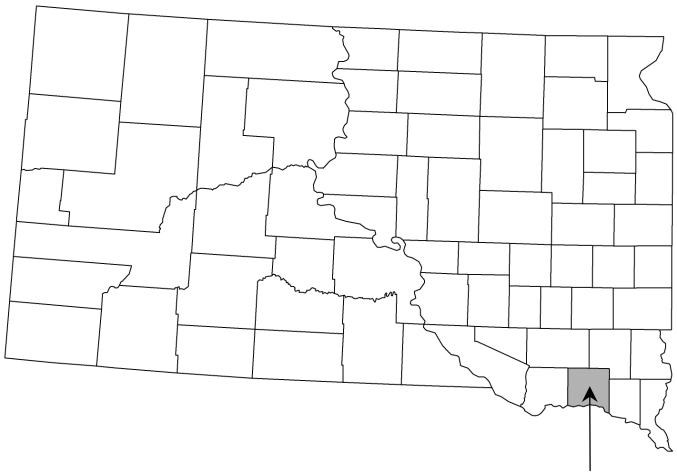
FLOOD INSURANCE STUDY

YANKTON COUNTY, SOUTH DAKOTA

AND INCORPORATED AREAS

Community Name	*Community Number*
GAYVILLE, TOWN OF*	460205
IRENE, TOWN OF	460120
LESTERVILLE, TOWN OF*	460206
MISSION HILL, TOWN OF	460091
UTICA, TOWN OF	460244
VOLIN, TOWN OF	460215
YANKTON COUNTY (UNINCORPORATED AREAS)	460088
YANKTON, CITY OF	460093

*No SFHAs Identified



July 6, 2010

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
46135CV000A

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 (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Selected Flood Insurance Rate Map 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 designations have been changed as follows:

Old Zones	New Zone
A4, A6, A7 and A10	AE
B	X
C	X

Initial Countywide FIS Report Effective Date: July 6, 2010

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FLOOD INSURANCE STUDY
YANKTON COUNTY AND INCORPORATED AREAS, SOUTH DAKOTA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and/or Flood Insurance Rate Maps (FIRMs) in the geographic area of Yankton County, South Dakota, including the City of Yankton, the Towns of Gayville, Irene, Lesterville, Mission Hill, Utica and Volin, and unincorporated areas of Yankton County (hereinafter referred to collectively as Yankton 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. This information will also be used by Yankton County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the Towns of Gayville and Lesterville are non-floodprone. Also, please note that the Town of Irene is located in more than one county but is included in its entirety in the Yankton County FIS and DFIRM.

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

1.2 Authority and Acknowledgments

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

The hydrologic and hydraulic analyses for the original FIS for the Town of Mission Hill were performed by Henningson, Durham & Richardson, for the FIA, under Contract No. H-4551. This work, which was completed in November 1978, covered all significant flooding sources affecting the Town of Mission Hill.

The hydrologic and hydraulic analyses for the original FIS for the City of Yankton were performed by Hennigson, Durham and Richardson, for the FIA, under Contract No. H-4551. This work, which was completed in March 1979, covered all significant flooding sources affecting the City of Yankton.

The hydrologic and hydraulic analyses for the James River were performed by the US Army Corps of Engineers, Omaha District, and completed in September 2004.

The digital base mapping information was provided by the USDA Data Gateway, Federal Center, 501 W. Felix St., Bldg. 23, P.O. Box 6567, Fort Worth, Texas. It was downloaded from their website, www.datagateway.nrcs.usda.gov. These files were compiled by remote-sensing methods and meet or exceed National Map Accuracy Standards at the original compilation scale of 1:12,000. The primary digital orthophotoquad (DOQ) is a 1-meter ground resolution, quarter-quadrangle (3.75-minute of latitude and 3.75-minute of longitude) image cast on the Universal Transverse Mercator Projection (UTM) on the North American Datum of 1983 (NAD83).

There were no previously printed Flood Insurance Studies for the Towns of Gayville, Irene, Lesterville, Utica, and Volin and Unincorporated Yankton County.

1.3 Coordination

For the county wide study, the final Consultation Coordination Officer (CCO) meeting was held April 29, 2009. This meeting was attended by representatives of FEMA, the South Dakota Office of Emergency Management, Yankton County, the City of Yankton, and the study contractor. All comments from the meeting have been addressed.

Town of Mission Hill

In June 1977, community base map selection and the identification of streams requiring detailed study were performed in a meeting attended by representatives of Henningson, Durham & Richardson (the study contractor); the Federal Insurance Administration; the State Planning Bureau; and, the Town of Mission Hill.

The following institutions, organizations, or individuals were contacted for coordination and information: State Planning Bureau, U.S. Geologic Survey (USGS), U.S. Soil Conservation Service, U.S. Department of Commerce, South Dakota Department of Transportation, South Dakota Department of Natural Resources and Development, U.S. Army Corps of Engineers, Lower James Conservancy Sub-District, Missouri River Basin Commission, South Eastern Council of Governments, and community officials.

The results of this study were reviewed at a final community coordination meeting held on April 16, 1979. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the town. The study incorporated all appropriate comments, and all problems were resolved.

City of Yankton

Community base map selection and the identification of streams requiring detailed study were performed in a meeting attended by representatives of Henningson, Durham & Richardson (the study contractor); the Federal Insurance Administration; the State Planning Bureau; and the City of Yankton in June 1977.

The following institutions, organizations, or individuals were contacted for coordination and information: State Planning Bureau, U.S. Geologic Survey (USGS), U.S. Soil Conservation Service, U.S. Department of Commerce, South Dakota Department of Transportation, South Dakota Department of Natural Resources and Development, U.S. Army Corps of Engineers,

Lower James Conservancy Sub-District, Missouri River Basin Commission, South Eastern Council of Governments, and community officials.

During the course of the work by the study contractor, data within this study were reviewed with community officials. On January 15, 1979, an intermediate coordination meeting was held in Yankton. The results of the work performed by the study contractor were presented to city officials for their review and comments.

The results of the study were reviewed at a final community coordination meeting held on August 27, 1979. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the community. No problems were raised at the meeting.

Yankton County
Representatives of the USACE coordinated with officials and residents of Yankton County to present draft results of the James River study and collect information on flood hazards in a public meeting held in December of 2004.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Yankton County, South Dakota including the City of Yankton, and the Towns of Gayville, Irene, Lesterville, Mission Hill, Utica, and Volin, and unincorporated areas of Yankton County.

The streams studied by detailed methods are presented in Table 1.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through 2009.

For this study, the floodplains for areas studied by approximate analyses were updated and remapped by Antelope Creek Engineering and Technology.

Flooding caused by the Missouri River was studied by approximate methods, due to the controlled release of water from the Gavins Point Dam, approximately 6 miles upstream from Yankton.

Table 1 – Streams Studied by Detailed Methods

Stream	Limits of Detailed Study
James River	Yankton County corporate limits
Marne Creek	From a point 300 feet upstream of its confluence with the Missouri River to its confluence with Marne Creek Tributary
Marne Creek North	From the confluence with Marne Creek North to the northern corporate limit for the City of Yankton
Marne Creek Tributary	From its confluence with Marne Creek to the northwestern corporate limits
Unnamed Stream	Town of Mission Hill corporate limits

2.2 Community Description

Yankton County is located in southeastern South Dakota, adjacent to Nebraska, and is bounded to the north by Hutchinson and Turner counties; to the east by Turner and Clay counties; to the south by the Missouri River; and to the west by Bon Homme County. The county encompasses approximately 533 square miles. The landscape ranges from nearly level to undulating and rolling with numerous wetland and lake basins. Most of the land is utilized for agricultural production.

Yankton County is served by US Highway 81, which runs north-south through its center. The City of Yankton is located along the southern border of Yankton County and serves as the hub of much of the economic activity in the County. The largest industries in 2000 were services, durable goods manufacturing and retail trade. According to the US Census Bureau, Yankton County had a population of 21,652 in 2000 and 19,252 in 1990 (References 18 and 19).

The climate of Yankton County is basically continental and generally sub-humid. Abrupt weather changes are brought about by invasion of large air masses of different characteristics: warm, moist air from the Gulf of Mexico; hot, dry air from the southwest; and cold, dry air from the interior of Canada. Precipitation tends to be irregular from year to year. The average annual precipitation is approximately 25 inches, with approximately 75 percent of it falling in the growing season from April through September. Snowfall averages approximately 20 to 30 inches per year. The average annual temperature is 48°F; the coldest month is January, having a monthly mean of 18°F; and the hottest month is July, having a monthly mean temperature of 76°F. Extreme temperatures in the area range from 110°F to nearly -40°F.

Town of Mission Hill

The Town of Mission Hill is located in southeastern Yankton County. Mission Hill is located 9 miles northeast of Yankton and 16 miles northwest of Vermillion. Interstate 29 is 20 miles east of Mission Hill and U.S. Highway 81 is 6 miles west of town.

The economy of Mission Hill is based mainly on agriculture. Many people living in Mission Hill work in Yankton or Vermillion. There is limited residential development on the flood plain. Mission Hill is located in a stable environment as far as population is concerned. The population was 183 in 2000 and 180 in 1990 (References 18 and 19).

The Unnamed Stream flowing through Mission Hill is a left bank tributary of the Missouri River. It has its origin approximately 6.5 miles northwest of Mission Hill. The stream flows in a southeasterly direction to its confluence with the Missouri River. The stream has a drainage area of approximately 6 square miles at Mission Hill and a slope of approximately 25 feet per mile.

Mission Hill is topographically similar to most of eastern South Dakota, with low, rolling hills on glacial plains and frequent flooding of lowlands. The Town of Mission Hill is located on Late Wisconsin age glacial till; the bedrock underlying the till is Cretaceous age shales.

There are two general soil associations in Mission Hill. One is the Houdek-Prosper association which is a mainly deep, loamy, well to moderately well-drained soil developed on glacial till above the flood plains. The other association is Albaton-Haynie. These are poor to moderately well-drained silty soils with slow to moderate permeability.

City of Yankton

The City of Yankton is located in extreme south-central Yankton County. Yankton is situated approximately 58 miles northwest of Sioux City, Iowa and 59 miles southwest of Sioux Falls, South Dakota.

The economy of Yankton is based primarily on agriculture. The city acts as a market for crops in the area. Light industry and commercial businesses are also important economic factors in Yankton. The city serves as a local business center for the surrounding rural area.

Yankton has experience a general growth trend since 1920 (Reference 2). The population has increased from 3,670 in 1890 to 13,528 in 2000 (Reference 19).

Marne Creek is a direct left bank tributary of the Missouri River. It has a drainage area of approximately 33 square miles, which includes its tributaries: Marne Creek Tributary with a drainage area of 20.5 miles, and Marne Creek North, with a drainage area of 7.2 square miles. Marne Creek Tributary and Marne Creek North join Marne Creek approximately 2.5 miles upstream from the mouth of Marne Creek. The Marne Creek watershed originates approximately 10 miles west of Yankton and discharges into the Missouri River at the southeastern edge of Yankton. The watershed is approximately 12 miles long and 3.5 miles wide at its widest point.

The topography of the watershed ranges from gently rolling in the headwaters to moderately rolling throughout the lower two thirds of the watershed. The bottom lands are relatively flat and narrow except in the lower reaches where the creek emerges from the uplands onto the wide flat-bottomed flood plain of the Missouri River.

Marne Creek watershed lies in the physiographic areas of the Central Lowlands Province. This area is covered by glacial till which consists of a mixture of clays, silts, sands, and gravels. The land along the southern part of the watershed is covered with a thin capping layer of loessial silts and clays (Reference 2). Soils developed from the glacial till are moderately fin textured and have a moderate to low permeability rate. Soils developed from loess are medium textured and have a moderate permeability rate (Reference 2).

2.3 Principal Flood Problems

A portion of Mission Hill is subject to flooding from the Unnamed Stream. The stream is intermittent, only having water when it rains or during snowmelt. The most recent flood was on May 22, 1966. During that flood, nine homes in Mission Hill sustained severe damages to the structures and contents.

A portion of Yankton is subject to flooding from Marne Creek, Marne Creek North, and Marne Creek Tributary. Flooding in the Marne Creek watershed is generally caused by intense thunderstorms that occur in the basin. The flood of record on Marne Creek occurred on June 16, 1957, with a discharge of approximately 4,400 cubic feet per second (cfs), which is greater than the 1%-annual-chance event. The stream is not gaged but the USGS estimated this flood to have a discharge of 4,450 cfs at Yankton (Reference 2).

The James River originates in Wells County of central North Dakota and meanders widely in a south-southeasterly direction across South Dakota until it joins the Missouri River approximately 5 miles below the City of Yankton (Reference 3). The James River is the longest prairie stream within the Missouri River drainage, and 474 of its total miles are in South Dakota. The James River has the flattest gradient of any river its length in North America, dropping only about 135 feet across its entire path through South Dakota. The upper James River in South Dakota even flows through areas in which no channel is well-defined, resulting in reverse flow due to tributaries with drastically higher bed slopes. The Yankton County area has better drainage, however, as the James River valley is incised into glacial drift and bluffs extend up to 200 feet above the channel.

Early spring snowmelt causes the majority of floods in the James River basin though rainfall has caused significant flooding as well primarily in the downstream area which includes Yankton County. Major floods occurred along the James River in 1881, 1888, 1897, 1920, 1922, 1942, 1943, 1950, 1952, 1962, 1969, 1984, 1986, 1993 through 1997, and 2001. The lower basin also has several smaller tributaries patterned for quick concentration of runoff, which cumulatively exacerbate flood events. Another issue in Yankton County specifically is bank collapse and high velocities causing bank failures and scour. Flood hydrographs of the James River, except for a few miles below the mouths of major tributaries, are characterized by slow rises, long flat peaks, and extremely prolonged recession periods, sometimes resulting in flood durations of more than a month (Reference 3).

Flooding caused by the Missouri River has been limited by the building of Gavins Point Dam. Flooding is caused by the release of water from the dam due to the low lying areas of

Yankton along the Missouri River flood plain.

2.4 Flood Protection Measures

No flood protection measures have been taken at Mission Hill. Some channel straightening and realignment has been done, but it has no effect on flooding. In 1975, the U.S. Soil Conservation Service water work plan for the Mission Hill watershed (Reference 1) recommended the building of one structure upstream of Mission Hill and channel straightening.

No flood protection measures have been taken at Yankton on Marne Creek. However, the city has been practicing flood plain management, and Yankton has been protected from most flooding along the Missouri River by the building of the Gavins Point Dam. The 1%- and 0.2%-annual-chance events are controlled by Gavins Point Dam and the only flooding that may occur is caused by water releases from the reservoir.

There are no flood control works on the James River in the vicinity in Yankton County.

Yankton County is provided some protection from floods through flood warning and forecasting by the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS).

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 are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, and 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 annual 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 the peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the

community.

For the Unnamed Stream in Mission Hill, discharges for the 10-, 2, and 1-percent annual chance events were determined using the USGS regionalized equations given in Water Resources Investigation 35-74 (Reference 4). The stream is ungaged, with no records of flooding. The variables used in the regionalized equations are drainage area and mean annual precipitation. The 0.2-percent annual chance event was determined by plotting the frequency-discharge relationship of the 10-, 2-, and 1-percent annual chance events on log-probability paper.

No stream flow gage records were available in the Marne Creek watershed. Discharges for the 10-, 2, and 1-percent annual chance events were calculated using the USGS regionalized equations found in Water Resources Investigation 35-74 (Reference 4). The USGS multiple regression equations utilize drainage area and mean annual precipitation to compute discharges. The 0.2-percent annual chance event was determined by plotting the frequency-discharge relationship of the 10-, 2-, and 1-percent annual chance events on log-probability paper (Reference 5).

The hydrology for the James River was developed using the USGS regional equations and gaging stations at Scotland and at Yankton (Reference 3).

Peak discharge-drainage area relationships for streams studied in detail are shown in Table 2.

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 Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data table 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 report in conjunction with the data shown on the FIRM.

The James River was studied by detailed methods (Reference 3). Water surface profiles for the 10-, 2-, 1- and 0.2-percent annual chance events were computed using the USACE standard step-backwater computer program HEC-RAS version 3.1.2 (Reference 6). The split flow model was then used to develop the water surface profiles for the flood events listed above.

Cross sections for the hydraulic model were obtained from a triangulated irregular network (TIN) that was acquired in 2002 as part of an aerial survey. These were extended using USGS quads where necessary. Bridge information was obtained from as-built plans.

Roughness coefficients (Manning's "n") for the James River were determined by field inspection, survey data, photographs, and engineering judgment. High water marks were not

available for the James River modeling so calibration was handled using the USGS gaging stations. The main channel of the James River is flat and sinuous, containing some debris and vegetation. The main channel of the James River was assigned a roughness coefficient of 0.045 through Yankton County. The overbank land use is mostly agricultural with scattered development and some woody vegetation. The corresponding roughness coefficient for the overbanks ranged from 0.035 to 0.050. Contraction and expansion coefficients for the James River hydraulic model were 0.1 and 0.3, respectively, for the overall channel reach with 0.3 and 0.5 used at most bridges.

The starting water surface for the James River was determined by using normal depth with a slope of 0.000416 ft/ft. The hydraulic analyses for this study are based only on the effects of unobstructed flow through the bridges and culverts. The effect of ice was not considered. A sensitivity analysis was performed on the starting water surface elevation of the James River by changing the downstream starting water surface to critical depth. The purpose of the sensitivity analysis was to evaluate the volatility of the water surface profiles in the vicinity and through Yankton County. The resulting water surface profiles using the critical depth constraint were identical to the original ones that used normal depth with a slope of 0.000416 ft/ft.

Cross sections for the backwater analysis of the Unnamed Stream were obtained by field survey techniques. Bridges, culverts, and intersection elevations were also determined by field measurements. Additional cross section data were taken from USGS topographic maps at a scale of 1:24,000, enlarged to a scale of 1:4,800, with a contour interval of 10 feet (Reference 7). HEC-2 was used for hydraulic modeling.

Roughness factors (Manning's "n") used in the hydraulic computations for the Unnamed Stream were established by field inspection and engineering judgment. Roughness values for the stream channel and overbanks for the Unnamed Stream were 0.040 and 0.099, respectively.

The 1-percent annual chance event shallow flooding with depths averaging less than 1.0 foot was determined by using the 1-percent annual chance event competed water-surface elevation for the Unnamed Stream in the area east of Washington Avenue, and, in conjunction with a topographic map (Reference 8).

Cross sections for the backwater analysis of Marne Creek, Marne Creek North, and Marne Creek Tributary were obtained by field survey techniques. Bridges, culverts, and intersection elevations were also determined by field measurements. Additional cross section data were taken from USGS topographic maps (Reference 9).

Roughness factors (Manning's "n") used in the hydraulic computations, were established by filed inspection and engineering judgment. Roughness values for the stream channel and overbanks for Marne Creek, Marne Creek North and Marne Creek Tributary, ranged from 0.02 to 0.150 for the overbanks and 0.030 to 0.045 for the channel.

Water-surface elevations of floods of selected recurrence intervals for Marne Creek, Marne Creek North and Marne Creek Tributary were computed through use of the USACE HEC-2 step-backwater computer program (Reference 8). Head losses at bridges and culverts were

computed using bridge routines contained in HEC-2. Starting water-surface elevations were computed using the slope-area method.

Approximate areas shown on the maps were taken from the FIA's Flood Hazard Boundary Map (Reference 10).

Locations of selected cross sections used in the hydraulic analyses are shown on the flood profiles (Exhibit 1) and on the Flood Insurance Rate Map (Exhibit 2).

Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study were based on unobstructed flow and do not include any effects from ice or debris. 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 2 – Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
James River					
At Scotland	20,653	10,300	25,700	35,700	70,100
At Yankton	20,942	10,590	28,200	33,300	69,300
Marne Creek					
At Confluence with Missouri River	33.0	1,400	3,000	4,100	7,200
Marne Creek North					
Above Confluence with Marne Creek Tributary	20.5	1,100	2,400	3,300	5,800
Marne Creek Tributary					
Above Confluence with Marne Creek and Marne Creek North	7.2	650	1,400	1,900	3,200
Unnamed Stream					
At Nichols Street	6	590	1,240	1,700	2,900

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 in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using the NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Elevation Reference Marks (ERMs) shown on the FIRM represent those used during the preparation of this and previous FIS reports. Users should be aware that these ERM elevations may have changed since the publication of this FIS report. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs 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. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes. It is important to note that adjacent communities may be referenced to NGVD. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between communities.

For this revision, a vertical datum conversion was completed for the entire county. The Profile Panel and FDT conversion from NGVD29 to NAVD88 was carried out in accordance to the procedure outlined in the FEMA document Map Modernization – Guidelines and Specifications for Flood Hazard Mapping Partners Appendix B: Guidance for Converting to the North American Vertical Datum of 1988. The datum conversion from NGVD 29 to NAVD 88 for Yankton County was plus 0.70 foot.

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

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 this data.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent annual chance flood elevations and delineations of the 1- and 0.2-percent annual chance floodplain boundaries and 1-percent annual chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and Floodway Data Tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Flood 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 1:24,000, with a contour interval of 10 feet (References 7 and 9). Approximate boundaries in some portions of the study area were taken from the FIA's Flood Hazard Boundary Map (Reference 10).

For the James River, the 1-percent annual chance event flood plain boundary has been delineated using the flood elevations determined at each cross section and the TIN topographic survey utilizing ArcView Geographic Information System map overlays for personal computers.

The 1- and 0.2-percent annual chance floodplain boundaries are shown on the FIRM (Exhibit 2). 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 (Exhibit 2).

4.2 Floodways

Encroachment on flood plains, 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 1-percent annual chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 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 at selected cross sections (Table 3). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary has been 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 of the 1-percent annual chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

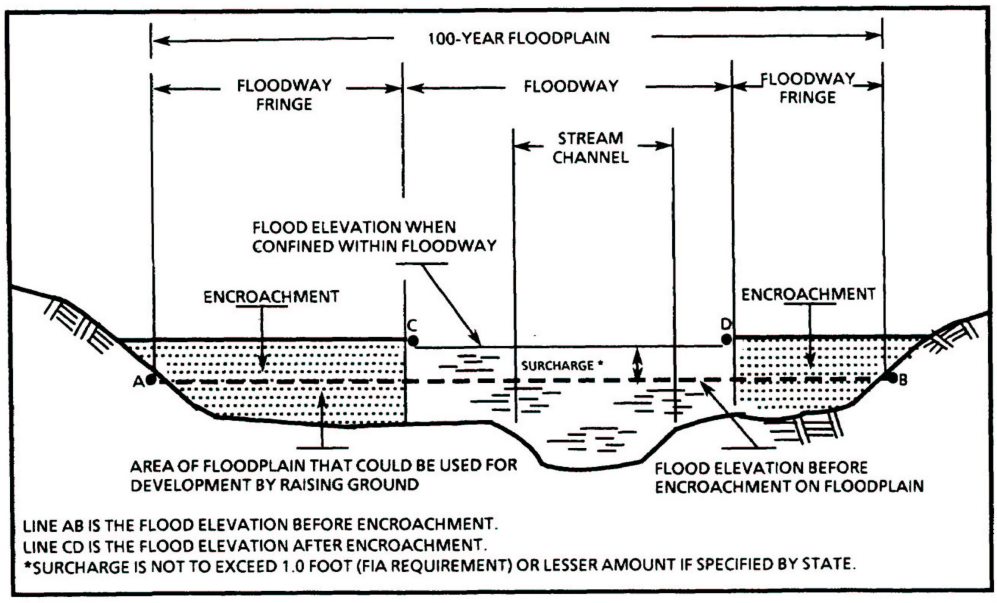

Figure 1 – Floodway Schematic

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
JAMES RIVER								
A	290	226	6,066	5.5	1,166.8	1,166.8	1,167.8	1.0
B	2,079	532	11,150	3.0	1,167.7	1,167.7	1,168.6	0.9
C	4,619	246	6,657	5.0	1,168.3	1,168.3	1,169.1	0.8
D	5,061	301	6,165	5.4	1,168.5	1,168.5	1,169.4	0.9
E	11,777	1,751	19,146	2.4	1,170.7	1,170.7	1,171.7	1.0
F	19,064	1,440	12,724	3.6	1,171.9	1,171.9	1,172.7	0.8
G	27,771	441	8,124	4.2	1,173.2	1,173.2	1,174.1	0.9
H	29,262	387	7,213	4.7	1,173.5	1,173.5	1,174.4	0.9
I	29,700	483	9,209	3.6	1,173.8	1,173.8	1,174.7	0.9
J	30,024	497	7,288	4.6	1,174.0	1,174.0	1,174.9	0.9
K	38,334	3,103	26,144	1.7	1,175.2	1,175.2	1,176.2	1.0
L	43,864	2,454	21,608	2.2	1,175.7	1,175.7	1,176.6	0.9
M	47,108	2,992	25,852	1.7	1,175.9	1,175.9	1,176.8	0.9
N	53,242	3,828	34,523	1.4	1,176.1	1,176.1	1,177.0	0.9
O	71,426	3,286	29,603	1.5	1,176.3	1,176.3	1,177.2	0.9
P	80,623	2,044	21,449	2.0	1,176.6	1,176.6	1,177.5	0.9
Q	89,596	551	7,099	6.3	1,177.9	1,177.9	1,178.8	0.9
R	90,130	508	7,197	6.0	1,178.7	1,178.7	1,179.6	0.9
S	96,568	2,367	29,139	1.7	1,179.5	1,179.5	1,180.4	0.9
T	108,143	1,222	16,638	2.7	1,179.9	1,179.9	1,180.8	0.9
U	115,267	2,743	39,577	0.9	1,180.1	1,180.1	1,181.0	0.9
V	122,587	2,892	42,455	0.9	1,180.1	1,180.1	1,181.0	0.9

[1]Feet above Confluence with Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

FLOODWAY DATA

JAMES RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
JAMES RIVER								
W	132,470	338	5,626	6.8	1,179.9		1,180.8	0.9
X	132,613	366	5,547	6.5	1,180.1		1,181.1	1.0
Y	139,789	3,305	44,961	0.8	1,181.1		1,181.9	0.8
Z	154,557	3,441	45,588	0.8	1,181.2		1,182.0	0.8
AA	167,869	1,017	13,145	3.0	1,181.2		1,182.0	0.8
AB	168,187	416	6,581	5.4	1,181.2		1,182.0	0.8
AC	182,409	2,678	33,481	1.1	1,182.0		1,182.8	0.8
AD	194,008	2,145	24,272	1.7	1,182.4		1,183.2	0.8
AE	199,195	691	8,197	4.8	1,182.4		1,183.3	0.9
AF	199,434	427	6,583	5.5	1,183.1		1,183.8	0.7
AG	208,044	2,006	27,335	1.3	1,183.8		1,184.7	0.9
AH	213,805	2,932	32,177	1.3	1,184.0		1,184.9	0.9
AI	225,929	2,956	31,701	1.3	1,184.1		1,185.0	0.9
AJ	231,166	2,107	24,667	1.6	1,184.5		1,185.4	0.9
AK	246,106	2,738	26,424	1.6	1,185.0		1,185.9	0.9
AL	251,980	2,370	24,836	1.5	1,185.2		1,186.1	0.9
AM	260,768	854	8,180	5.8	1,185.6		1,186.5	0.9
AN	261,358	354	5,190	6.9	1,186.6		1,187.4	0.8
AO	266,893	2,709	30,855	1.2	1,187.7		1,188.5	0.8
AP	273,484	2,588	23,274	1.8	1,187.9		1,188.7	0.8
AQ	281,759	3,199	32,424	1.3	1,188.2		1,189.0	0.8

[1]Feet above Confluence with Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

FLOODWAY DATA

JAMES RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MARNE CREEK								
A	0	68	714	5.7	1,170.3	1,170.3	1,171.3	1.0
B	1,100	66	617	6.6	1,172.3	1,172.3	1,172.9	0.6
C	1,950	66	595	6.9	1,174.2	1,174.2	1,174.5	0.3
D	2,410	103	811	5.1	1,175.4	1,175.4	1,175.7	0.3
E	2,470	103	816	5.0	1,175.5	1,175.5	1,175.7	0.2
F	2,710	78	610	6.7	1,176.8	1,176.8	1,176.8	0.0
G	3,200	72	350	11.7	1,178.9	1,178.9	1,178.9	0.0
H	4,005	78	811	5.1	1,184.6	1,184.6	1,185.5	0.9
I	4,155	69	790	5.2	1,186.8	1,186.8	1,187.6	0.8
J	4,570	75	649	6.3	1,887.3	1,887.3	1,188.0	0.7
K	5,175	75	708	5.8	1,188.5	1,188.5	1,189.1	0.6
L	6,130	63	410	10.0	1,190.4	1,190.4	1,191.0	0.6
M	6,420	37	429	9.6	1,192.7	1,192.7	1,192.7	0.0
N	6,475	37	466	8.8	1,193.8	1,193.8	1,193.8	0.0
O	6,945	32	380	10.8	1,195.5	1,195.5	1,195.6	0.1
P	7,125	90	829	4.9	1,196.2	1,196.2	1,197.0	0.8
Q	7,350	155	1058	3.9	1,196.5	1,196.5	1,197.2	0.7
R	7,550	100	830	4.9	1,197.0	1,197.0	1,197.6	0.6
S	7,600	100	845	4.9	1,197.2	1,197.2	1,197.9	0.7
T	7,950	100	709	5.8	1,197.8	1,197.8	1,198.3	0.5
U	8,190	67	602	6.8	1,198.1	1,198.1	1,198.6	0.5
V	8,245	69	714	5.7	1,199.5	1,199.5	1,200.2	0.7

[1]Approximately 290 Feet above Confluence with Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

FLOODWAY DATA

MARNE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MARNE CREEK								
W	8,670	100	682	6.0	1,199.8	1,199.8	1,200.8	1.0
X	9,645	154	834	4.9	1,201.8	1,201.8	1,202.1	0.3
Y	9,725	154	938	4.4	1,202.6	1,202.6	1,202.9	0.3
Z	10,230	116	666	6.2	1,203.0	1,203.0	1,203.3	0.3
AA	11,380	224	1,510	2.7	1,207.7	1,207.7	1,208.7	1.0
AB	12,380	128	857	4.8	1,210.3	1,210.3	1,211.0	0.7
AC	12,535	140	920	4.5	1,210.8	1,210.8	1,211.8	1.0
AD	12,580	140	971	4.2	1,211.5	1,211.5	1,212.3	0.8
AE	12,680	67	477	8.6	1,211.5	1,211.5	1,211.5	0.0
AF	12,835	200	1,086	3.8	1,212.0	1,212.0	1,213.0	1.0
AG	12,880	200	1,183	3.5	1,212.6	1,212.6	1,213.6	1.0
AH	13,180	73	658	6.2	1,213.0	1,213.0	1,214.0	1.0

[1]Approximately 290 Feet above Confluence with Missouri River

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

FLOODWAY DATA

MARNE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MARNE CREEK NORTH								
A	270	101	544	6.1	1,213.0	1,211.0[2]	1,211.0[2]	0.0
B	580	332	1,567	2.1	1,213.0	1,212.1[2]	1,213.1[2]	1.0
C	680	150	966	3.4	1,213.0	1,212.4[2]	1,213.3[2]	0.9
D	735	150	1,088	3.0	1,213.4	1,213.4	1,214.2	0.8
E	1,080	140	835	4.0	1,214.0	1,214.0	1,214.9	0.9
F	2,230	200	484	6.8	1,218.8	1,218.8	1,218.8	0.0
G	2,320	200	645	5.1	1,219.5	1,219.5	1,219.5	0.0
H	2,370	200	1,119	2.9	1,220.8	1,220.8	1,221.8	1.0
I	2,630	100	700	4.7	1,221.9	1,221.9	1,222.5	0.6
J	2,675	100	699	4.7	1,221.9	1,221.9	1,222.6	0.7
K	2,790	117	445	7.4	1,222.0	1,222.0	1,222.3	0.3
L	2,910	129	820	4.0	1,222.5	1,222.5	1,223.1	0.6
M	2,955	129	819	4.0	1,222.6	1,222.6	1,223.3	0.7
N	3,050	117	543	6.1	1,222.7	1,222.7	1,223.1	0.4
O	3,230	175	1,578	2.1	1,222.9	1,222.9	1,223.7	0.8
P	3,290	175	1,588	2.1	1,223.0	1,223.0	1,223.9	0.9
Q	3,730	188	1,416	2.3	1,223.0	1,223.0	1,223.9	0.9
R	4,200	170	846	3.9	1,223.0	1,223.0	1,223.8	0.8

[1]Feet above Confluence with Marne Creek Tributary
[2]Elevation Computed without Consideration of Backwater Effects from Marne Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

FLOODWAY DATA

MARNE CREEK NORTH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
MARNE CREEK TRIBUTARY								
A	430	59	400	4.8	1,213.0	1,212.3[2]	1,213.3[2]	1.0
B	1,290	56	322	5.9	1,214.3	1,214.3	1,214.8	0.5
C	2,360	66	250	7.6	1,219.0	1,219.0	1,219.1	0.1
D	2,520	135	263	7.2	1,220.7	1,220.7	1,221.1	0.4
E	2,870	66	352	5.4	1,221.9	1,221.9	1,222.8	0.9
F	4,100	59	186	10.2	1,226.5	1,226.5	1,226.5	0.0
G	5,430	60	290	6.5	1,232.7	1,232.7	1,232.9	0.2

[1]Feet above Limit of Detailed Study
[2]Elevation Computed without Consideration of Backwater Effects from Marne Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

FLOODWAY DATA

MARNE CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
UNNAMED STREAM								
A	0	101	490	3.5	1,172.5	1,172.5	1,173.5	1.0
B	700	103	490	3.5	1,175.2	1,175.2	1,176.1	0.9
C	800	92	470	3.6	1,175.7	1,175.7	1,176.5	0.8
D	950	126	770	2.2	1,177.0	1,177.0	1,177.9	0.9
E	1,250	106	490	3.5	1,177.3	1,177.3	1,178.3	1.0
F	1,441	129	740	2.3	1,178.6	1,178.6	1,179.6	1.0
G	1,791	128	530	3.2	1,178.9	1,178.9	1,179.8	0.9
H	1,891	144	625	2.7	1,179.2	1,179.2	1,180.1	0.9
I	2,041	150	870	2.0	1,181.3	1,181.3	1,181.6	0.3
J	3,491	29	140	12.4	1,182.9	1,182.9	1,183.9	1.0

[1]Feet above Town of Mission Hill Corporate Limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

FLOODWAY DATA

UNNAMED STEAM

5.0 INSURANCE APPLICATIONS

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 risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or base flood depths are shown within this zone.

Zone AE

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

Zone AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance risk zone that corresponds to the areas of 1-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone X

Zone X is the flood insurance risk 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, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood 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 risk 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 the 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 FIRM presents flooding information for the entire geographic area of Yankton County. Previously, separate FIRMs were prepared for each identified flood prone incorporated community and for the unincorporated areas of the County. Historical data relating to the maps prepared for each community are presented in Table 4.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDAY MAP REVISION DATE	INITIAL FIRM EFFECTIVE DATE	FIRM REVISION DATE
*Gayville, Town of	--	--	--	--
Irene, Town of	July 6, 2010	--	July 6, 2010	--
*Lesterville, Town of	--	--	--	--
Mission Hill, Town of	December 13, 1974	--	June 18, 1980	--
Utica, Town of	July 6, 2010	--	July 6, 2010	--
Volin, Town of	July 6, 2010	--	July 6, 2010	--
Yankton, City of	March 22, 1974	January 19, 1976 January 23, 1979	August 15, 1980	--
Yankton County (Unincorporated Areas)	August 16, 1977	April 24, 1979	October 1, 1986	--

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

The James River study builds on several previous USACE studies for the James River including a Section 557(b) Study from August 2002 and a Reconnaissance Report/Environmental Initiative from February 1992.

Flood Insurance Studies have been completed for the Cities of Mission Hill and Yankton (References 16 and 17). This FIS supersedes the previous individual Flood Insurance Studies.

Flood Hazard Boundary Maps were previously published for the Cities of Mission Hill and Yankton (References 15 and 16). The results of this study supersede the Flood Hazard Boundary Maps for the Cities of Mission Hill and Yankton.

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

No Letters of Map Revision were incorporated into this study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, FEMA, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

9.0 BIBLIOGRAPHY AND REFERENCES

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6. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 3.1.2, Davis, California, April 2004.

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12. Missouri Basin Inter-Agency Committee, The Missouri River Basin Comprehensive Framework Study, Vols. 1-7, December 1971.

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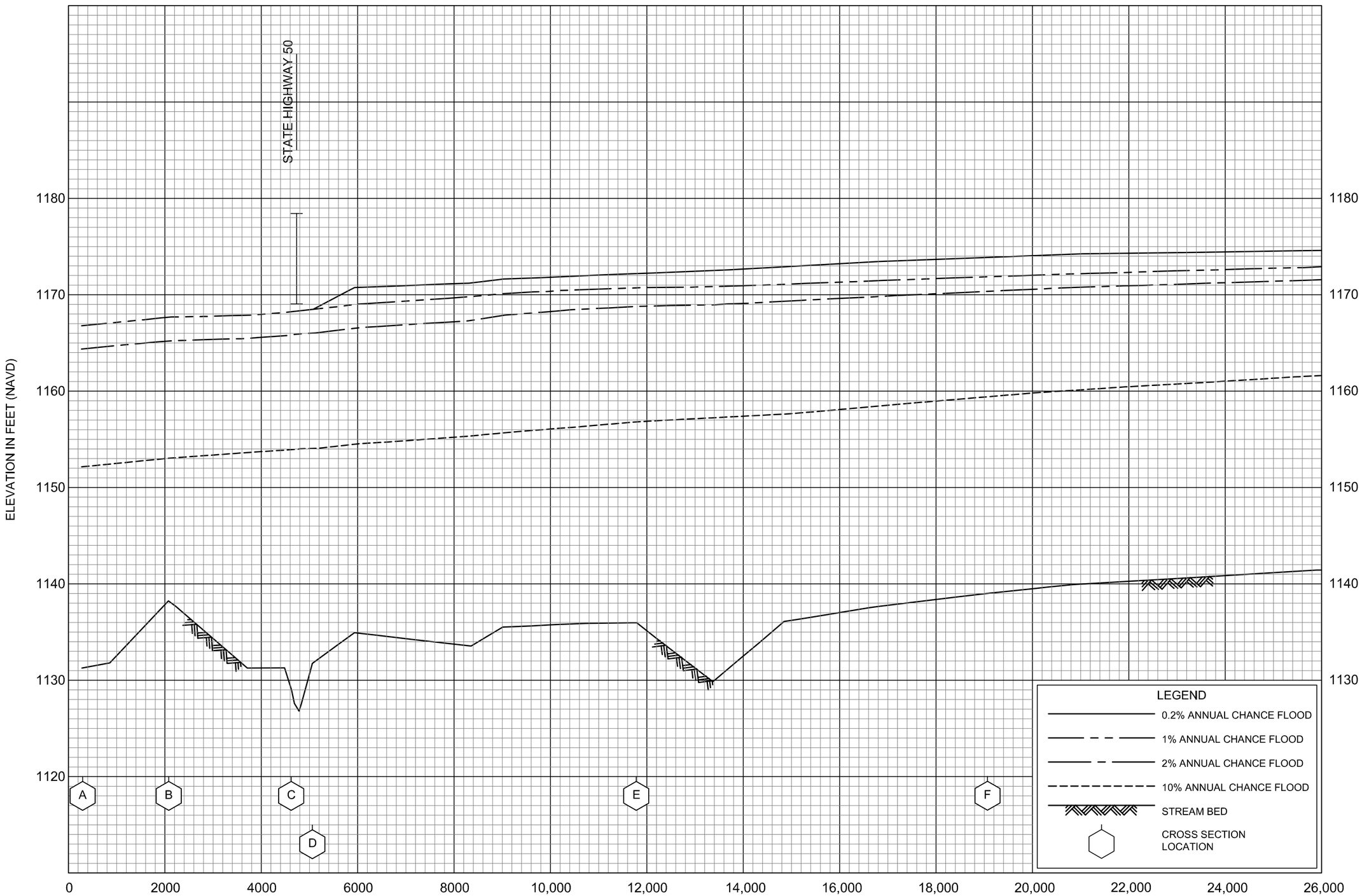
18. U.S. Census Bureau, Census 1990 Summary File 1 (South Dakota), 1991

19. U.S. Census Bureau, Census 2000 Summary File 1 (South Dakota), 2001



ELEVATION IN FEET (NAVD)

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH MISSOURI RIVER

FLOOD PROFILES

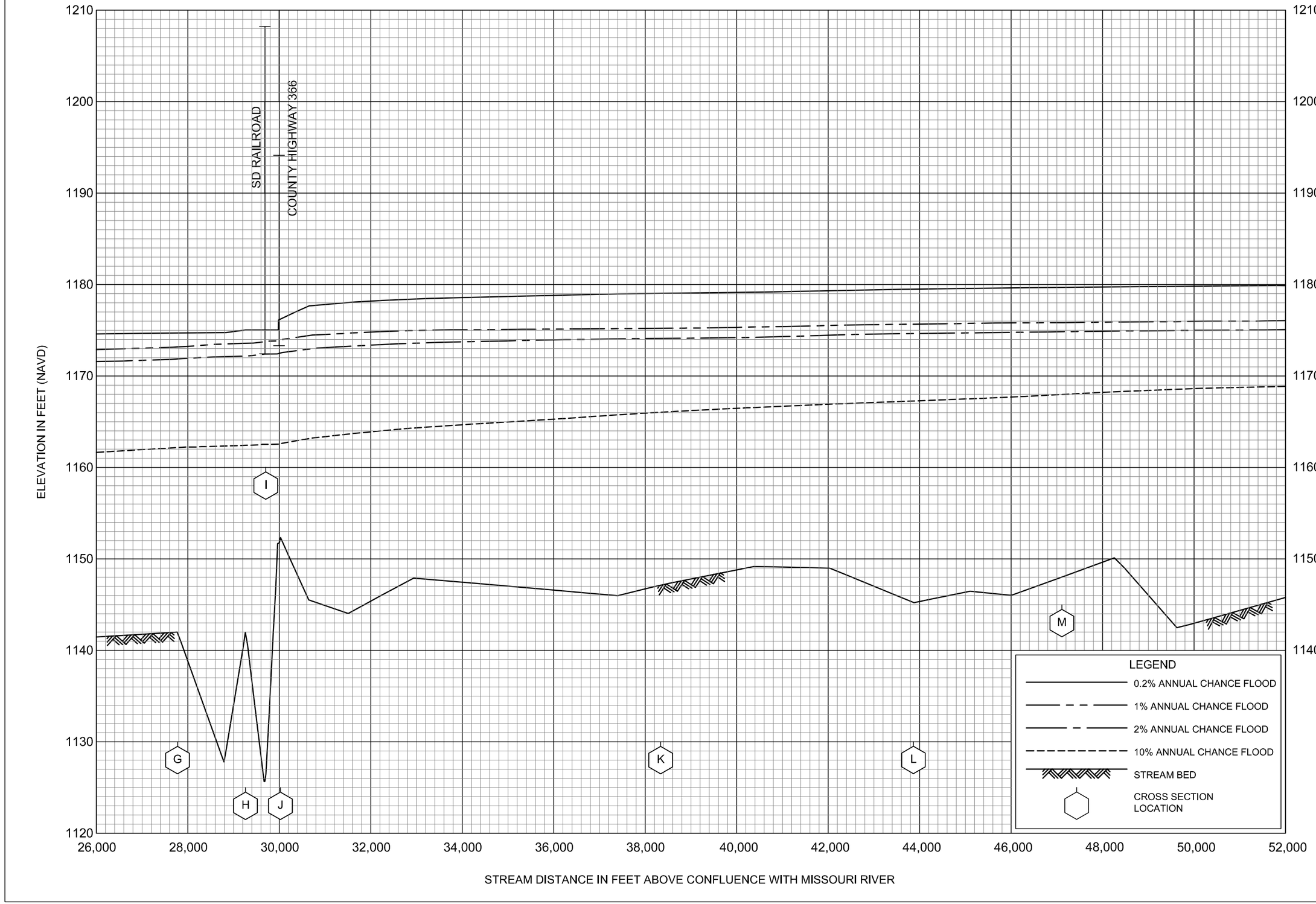
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

01P



FLOOD PROFILES

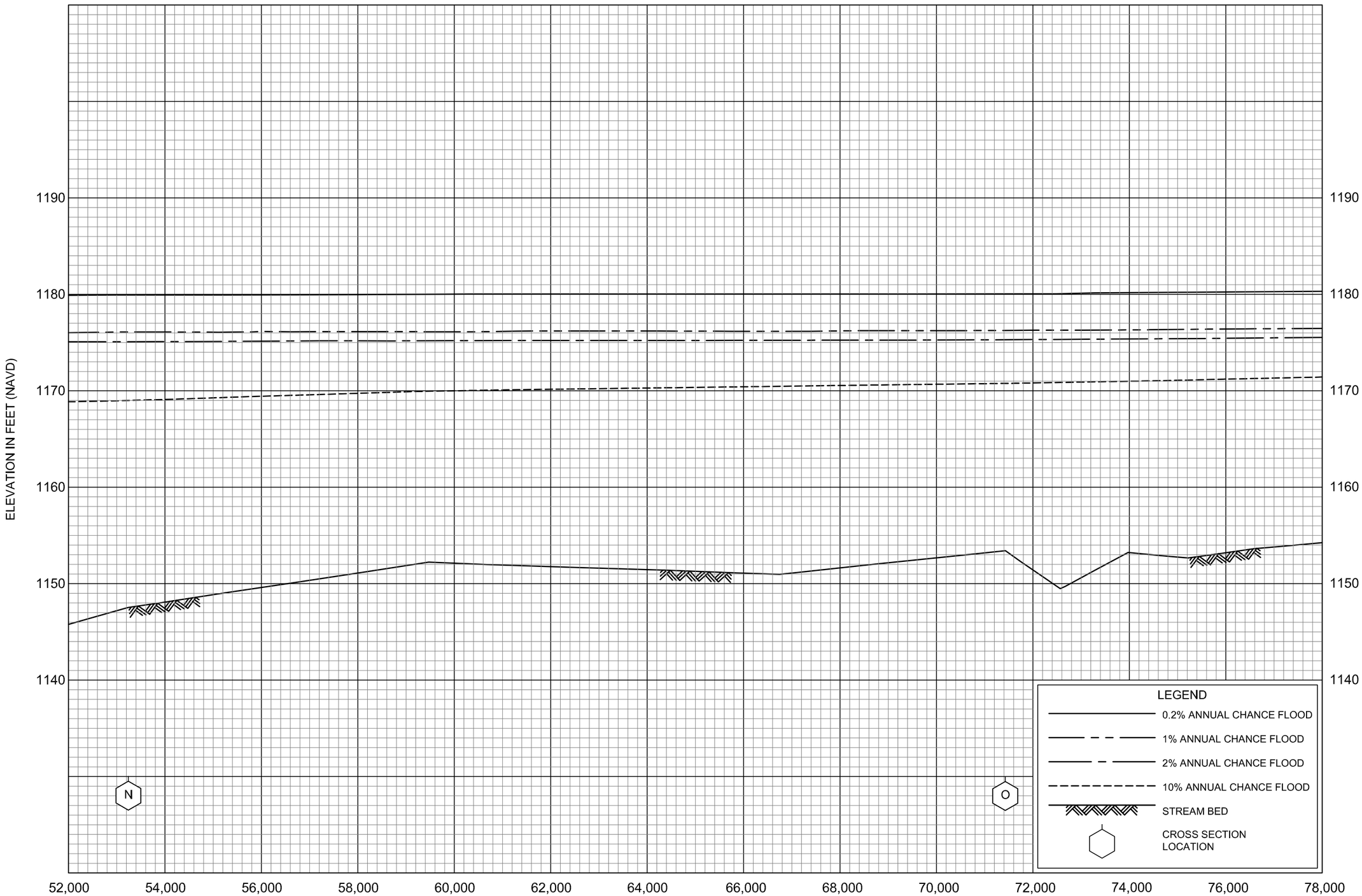
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

02P



FLOOD PROFILES

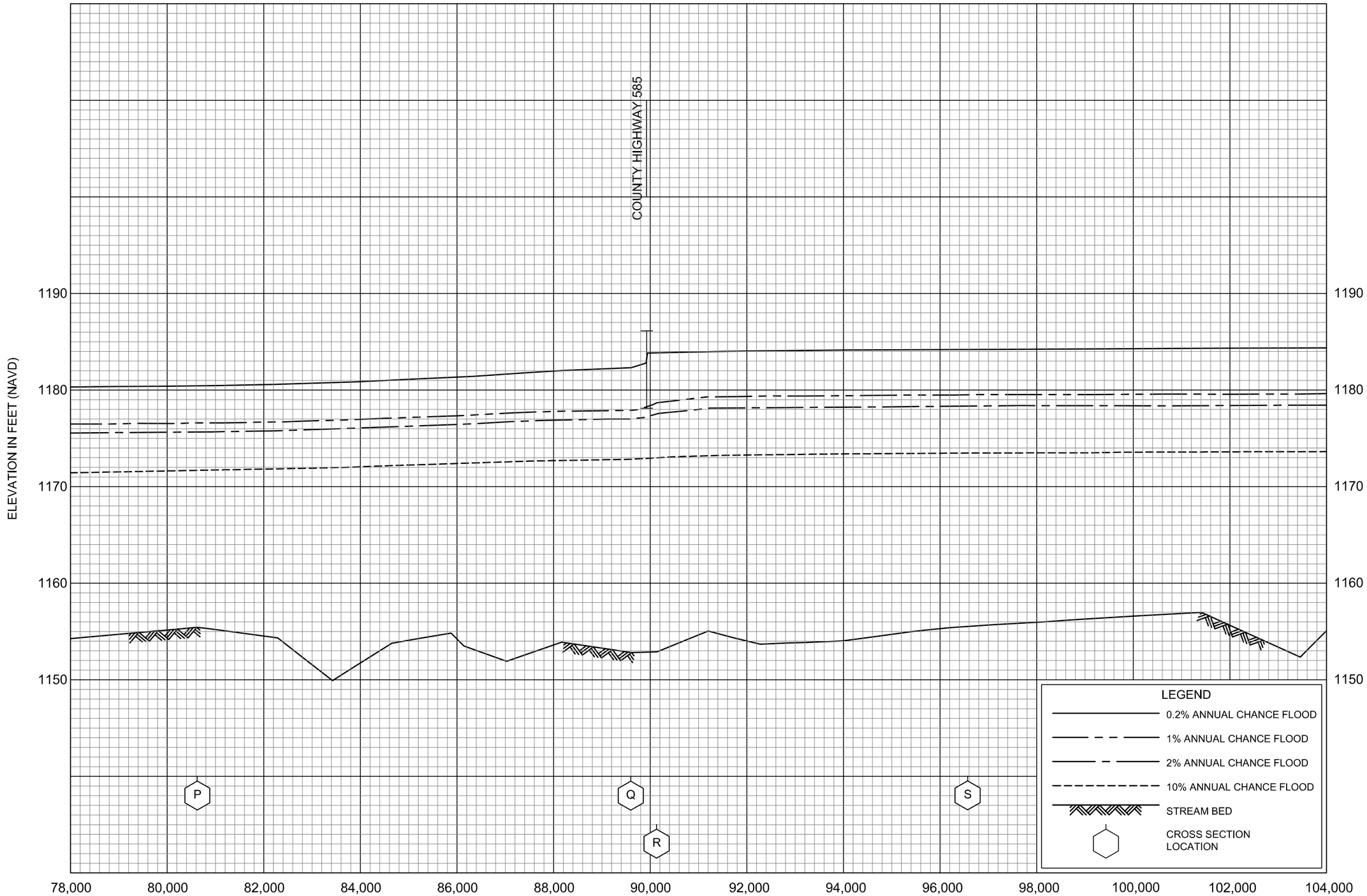
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

03P



FLOOD PROFILES

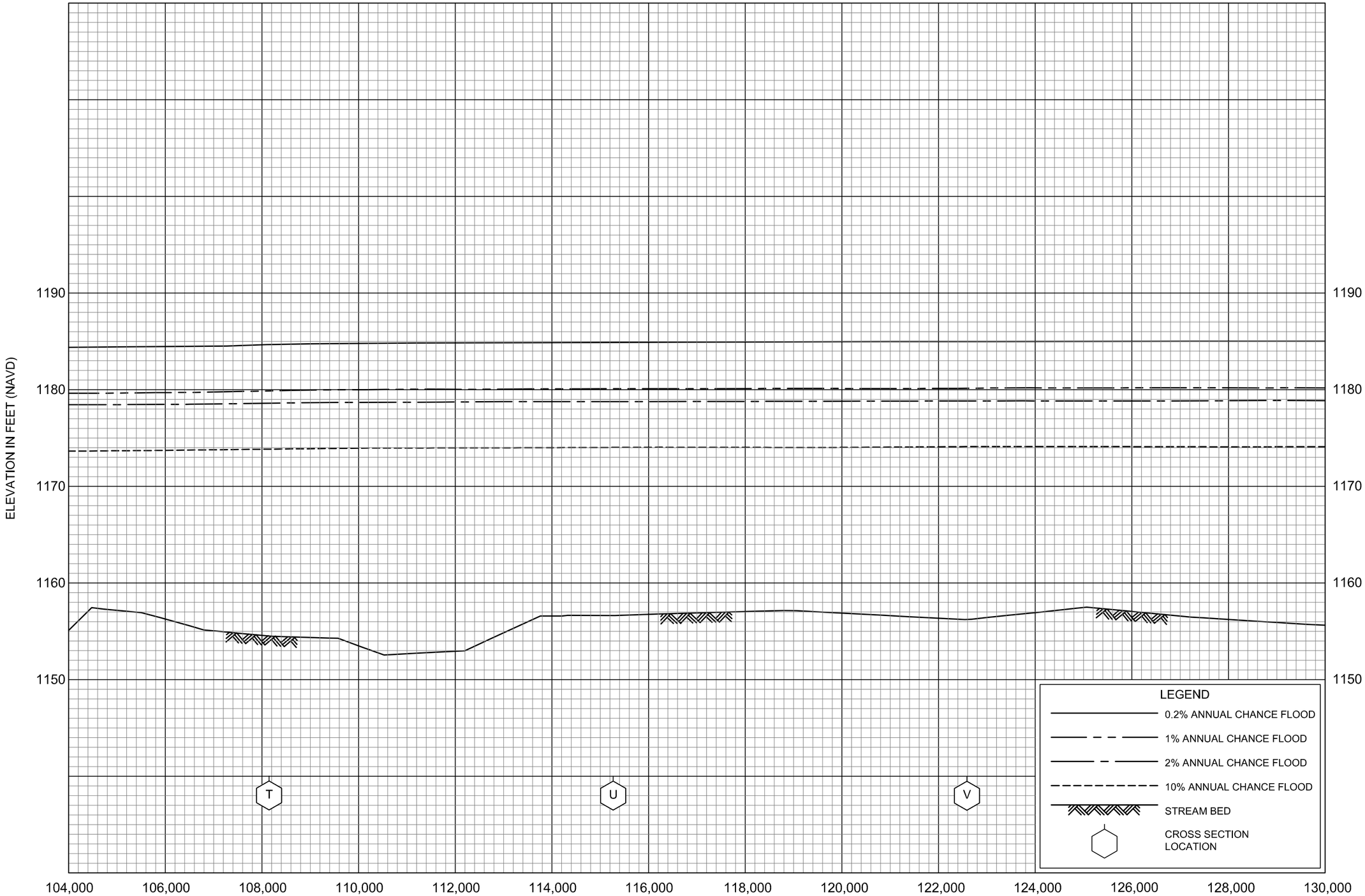
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

04P



FLOOD PROFILES

JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

05P

FLOOD PROFILES

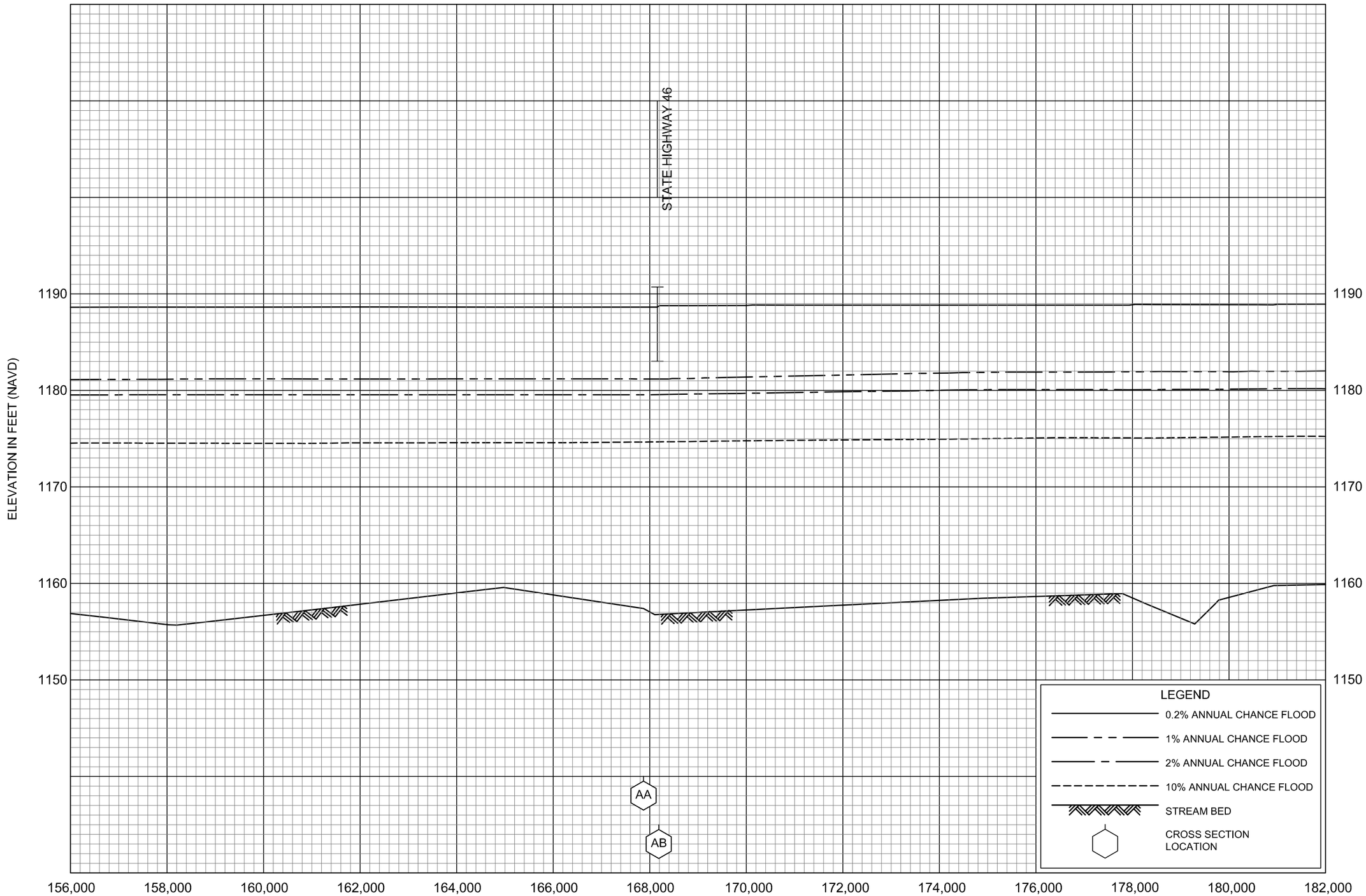
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

06P



FLOOD PROFILES

JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

07P

FLOOD PROFILES

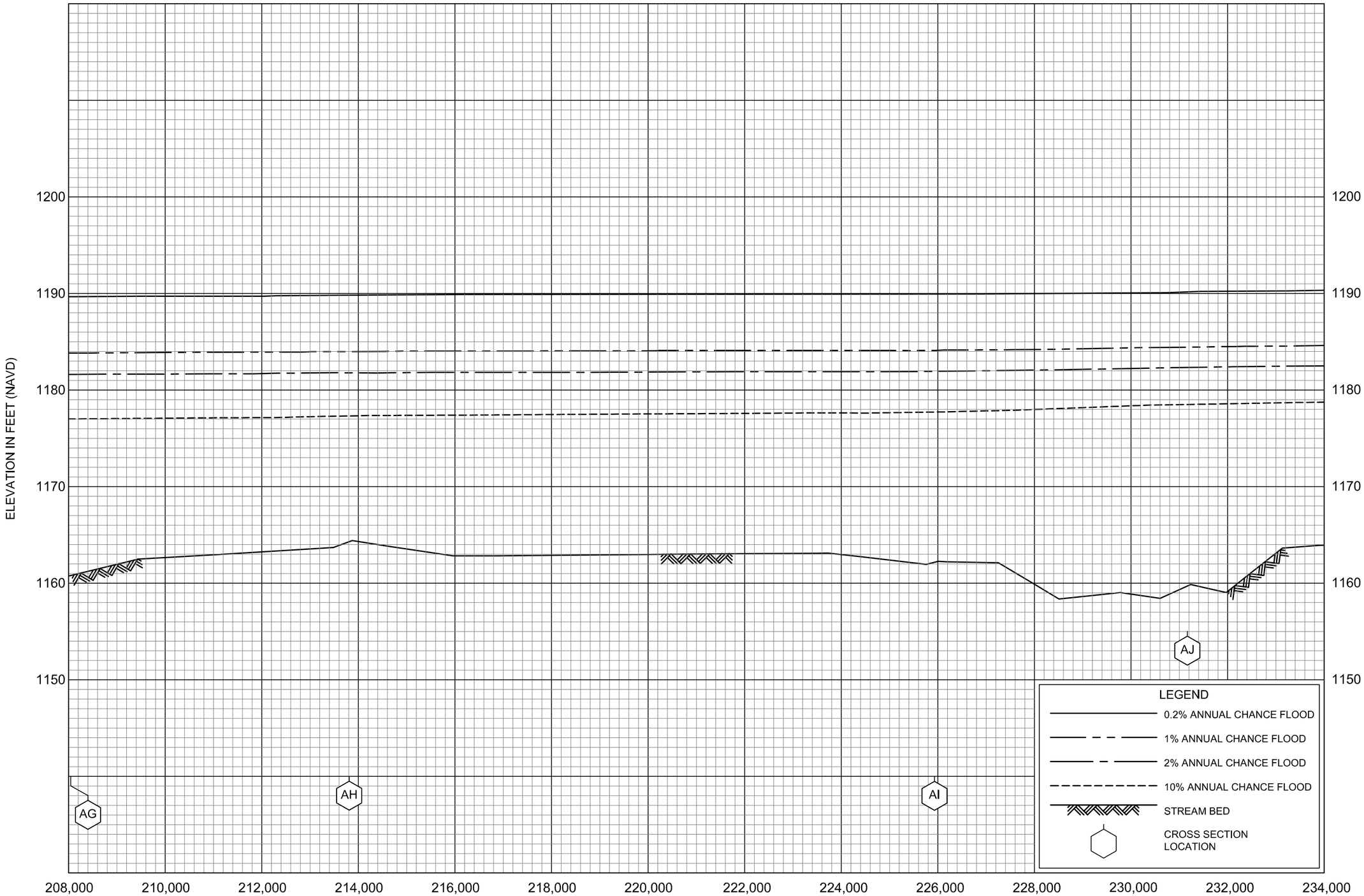
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

08P



FLOOD PROFILES

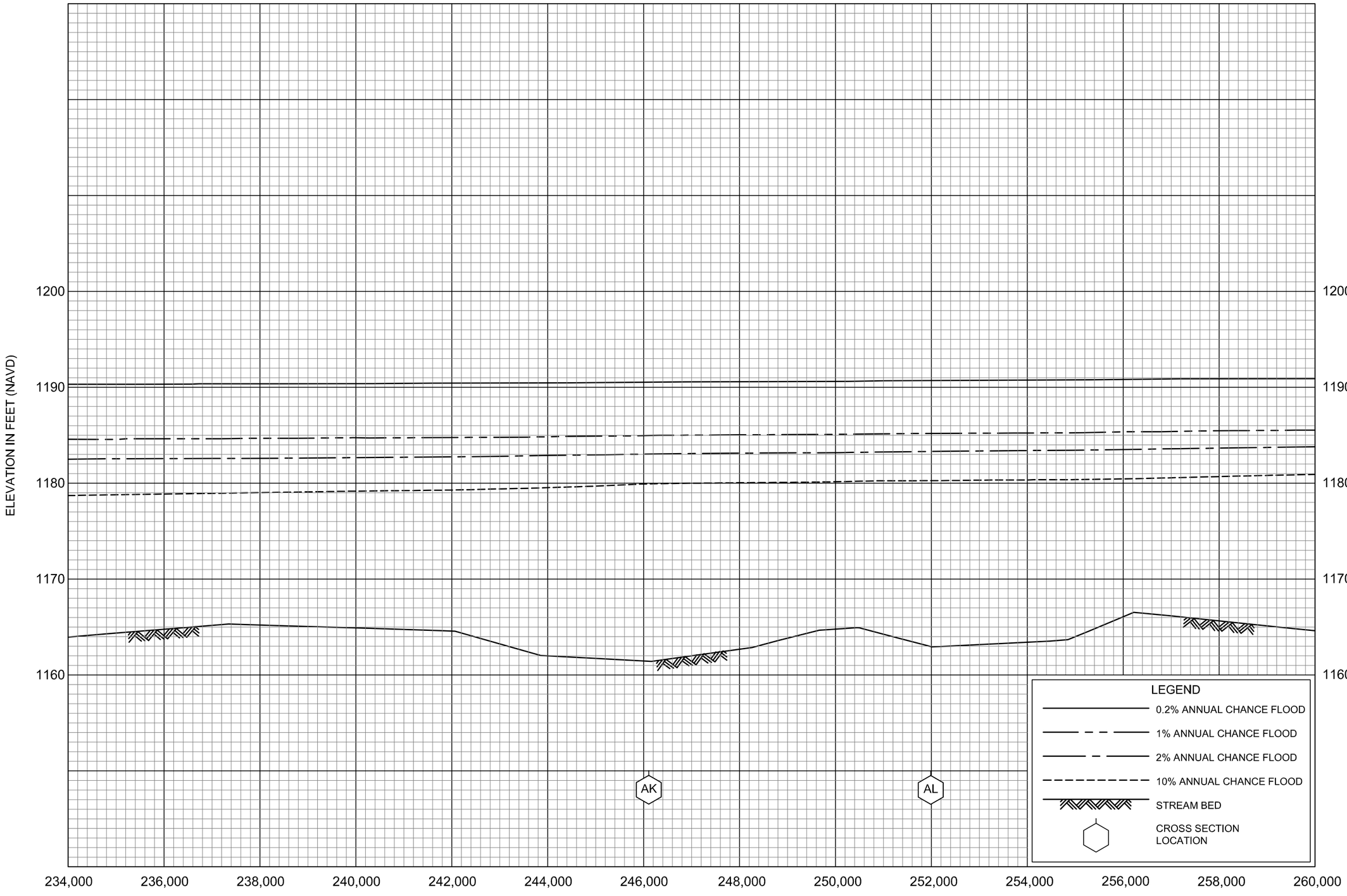
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

09P



FLOOD PROFILES

JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

10P

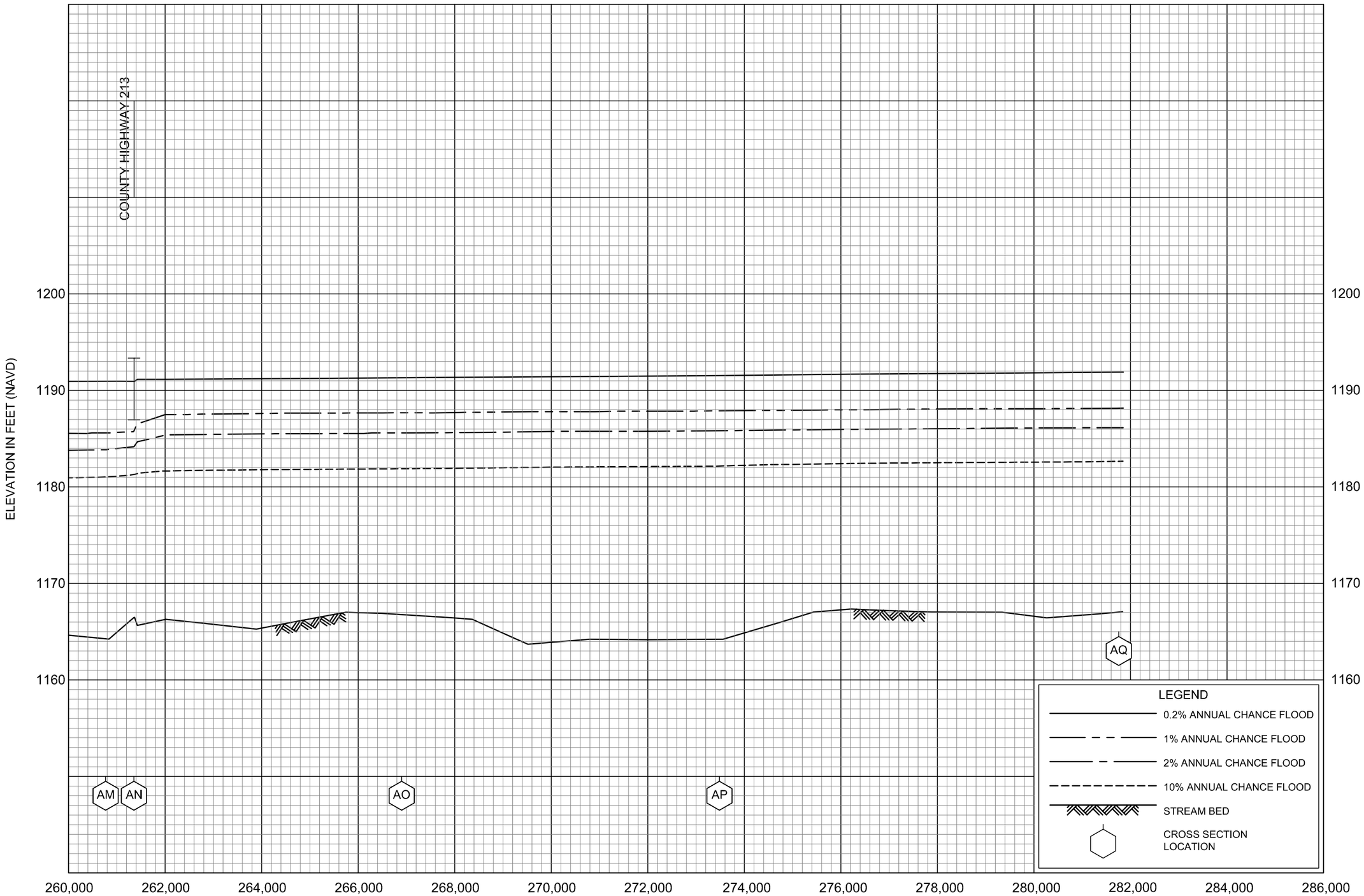
FLOOD PROFILES

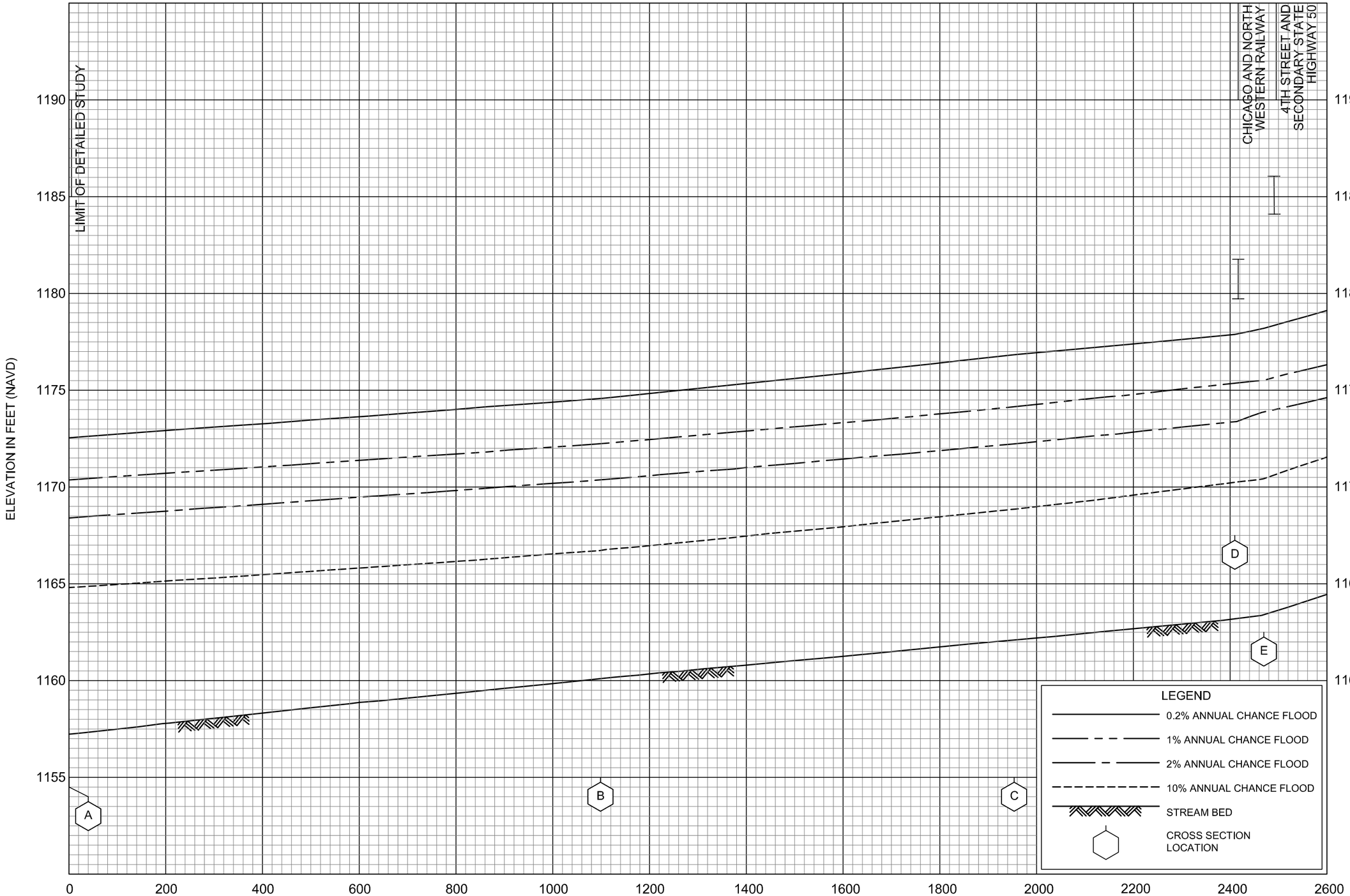
JAMES RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS





FLOOD PROFILES

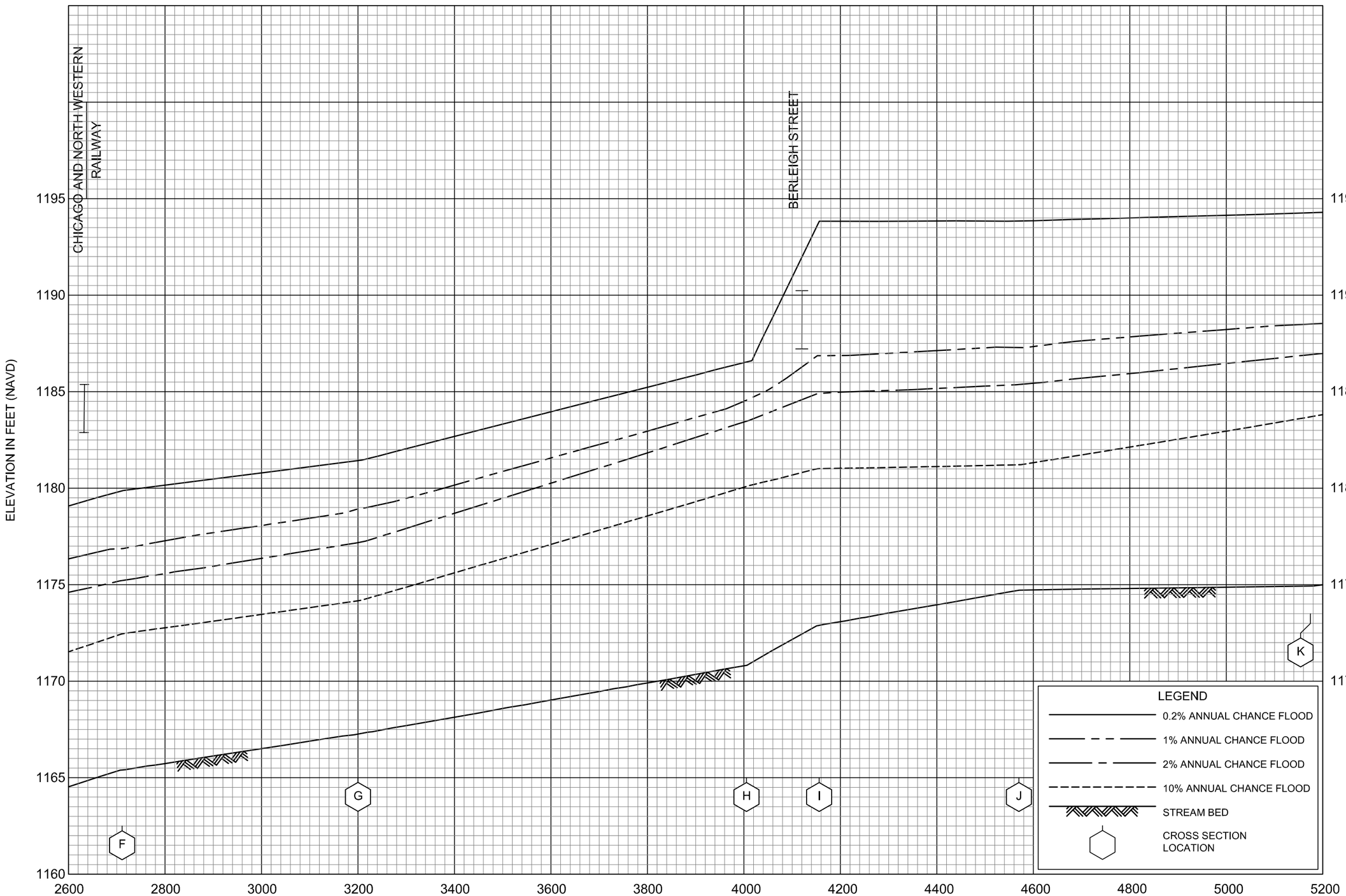
MARNE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

12P



FLOOD PROFILES

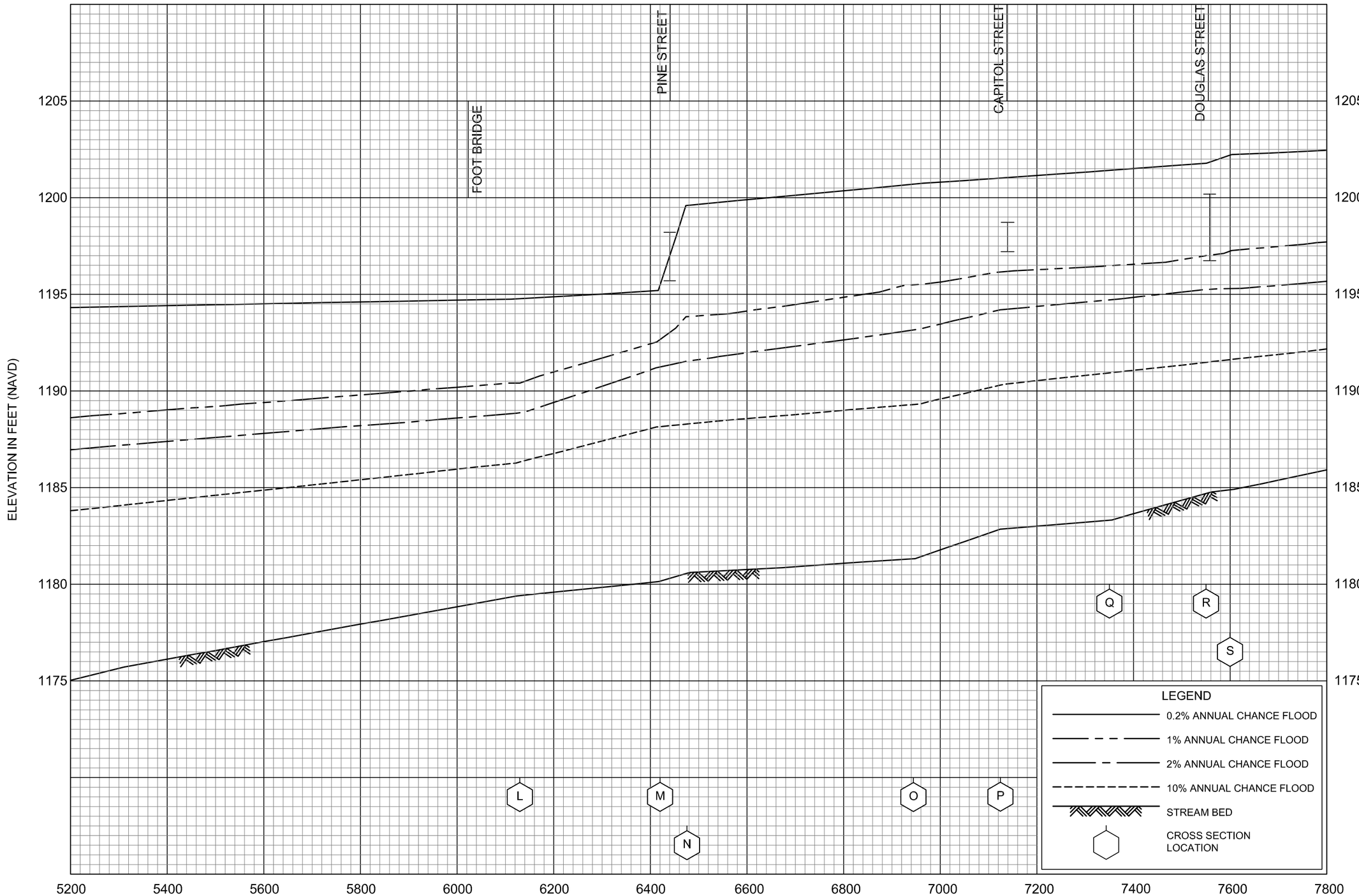
MARNE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

13P



FLOOD PROFILES

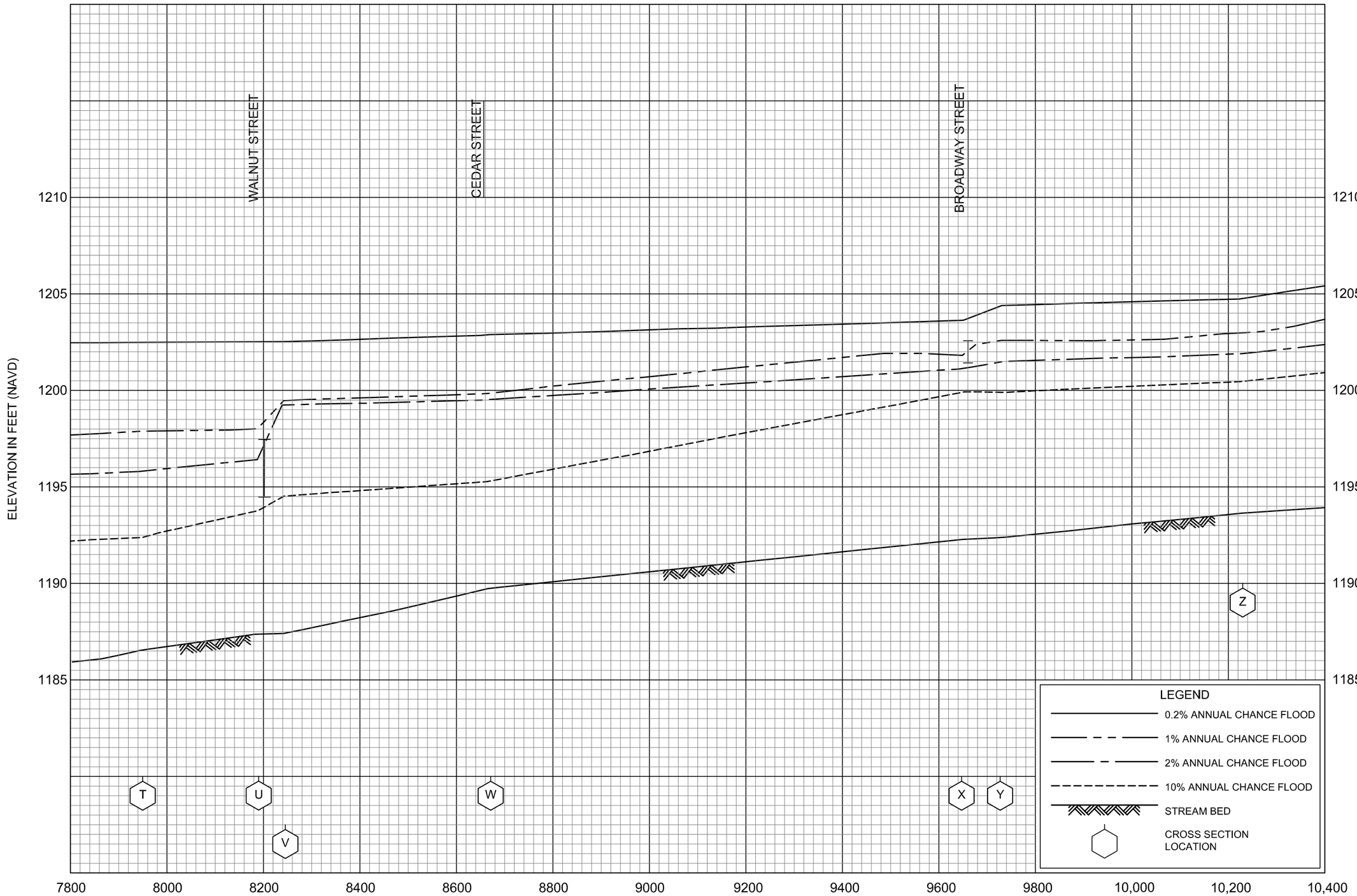
MARNE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

14P



FLOOD PROFILES

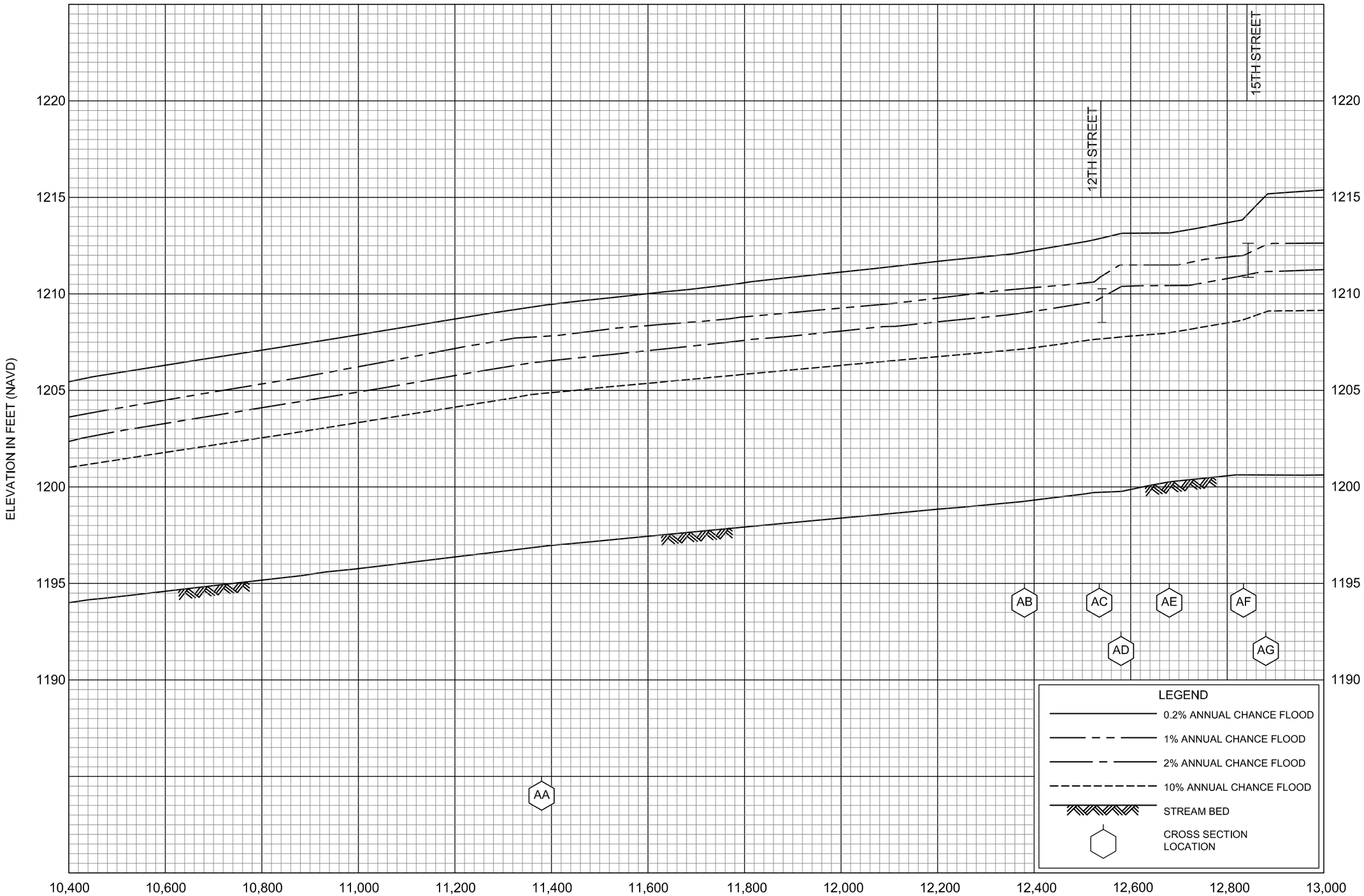
MARNE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD.

AND INCORPORATED AREAS

15P



FLOOD PROFILES

MARNE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

STREAM DISTANCE IN FEET APPROXIMATELY 290 FEET ABOVE CONFLUENCE WITH MISSOURI RIVER

FLOOD PROFILES

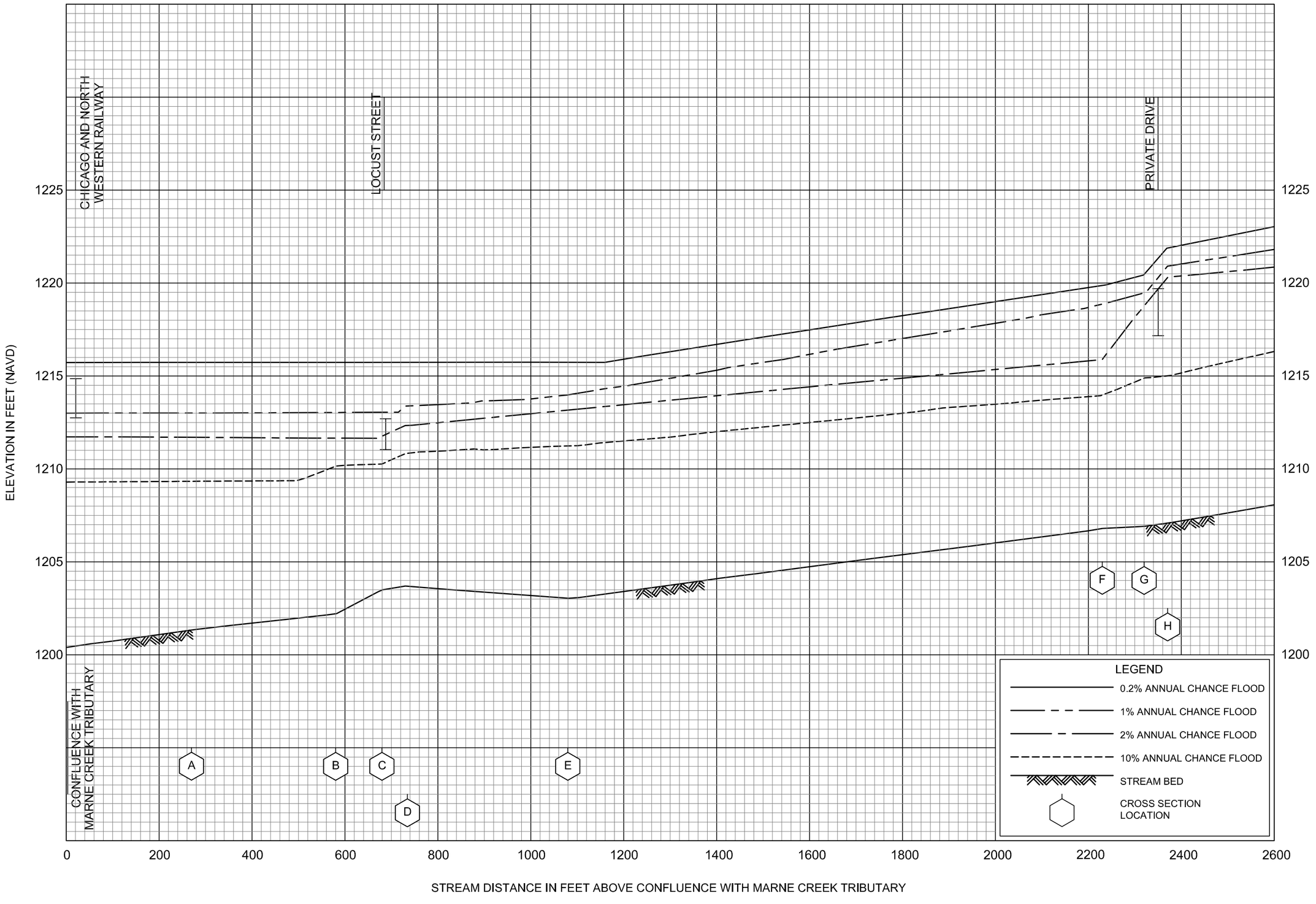
MARNE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

17P



FLOOD PROFILES

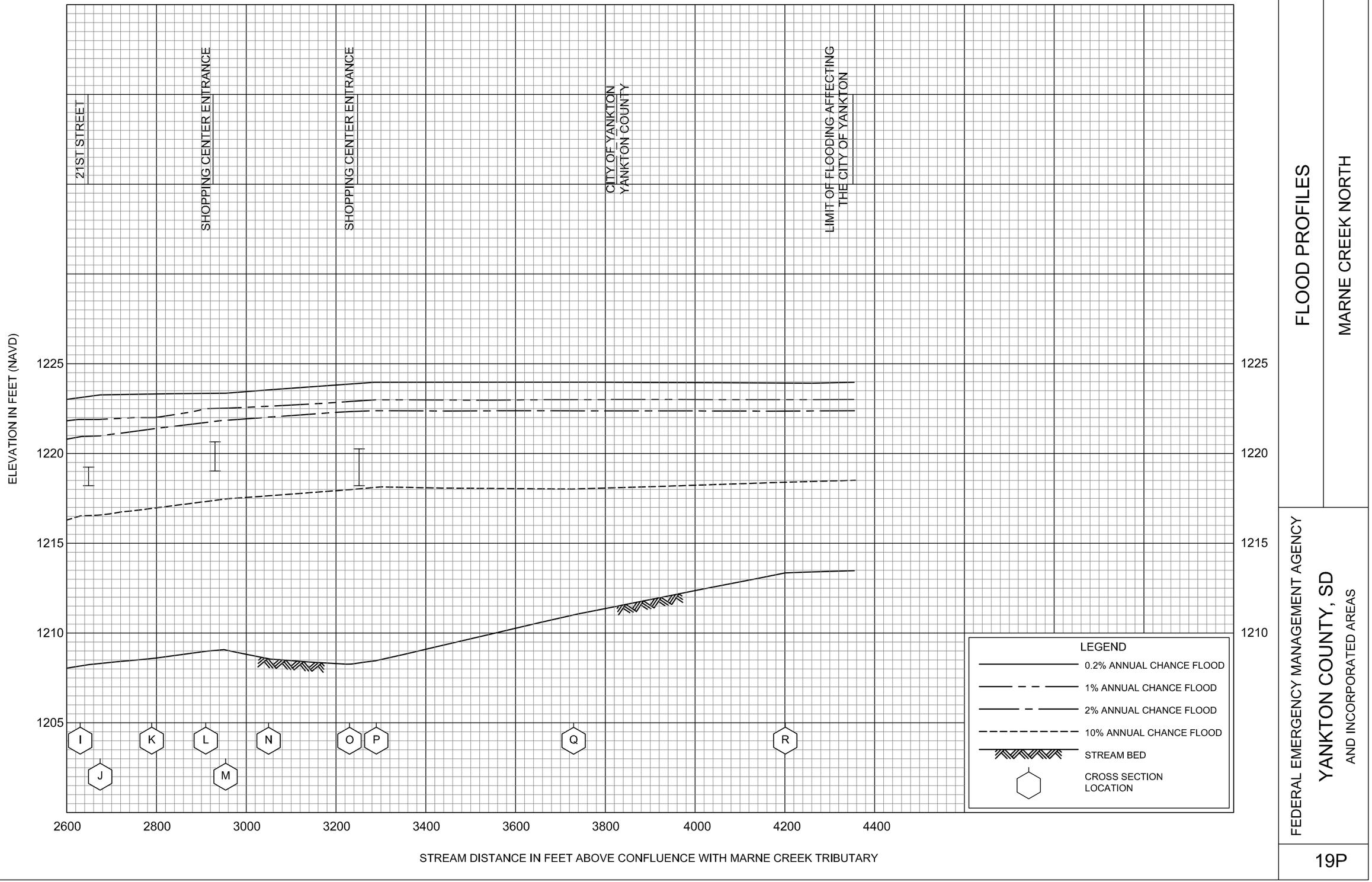
MARNE CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

18P



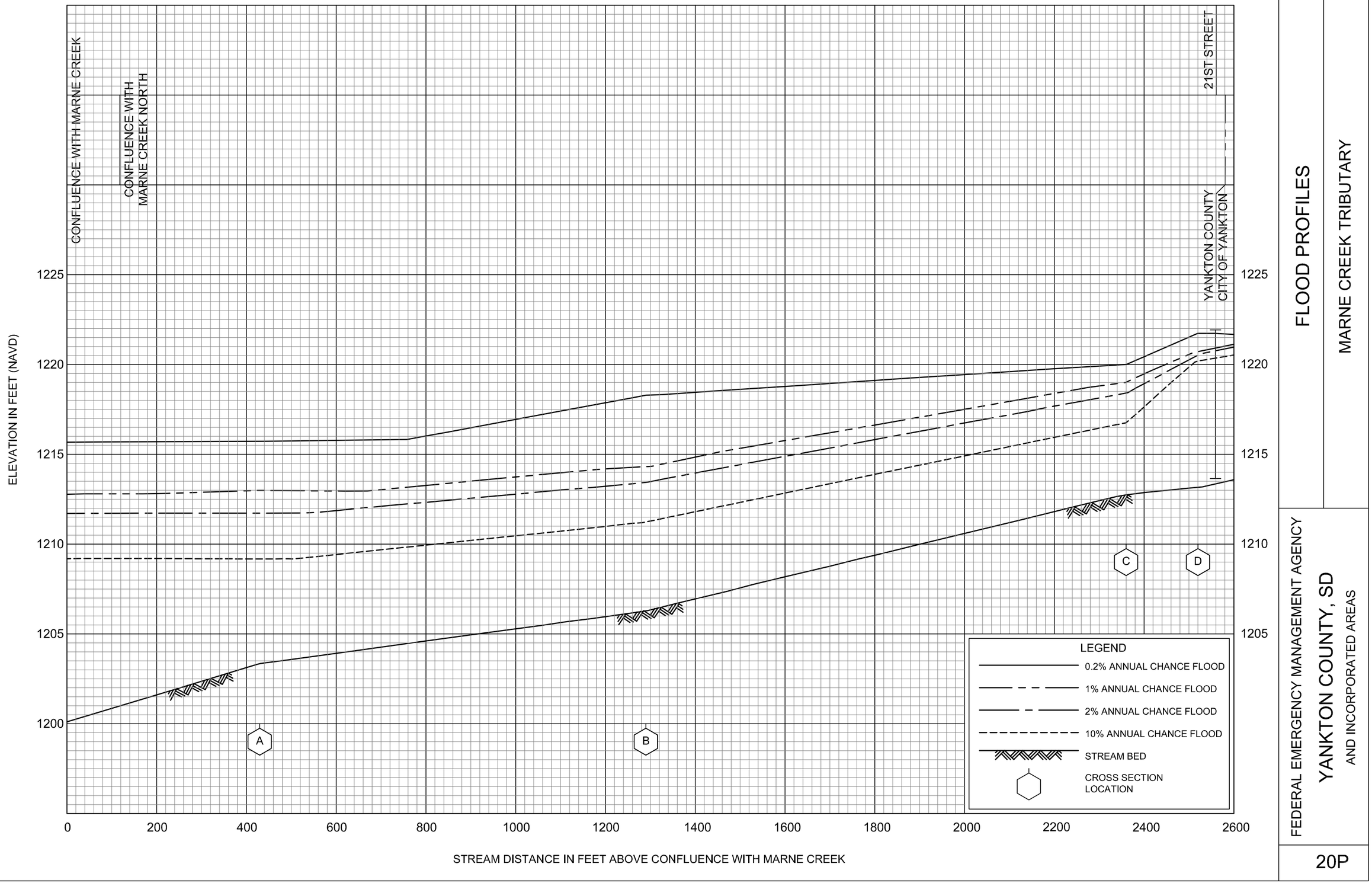
FLOOD PROFILES

MARNE CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS



FLOOD PROFILES

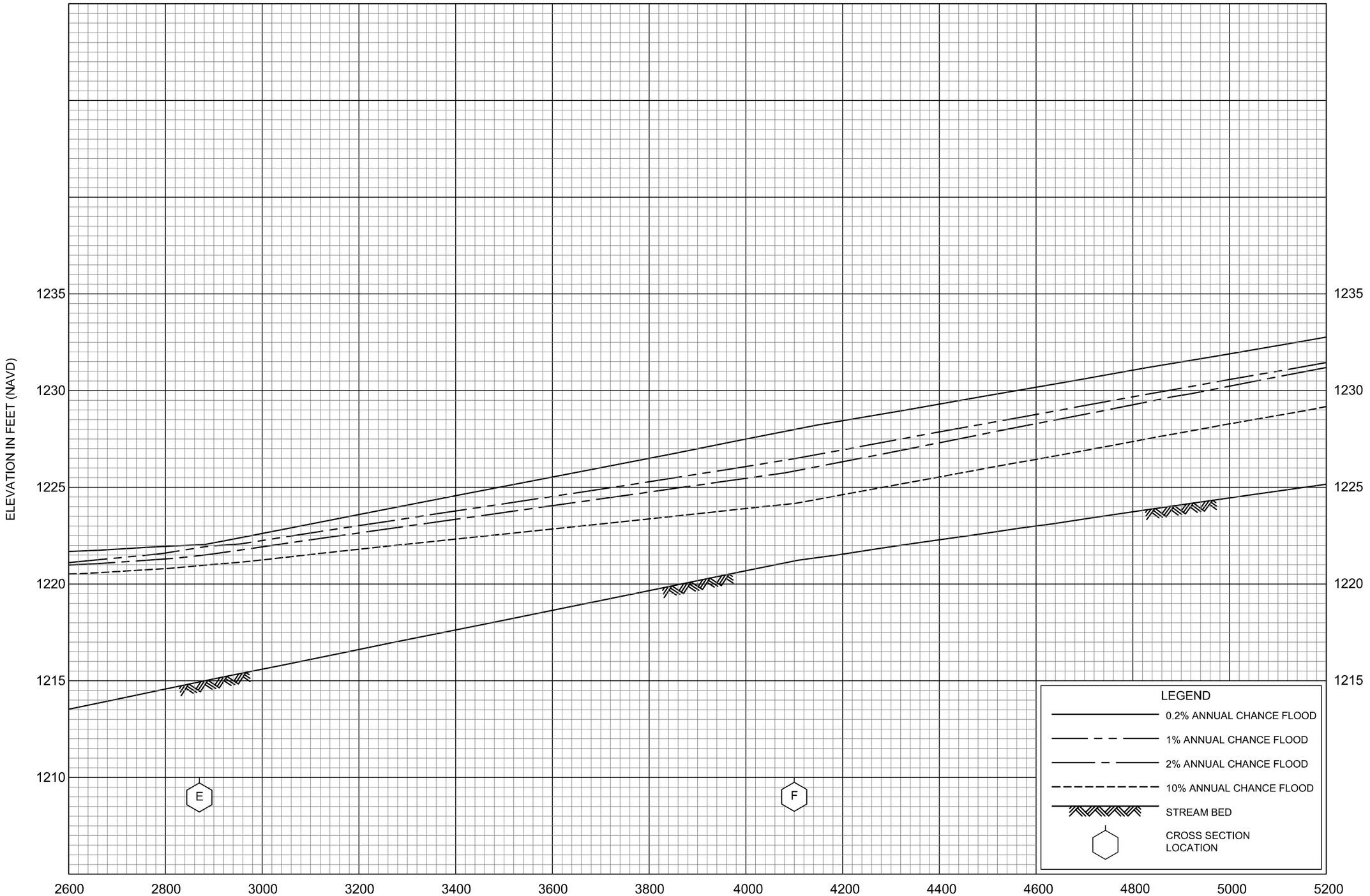
MARNE CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

20P



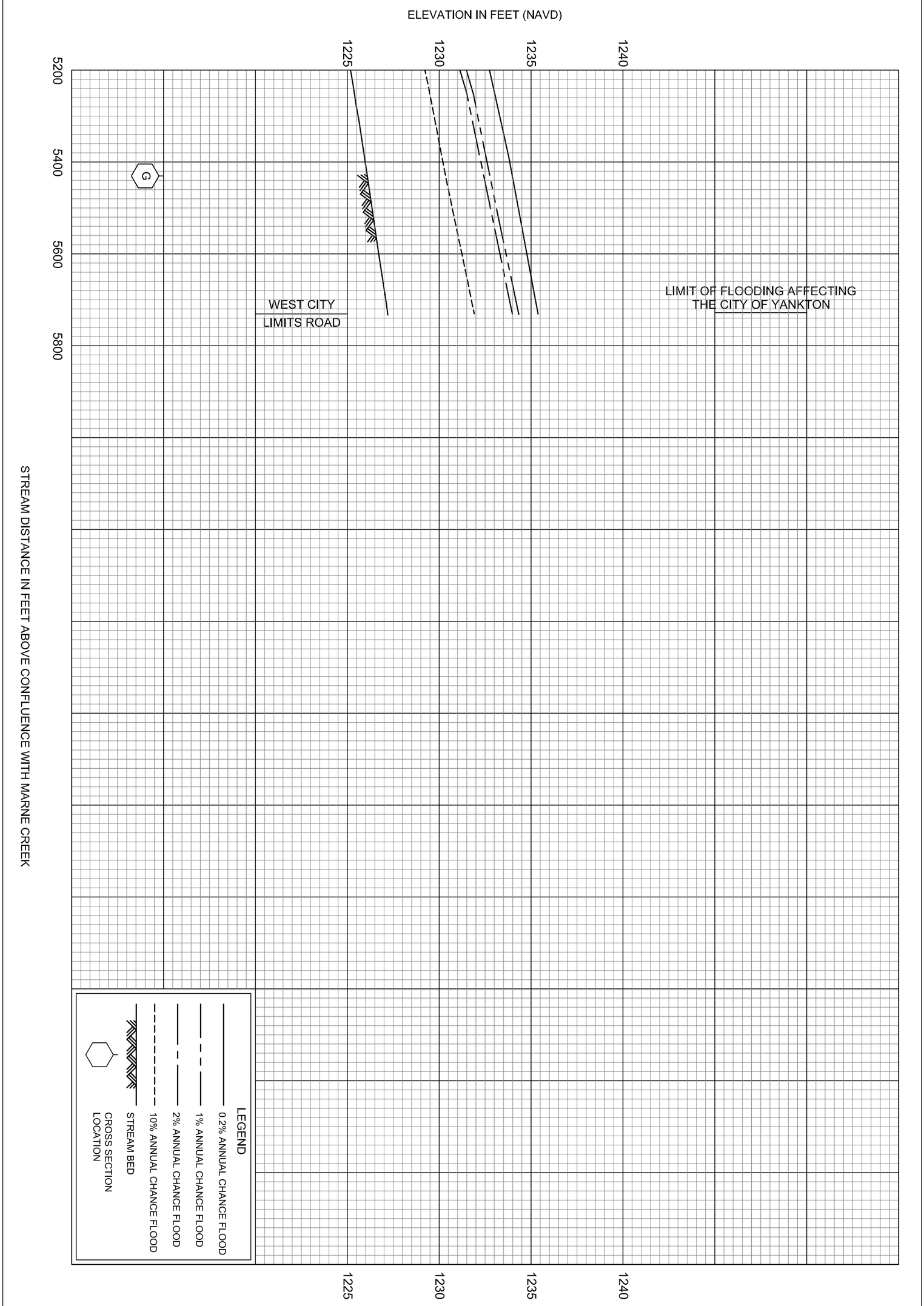
FLOOD PROFILES

MARNE CREEK TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS



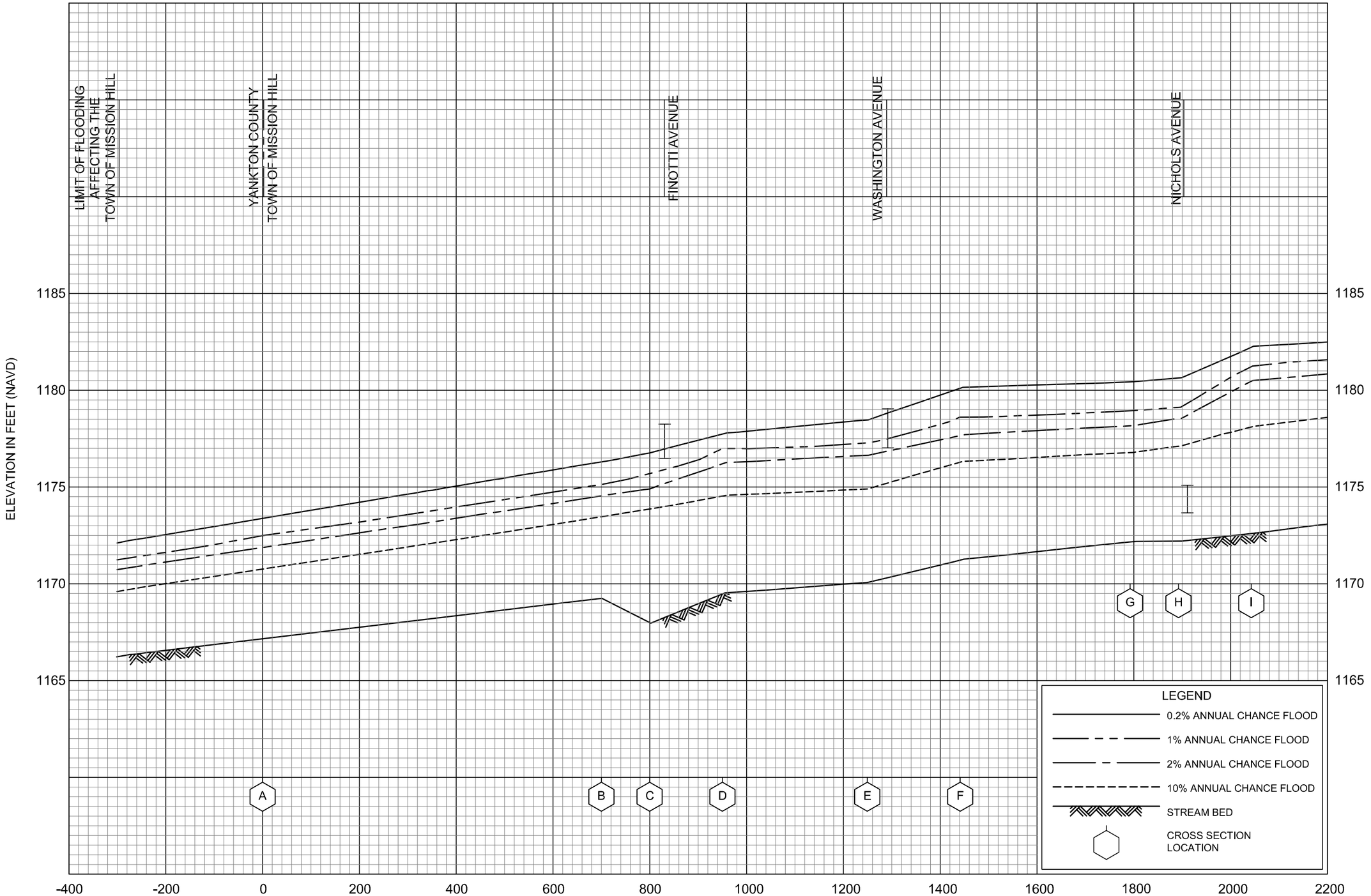
FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

FLOOD PROFILES

MARNE CREEK TRIBUTARY



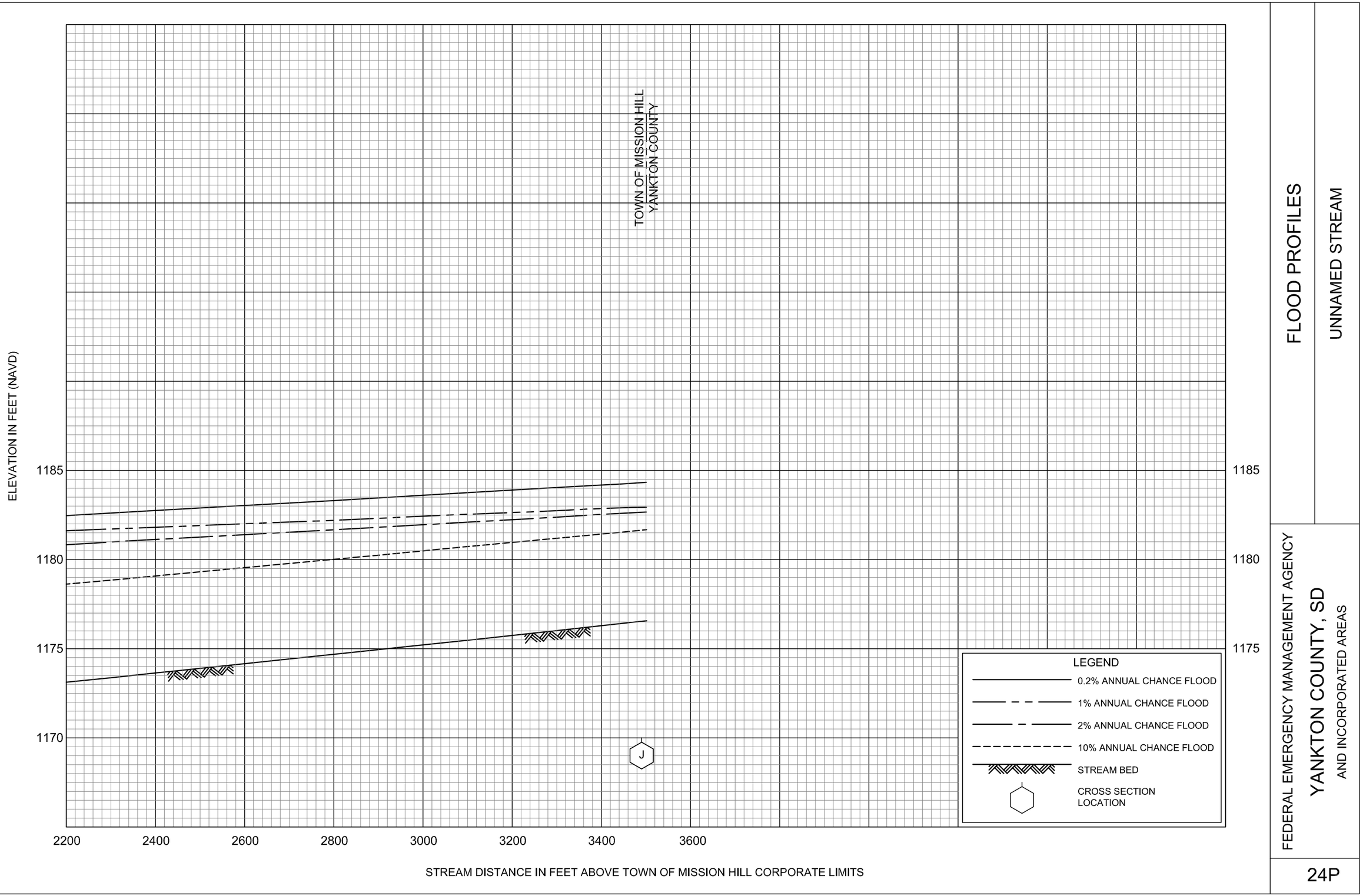
FLOOD PROFILES

UNNAMED STREAM

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY,SD

AND INCORPORATED AREAS



FLOOD PROFILES

UNNAMED STREAM

FEDERAL EMERGENCY MANAGEMENT AGENCY

YANKTON COUNTY, SD

AND INCORPORATED AREAS

24P