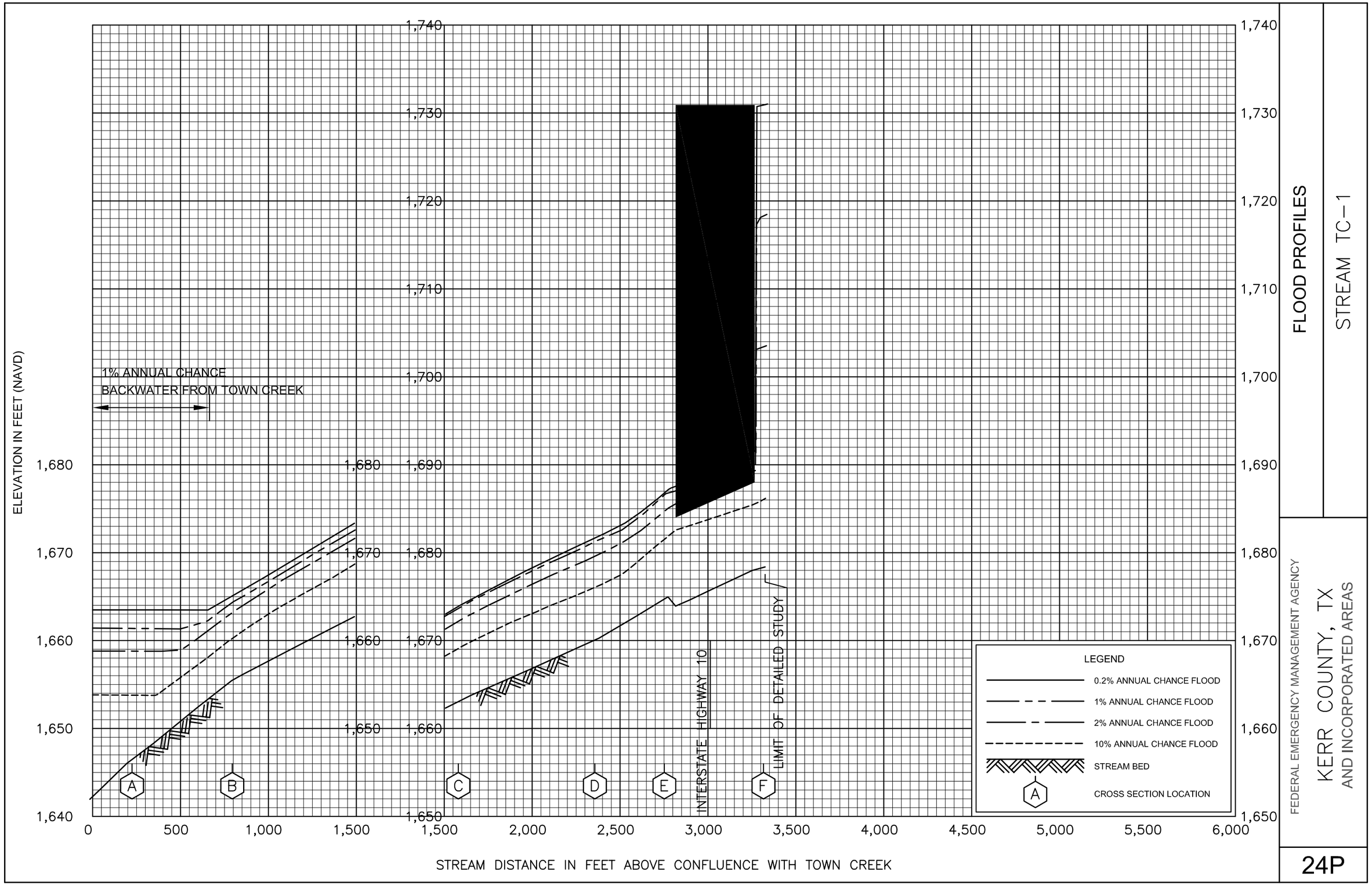


FLOOD PROFILES

STREAM QC–2

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

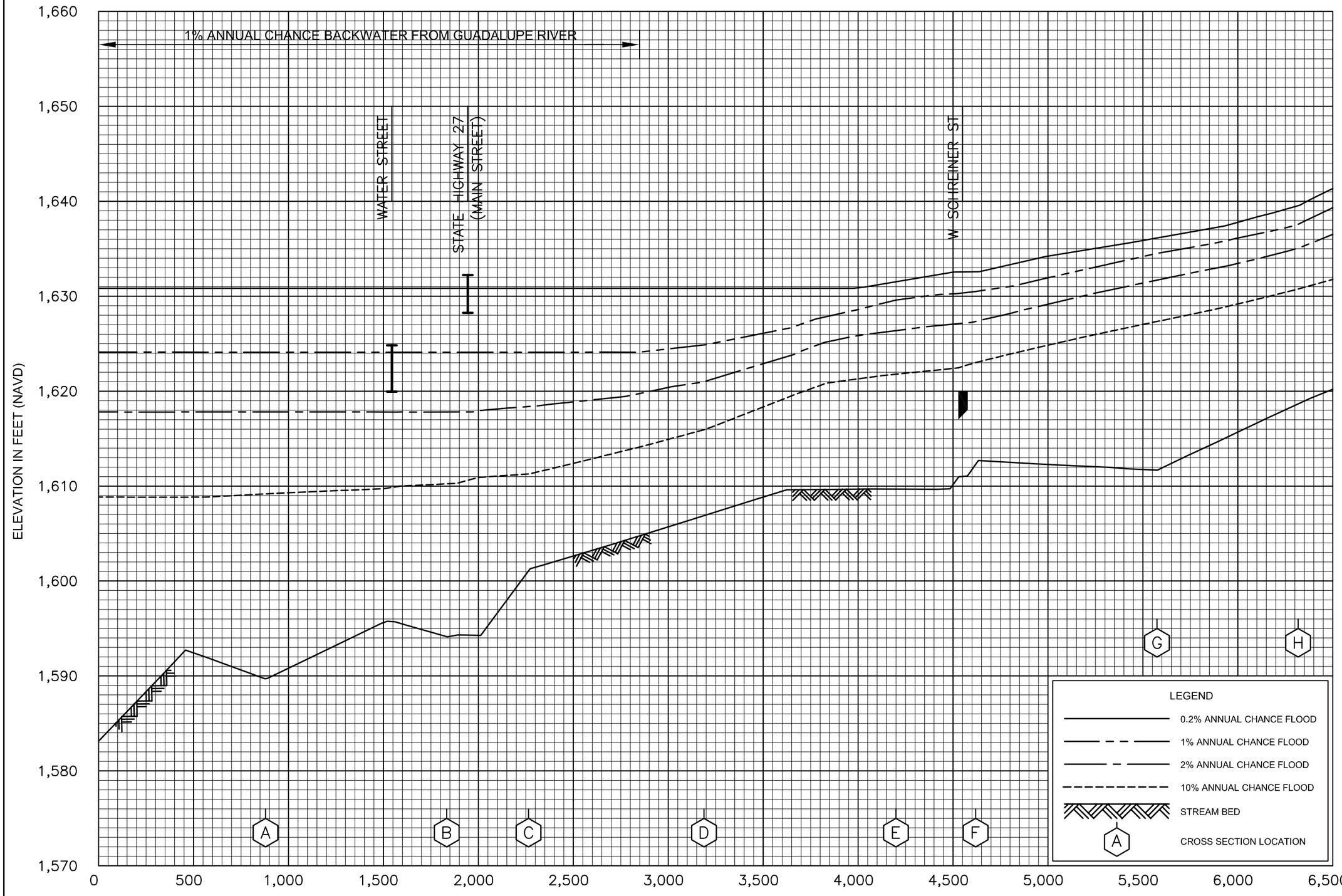


FLOOD PROFILES

STREAM TC – 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



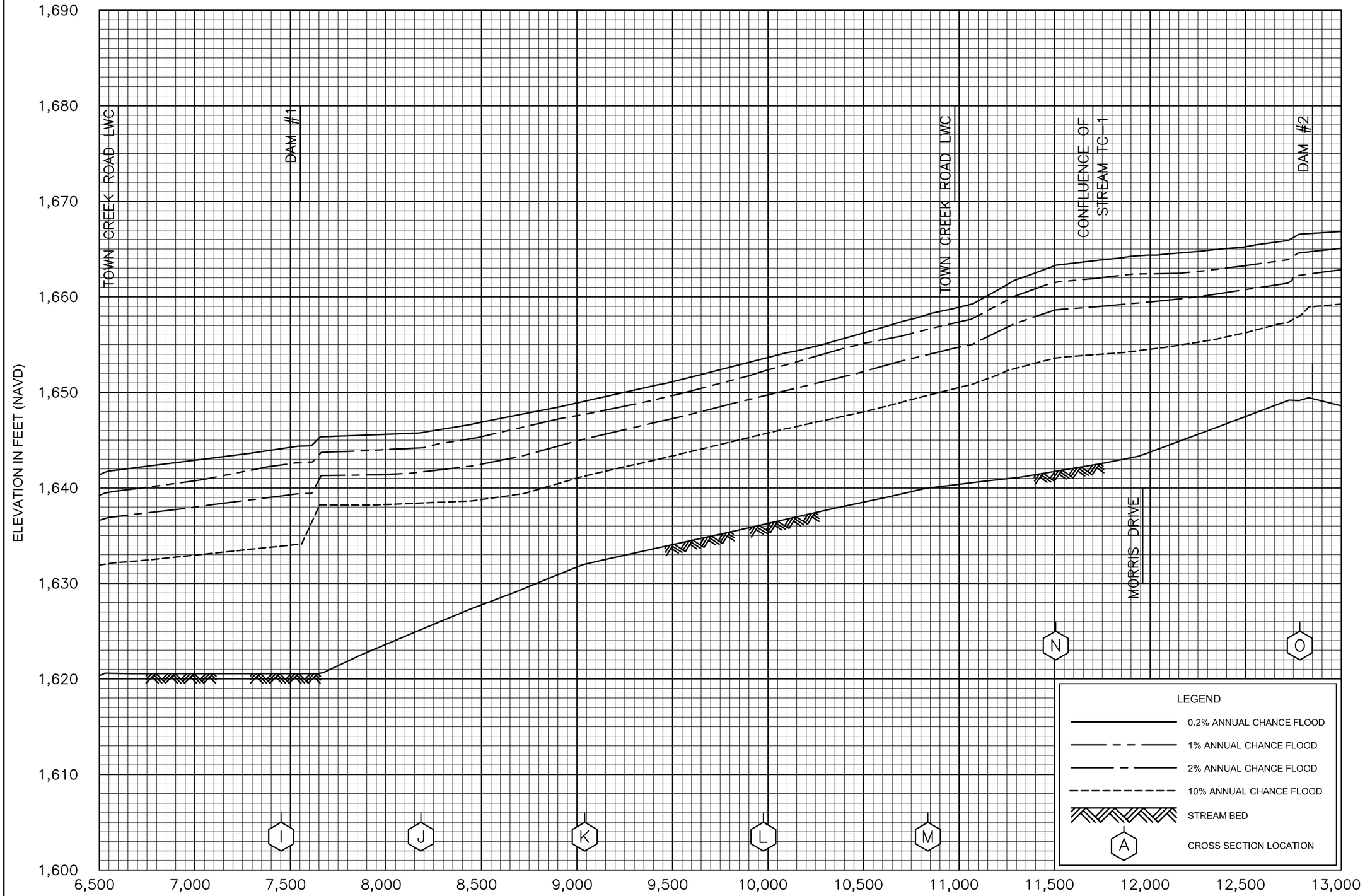
FLOOD PROFILES

TOWN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

25P

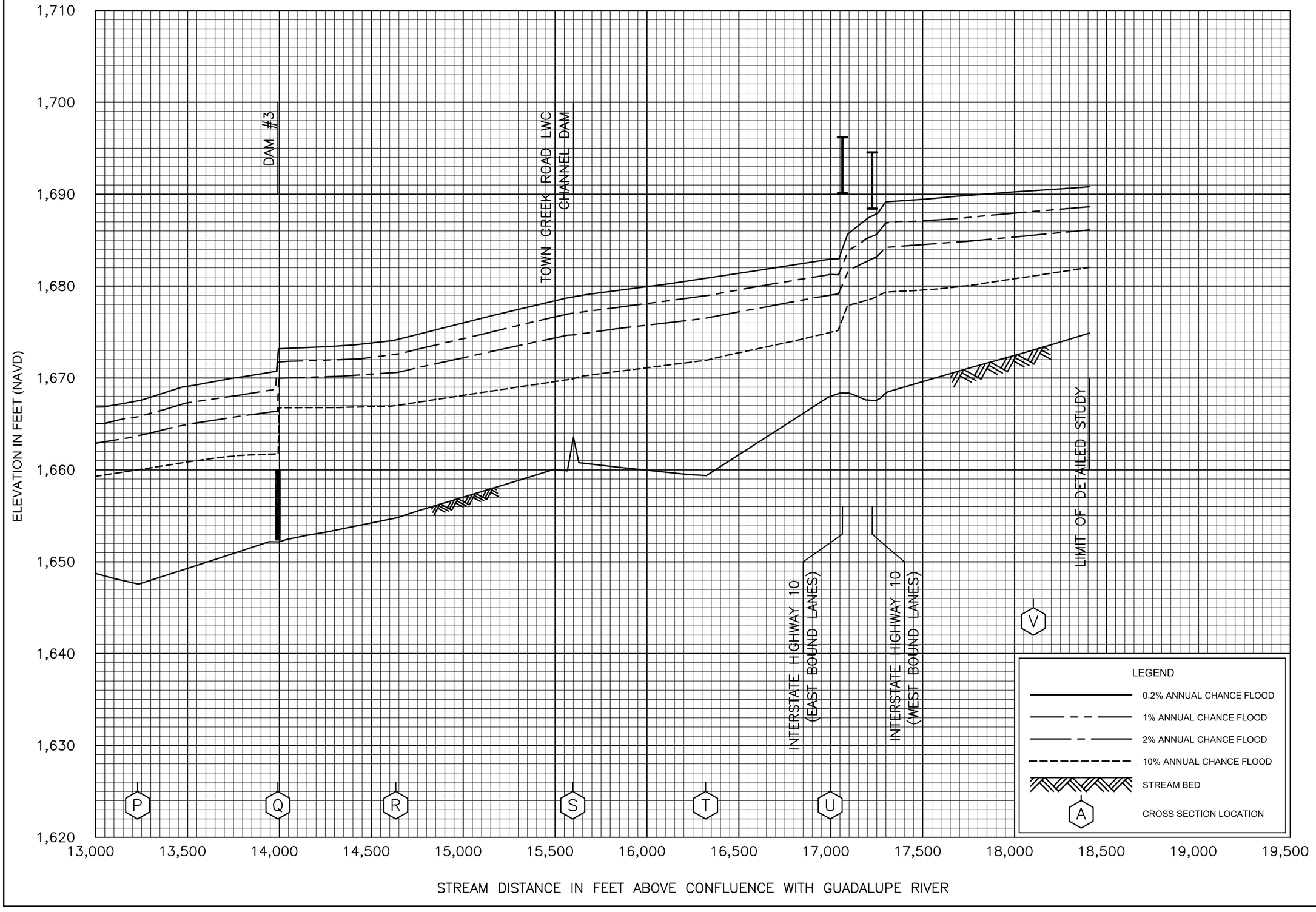


FLOOD PROFILES

TOWN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS



FLOOD PROFILES

TOWN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

KERR COUNTY, TX
AND INCORPORATED AREAS

27P