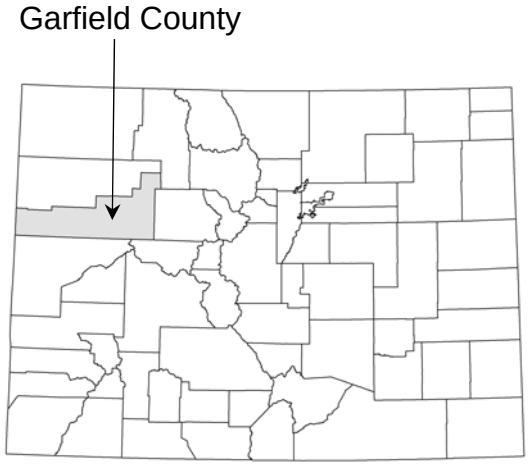
FLOOD INSURANCE STUDY

Volume 2 of 2

GARFIELD COUNTY, COLORADO

AND INCORPORATED AREAS

Community Name	Community Number
CARBONDALE, TOWN OF	080234
GARFIELD COUNTY (UNINCORPORATED AREAS)	080205
GLENWOOD SPRINGS, CITY OF	080071
NEW CASTLE, TOWN OF	080256
PARACHUTE, TOWN OF	080215
RIFLE, CITY OF	085078
SILT, TOWN OF	080223



Revised Preliminary: November 23, 2016

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
08045CV002A

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
A1 through A6 and A8 and A9	AE
B	X
C	X

Initial Countywide FIS Effective Date: TBD

TABLE OF CONTENTS

Volume 1

Table of Contents - Volume 1 - Continued

Page

FIGURES

TABLES

EXHIBITS

Table of Contents - Volume 2

FLOOD INSURANCE STUDY
GARFIELD COUNTY, COLORADO AND INCORPORATED AREAS

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)/Flood Boundary and Floodway Maps in the geographic area of Garfield County, Colorado, including the Cities of Glenwood Springs and Rifle, and the Towns of Carbondale, New Castle, Parachute, and Silt, and unincorporated areas of Garfield County (hereinafter referred to collectively as Garfield 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 Garfield 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.

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 Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The countywide FIS was prepared by combining data from the Cities of Glenwood Springs and Rifle, the Towns of Carbondale, Parachute and Silt, and the Unincorporated Areas within Garfield County (References 1 thru 6, respectively). Information on the authority and acknowledgements for each jurisdiction included in the countywide FIS, as compiled from their previously printed individual FIS reports is shown below.

Town of Carbondale

The hydrologic and hydraulic analyses for the Crystal River were performed by Simons, Li & Associates, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-C-0942. This study was completed in December 1983.

Garfield County (Unincorporated Areas)

The hydrologic and hydraulic analyses for the original study for the Unincorporated Areas of Garfield County were performed by the U.S. Army Corps of Engineers (USACE), Sacramento District, for FEMA, under Inter-Agency Agreement Nos. IAA-H-16-75 and IAA-H-7-76, Project Order Nos. 20 and 1, respectively.

Revised hydrologic and hydraulic analyses for the Roaring Fork River, Cattle, Rifle, and Government Creeks and Hubbard Gulch along with new hydrologic and hydraulic analyses for the Crystal River, Fourmile, Threemile, and Mitchell Creeks and Helmer and Ramsey Gulches were performed by Simons, Li & Associates, Inc., for FEMA, under Contract No. EMW-C-0942. This study was completed in December 1983.

City of Glenwood Springs

The hydrologic analyses of the Roaring Fork and Colorado Rivers were performed by the USACE, Sacramento District, for the 1977 Garfield County, Colorado, FIS and provided to Gingery Associates, Inc., for use in preparing the hydraulic calculations for these streams. The hydraulic calculations on the Roaring Fork River and the Colorado River downstream of the confluence with the Roaring Fork River were provided by the Colorado Water Conservation Board (CWCB). The hydraulic calculations on the Colorado River upstream of the confluence of the Roaring Fork River were performed by Gingery Associates, Inc., under Contract No. H-4017. This work, which was completed in January 1978, covered all significant flooding sources affecting the City of Glenwood Springs.

Hydrologic and hydraulic analyses for Threemile Creek and revised analyses for the Roaring Fork River upstream of the abandoned Cardiff Bridge were performed by Simons, Li and Associates, Inc., for FEMA under Contract No. EMW-C-0942. These analyses were completed in December 1983.

The hydraulic analysis for Mitchell Creek downstream of Interstate Highway 70 was performed by Claycomb Engineering Associates, Inc., Glenwood Springs, Colorado. This work was completed in December 1984.

Town of Parachute

The hydrologic and hydraulic analyses for the original study were performed by the USACE, Sacramento District, and the U.S. Soil Conservation Service (SCS) for FEMA. Additional data were provided by consultants to the Town of Parachute, James E. Langford and Associates. This work was completed in October 1989.

City of Rifle

The hydrologic and hydraulic analyses for this study were performed by the USACE, Sacramento District, for FEMA, under Inter-Agency Agreement Nos. IAA-H-16-75 and IAA-H-7-76, Project Order Nos. 20 and 1, respectively.

Revised hydrologic and hydraulic analyses for Rifle and Government Creeks and Hubbard Gulch along with new hydrologic and hydraulic analyses for Helmer and Ramsey Gulches were performed by Simons, Li & Associates, Inc., for FEMA, under Contract No. EMW-C-0942. This study was completed in December 1983.

Town of Silt

The hydrologic and hydraulic analyses for the study were performed by the USACE, Sacramento District, and the CWCB. Additional data were provided by consultants to the Town of Silt, Schmueser Gordon Meyer, Inc. This work was completed in October 2004.

There was no previously printed Flood Insurance Study for the Town of New Castle.

For the initial countywide FIS, revised hydrologic and hydraulic analyses for Parachute Creek were performed by PBS&J for the Colorado Water Conservation Board (CWCB) and FEMA (References 7). This work was completed in 2007. Additionally, a revised hydrologic analysis for Mitchell Creek was performed by the USGS (Reference 8) to consider impacts of the Coal Seam Fire in 2002. USGS also performed a revised hydraulic analysis for the upper reach of Mitchell Creek (upstream of Donegan Road, Reference 8). A revised hydraulic analysis for Mitchell Creek was also performed by Michael Baker Jr., Inc. (Baker) for FEMA under contract HFSFEHQ-04-D-0025. This work was completed in February 2010 (Reference 9), and covers the reach from Donegan Road to a point approximately 350 feet downstream of Donegan Road. The Baker study includes a split-flow analysis of Mitchell Creek- Right Overbank Split Flow as well as other split flows. Alluvial Fan flooding potential for Helmer Gulch near the City of Rifle was analyzed in a new study by Baker under contract to FEMA. This work was completed in 2016 (Reference 10).

Approximate studies for East Elk Creek and West Elk Creek, performed by the U.S. Department of Agriculture, Soil Conservation Service in-cooperation with the CWCB, Town of New Castle, and Garfield County in 1986 have also been incorporated into this FIS (Reference 11).

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, dated 2009. It was downloaded from their website, https://gdg.sc.egov.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 ortho-photo quadrangle (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).

1.3 Coordination

For the countywide FIS, the initial Consultation Coordination Officer (CCO) meeting was held on October 19, 2005, and attended by representatives of FEMA, CWCB, Baker, Garfield County, Town of Carbondale, City of Glenwood Springs, Town of New Castle, Town of Parachute, City of Rifle, Town of Silt, and the study contractor.

The results of the revised study were reviewed at the final CCO meeting held on January 10, 2012, and attended by representatives of FEMA, CWCB, the communities, and the study contractor. All issues raised at that meeting have been addressed.

Additional meetings were held with representatives from the City of Glenwood Springs and Garfield County in the Spring of 2014 and Summer of 2016 to discuss and resolve comments submitted to FEMA following the October 10, 2012 CCO meeting.

The countywide FIS was prepared by combining data from the Cities of Glenwood Springs and Rifle, the Towns of Carbondale, Parachute and Silt, and the Unincorporated Areas within Garfield County (References 1 thru 6, respectively). Information on the coordination of the original studies for each jurisdiction included in the countywide FIS, as compiled from their previously printed individual FIS reports is shown below.

Town of Carbondale

On April 9, 1984, Dames & Moore was instructed by FEMA to proceed with an Existing Data Study for the Town of Carbondale, Colorado, using the study data from the Garfield County FIS.

The results of the hydrologic analyses were coordinated with the USACE, CWCB, and the USGS.

The final community coordination meeting was held on January 28, 1985, and was attended by representatives of FEMA, the study contractor, and the Town of Carbondale. No problems were raised at the meeting.

Garfield County (Unincorporated Areas)

For the original study for the unincorporated areas of Garfield County, streams requiring detailed and approximate study were identified at a meeting attended by representatives of Garfield County, FEMA, and the study contractor in June 1982.

Results of the hydrologic analyses were coordinated with the USACE, CWCB, ARIX Consultants, Claycomb Engineering Associates, Inc., and the USGS.

In January 1984, the results of the study were reviewed at an intermediate coordination meeting attended by representatives of Garfield County, FEMA, and the study contractor.

City of Glenwood Springs

On August 3, 1977, a meeting was held with representatives of FEMA; CWCB; the City of Glenwood Springs; and Gingery Associates, Inc., the study contractor, to aid in base map selection and identification of streams requiring detailed study for the original FIS. The Colorado Geological Survey was also contacted for information pertinent to the original FIS.

Flood elevations, flood boundaries, and floodway delineations were reviewed by community officials and by officials of CWCB during the original study.

A final community coordination meeting was held on July 20, 1978, and attended by representatives of FEMA, the study contractor, and the City of Glenwood Springs. All corrections resulting from the meeting were incorporated into the original study.

A request was made in October 1983 by the community to update the 1979 Glenwood Springs FIS in annexed areas. The community supplied 1980 topographic mapping, which was used to update flood boundaries along portions of the Colorado and Roaring Fork Rivers.

Detailed analyses completed for Garfield County in December 1983 were used to revise the Roaring Fork River upstream of the abandoned Cardiff Bridge, and to add flooding along Threemile Creek and Mitchell Creek within annexed areas. At that time, FEMA decided to include flooding information through the unincorporated areas adjacent to Glenwood Springs on the 1985 revision of the Flood Insurance Rate Map and Flood Boundary and Floodway Map.

Town of Parachute

On October 16, 1990, FEMA notified the Town of Parachute that an Existing Data Study (XDS) was being prepared for the community using information prepared by J.E. Langford and Associates, Inc.

The cooperation and assistance of CWCB, the SCS, and the Town of Parachute in preparing that document is acknowledged.

The results of that study were reviewed at the final CCO meeting held on December 5, 1990, and attended by representatives of FEMA, the community, and the study contractor. All problems raised at that meeting were addressed in that study.

City of Rifle

Streams requiring detailed study were identified at a meeting attended by representatives of the study contractor, FEMA, and the City of Rifle in June 1982.

In August 1983 the results of the study were reviewed at an intermediate coordination meeting attended by representatives of the study contractor, FEMA, CWCB, and the City of Rifle.

Results of the hydrologic analyses were coordinated with the USACE, CWCB, ARIX Engineers, Claycomb Engineers, and the USGS.

Town of Silt

On January 31, 2005, FEMA notified the Town of Silt that a Physical Map Revision (PMR) was being prepared for the community using information prepared by Schmueser Gordon Meyer, Inc.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Garfield County, Colorado including the Cities of Glenwood Springs, Rifle, and the Towns of Carbondale, New Castle, Parachute, and Silt, and unincorporated areas of Garfield 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 2012.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and officials of Garfield County.

Divide Creek; Dry Hollow Creek; Warmbroth Creek; East Elk Creek; West Elk Creek; Glenwood Springs Wash Number 1, 2, and 3; Monument Gulch; many small tributary washes near Grand Valley; Pioneer Ditch, and portions of the Colorado River were studied by approximate methods.

For the City of Glenwood Springs, nine areas were studied by approximate methods; eight are unnamed streams; the ninth is Cemetery Gulch. The flow patterns for the unnamed streams are as follows: (1) across Red Mountain Drive, Midland Avenue, and West 9th Street; (2) along 13th Street; (3) across Midland Avenue south of 13th Street; (4) across Lincolnwood Drive and Hyland Park Drive (north); (5) toward 19th Street; (6) down 21st Street and Blake and Bennett Avenues; (7) to Bennett Avenue (south and across Palmer Avenue); and (8) across Palmer Avenue to Blake Avenue (south) and over 21st Street. These nine areas were studied by approximate methods because they have no defined channel and because, except for the first unnamed stream, they all have drainage areas of less than 1 square mile.

Table 1 – Streams Studied by Detailed Methods

Stream	Limits of Detailed Study
Alkali Creek	From its confluence with the Colorado River to approximately 0.3 mile upstream
Cattle Creek	From its confluence with the Roaring Fork River to approximately 5.4 miles upstream
Colorado River	Segments at Parachute, Rifle, Silt, and Glenwood Springs
Crystal River	From its confluence with the Roaring Fork River to approximately 4.6 miles upstream
Fourmile Creek	From its confluence with the Roaring Fork River to approximately 6.8 miles upstream
Government Creek	From its confluence with Rifle Creek to approximately 3.1 miles upstream
Helmer Gulch	From its confluence with the Colorado River to approximately 1.1 miles upstream
Hubbard Gulch	From its confluence with Rifle Creek to approximately 2.8 miles upstream
Mitchell Creek	From its confluence with the Colorado River to approximately 1.7 miles upstream
Mitchell Creek – Right Overbank Split Flow	Just upstream of Colorado State Highway 6 to approximately 0.18 mile upstream
Parachute Creek	From its confluence with the Colorado River to approximately 1.6 mile upstream at the Town of Parachute's corporate limits

Rifle Creek	From its confluence with the Colorado River to approximately 12.4 miles upstream
Rifle Creek Split Flow	From its confluence with Rifle Creek to approximately 0.7 mile upstream
Roaring Fork River	From its confluence with the Colorado River to approximately 20.2 miles upstream
Threemile Creek	From its confluence with the Roaring Fork River to approximately 1.0 mile upstream

The following table shows the Letters of Map Revisions (LOMRs) that were incorporated into this revision since the previous effective date. These cases were incorporated into the respective DFIRM panels, FIS profiles, Summary of Discharge Tables, and Floodway Data Tables for clarity and consistency.

Table 2 – Summary of LOMCs

Type of LOMC	Case Number	Effective Date	Project Identifier
LOMR	88-08-11P	December 22, 1988	Roaring Fork River Floodway
LOMR	91-08-11P	February 26, 1991	Battlement Mesa
LOMR	91-08-15P	November 15, 1991	Mitchell Creek at Donegan Road
LOMR	92-08-054P	October 1, 1992	Battlement Mesa
LOMR	94-08-019P	June 8, 1994	Roaring Fork River upstream of Confluence with Cattle Creek
LOMR	96-08-171P	May 31, 1996	Rifle Creek and Rifle Creek Splitflow
LOMR	02-08-123P	December 4, 2002	Rifle Creek Splitflow
LOMR	07-08-0852P	December 19, 2008	14th Street Marketplace

2.2 Community Description

Garfield County is located in the southern sector of the northwest quadrant of Colorado and is approximately 3,000 square miles in area. It is approximately 100 miles from east to west and ranges from approximately 20 miles from north to south on the western end and 50 miles from north to south on the eastern end. The closest major urban centers are the City of Denver, which is approximately 150 air miles from the central portions of the county, and the City of Salt Lake, Utah, which is 225 air miles from the center of the county. Garfield County is bounded by Rio Blanco County to the north, Eagle and Routt Counties to the east, Pitkin County to the southeast, and Mesa County to the south, and Uintah and Grand Counties, Utah, to the west.

Garfield County is served by Interstate Highway 70, State Highways 133 and 82, and approximately 900 miles of county roads. All but one of the larger communities in the county (Carbondale) are located on Interstate Highway 70. The Denver and Rio Grande Western Railroad provides freight service and Amtrak provides passenger service. There

are no scheduled airline connections in the county, but major airlines maintain scheduled flights to Grand Junction and Aspen nearby. General aviation fields are maintained at Rifle and Glenwood Springs. Bus service is provided by one local and two national bus lines.

The population of Garfield County and its incorporated communities in 2010 included in this Flood Insurance Study are listed below (Reference 12):

Community	Population
Garfield County	56,389
Carbondale, Town of	6,427
Glenwood Springs, City of	9,614
New Castle, Town of	4,518
Parachute, Town of	1,085
Rifle, City of	9,172
Silt, Town of	2,930

The Town of Carbondale is located in southeast Garfield County. Glenwood Springs is approximately 12 miles to the north and Denver is approximately 130 miles to the northeast. Carbondale sits at approximately 6,000 feet and is bordered by high mesas ranging in elevation from 7,000 to 11,000 feet.

The City of Glenwood Springs is located in southeast Garfield County. It is approximately 8 miles southwest of Shoshone, 3 miles north of Cardiff, and 9 miles southeast of New Castle. Grand Junction, the nearest large city, is approximately 88 miles west of Glenwood Springs.

The Town of New Castle is located in the southeastern part of Garfield County, along the Colorado River and I-70. It is situated approximately 16 miles west of Glenwood Springs and approximately 11 miles east of Silt. The towns' elevation is approximately 5,597 feet.

The Town of Parachute is located in western Garfield County. Incorporated in 1908 as Grand Valley, the town's name was changed in 1981 to Parachute when oil shale development was in rapid progress. The town lies on the north bank of the Colorado River and straddles Parachute Creek at its confluence with the Colorado River.

The City of Rifle is located in central Garfield County. It is situated approximately 65 miles west of Glenwood Springs. Elevations in the Rifle Creek basin range from approximately 5,300 feet at the Colorado River to approximately 9,900 feet in the higher headwater ranges of the basin.

The Town of Silt is located in central Garfield County, along the Colorado River and I-70. It is situated approximately 20 miles west of Glenwood Springs and approximately 8 miles east of Rifle. The town has an average elevation of 5,438 feet.

In general, the history and development of Garfield County can be separated into three time periods that reflect a major, but nonexclusive, economic eras. From approximately 1880 to 1900, mining activity flourished and created an incentive for development of railroads and

the service activities supported by the wealth from mining. By 1886, however, agricultural production resulted in the formation of communities at Silt, Rulison, Grand Valley, and Rifle. In the 1890s, Glenwood Springs emerged as a resort center, with the development of popular mineral hot spring spas.

At present, the economy of Garfield County is based on agriculture, mining, and tourism-recreation. Several thousand acres of rangeland and National Forest reserves surround cultivated areas and are used for summer livestock grazing. Most irrigated farmland is devoted to the production of alfalfa, grain, and native hay for livestock feed; a small acreage is used for the production of fruit and truck crops. Increased activity in the extraction of natural gas, oil from oil-shale deposits, coal, and carbonate minerals is expected.

Garfield County is located in a mountainous region of plateaus and canyon lands that are part of the Rocky Mountains. A number of waterways cut deeply through the high mesas which run into mountain peaks that are at approximately 13,000 feet. Elevations in the western end of the county range from 5,000 to 8,000 feet; the east end has valleys at 6,000 feet and is bordered by high mesas at elevations from 7,000 to 11,000 feet. The headwater terrain is precipitous and inaccessible. The highest and most mountainous areas are in the northeast section. Towering cliffs, in some locations, compose the transition from river level to high forested mesas and mountains.

All streams in Garfield County are tributaries of the Colorado River, which traverses the southeastern and south-central portions of the county on a west southwesterly course. The Roaring Fork River, the principal tributary to the Colorado River within the county, flows northwesterly and drains the southeastern corner of the county. East and West Salt Creek drain the far western portions of the county; Roan, Parachute, Rifle, and Main Elk Creeks, and other small creeks flowing south drain the west-central, central, and northeastern portions. Garfield, David Mann, and Beaver Creeks, all flowing north, drain most of the southeastern portion of the county. Drainage from the most northeastern section is northwesterly into the systems of the White River. The White River is a tributary to the Colorado River via the Green River.

The stream system shows markedly dendritic patterns and the stream-ways are steep and well-defined. Average stream gradients on the watercourses studied by detailed methods range from 25 to 40 feet per mile on the Roaring Fork River and are up to 100 feet per mile on Cattle Creek.

The climate of the county is characterized by cool summers and moderately severe winters, especially in the mountainous northeast corner. Drastic climate variations occur within the short distances due to dramatically varying topography. Local weather conditions may change rapidly due to movement of storm systems from west to east through the region. Precipitation in the county ranges from 10 to 15 inches in the river valleys to 30 to 40 inches in the high mountainous northeastern areas. Average snowfall varies from approximately 40 inches at Rifle to approximately 70 inches at Glenwood Springs. Snowpack normally begins to accumulate in late October, and snowmelt begins in late April and continues into June or early July. Rain may occur over large areas of the county from late spring through late fall and convective-type cloudburst storms occur in summer. The largest amounts of precipitation occur from January through April, and in August. In the river valleys, mean

maximum temperature varies from the mid 30°F range in January to approximately 90°F in July, and the mean minimums vary from 10°F in January to 50°F in July. The growing season is 136 days and lasts from mid-March through late October.

Native vegetation in Garfield County varies from salt desert shrub and associated growth in the southwest corner to alpine and tundra-type cover in high mountain areas. Agricultural operations and urbanization have drastically modified native vegetation in the main river valleys, the adjoining benchlands, and the lower portions of small tributary valleys.

The surface cover of western Colorado ranges from substantially barren rock to deep fertile friable loams and clays of good to excellent quality for plant growth. Along the north side of the Colorado River is a prominent escarpment known as the Roan or Book Cliffs near Rifle. Most of the area has fairly deep soils and step slopes. Mancos shale outcrops follow West Rifle Creek. Sedimentary formations are nearly horizontal in the upper part of the Rifle Creek basin. Soil characteristics for the Glenwood Springs area consist of claying to loamy textures with variable amounts of gravel, cobble, and stone throughout.

Soils in the Parachute Creek basin include Mollisols at the higher elevations and Aridisols and Entisols in the lower parts. Fluvents are predominant in and adjacent to stream channels. Geologic formations include the Wasatch formation and the Tertiary Green River formation which contain oil shale deposits. Vegetation indigenous to the basin includes conifer and aspen forests at the higher elevations and juniper, pinon and sagebrush stands at lower elevations. Stream banks are lined willows and cottonwoods. There are irrigated pasturelands in the Parachute Creek valley north of the Town of Parachute.

2.3 Principal Flood Problems

Most of the annual precipitation in the Colorado River Basin occurs as snow resulting in a deep snowpack in the higher regions. General rainstorms can occur in the area from late spring through late fall, and convective type cloudburst storms can be expected frequently during the summer.

Major floodflows on the Colorado, Crystal and Roaring Fork Rivers result from rapid melting of the mountain snowpack during the period from late May through early July. Snowmelt floods are characterized by moderate peak flows, large volumes and long durations, and marked diurnal fluctuation in flow. Rainfall on melting snow may accelerate the rate of snowmelt adding to floodflows. Major floods on the dry washes, gulches, and smaller streams under study, especially those with much of their drainage area below 8,000 feet, are generally caused by cloudburst storms. This type of storm is characterized by a high peak flow and short duration. Due to the storm's small area extent and other factors, cloudburst runoff would not significantly affect flooding along streams as large as the Colorado, Crystal and the Roaring Fork Rivers. Flooding from general rain does not constitute a significant problem in Garfield County. The 1- and 0.2-percent annual chance floods would result from cloudburst storms on the small washes, tributary gulches, and tributary creeks; from snowmelt on the Colorado and Crystal Rivers; and from snowmelt that could be augmented by rain on the Roaring Fork River.

Garfield County is known to have a long history of snowmelt and summer cloudburst floods, but limited definitive data on specific floods are available because flooding largely occurred on farmland and was seldom reported.

The Rifle Creek basin has a long history of floods, but limited definitive data on specific floods are available. Damage from floods within the Rifle Creek basin occurred in 1914, 1917, 1921 (July and August), 1929, 1930 (July and August), 1937, 1945, 1947, 1951, and 1963. The August 1930 flood is reported to have been the worst in the history of Rifle.

The most recent floods of importance in Rifle occurred in August 1963. On August 9th, floodflows from a cloudburst severely damaged the Pioneer Ditch diversion in Rifle. In areas nearby, roads were covered with mud, agricultural facilities were damaged, and a large culvert was destroyed. The cloudburst resulted in the largest flow ever recorded (1,720 cfs) at the USGS Rifle Creek gaging station near Rifle. On August 12th, another cloudburst resulted in the flooding of several downtown streets, severe damage to streets, and deposition of tons of sediment and other flood debris on streets and roads. It was estimated that several inches of rain fell on the watershed's tributary to Rifle Creek.

Along Rifle Creek, there is one major constriction to the conveyance of floodflows: the aggraded channel bed occurring upstream of the Pioneer Ditch diversion structure. The channel bed has aggraded up to 10 feet over an 800-foot reach. The rise in bed elevation has constricted the flow capacity of the Third Street bridge just upstream.

Along Hubbard Gulch, the major feature contributing to flooding along the stream is the 14th Street culvert crossing. At that location, the capacity of the culvert and natural topography combine so that flows spill to the east of the channel, presenting a flood danger to a portion of the city.

Between the Colorado River and the D&RG Railroad, the Parachute Creek channel meanders through agricultural and industrial tracts which have some residential areas interspersed. Between the railroad and the westbound lanes of Interstate Highway 70 (1-70), the channel is straight and relatively deep. The railroad bridge constitutes the primary potential obstruction to flood flows in this reach. Upstream of 1-70, the channel is confined between residential areas and a commercial strip along U.S. Highway 6. The stream was channelized as the town grew up on its banks. Within this reach, the U.S. Highway 6 bridge is the most significant hydraulic obstruction. Overflow of the creek from a 0.2-percent annual chance flood would subject the main business sector of town to floodwaters which can only be directed back to the main channel by the highway and railroad embankments. Water which flows over the railroad embankment will not re-enter Parachute Creek but will flow in a southerly direction to the Colorado River.

In the vicinity of the Town of Parachute, the Colorado River is a braided river. The floodplain meanders along the southern boundary of the town and reaches up to about 1/2 mile in width in certain areas. Portions of the overbank areas are used for gravel mining. The south bank of the river rises steeply and forms a substantial barrier for flood flows, while the north bank rises more gently and subjects portions of the town to periodic inundation.

In the vicinity of the Town of Silt, the Colorado River is a braided river. The south bank of the river rises steeply and forms a substantial barrier for flood flows, while the north bank rises more gently and potentially subjects the town to periodic inundation.

Although not recorded by river gage, a snowmelt flood that occurred on the Colorado River in 1884 is generally considered the most severe known, with a 0.33-percent annual chance recurrence interval. A flood that occurred in 1971 is judged the most severe of record on the Roaring Fork River, with a 1.25- to 1.11-percent annual chance recurrence interval. On both streams, runoff was augmented by general rain during the flood period. The largest recorded flow on the Colorado River is 30,100 cubic feet per second (cfs), which occurred in 1918. This flow is slightly greater than the calculated 2-percent annual chance flood event. A 19,000 cfs discharge was recorded on the Roaring Fork River in 1977. This flood is equivalent to the calculated 2-percent annual chance flood event (Reference 13).

No significant low-lying areas exist along the Colorado River at Glenwood Springs, but two can be found on the Roaring Fork River; one is a trailer park and the other is an area near the sewage treatment plant.

More recent floods in Glenwood Springs occurred on July 24, 1977, and July 12, 1981. The 1977 floods took place on the afternoon and evening of July 24, following a period of prolonged drought. A brief, but very intense, thunderstorm generated debris flows and mud floods in many of the watersheds draining onto the southern two-thirds of the city. Flooding affected nearly 200 acres within the city, leaving mud and debris deposits of up to 4 feet near the fanheads and sheets of silty mud 2 to 4 inches deep between Grand and Glen Avenues and the Roaring Fork River. Initial estimates of the damage were as high as $2 million; however, the final tallies indicated that a figure on the order of $500,000 was probably closer to the actual total. This translated to a per capita cost of between $50 and $100 (Reference 13).

The July 12, 1981, flood in Glenwood Springs was in many respects a smaller version of the 1977 event. Approximately $100,000 in damage resulted. As in 1977, the floods occurred after an unusually dry winter and spring. Smaller debris flows, mudflows, and waterflows followed throughout the summer, although none achieved the magnitude of the July 12 event (Reference 13).

Because of the well-defined channels of the rivers in the Glenwood Springs area, there are no problem flood areas, with the exception of existing houses located on the alluvial fans of the small basins around Glenwood Springs.

The Town of New Castle experienced significant flooding from mudslides because of a severe localized storm in August 2001 (1.5 inches of rain in 15 minutes) (Reference 16).

2.4 Flood Protection Measures

In 1967, the Bureau of Reclamation completed the Silt Project, located near the Towns of Rifle and Silt. The project stores the flows of Rifle Creek and pumps water from the Colorado River to supply irrigation water for approximately 7,000 acres of land. Principal features of the project are the Rifle Gap Dam and Reservoir (approximately five miles

upstream of Rifle along Rifle Creek), a pumping plant, and a lateral system. The Bureau of Reclamation turned over the operation and maintenance of the Silt Project to the Silt Water Conservancy District in 1968. The district also operates the private Farmers Irrigation Company facilities as part of this project. Although no specific reservoir capacity is assigned for flood control, the Silt Project has provided an accumulated $150,000 in flood-control benefits from 1950 to 1999 (Reference 15).

The U.S. Bureau of Reclamation diverts water from the Roaring Fork River basin to the Arkansas River basin upstream from Garfield County, but diversions are usually curtailed during periods of high runoff. Irrigation use also serves to reduce main stem flows, but not in significant amounts. Thus, reduction of peak flow along the Colorado and Roaring Fork Rivers in Garfield County is uncertain and unlikely under existing conditions.

The Roaring Fork and Colorado Rivers exist in deep channels. A series of major water-supply storage reservoirs exist in the upstream areas of both basins, but these reservoirs are not specifically designed for flood control.

Flood protection facilities in Glenwood Springs in the areas studied by approximate methods consist of the Cemetery Gulch on the 12th Street drainageway and the Lincolnwood Subdivision drainage system. Both facilities are adequate for frequent storms, but have a history of debris plugging during severe floods.

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

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

Pre-countywide analysis

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

Hydrologic analyses for the Colorado River were carried out by the CWCB (Reference 16). Flood frequency curves for the 10-, 2-, 1-, and 0.2-percent annual chance flood events were developed based on records from USGS stream-gaging stations and on the results of a regional peak flow-frequency analysis.

The 10-, 2-, 1- and 0.2-percent annual chance peak discharges for the Colorado River (at Glenwood Springs) and Road Fork Rivers were previously approved by CWCB as a part of the Glenwood Springs Flood Plain Information Report (Reference 13).

Peak flows on Alkali Creek were based on records from USGS stream gaging stations and on the results of a regional peak flow-frequency analysis (Reference 17).

Peak discharge values on the Crystal River were adopted from a regional analysis performed by the USACE (Reference 19). Both snowmelt and rainfall flood peaks were analyzed to define floodflow frequency. Regional drainage area-mean peak flow relationships, regional standard elevations, and regional skew coefficients were developed for both flood types. This information was adjusted using statistics developed from Crystal River USGS stream gage records. Floodflow frequency curves for rainfall and snowmelt floods were developed at selected sites using the adjusted information. These curves were then combined statistically to generate composite flow frequency curves. A separate review by the study contractor (Reference 19) of existing methods recommended using the USACE regional analysis.

Peak flows of the Cattle, Fourmile, Threemile, Mitchell, and Government Creeks; and Hubbard, Helmer, and Ramsey Gulches were derived from combined-frequency curves of annual peak flow data for snowmelt- and rainfall-dominated watersheds.

Annual peak flows for rainfall and snowmelt floods have been published by the USGS (Reference 21). Additional annual peak flows were obtained from inspection of the USGS strip charts. Frequency analyses were made on both peak flow data sets. The two frequency curves were assumed to represent independent events, and a composite flow-frequency curve was developed for each gaging. A regional regression analysis was then made to determine peak flow as a function of drainage area and return period (Reference 20).

Annual peak discharges for Parachute Creek were developed using the USACE's HEC-HMS model. The curve number and transform parameters were calibrated in HEC-HMS to yield the 1-percent annual chance flow approximately equal to the PeakFQ analysis for USGS Gage 09093000. A 24-hours SCS Type II storm distribution using point precipitation depths from NOAA was utilized to simulate rainfall over the watersheds. The Synder Lag time was

used to estimate the transform and curve number estimates were derived based on soil type for the loss rate method (Reference 7).

Updated annual peak discharges for Mitchell Creek were developed by USGS using the USACE's HEC-HMS model following the Coal Seam Fire in 2002. A 24-hours SCS Type II storm distribution using point precipitation depths from NOAA was utilized to simulate rainfall over 15 sub-basins. The SCS curve number method was used to model the potential losses, and the SCS unit hydrograph was used to transform excess precipitation into storm runoff (Reference 9). The report includes peak discharges at select locations along the main stem of Mitchell Creek. Flows from the original study on Mitchell Creek are presented in Table 3 for the reach from the Colorado River to approximately 350' downstream of Donegan Road. Users should consult the USGS hydrologic study and the revised Mitchell Creek modeling performed by USGS and Baker for specific flow changes along the revised reaches.

Peak flows along Rifle Creek were based on the regional regression relationship and the routing of the inflow through Rifle Gap Reservoir (Reference 20). The hydrograph was developed from SCS methodology. The inflow peaks corresponded to the peak as determined from the regression relationship, and the volume was checked to correspond with the excess volume as determined from the SCS analyses.

Hydrologic analyses for the approximate study areas in Glenwood Springs were carried out to establish the peak discharge-frequency relationship for 1-percent annual chance floods. The U.S. Soil Conservation Service report on urban hydrology for small watersheds was used in the analysis for the nine individual basins in Glenwood Springs that were studied by approximate methods (Reference 22). A study was also made of the areas damaged by the July 24, 1977, flood. Information from a report on debris-flow hazard analysis and mitigation (Reference 23); a study of the mud flows (Reference 24); past newspaper articles; and photographs of the July 24, 1977, flood (Reference 25) were analyzed.

The historical and geological data and the results of the hydrology study by the SCS method were used to determine the 1-percent annual chance flood plain boundaries for the basins in Glenwood Springs studied by approximate methods. Because of the general shape of the alluvial fans, the most extensive damage during 1-percent annual chance floods occurs in areas directly in the discharge paths of the basins. As the 1-percent annual chance flood extends over the widening alluvial fans, it turns to sheetflow, thereby reducing considerably the damage from the 1-percent annual chance floods. For this reason, the 1-percent annual chance flood plain usually does not extend to the Roaring Fork River.

Peak discharge-drainage area relationships for streams studied in detail are shown in Table 3.

Countywide Analysis

Peak flows of Parachute Creek were derived from HEC-HMS. The Parachute Creek watershed was delineated in an automated fashion using Arc Hydro. The longest and centroidal flow paths were determined from the National Hydrography Dataset (NHD) reach file. The rainfall was taken from NOAA isopluvials for the 10-, 50-, and 100-year 24 hour events. The 500-year rainfall value was determined by multiplying the 100-Year rainfall by

1.2. The rainfall was distributed using the SCS Type II, 24-hour distribution. The Snyder Lag time was used to estimate the transform and curve number estimates were derived based on soil type for the loss rate method.

Peak flows of Mitchell Creek were developed using the US Army Corps of Engineers HEC-HMS Version 2.1.3 rainfall-runoff hydrologic modeling. The report titled "Post-Fire Hydrologic Analysis of Mitchell Creek near Glenwood Springs, Colorado", dated September 4, 2008 by USGS utilized the HEC-HMS hydrologic model in conjunction with the SCS Curve Number Loss Method and the SCS Unit Hydrograph runoff methodology.

For the 2016 analysis of Helmer Gulch, a bulked (sediment-laden) flow factor of 1.25 was applied to the 1%-annual-chance discharge based on recent experienced sediment-laden debris flows in Garfield County (Reference 10).

Table 3 – 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
Alkali Creek					
At Confluence with Colorado River	14.8	260	600	850	1,845
Cattle Creek					
At Confluence with Roaring Fork River	93	2,100	2,550	2,850	4,400
Colorado River					
At Confluence with Parachute Creek	7,370	30,200	40,000	44,200	54,100
At Rifle	6,930	23,900	37,900	45,000	65,000
Downstream of the Confluence of Divide Creek	6,590	28,300	37,700	41,800	51,300
At New Castle	6,300	22,900	34,800	41,000	56,800
Just Downstream of Roaring Fork River	6,020	22,000	33,000	40,000	57,000
Upstream of the Confluence with Roaring Fork River	4,560	21,500	29,000	32,500	41,000
Crystal River					
At Confluence with Roaring Fork River	364	5,500	6,800	7,800	12,600
Upstream of Confluence with Prince Creek	- -[1]	5,200	6,400	7,200	10,700
Upstream of Confluence with Edgarton Creek	- -[1]	5,400	6,700	7,600	12,000
At Barbers Gulch	- -[1]	5,404	6,704	7,604	12,004
At Upstream Corporate Limits of Town of Carbondale	- -[1]	5,310	6,510	7,410	11,210
Fourmile Creek					
At Confluence with Roaring Fork River	36	940	1,200	1,400	2,250
Government Creek					
At Confluence with Rifle Creek	43	760	1,330	2,340	4,110

[1] Not Determined

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
Helmer Gulch					
At Canyon Mouth	6.7[3]	313[3]	538[3]	950[3]	1,675[3]
Hubbard Gulch					
At Confluence with Rifle Creek	8	290	500	880	1,550
Mitchell Creek					
At Mouth[2]	5.9	240	300	360	590
Approx. 350' downstream of Donegan Rd	- -[1]	194	384	463	593
At Donegan Road	11.2	215	585	865	1,800
Mitchell Creek – Right Overbank Split Flow					
At RS 120	- -[1]	12	24	30	41
At RS 471	- -[1]	98	282	360	489
At RS 645	- -[1]	16	201	403	1,208
Parachute Creek					
At Confluence with Colorado River	198	462	2,410	3,500	7,077
Ramsey Gulch					
At Canyon Mouth	4.9	220	380	670	1,170
Rifle Creek					
Downstream of Confluence with Hubbard Gulch	201	1,590	2,410	3,920	6,690
Downstream of Confluence with Government Creek	193	1,490	2,230	3,610	6,150
Upstream of Confluence with Government Creek	150	990	1,350	2,070	3,430

[1] Not Determined [2] Applies to unrevised reach between the Colorado River and approximately 350' downstream of Donegan Rd.
[3]Includes a Bullking Factor of 1.25

Table 3– Summary of Discharges Continued

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
Rifle Creek Splitflow					
At 30th Street	- -[1]	455	702	1,227	2,283
Roaring Fork River					
At Confluence with Colorado River	1,460	13,700	19,000	21,200	28,000
Upstream of Confluence with Threemile Creek	1,440	13,500	18,700	20,900	27,600
Upstream of Confluence with Crystal River	- -[1]	7,000	10,750	12,600	18,750
Upstream of Confluence with Cattle Creek	- -[1]	12,000	17,000	19,200	25,000
Upstream of Confluence with Fourmile Creek	- -[1]	12,850	17,800	20,000	26,250
Upstream of Red Canyon	- -[1]	13,300	18,400	20,700	27,200
Upstream of Confluence with Tenmile Creek	- -[1]	13,500	18,700	20,900	27,600
Threemile Creek					
At Confluence with Roaring Fork River	15	500	620	710	1,300

[1]Not Determined

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.

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 or HEC-RAS step-backwater program (References 26 and 27).

Pre-Countywide Analysis

Cross section data for the Colorado River at New Castle and Glenwood Springs and for Alkali Creek were field surveyed. Cross section data for the Colorado River at Rifle was developed from topographic data furnished by the Colorado Department of Highways (References 28 and 29). Cross-section data for the Colorado River (at Silt) were developed from topographic maps prepared by Analytical Surveys, Inc. (Reference 30). Cross sectional data the Colorado River (at Parachute) were obtained from photogrammetric mapping of the area provided by Analytical Surveys, Inc. (References 31 and 32). Cross sections for the Roaring Fork and Crystal Rivers; Fourmile, Threemile, Cattle, Mitchell, Rifle, and Government Creeks; and Hubbard Gulch were digitized from aerial photographs flown in May 1980 and November 1980 and 1982 (References 33, 34, and 35).

The starting water-surface elevations for the Colorado River, Government and Alkali Creeks, and Hubbard Gulch were determined by the slope-area method. The starting water-surface elevation for the Roaring Fork River was derived from a previous flood study done by Gingery Associates, Inc. (Reference 13). For the Crystal River, the starting water-surface elevation was based on the flood elevation on the Roaring Fork at the confluence. Cattle Creek and Threemile Creek derived their starting water-surface elevations from critical depth computations. Rifle and Fourmile Creeks starting water-surface elevation was taken as the normal depth for the given discharge.

The starting water-surface elevations for Rifle Creek Splitflow were based upon the computed water-surface elevations on Rifle Creek.

Rifle Creek overflows its western bank just upstream of County Highway 291. This overflow is referred to in this FIS as Rifle Creek Splitflow. A separate HEC-2 step-backwater analysis was performed for the Rifle Creek Splitflow. Discharge values used in the step-backwater analysis were based on hydraulic analysis of the overflow from the main channel of Rifle Creek. A profile base line was used to establish the relative distance shown on the profile for Rifle Creek Splitflow. This profile base line is shown and identified on the maps.

Alluvial fan methodologies were applied to calculate flow depths and velocities on Ramsey Gulch (Reference 36).

Countywide Analysis

Cross sections for Rifle Creek Splitflow were digitized from aerial photographs (Reference 33). Composite cross sections for the new segment of the Colorado River, and Parachute Creek were created from field survey of the channels and topography of the overbanks (Reference 7). Cross section data for Mitchell Creek and Mitchell Creek – Right Overbank Split Flow were obtained from two foot topography (Reference 8). All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Since the cross section data for the Crystal River and Cattle Creek did not include any below-water geometry, adjusted discharge values were used in the HEC-2 analyses for these streams. The adjusted discharge values were determined by reducing the peak discharges, as shown in Table 4, by the flow in the streams at the time of the aerial photography. The flow in the streams at the time of the photography was obtained from USGS gaging station records.

The starting water surface elevations for the Colorado River, Parachute Creek, Mitchell Creek, Mitchell Creek Right Overbank Split Flow, and Helmer Gulch were estimated using normal depth based on the energy slope of each reach.

A culvert along Hubbard Gulch near 14th Street obstructs the flow. Water leaves the channel along the east bank, causing shallow flooding in the vicinity of the Garfield County Fairgrounds.

For Helmer Gulch, normal depth calculations for the 1-percent-annual-chance flood determined that the bulked flows discussed in Section 3.1 are contained within the Helmer Gulch channel for the majority of the alluvial fan. At Village Drive, however, flows can exit the channel. FLO-2D was used to analyze the flow exiting the channel, which proceeds north along Village Drive, but due to topography spreads out and becomes shallow sheet flow. Flow depths were generally less than one foot, with some areas of deeper depths. Areas less than a foot were mapped as shaded Zone X, while regions greater than a foot were mapped as Zone A. The main channel of Helmer Gulch is mapped as Zone AE (Reference 10).

Roughness coefficients were determined by field observations. Channel roughness coefficients (Manning's "n") were assigned as follows in Table 4:

Table 4 – Manning's "n" Values

Flooding Source	Channel	Overbanks
Alkali Creek	0.035 – 0.040	0.060 – 0.070
Cattle Creek	0.035 – 0.050	0.050 – 0.060
Colorado River	0.035 – 0.040	0.050 – 0.090
Crystal River	0.035 – 0.040	0.050 – 0.090
Fourmile Creek	0.060 – 0.070	0.060 – 0.080
Government Creek	0.035 – 0.040	0.035 – 0.045
Helmer Gulch	0.050	0.100
Hubbard Gulch	0.035 – 0.045	0.035 – 0.050
Mitchell Creek	0.040	0.060
Mitchell Creek – Right Overbank Split Flow	0.060	0.060
Parachute Creek	0.035 – 0.060	0.075 – 0.080
Rifle Creek	0.040 – 0.050	0.050 – 0.080
Rifle Creek Splitflow	0.050 – 0.080	0.080
Roaring Fork River	0.035 – 0.045	0.050 – 0.090
Threemile Creek	0.045 – 0.050	0.080 – 0.090

The hydraulic analyses for this FIS 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.

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 to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

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 each studied reach. The range of conversion factors was prohibitively high; therefore, a standard conversion factor was not applied for the entire community. 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.

For the recently studied reaches, Colorado River, Parachute Creek, Mitchell Creek, Mitchell Creek Right Overbank Split Flow, and Helmer Gulch a datum conversion was not necessary since the studies were completed in the NAVD88 datum.

Using the multiple conversion factor approach, an average conversion factor for each flooding source was developed by establishing separate conversion factors at the upstream end, at the downstream end and at an intermediate point of the studied reach. From this data, the average conversion factors for each reach were developed. In some cases, it was necessary to divide each reach into multiple sections in order for the maximum offset from the average conversion factor to be less than or equal to 0.25 feet.

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.

Conversion factors for each studied reach are shown in Table 5.

Table 5 – Datum Conversion Factors

Stream/Reach	Conversion from NGVD29 to NAVD88 (feet)	Begin Station	End Station
Alkali Creek	4.0	Entire Reach	
Cattle Creek	4.4	Entire Reach	
Colorado River			
At Parachute	3.7	Entire Reach	
At Rifle	3.9	Entire Reach	
At Silt	3.9	Entire Reach	
At New Castle	4.0	Entire Reach	
At Glenwood Springs	4.1	At Cross Section BF	At Cross Section CE
Crystal River	4.5	Entire Reach	
Fourmile Creek	4.5	Entire Reach	
Government Creek	3.9	Entire Reach	
Hubbard Gulch	3.9	Entire Reach	
Rifle Creek	4.0	Entire Reach	
Rifle Creek Splitflow	3.9	Entire Reach	
Roaring Fork River	4.3	At Confluence with Colorado River	Approximately 3600' Downstream from Confluence with Cattle Creek
	4.5	Approximately 3,600' Downstream from Confluence with Cattle Creek	At Garfield/Eagle County Line
Threemile Creek	4.2	Entire Reach	

4.0 FLOODPLAIN 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 Table. 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 scales of 1:2,400, 1:6,000, and 1:24,000, with contour intervals of 2, 5, 20 and 40 feet (References 28, 29, 30, 37, 38, 39 and 40).

Flood boundaries for the nine basins in Glenwood Springs studied by approximate methods were determined by the analysis of the flow of each basin, based on the U.S. Soil Conservation Service method and records of past flood damage from each basin (References 22).

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

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

4.2 Floodways

Encroachment on 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 on the basis of equal conveyance reduction from each side of the floodplain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 6).

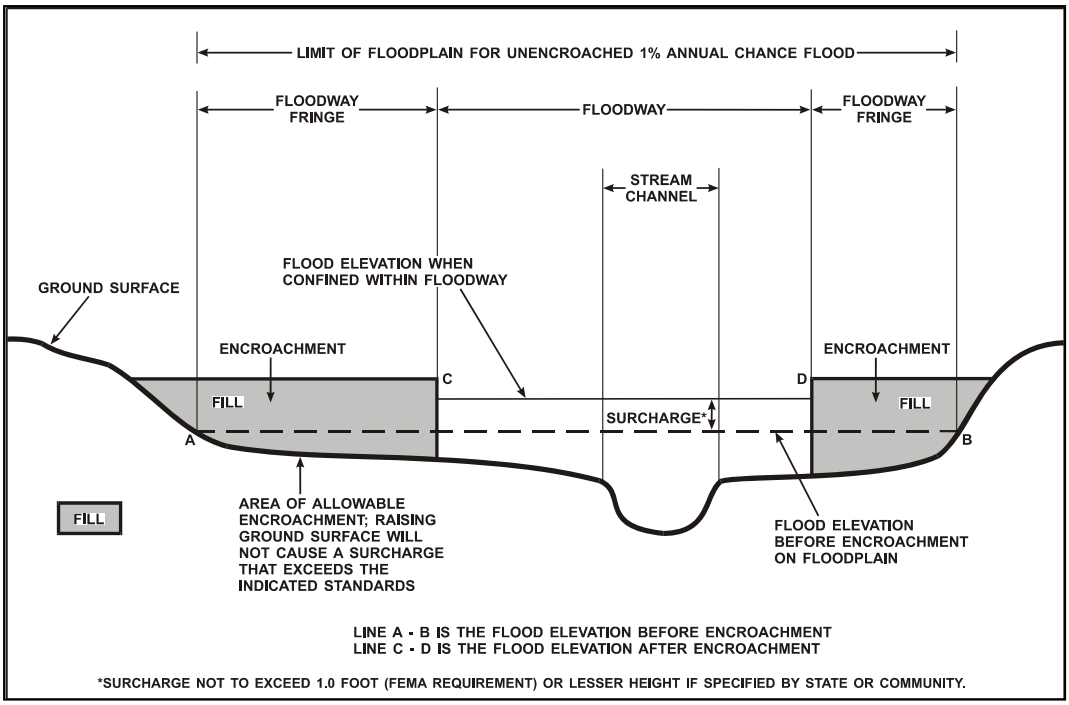
A floodway is not appropriate on an alluvial fan. For this reason no floodway is presented for Helmer and Ramsey Gulches.

No floodway was computed for Alkali Creek or Helmer Gulch.

As shown on the Flood Insurance Rate Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 1-percent-annual-chance flood plain 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)
CATTLE CREEK								
A	1,620	362[2]	625	4.6	5,944.9	5,944.9	5,945.9	1.0
B	2,330	74	269	10.6	5,959.2	5,959.2	5,959.3	0.1
C	3,210	78	269	10.6	5,983.9	5,983.9	5,984.0	0.1
D	4,460	83	415	6.9	5,999.9	5,999.9	6,000.8	0.9
E	4,680	64	322	8.9	6,003.9	6,003.9	6,004.0	0.1
F	5,125	46	225	12.7	6,007.4	6,007.4	6,007.4	0.0
G	5,145	58	447	6.4	6,011.7	6,011.7	6,011.7	0.0
H	5,210	70	547	5.2	6,012.2	6,012.2	6,012.2	0.0
I	5,420	276	221	12.9	6,014.0	6,014.0	6,014.0	0.0
J	5,472	375	4,422	0.6	6,018.2	6,018.2	6,018.2	0.0
K	7,170	162	379	7.5	6,020.5	6,020.5	6,020.8	0.3
L	8,770	114	519	5.5	6,033.5	6,033.5	6,034.5	1.0
M	9,440	56	261	10.9	6,043.4	6,043.4	6,043.5	0.1
N	11,060	57	267	10.6	6,057.3	6,057.3	6,057.3	0.0
O	11,710	48	269	10.5	6,064.8	6,064.8	6,064.8	0.0
P	12,850	113	493	5.7	6,074.5	6,074.5	6,075.2	0.7
Q	13,510	86	292	9.7	6,082.0	6,082.0	6,082.4	0.4
R	14,780	48	235	11.9	6,100.4	6,100.4	6,100.5	0.1
S	16,155	112	418	6.7	6,113.6	6,113.6	6,114.5	0.9
T	17,320	49	246	11.4	6,138.8	6,138.8	6,139.0	0.2
U	18,150	187	501	5.6	6,150.4	6,150.4	6,151.3	0.9
V	19,660	72	289	9.7	6,175.7	6,175.7	6,176.0	0.3

[1]Feet Above Confluence with Roaring Fork River
[2]Floodway Width Includes Island

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CATTLE 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)
CATTLE CREEK (cont'd)								
W	21,240	164	419	6.7	6,201.0	6,201.0	6,201.7	0.7
X	22,910	55	249	10.9	6,230.8	6,230.8	6,231.1	0.3
Y	24,085	121	439	6.2	6,242.4	6,242.4	6,243.3	0.9
Z	25,040	52	245	11.1	6,263.4	6,263.4	6,263.6	0.2
AA	26,940	61	265	10.2	6,286.8	6,286.8	6,286.9	0.1
AB	28,310	64	281	9.7	6,303.4	6,303.4	6,303.8	0.4

[1]Feet Above Confluence with Roaring Fork River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CATTLE 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)
COLORADO RIVER (AT RIFLE)								
I	450.92	2,100	15,660	2.9	5,278.3	5,278.3	5,279.3	1.0
J	451.08	2,100	12,670	3.6	5,279.2	5,279.2	5,280.0	0.8
K	451.40	1,300	6,190	7.3	5,282.3	5,282.3	4,282.3	0.0
L	451.59	850	6,810	6.6	5,284.9	5,284.9	5,285.6	0.7
M	451.74	1,020	6,260	7.2	5,286.6	5,286.6	5,287.4	0.8
N	452.08	1,950	10,310	4.4	5,291.4	5,291.4	4,292.3	0.9
O	452.23	1,750	8,340	5.4	5,293.0	5,293.0	5,293.7	0.7
P	452.38	1,300	6,430	7.0	5,295.3	5,295.3	5,296.0	0.7
Q	452.61	730	6,110	7.2	5,299.3	5,299.3	5,300.3	1.0
R	453.18	470	4,610	9.8	5,307.4	5,307.4	5,307.6	0.2
S	453.52	650	5,870	7.7	5,313.6	5,313.6	5,314.5	0.9
T	453.78	700	5,480	8.2	5,317.1	5,317.1	5,318.1	1.0
U	453.93	1,150	10,610	4.2	5,319.8	5,319.8	5,320.6	0.8
V	454.16	1,870	14,280	3.2	5,321.1	5,321.1	5,321.9	0.8
W	454.27	1,950	11,370	4.0	5,322.1	5,322.1	5,322.7	0.6

[1]Miles Above Lees Ferry

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

COLORADO RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
COLORADO RIVER (AT SILT)								
X	1,340[1]	850	5,526	7.6	5,408.9	5,408.9	5,409.0	0.1
Y	2,200[1]	778	5,760	7.3	5,411.3	5,411.3	5,411.7	0.4
Z	3,530[1]	1,040	6,398	6.5	5,414.6	5,414.6	5,415.0	0.4
AA	5,245[1]	1,880	8,607	4.9	5,418.7	5,418.7	5,419.1	0.4
AB	6,395[1]	2,050	4,559	9.2	5,423.3	5,423.3	5,423.4	0.1
AC	7,215[1]	1,669	6,487	6.4	5,428.7	5,428.7	5,429.1	0.4
AD	8,075[1]	1,311	4,501	9.4	5,431.5	5,431.5	5,432.1	0.6
(AT NEW CASTLE)								
AE	466.43[2]	400	4,400	9.3	5,517.4	5,517.4	5,518.4	1.0
AF	466.62[2]	340	3,140	13.0	5,520.4	5,520.4	5,520.7	0.3
AG	466.93[2]	220	2,810	14.6	5,527.4	5,527.4	5,527.4	0.0
AH	467.04[2]	240	3,760	10.9	5,530.1	5,530.1	5,530.1	0.0
AI	467.19[2]	220	3,200	12.8	5,531.6	5,531.6	5,531.6	0.0

[1]Feet Above Eastbound Interstate 70 Bridge [2]Miles Above Lees Ferry

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

COLORADO 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)
COLORADO RIVER (AT GLENWOOD SPRINGS)								
AJ	14,102	302	3,889	10.3	5,699.5	5,699.5	5,699.5	0.0
AK	15,093	150	2,574	15.5	5,700.5	5,700.5	5,701.2	0.7
AL	16,085	262	4,704	8.5	5,704.7	5,704.7	5,705.7	1.0
AM	16,825	177	2,977	13.4	5,704.9	5,704.9	5,705.9	1.0
AN	17,627	178	3,176	12.6	5,707.3	5,707.3	5,708.1	0.8
AO	18,589	306	4,863	8.2	5,710.6	5,710.6	5,711.5	0.9
AP	19,617	230	2,975	13.4	5,711.8	5,711.8	5,712.5	0.7
AQ	20,654	198	2,914	13.7	5,715.1	5,715.1	5,715.8	0.7
AR	21,842	326	4,594	8.7	5,719.5	5,719.5	5,720.3	0.8
AS	23,027	354	2,743	14.6	5,721.1	5,721.1	5,721.6	0.5
AT	23,077	187	2,520	15.9	5,721.1	5,721.1	5,721.6	0.5
AU	23,166	187	2,682	14.9	5,722.1	5,722.1	5,722.5	0.4
AV	23,155	274	4,150	9.6	5,724.7	5,724.7	5,724.9	0.2
AW	23,620	517	7,214	5.5	5,726.4	5,726.4	5,726.5	0.1
AX	24,037	247	3,751	10.7	5,726.5	5,726.5	5,726.5	0.0
AY	24,369	248	3,178	12.6	5,726.7	5,726.7	5,727.1	0.4
AZ	24,910	206	2,875	13.9	5,728.9	5,728.9	5,729.1	0.2
BA	25,283	161	2,651	12.3	5,731.3	5,731.3	5,731.6	0.3

[1]Feet Above South Canyon Creek Road

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

COLORADO 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)
COLORADO RIVER (AT GLENWOOD SPRINGS)								
BB	25,873	181	2,423	13.4	5,732.5	5,732.5	5,733.2	0.7
BC	26,332	175	2,568	12.7	5,735.7	5,735.7	5,735.8	0.1
BD	26,688	184	2,444	13.3	5,736.5	5,736.5	5,736.9	0.4
BE	26,734	183	2,516	12.9	5,737.3	5,737.3	5,737.6	0.3
BF	26,787	182	2,473	13.1	5,737.5	5,737.5	5,737.8	0.3
BG	26,837	185	2,513	12.9	5,737.7	5,737.7	5,738.0	0.3
BH	27,306	194	2,598	12.5	5,739.9	5,739.9	5,740.0	0.1
BI	28,136	279	3,201	10.2	5,743.1	5,743.1	5,743.1	0.0
BJ	28,786	218	2,985	10.9	5,744.9	5,744.9	5,744.9	0.0
BK	30,910	187	3,258	10.0	5,749.9	5,749.9	5,749.9	0.0

[1]Feet Above South Canyon Creek Road

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

COLORADO 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)
CRYSTAL RIVER								
A	520	179	1,950	3.9	6,072.4	6,072.4	6,073.2	0.8
B	1,160	277	918	8.2	6,073.4	6,073.4	6,073.4	0.0
C	1,790	165	838	9.0	6,079.4	6,079.4	6,079.6	0.2
D	2,805	131	913	8.3	6,087.1	6,087.1	6,087.7	0.6
E	4,050	84	599	12.6	6,102.6	6,102.6	6,102.6	0.0
F	4,345	143	863	8.8	6,105.6	6,105.6	6,106.1	0.5
G	4,655	125	650	11.3	6,109.0	6,109.0	6,109.0	0.0
H	5,110	122	827	8.9	6,114.3	6,114.3	6,114.4	0.1
I	6,080	131	652	11.3	6,119.9	6,119.9	6,120.1	0.2
J	7,190	220	1,040	7.1	6,130.6	6,130.6	6,131.1	0.5
K	8,315	100	644	11.5	6,138.5	6,138.5	6,139.5	1.0
L	8,660	95	539	13.7	6,143.5	6,143.5	6,143.9	0.4
M	9,725	88	636	11.6	6,150.9	6,150.9	6,151.7	0.8
N	11,770	92	540	13.7	6,166.7	6,166.7	6,166.8	0.1
O	12,865	142	827	8.7	6,177.3	6,177.3	6,178.3	1.0
P	15,710	99	615	11.7	6,197.2	6,197.2	6,197.4	0.2
Q	16,770	171	1,057	6.8	6,206.2	6,206.2	6,207.2	1.0
R	18,620	116	682	10.5	6,218.4	6,218.4	6,218.9	0.5
S	19,090	170	1,269	5.7	6,222.2	6,222.2	6,223.0	0.8
T	19,575	139	683	10.5	6,224.3	6,224.3	6,224.6	0.3
U	19,920	393	2,468	2.9	6,232.2	6,232.2	6,232.2	0.0
V	20,490	188	738	9.7	6,232.2	6,232.2	6,232.2	0.0

[1]Feet Above Confluence with Roaring Fork River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CRYSTAL 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)
CRYSTAL RIVER (cont'd)								
W	20,660	95	729	9.9	6,236.4	6,236.4	6,236.4	0.0
X	22,395	148	616	11.7	6,245.1	6,245.1	6,245.1	0.0
Y	22,885	95	581	12.4	6,249.5	6,249.5	6,249.6	0.1
Z	24,000	140	865	8.3	6,256.2	6,256.2	6,257.1	0.9

[1]Feet Above Confluence with Roaring Fork River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

CRYSTAL 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)
FOURMILE CREEK								
A	770	29	155	9.0	5,904.1	5,904.1	5,905.1	1.0
B	1,340	25	115	12.2	5,926.6	5,926.6	5,926.9	0.3
C	2,880	32	135	10.4	5,990.2	5,990.2	5,990.6	0.4
D	4,590	28	120	11.6	6,072.8	6,072.8	6,073.0	0.2
E	4,720	67	96	6.9	6,091.4	6,091.4	6,091.9	0.5
F	4,830	39	431	3.3	6,092.4	6,092.4	6,093.3	0.9
G	6,170	26	120	11.7	6,125.4	6,125.4	6,125.4	0.0
H	7,585	43	173	8.1	6,176.7	6,176.7	6,177.7	1.0
I	8,295	30	122	11.5	6,210.5	6,210.5	6,210.6	0.1
J	8,490	72	143	7.7	6,223.9	6,223.9	6,224.4	0.5
K	8,520	178	592	1.8	6,225.1	6,225.1	6,226.1	1.0
L	9,520	36	133	10.5	6,261.0	6,261.0	6,261.3	0.3
M	10,570	32	127	11.0	6,298.1	6,298.1	6,298.3	0.2
N	11,500	34	153	9.1	6,331.0	6,331.0	6,331.9	0.9
O	11,545	71	144	8.1	6,337.4	6,337.4	6,337.8	0.4
P	11,630	41	323	4.3	6,338.9	6,338.9	6,339.7	0.8
Q	12,570	39	144	9.7	6,372.8	6,372.8	6,372.8	0.0
R	12,830	31	176	8.0	6,379.9	6,379.9	6,380.9	1.0
S	12,900	50[2]	286	4.3	6,389.6	6,389.6	6,389.6	0.0
T	13,330	20	109	11.3	6,400.5	6,400.5	6,400.5	0.0
U	13,360	50	271	4.5	6,404.0	6,404.0	6,404.0	0.0
V	13,960	61	149	8.3	6,428.7	6,428.7	6,429.4	0.7

[1]Feet Above Confluence with Roaring Fork River

[2]Widths have been adjusted from the previous effective Floodway Data Table to match the re-delineated floodway

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

FOURMILE 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)
FOURMILE CREEK (cont'd)								
W	14,650	31	118	10.4	6,462.9	6,462.9	6,463.2	0.3
X	14,755	50	263	5.3	6,470.3	6,470.3	6,471.0	0.7
Y	15,335	32	112	10.5	6,495.7	6,495.7	6,496.1	0.4
Z	15,550	25	118	9.9	6,504.7	6,504.7	6,505.5	0.8
AA	15,635	83	242	4.8	6,510.9	6,510.9	6,511.0	0.1
AB	16,590	41	135	8.7	6,540.9	6,540.9	6,541.3	0.4
AC	17,455	28	130	9.0	6,568.6	6,568.6	6,569.4	0.8
AD	18,990	25	114	10.3	6,633.5	6,633.5	6,634.0	0.5
AE	19,825	26	110	10.6	6,665.1	6,665.1	6,665.4	0.3
AF	20,670	22	94	11.7	6,697.7	6,697.7	6,697.8	0.1
AG	21,355	44	122	9.0	6,729.2	6,729.2	6,729.7	0.5
AH	22,070	22	120	9.2	6,756.9	6,756.9	6,757.8	0.9
AI	22,215	337	2,907	0.4	6,780.3	6,780.3	6,780.3	0.0
AJ	22,830	25	105	10.5	6,789.2	6,789.2	6,789.2	0.0
AK	23,715	38	135	7.3	6,821.7	6,821.7	6,822.7	1.0
AL	24,540	33	101	9.7	6,855.0	6,855.0	6,855.3	0.3
AM	25,200	23	90	10.8	6,878.4	6,878.4	6,878.7	0.3
AN	26,100	28	96	10.2	6,922.1	6,922.1	6,922.4	0.3
AO	26,255	40	107	9.2	6,932.8	6,932.8	6,933.2	0.4
AP	26,955	33	134	7.3	6,957.7	6,957.7	6,958.6	0.9
AQ	27,030	28	142	6.9	6,962.1	6,962.1	6,962.1	0.0
AR	28,200	139 [2]	146	6.7	7,020.9	7,020.9	7,021.7	0.8

[1]Feet Above Confluence with Roaring Fork River
[2]Width Includes Island

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

FOURMILE 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)
FOURMILE CREEK (cont'd)								
AS	28,890	86	122	6.7	7,049.4	7,049.4	7,049.9	0.5
AT	28,940	70	137	7.1	7,051.3	7,051.3	7,051.9	0.6
AU	29,230	81	146	6.7	7,062.8	7,062.8	7,063.5	0.7
AV	30,700	170[2]	144	5.9	7,116.9	7,116.9	7,117.9	1.0
AW	31,400	37	104	8.1	7,144.3	7,144.3	7,144.3	0.0
AX	32,125	15	70	12.1	7,175.3	7,175.3	7,175.3	0.0
AY	32,830	24	102	8.4	7,205.1	7,205.1	7,206.0	0.9
AZ	33,560	65	125	6.8	7,236.1	7,236.1	7,236.8	0.7
BA	33,660	208	1,068	0.8	7,245.4	7,245.4	7,246.1	0.7
BB	34,320	32	99	8.6	7,269.6	7,269.6	7,270.1	0.5
BC	35,245	24	88	9.6	7,308.2	7,308.2	7,308.7	0.5
BD	35,920	22	80	10.6	7,338.6	7,338.6	7,338.7	0.1

[1]Feet Above Confluence with Roaring Fork River
[2]Width Includes Island

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

FOURMILE 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)
GOVERNMENT CREEK								
A	450	141	594	3.9	5,391.1	5,391.1	5,392.1	1.0
B	1,320	65	361	6.5	5,398.6	5,398.6	5,398.7	0.1
C	2,265	58	217	10.8	5,404.4	5,404.4	5,404.4	0.0
D	3,035	45	204	11.5	5,412.0	5,412.0	5,412.0	0.0
E	3,370	33	266	8.8	5,415.3	5,415.3	5,415.3	0.0
F	3,715	79	309	7.6	5,415.8	5,415.8	5,416.8	1.0
G	4,075	56	216	10.8	5,419.4	5,419.4	5,419.4	0.0
H	4,180	78	242	9.7	5,427.7	5,427.7	5,427.7	0.0
I	4,735	95	256	9.2	5,433.4	5,433.4	5,433.9	0.5
J	5,500	53	224	10.5	5,442.1	5,442.1	5,442.1	0.0
K	5,772	35	187	12.5	5,446.0	5,446.0	5,446.1	0.1
L	7,435	79	241	9.7	5,457.1	5,457.1	5,457.1	0.0
M	9,185	65	233	10.0	5,474.6	5,474.6	5,474.7	0.1
N	9,400	51	213	11.0	5,478.3	5,478.3	5,478.3	0.0
O	11,280	65	232	10.1	5,495.3	5,495.3	5,495.3	0.0
P	11,790	61	220	10.6	5,501.8	5,501.8	5,501.8	0.0
Q	12,840	47	203	11.5	5,513.7	5,513.7	5,513.9	0.2
R	12,960	32	180	13.0	5,516.1	5,516.1	5,516.1	0.0
S	14,265	52	226	10.4	5,526.7	5,526.7	5,526.7	0.0
T	14,590	59	225	10.4	5,532.3	5,532.3	5,532.3	0.0
U	15,275	46	260	9.0	5,538.2	5,538.2	5,538.8	0.4
V	16,391	47	226	10.4	5,549.9	5,549.9	5,550.2	0.3

[1]Feet Above Confluence with Rifle Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

GOVERNMENT 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)
HUBBARD GULCH								
A	470	21	90	9.8	5,353.3	5,353.3	5,353.3	0.0
B	690	23	113	7.8	5,355.3	5,355.3	5,355.7	0.4
C	800	34	110	8.0	5,360.2	5,360.2	5,360.2	0.0
D	1,170	41	104	8.4	5,367.0	5,367.0	5,367.0	0.0
E	1,410	29	103	8.5	5,371.5	5,371.5	5,371.5	0.0
F	1,430	29	177	5.0	5,376.3	5,376.3	5,376.6	0.3
G	1,738	23	85	10.3	5,377.5	5,377.5	5,377.5	0.0
H	1,866	30	96	9.1	5,379.6	5,379.6	5,379.7	0.1
I	2,172	17	77	11.5	5,385.2	5,385.2	5,385.2	0.0
J	2,220	39	178	4.9	5,387.6	5,387.6	5,387.6	0.0
K	2,552	90	278	3.2	5,392.3	5,392.3	5,392.4	0.1
L	2,863	17	76	11.7	5,394.8	5,394.8	5,394.8	0.0
M	3,450	20	78	11.2	5,402.6	5,402.6	5,402.8	0.2
N	3,635	37	107	8.2	5,409.4	5,409.4	5,409.4	0.0
O	3,855	78	163	5.4	5,413.0	5,413.0	5,413.0	0.0
P	3,970	30	147	6.0	5,413.8	5,413.8	5,413.8	0.0
Q	4,090	18	108	8.1	5,415.7	5,415.7	5,415.7	0.0
R	4,300	20	132	6.7	5,417.2	5,417.2	5,417.2	0.0
S	5,070	27	91	9.7	5,427.3	5,427.3	5,427.5	0.2
T	5,760	85	127	6.9	5,439.7	5,439.7	5,440.2	0.5
U	5,880	25	106	8.3	5,443.8	5,443.8	5,443.8	0.0
V	7,200	74	120	7.3	5,459.6	5,459.6	5,459.6	0.0

[1]Feet Above Confluence with Rifle Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

HUBBARD GULCH

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)
HUBBARD GULCH (cont'd)								
W	7,615	52	118	7.5	5,464.8	5,464.8	5,464.9	0.1
X	7,870	30	106	8.3	5,467.1	5,467.1	5,467.4	0.3
Y	8,110	48	110	8.0	5,471.1	5,471.1	5,471.2	0.1
Z	9,200	21	82	10.8	5,492.7	5,492.7	5,492.8	0.1
AA	10,635	23	85	10.3	5,518.4	5,518.4	5,518.4	0.0
AB	11,720	27	86	10.2	5,536.4	5,536.4	5,536.4	0.0
AC	12,350	21	83	10.7	5,548.2	5,548.2	5,548.3	0.1
AD	14,125	24	86	10.3	5,581.1	5,581.1	5,581.5	0.4
AE	15,055	49	132	6.7	5,603.9	5,603.9	5,603.9	0.0

[1]Feet Above Confluence with Rifle Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

HUBBARD GULCH

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)
MITCHELL CREEK								
A	50	16	32	8.0	5,692.4	5,692.4	5,692.4	0.0
B	80	27	37	7.0	5,691.7	5,694.7	5,695.1	0.4
C	108	17	34	7.7	5,697.9	5,697.9	5,697.9	0.0
D	391	10	—[2]	—[2]	5,708.5	5,708.5	—[2]	—[2]
E	1,028	80	—[2]	—[2]	5,729.0	5,729.0	—[2]	—[2]
F	1,597	50	—[2]	—[2]	5,747.3	5,747.3	—[2]	—[2]
G	1,953	57	60	6.6	5,754.2	5,754.2	5,754.2	0.0
H	2,363	69	139	6.2	5,770.0	5,770.0	5,770.0	0.0
I	3,139	35	93	9.3	5,824.1	5,824.1	5,824.1	0.0
J	3,360	35	93	9.3	5,838.2	5,838.2	5,838.2	0.0
K	4,295	66	114	7.6	5,895.7	5,895.7	5,895.7	0.0
L	5,069	30	88	9.8	5,927.7	5,927.7	5,927.7	0.0
M	5,517	46	88	9.8	2,957.1	2,957.1	2,957.1	0.0
N	5,802	49	101	8.5	5,983.0	5,983.0	5,983.0	0.0
O	5,900	19	76	11.3	5,992.3	5,992.3	5,992.3	0.0
P	5,961	68	242	10.4	6,000.9	6,000.9	6,000.9	0.0
Q	6,120	26	79	9.2	6,004.3	6,004.3	6,004.3	0.0
R	6,222	24	83	9.8	6,016.0	6,016.0	6,016.0	0.0
S	6,407	19	61	8.3	6,027.4	6,027.4	6,027.4	0.0
T	6,509	32	57	10.3	6,033.7	6,033.7	6,033.7	0.0
U	6,665	17	67	3.1	6,046.1	6,046.1	6,046.1	0.0
V	6,790	17	55	9.3	6,054.0	6,054.0	6,054.0	0.0

[1]Feet Above Confluence with Colorado River
[2]Data not available

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

MITCHELL 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)
MITCHELL CREEK (cont'd)								
W	6,879	22	198	10.2	6,063.5	6,063.5	6,063.5	0.0
X	7,098	18	60	11.2	6,074.4	6,074.4	6,074.4	0.0
Y	7,381	18	55	10.2	6,092.5	6,092.5	6,092.5	0.0
Z	7,582	13	50	11.2	6,103.6	6,103.6	6,103.6	0.0
AA	8,076	20	58	9.7	6,139.1	6,139.1	6,139.1	0.0
AB	8,305	22	59	9.4	6,164.3	6,164.3	6,164.3	0.0
AC	8,779	38	75	8.9	6,231.4	6,231.4	6,231.4	0.0
AD	8,852	44	58	8.4	6,243.6	6,243.6	6,243.6	0.0
AE	9,016	56	89	7.8	6,270.0	6,270.0	6,270.0	0.0
AF	9,138	21	58	9.6	6,286.8	6,286.8	6,286.8	0.0
AG	9,359	61	88	8.2	6,312.3	6,312.3	6,312.3	0.0
AH	9,702	32	66	9.0	6,353.1	6,353.1	6,353.1	0.0

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

MITCHELL 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)
PARACHUTE CREEK								
A	929	106	570	6.1	5,063.2	5,063.2	5,064.2	1.0
B	1,475	71	475	7.4	5,065.5	5,065.5	5,066.4	0.9
C	2,408	218	912	3.8	5,071.9	5,071.9	5,072.6	0.6
D	3,693	292	811	4.3	5,079.5	5,079.5	5,080.0	0.6
E	3,824	88	381	9.2	5,080.9	5,080.9	5,080.9	0.0
F	4,648	45	257	13.6	5,085.5	5,085.5	5,085.7	0.3
G	5,149	110	539	6.5	5,089.8	5,089.8	5,090.8	1.0
H	5,710	69	418	8.4	5,094.4	5,094.4	5,094.4	0.0
I	6,241	175	798	4.4	5,098.9	5,098.9	5,098.9	0.0
J	7,563	109	541	6.5	5,105.2	5,105.2	5,105.9	0.7

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

PARACHUTE 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)
RIFLE CREEK								
A	355	30	261	15.0	5,297.7	5,297.7	5,297.7	0.0
B	425	158	1,315	3.0	5,302.1	5,302.1	5,302.1	0.0
C	470	158	1,333	2.9	5,302.3	5,302.3	5,302.3	0.0
D	605	96	426	9.2	5,302.7	5,302.7	5,302.7	0.0
E	830	166	685	5.7	5,305.1	5,305.1	5,305.1	0.0
F	1,500	107	372	10.5	5,310.0	5,310.0	5,310.1	0.1
G	1,750	51	316	12.4	5,313.4	5,313.4	5,313.4	0.0
H	2,140	71	321	12.2	5,318.8	5,318.8	5,318.8	0.0
I	2,270	87	531	7.4	5,321.8	5,321.8	5,321.8	0.0
J	2,690	116	437	9.0	5,324.4	5,324.4	5,324.7	0.3
K	3,955	211	648	6.0	5,336.9	5,336.9	5,337.6	0.7
L	4,600	93	652	6.0	5,345.8	5,345.8	5,346.8	1.0
M	5,000	142	1,005	3.6	5,350.9	5,350.9	5,351.8	0.9
N	5,390	352	1,006	3.6	5,351.7	5,351.7	5,352.5	0.8
O	5,675	107	456	7.9	5,354.1	5,354.1	5,354.1	0.0
P	5,720	91	354	10.2	5,354.2	5,354.2	5,354.2	0.0
Q	5,930	163	614	5.9	5,357.1	5,357.1	5,357.1	0.0
R	6,410	55	288	12.5	5,361.4	5,361.4	5,361.4	0.0
S	6,695	69	466	7.7	5,365.4	5,365.4	5,365.9	0.5
T	6,945	65	378	9.6	5,366.5	5,366.5	5,367.3	0.8
U	7,585	42	266	13.6	5,373.7	5,373.7	5,373.7	0.0
V	8,120	79	570	6.3	5,379.1	5,379.1	5,379.3	0.2

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

RIFLE 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)
RIFLE CREEK (cont'd)								
W	8,890	101	461	7.8	5,383.0	5,383.0	5,383.5	0.5
X	9,230	117	666	5.4	5,386.1	5,386.1	5,387.1	1.0
Y	9,280	193	259	6.6	5,389.4	5,389.4	5,389.4	0.0
Z	10,100	67	285	7.3	5,390.9	5,390.9	5,391.3	0.4
AA	10,750	108	269	7.7	5,396.5	5,396.5	5,396.5	0.0
AB	11,415	46	197	10.5	5,399.4	5,399.4	5,399.7	0.3
AC	11,485	48	191	10.9	5,401.9	5,401.9	5,402.1	0.2
AD	12,030	52	242	8.6	5,405.2	5,405.2	5,405.8	0.6
AE	12,550	40	174	11.9	5,410.3	5,410.3	5,410.3	0.0
AF	12,560	40	225	9.2	5,411.6	5,411.6	5,411.6	0.0
AG	13,730	110	247	8.4	5,417.4	5,417.4	5,417.4	0.0
AH	14,070	177	509	4.1	5,419.5	5,419.5	5,420.3	0.8
AI	14,465	139	484	4.3	5,420.6	5,420.6	5,421.0	0.4
AJ	14,900	164	653	3.2	5,422.4	5,422.4	5,422.7	0.3
AK	15,180	56	211	9.8	5,427.8	5,427.8	5,427.8	0.0
AL	16,205	82	237	8.7	5,439.2	5,439.2	5,439.5	0.3
AM	17,420	116	456	1.8	5,445.2	5,445.2	5,445.5	0.3
AN	18,880	95	128	6.6	5,450.5	5,450.5	5,450.5	0.0
AO	19,520	51	140	6.0	5,458.7	5,458.7	5,458.7	0.0
AP	20,320	36	112	7.5	5,468.2	5,468.2	5,468.7	0.5
AQ	20,870	17	97	8.7	5,471.6	5,471.6	5,471.9	0.3
AR	20,900	17	110	7.7	5,472.5	5,472.5	5,472.6	0.1

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

RIFLE 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)
RIFLE CREEK (cont'd)								
AS	21,450	35	172	4.7	5,477.1	5,477.1	5,478.0	0.9
AT	22,560	205	474	4.2	5,484.1	5,484.1	5,484.6	0.5
AU	23,560	156	596	3.3	5,486.8	5,486.8	5,487.7	0.9
AV	24,490	153	298	6.7	5,490.4	5,490.4	5,490.8	0.4
AW	25,835	288	736	2.7	5,495.1	5,495.1	5,496.1	1.0
AX	26,020	279	473	3.8	5,497.2	5,497.2	5,497.2	0.0
AY	27,925	217	700	2.8	5,507.8	5,507.8	5,507.8	0.0
AZ	30,030	125	356	5.6	5,515.9	5,515.9	5,516.3	0.4
BA	30,740	71	234	8.5	5,524.9	5,524.9	5,524.9	0.0
BB	32,120	120	463	4.3	5,532.9	5,532.9	5,533.8	0.9
BC	32,750	76	270	7.4	5,535.8	5,535.8	5,536.5	0.7
BD	34,380	422	555	3.3	5,546.0	5,546.0	5,546.0	0.0
BE	34,770	95	350	5.3	5,547.1	5,547.1	5,547.5	0.4
BF	35,580	111	238	7.8	5,554.2	5,554.2	5,554.3	0.1
BG	36,795	157	439	4.2	5,562.0	5,562.0	5,562.8	0.8
BH	37,055	143	284	6.5	5,566.0	5,566.0	5,566.0	0.0
BI	37,425	150	708	2.6	5,566.9	5,566.9	5,567.4	0.5
BJ	38,000	66	188	9.7	5,571.0	5,571.0	5,571.0	0.0
BK	39,150	40	250	7.3	5,580.0	5,580.0	5,580.4	0.4
BL	40,250	35	231	7.9	5,584.6	5,584.6	5,585.4	0.8
BM	41,350	62	230	9.4	5,594.8	5,594.8	5,595.1	0.3
BN	42,400	25	162	11.3	5,603.4	5,603.4	5,604.2	0.8

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

RIFLE 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)
RIFLE CREEK								
BO	43,500	32	218	8.4	5,612.3	5,612.3	5,612.7	0.4
BP	44,425	65	208	8.8	5,622.3	5,622.3	5,622.3	0.0
BQ	44,515	120	714	2.6	5,629.0	5,629.0	5,630.0	1.0
BR	45,230	48	170	10.8	5,631.2	5,631.2	5,631.2	0.0
BS	46,040	21	130	14.1	5,653.8	5,653.8	5,653.9	0.1
BT	47,690	48	276	6.6	5,666.7	5,666.7	5,667.6	0.9
BU	48,840	30	168	9.8	5,672.5	5,672.5	5,672.5	0.0
BV	50,190	51	198	8.3	5,682.4	5,682.4	5,682.4	0.0
BW	51,720	67	267	6.2	5,691.1	5,691.1	5,691.1	0.0
BX	52,770	46	190	8.6	5,697.1	5,697.1	5,697.1	0.0
BY	54,240	38	158	10.4	5,711.4	5,711.4	5,711.5	0.1
BZ	55,615	34	209	7.9	5,722.5	5,722.5	5,722.7	0.2
CA	57,415	40	200	8.2	5,733.1	5,733.1	5,733.5	0.4
CB	58,265	44	154	10.7	5,741.4	5,741.4	5,741.9	0.5
CC	59,065	46	156	10.5	5,755.9	5,755.9	5,755.9	0.0
CD	59,815	26	132	12.5	5,779.3	5,779.3	5,779.5	0.2
CE	60,615	30	115	9.9	5,794.1	5,794.1	5,794.1	0.0
CF	61,915	32	107	10.6	5,821.4	5,821.4	5,821.4	0.0
CG	62,715	92	177	6.4	5,834.8	5,834.8	5,834.9	0.1
CH	64,525	45	155	7.3	5,852.1	5,852.1	5,852.5	0.4
CI	65,285	41	212	5.4	5,855.8	5,855.8	5,856.2	0.4

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

RIFLE 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)
RIFLE CREEK SPLITFLOW								
A	822	103	167	7.3	5,445.9	5,445.9	5,445.9	0.0
B	1,121	104	265	4.6	5,449.5	5,449.5	5,449.5	0.0
C	1,535	115	205	6.0	5,453.8	5,453.8	5,452.9	0.0
D	2,405	250	428	2.9	5,461.8	5,461.8	5,462.1	0.3
E	2,423	394	1,575	0.8	5,465.8	5,465.8	5,465.9	0.1
F	3,523	171	199	6.2	5,476.5	5,476.5	5,476.5	0.0

[1]Feet Above Confluence with Rifle Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

RIFLE CREEK SPLITFLOW

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)
ROARING FORK RIVER								
A	145	216[2]	2,700	7.9	5,729.7	5,729.7	5,730.7	1.0
B	210	175	2,745	7.7	5,730.0	5,730.0	5,731.0	1.0
C	720	184	2,280	9.3	5,730.8	5,730.8	5,731.6	0.8
D	1,020	120	1,357	15.6	5,730.9	5,730.9	5,731.9	1.0
E	1,130	120	1,521	13.9	5,733.3	5,733.3	5,734.2	0.9
F	2,030	221	2,689	7.9	5,738.6	5,738.6	5,739.5	0.9
G	2,830	266	2,403	8.8	5,740.7	5,740.7	5,741.7	1.0
H	3,870	207	1,987	10.7	5,744.7	5,744.7	5,745.6	0.9
I	4,830	168	1,801	11.8	5,750.2	5,750.2	5,750.5	0.3
J	5,940	146	1,744	12.2	5,755.8	5,755.8	5,756.6	0.8
K	6,880	175	2,238	9.5	5,760.3	5,760.3	5,761.0	0.7
L	7,830	177	2,032	10.4	5,763.4	5,763.4	5,763.9	0.5
M	8,730	185	1,812	11.7	5,768.0	5,768.0	5,768.4	0.4
N	9,620	147	1,691	12.5	5,773.2	5,773.2	5,773.6	0.4
O	9,820	135	1,627	13.0	5,774.2	5,774.2	5,774.7	0.5
P	9,910	172	3,166	6.7	5,781.1	5,781.1	5,781.8	0.7
Q	10,870	210	3,069	6.9	5,782.2	5,782.2	5,782.8	0.6
R	11,610	190	2,549	8.3	5,783.2	5,783.2	5,783.8	0.6
S	12,450	160	1,919	11.0	5,785.3	5,785.3	5,785.9	0.6
T	13,208	192	2,071	9.9	5,791.3	5,791.3	5,791.3	0.0
U	13,273	183	2,212	9.3	5,791.4	5,791.4	5,791.4	0.0
V	14,038	173	1,845	11.1	5,793.0	5,793.0	5,793.1	0.1

[1]Feet Above Confluence with Colorado River [2]Floodway top width controlled by Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

ROARING FORK 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)
ROARING FORK RIVER (cont'd)								
W	14,878	225	2,062	9.8	5,795.8	5,795.8	5,796.2	0.4
X	15,258	222	1,919	10.6	5,797.0	5,797.0	5,797.4	0.4
Y	16,048	151	1,378	14.7	5,806.0	5,806.0	5,806.0	0.0
Z	16,663	156	1,533	13.2	5,810.6	5,810.6	5,810.6	0.0
AA	17,403	103	1,144	17.7	5,814.5	5,814.5	5,814.6	0.1
AB	18,343	127	1,596	12.7	5,821.4	5,821.4	5,822.3	0.9
AC	18,803	141	1,568	12.9	5,823.1	5,823.1	5,823.7	0.6
AD	19,698	122	1,478	13.7	5,828.0	5,828.0	5,828.4	0.4
AE	20,568	136	1,339	15.1	5,830.6	5,830.6	5,830.6	0.0
AF	21,823	170	2,003	10.1	5,837.7	5,837.7	5,837.7	0.0
AG	23,263	133	1,481	13.6	5,841.9	5,841.9	5,841.9	0.0
AH	23,663	222	2,743	7.3	5,845.4	5,845.4	5,846.0	0.6
AI	24,803	119	1,142	17.6	5,847.7	5,847.7	5,847.9	0.2
AJ	25,923	255	2,544	7.9	5,856.2	5,856.2	5,857.0	0.8
AK	26,603	373	3,309	6.1	5,858.4	5,858.4	5,859.3	0.9
AL	27,813	216	1,421	13.7	5,864.8	5,864.8	5,864.9	0.1
AM	28,798	199	1,878	10.3	5,871.9	5,871.9	5,872.8	0.9
AN	31,573	133	1,193	16.3	5,887.6	5,887.6	5,887.7	0.1
AO	32,433	159	1,707	11.4	5,893.5	5,893.5	5,894.5	1.0
AP	34,173	97	1,092	17.8	5,900.8	5,900.8	5,901.0	0.2
AQ	34,333	225	2,522	7.7	5,907.4	5,907.4	5,907.5	0.1
AR	36,093	317	1,840	10.5	5,910.5	5,910.5	5,910.5	0.0

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

ROARING FORK 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)
ROARING FORK RIVER (cont'd)								
AS	36,993	205	1,881	10.3	5,914.5	5,914.5	5,914.5	0.0
AT	37,943	149	1,355	14.3	5,917.9	5,917.9	5,918.0	0.1
AU	39,543	274	2,247	8.6	5,927.0	5,927.0	5,927.5	0.5
AV	40,363	170	1,325	14.6	5,930.9	5,930.9	5,930.9	0.0
AW	41,458	357	2,623	7.4	5,937.7	5,937.7	5,938.6	0.9
AX	42,103	163	1,776	10.9	5,939.9	5,939.9	5,940.0	0.1
AY	43,118	449	2,977	6.3	5,942.3	5,942.3	5,943.3	1.0
AZ	44,518	328	2,537	7.3	5,949.8	5,949.8	5,950.8	1.0
BA	45,583	367	2,170	8.6	5,953.2	5,953.2	5,953.7	0.5
BB	48,633	400	2,737	6.8	5,967.3	5,967.3	5,967.3	0.0
BC	49,533	372	2,074	9.0	5,969.6	5,969.6	5,970.1	0.5
BD	53,303	343	2,295	8.1	5,993.4	5,993.4	5,994.2	0.8
BE	56,403	226	1,671	11.2	6,009.7	6,009.7	6,010.4	0.7
BF	57,573	421	2,844	6.6	6,015.7	6,015.7	6,016.5	0.8
BG	58,688	384	2,202	8.5	6,019.6	6,019.6	6,020.3	0.7
BH	60,708	144	1,392	13.4	6,030.0	6,030.0	6,030.8	0.8
BI	66,143	138	1,164	16.0	6,061.0	6,061.0	6,061.3	0.3
BJ	67,283	107	1,363	13.7	6,068.9	6,069.1	6,069.9	0.8
BK	69,163	105	1,065	11.5	6,077.6	6,077.6	6,077.6	0.0
BL	69,273	156	1,580	7.8	6,080.6	6,080.6	6,080.6	0.0
BM	70,358	161	1,457	8.4	6,084.3	6,084.3	6,084.4	0.1
BN	70,763	160	903	13.6	6,086.5	6,086.5	6,086.5	0.0

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

ROARING FORK 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)
ROARING FORK RIVER (cont'd)								
BO	70,778	168	1,168	10.5	6,088.1	6,088.1	6,088.1	0.0
BP	71,843	120	880	14.0	6,094.5	6,094.5	6,094.5	0.0
BQ	71,968	110	800	15.3	6,095.9	6,095.9	6,095.9	0.0
BR	72,003	119	1,101	11.2	6,098.5	6,098.5	6,098.5	0.0
BS	72,598	303	2,092	5.9	6,101.9	6,101.9	6,101.9	0.0
BT	73,498	459	1,685	7.3	6,104.9	6,104.9	6,105.2	0.3
BU	75,438	444	1,574	7.8	6,119.1	6,119.1	6,119.4	0.3
BV	77,858	1,060	2,919	4.2	6,136.4	6,136.4	6,137.3	0.9
BW	79,508	1,063	2,821	4.4	6,145.9	6,145.9	6,146.8	0.9
BX	82,993	1,280	2,635	4.7	6,174.4	6,174.4	6,175.1	0.7
BY	87,058	1,675	2,034	6.0	6,208.2	6,208.2	6,208.9	0.7
BZ	88,033	1,230	2,544	4.8	6,220.0	6,220.0	6,221.0	1.0
CA	92,993	1,313	2,737	4.5	6,263.5	6,263.5	6,264.0	0.5
CB	93,958	1,530	1,584	7.8	6,273.9	6,273.9	6,273.9	0.0
CC	94,078	1,637	3,299	3.7	6,275.1	6,275.1	6,275.1	0.0
CD	96,983	163	1,988	12.4	6,297.3	6,297.3	6,297.8	0.5
CE	98,628	385	1,924	6.4	6,312.8	6,312.8	6,313.6	0.8
CF	101,058	474	2,338	5.3	6,332.3	6,332.3	6,332.8	0.5
CG	103,173	297	1,786	6.9	6,350.8	6,350.8	6,351.7	0.9
CH	104,843	685	2,247	5.5	6,363.0	6,363.0	6,363.5	0.5
CI	106,683	601	2,061	6.0	6,381.0	6,381.0	6,381.8	0.8

[1]Feet Above Confluence with Colorado River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

ROARING FORK 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)
THREEMILE CREEK								
A	250	22	55	13.0	5,795.0	5,795.0	5,795.1	0.1
B	500	24	81	8.7	5,808.0	5,808.0	5,808.7	0.7
C	780	20	49	14.3	5,821.2	5,821.2	5,821.2	0.0
D	1,010	22	80	8.9	5,834.6	5,834.6	5,835.2	0.6
E	1,510	22	69	10.3	5,850.2	5,850.2	5,850.5	0.3
F	1,780	18	51	14.0	5,862.7	5,862.7	5,863.0	0.3
G	2,000	16	69	10.3	5,874.3	5,874.3	5,874.7	0.4
H	2,145	13	39	18.2	5,878.5	5,878.5	5,878.8	0.3
I	2,175	15	60	11.8	5,883.2	5,883.2	5,883.2	0.0
J	2,245	10	53	13.4	5,884.0	5,884.0	5,884.0	0.0
K	2,295	16	54	13.3	5,885.0	5,885.0	5,885.4	0.4
L	2,475	24	82	8.7	5,894.7	5,894.7	5,895.1	0.4
M	2,585	19	53	13.3	5,898.2	5,898.2	5,898.6	0.4
N	2,645	36	93	7.6	5,902.4	5,902.4	5,902.9	0.5
O	2,665	47	108	6.6	5,903.2	5,903.2	5,903.7	0.5
P	2,740	30	79	9.0	5,903.8	5,903.8	5,904.1	0.3
Q	2,950	34	90	7.9	5,911.9	5,911.9	5,912.4	0.5
R	3,230	21	61	11.7	5,920.8	5,920.8	5,921.2	0.4
S	3,445	15	51	14.0	5,934.2	5,934.2	5,934.5	0.3
T	3,575	22	52	13.7	5,943.1	5,943.1	5,943.1	0.0
U	3,620	21	75	9.4	5,947.1	5,947.1	5,947.5	0.4
V	3,830	11	32	22.3	5,954.2	5,954.2	5,954.6	0.4

[1]Feet Above Confluence with Roaring Fork River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

THREEMILE 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)
THREEMILE CREEK (cont'd)								
W	3,885	22	68	10.5	5,965.4	5,965.4	5,965.4	0.0
X	4,180	13	50	14.1	5,987.3	5,987.3	5,988.1	0.8
Y	4,330	18	46	15.4	5,997.5	5,997.5	5,997.5	0.0
Z	4,580	19	51	14.0	6,016.7	6,016.7	6,016.7	0.0
AA	4,795	25	62	11.5	6,034.7	6,034.7	6,034.7	0.0
AB	4,830	29	94	7.6	6,038.0	6,038.0	6,038.2	0.2
AC	5,135	40	67	10.7	6,050.9	6,050.9	6,050.9	0.0
AD	5,235	20	49	14.6	6,056.5	6,056.5	6,056.7	0.2
AE	5,340	18	74	9.7	6,064.3	6,064.3	6,064.3	0.0

[1]Feet Above Confluence with Roaring Fork River

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

THREEMILE CREEK

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 AO
Zone AO is the flood insurance risk zone that corresponds to the areas of 1-percent-anuual-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.

Zone D
Zone D is the flood insurance risk zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

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 Garfield 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 7.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDAY MAP REVISION DATE	INITIAL FIRM EFFECTIVE DATE	FIRM REVISION DATE
Carbondale, Town of	August 29, 1975	--	February 5, 1986	--
Garfield County (Unincorporated Areas)	December 15, 1977	--	December 15, 1977	January 3, 1986 August 2, 2006
Glenwood Springs, City of	March 1, 1974	--	July 16, 1979	October 15, 1985
New Castle, Town of	July 25, 1975	--	--	--
Parachute, Town of	August 13, 1976	--	September 27, 1991	--
Rifle, City of	June 15, 1973	--	June 15, 1973	July 1, 1974 March 12, 1976 September 1, 1978 December 28, 1982 January 3, 1986
Silt, Town of	July 25, 1975	--	April 1, 1987	August 2, 2006

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

The USACE has published a Flood Plain Information report for the Colorado River, Rifle and Government Creeks, and Hubbard Gulch (Reference 41). Due to the use of more recent topographic mapping and a revised hydraulic analysis, this study supersedes that report.

In 1977, a study was made of the Colorado and Roaring Fork Rivers at Glenwood Springs, Colorado, for CWCB and the City of Glenwood Springs (Reference 13). The information obtained from that report was used in preparing the original FIS. The information does not conflict with this FIS.

A study of flow hazard mitigation was made for the Colorado Geological Survey by Arthur I. Mears in 1977 (Reference 23). A study of geologic hazards was made by the Lincoln DeVore Testing Laboratory in 1977 (Reference 24). Information presented in these studies does not conflict with this FIS.

In 1979, the Sacramento District of the USACE prepared a hydrology report covering the Crystal River (Reference 42). That report developed recurrence intervals for peak flows in the Crystal River basin.

ARIX Engineers prepared a Comprehensive Drainage Plan for the City of Rifle in January 1982 (Reference 43) which presented 1-percent annual chance discharges and floodplain boundaries for Hubbard Gulch and Rifle and Government Creeks. The same cross section data were used in both that report and the 1986 revised FIS; however, in that study the data were supplemented with December 1982 field surveyed data. Discharges and flood plain delineations are similar between that report and this FIS.

In August 1985, the SCS published a report of the detailed analysis of Parachute Creek in the vicinity of Parachute, and Roan Creek in the vicinity of DeBeque, Colorado (Reference 44). The SCS conducted the technical studies and prepared the report according to a Plan of Work between the SCS and CWCB dated December 1982. This study is superseded by the new analysis in this FIS.

The USACE, Sacramento District, prepared an analysis of the Colorado River floodplain from DeBeque to Glenwood Springs which was published by the CWCB (Reference 16).

In December 1986, the Town of Parachute requested J.E. Langford and Associates to check certain cross sections used in the floodplain analysis of Parachute Creek and to review the results of the technical studies performed by the SCS. The result of the review is presented in a Floodplain Information Report prepared for the Town of Parachute and the CWCB (Reference 45). This study is superseded by the new analysis in this FIS.

The hydraulic analysis for the portion of Mitchell Creek downstream of Interstate Highway 70 was performed by Claycomb Engineering Associates, Inc. This study is superseded by the new analysis in this FIS.

Revised hydrologic and hydraulic analyses for Parachute Creek were completed by PBS&J in November 2006 (Reference 7). The information from the study has been incorporated into this FIS.

A hydraulic analysis on the Colorado River from upstream of South Canon Creek Road to upstream of the Midland Avenue bridge in Glenwood Springs was completed by PBS&J in May 2007 (Reference 51). This study tied into the effective study of the Colorado River through Glenwood Springs.

USGS performed a post-fire hydrologic analysis of Mitchell Creek in September 2008 (Reference 8). Using this hydrology, Michael Baker Jr., Inc. performed a hydraulic analysis of Mitchell Creek in 2010 (Reference 9).

Flood Insurance Studies have been completed for the Cities of Glenwood Springs and Rifle, and the Towns of Carbondale, Parachute and Silt, and the Unincorporated Areas of Garfield County (References 1 through 6, respectively). This Flood Insurance Study supersedes the previous individual Flood Insurance Studies.

Flood Hazard Boundary Maps (FHBMs) were previously published for Cities of Glenwood Springs and Rifle, Town of Carbondale, Town of New Castle, and unincorporated areas of Garfield County (References 46, 47, 48, 49, and 50, respectively). This Flood Insurance Study supersedes the previous FHBMs.

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.

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

1. Federal Emergency Management Agency, Flood Insurance Study, City of Glenwood Springs, Colorado, October 15, 1985
2. Federal Emergency Management Agency, Flood Insurance Study, City of Rifle, Colorado, January 3, 1986
3. Federal Emergency Management Agency, Flood Insurance Study, Town of Carbondale, Colorado, February 5, 1986
4. Federal Emergency Management Agency, Flood Insurance Study, Town of Parachute, Colorado, September 27, 1991
5. Federal Emergency Management Agency, Flood Insurance Study, Town of Silt, Colorado, August 2, 2006

6. Federal Emergency Management Agency, Flood Insurance Study, Garfield County, Colorado (Unincorporated Areas), August 2, 2006

7. PBS&J Inc., prepared for Colorado Water Conservation Board, Parachute Creek, Town of Parachute, Hydrologic/Hydraulic Analysis Technical Support Data Notebook, Garfield County, Colorado, November 2006

8. U.S. Geological Survey, Post-Fire Hydrologic Analysis of Mitchell Creek near Glenwood Springs, Colorado, September 4, 2008; Mitchell Creek Hydraulic Analysis, May 5, 2009.

9. Michael Baker Jr. Inc., prepared for Federal Emergency Management Agency, Hydraulic Analysis for Mitchell Creek, Garfield County, Colorado, February 2010

10. Michael Baker International, Helmer Gulch Alluvial Fan Study, June 2016

11. U.S. Department of Agriculture, Soil Conservation Service, Flood Plain Management Study, Colorado River Tributaries, July, 1986

12. U.S. Census Bureau, United States Census 2010, http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

13. Gingery Associates Inc., prepared for Colorado Water Conservation Board, City of Glenwood Springs and Garfield County, Flood Plain Information Report, Roaring Fork River and Colorado River, November 1977

14. ESA Geotechnical Consultants and ARIX Corporation, Final Report, Drainage and Debris Control Plan for the City of Glenwood Springs, Colorado, Volume I, December 1982

15. U.S. Bureau of Reclamation, Silt Project, Colorado, http://www.usbr.gov/dataweb/html/silt.html, retrieved March 2005

16. Colorado Water Conservation Board, 2001 Flood Report, http://cwcb.state.co.us/flood_watch/Flood_Reports/2001FloodReport.pdf, retrieved March 2005

17. Colorado Water Conservation Board, Hydrology Report Colorado River from Glenwood Springs to DeBeque Canyon, Colorado, September 1985

18. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Garfield County, Colorado (Unincorporated Areas), 1977

19. U.S. Department of the Army, Corps of Engineers, Sacramento District, Hydrology, Crystal River, Colorado, February 1979

20. Simons, Li & Associates, Inc., Hydrology Report for Town of Rangely, City of Rifle, and Garfield County Flood Insurance Studies, January 1983

21. U.S. Department of the Interior, Geological Survey, Annual Snowmelt and Rainfall Peak – Flow Data on Selected Foothills Region Streams, South Platte River, Arkansas River and Colorado River Basin, Colorado, Open-File Report 82-426, 1982

22. U.S. Department of Agriculture, Soil Conservation Service, Incorporates and Supplements Technical Release No. 55, Urban Hydrology for Small Watersheds, Procedures for Determining Peak Flows in Colorado, July 1975

23. Colorado Geological Survey, Department of Natural Resources, Debris – Flow Hazard Analysis and Mitigation, State of Colorado, Arthur I. Mears, 1977

24. Colorado Geological Survey, Department of Natural Resources, City of Glenwood Springs, Geologic Hazards, Lincoln DeVore Testing Laboratory, preliminary report, 1977

25. The Weekly Newspaper, Glenwood Springs, Colorado, July 24, 1977

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

27. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System, Davis California, April 2004

28. State of Colorado, Department of Highways, Highway Project Map, Scale 1"2,400, Contour Interval 2 feet, File: Project No. 170-1(12), Sheets 4 and 5, 1964

29. State of Colorado, Department of Highways, Highway Project Map, Scale 1"1,200, Contour Interval 2 feet, File: Project No. 170-1(12)89, Sheets 31 and 32, 1964

30. Analytical Surveys, Inc., Topographic Mapping, Scale 1:2,400, Contour Interval 2 feet, November 1982

31. Analytical Surveys, Inc., Colorado River and Tributaries, Flood Plain Study, Scale 1:2,400, December 1982.

32. Analytical Surveys, Inc., Colorado Water Conservation Board, Mapping of the Colorado River at DeBeque, Colorado, to upstream of Glenwood Springs, Colorado, 1982

33. Kucera and Associates, Inc., City of Rifle, Aerial Photography, Scale 1:6,000, May 3, 1980

34. Delta Aerial Surveys, Inc., Aerial Photography, Scale 1:2,400, November 1980

35. Analytical Surveys, Inc., Aerial Photography, Scale 1:2,400, November 1982

36. David R. Dawdy, "Flood Frequency Estimates on Alluvial Fans", Journal of the Hydraulics Division ASCE, Proceedings, Vol. 105, No HY11, 1979

37. Delta Aerial Surveys, Inc., Topographic Mapping, Scale 1:2,400, Contour Interval 2 feet, November 1980

38. Kucera and Associates, Inc., City of Rifle, Topographic Mapping, Scale 1:6,000, Contour Interval 5 feet, May 1980

39. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, 1:24,000, Contour Interval 40 feet, 20 feet supplementary: Rifle, Colorado (1952)

40. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale of 1:24,000, Contour Interval 40 feet: Glenwood Springs, Colorado (1961)

41. U.S. Department of the Army, Corps of Engineers, Sacramento District, Flood Plain Information – Colorado River and Rifle, Government and Hubbard Gulch Creeks, Rifle, Colorado, April 1973

42. U.S. Department of the Army, Corps of Engineers, Sacramento District, Hydrology, Crystal River, Colorado, February 1979

43. ARIX Engineers, Comprehensive Drainage Plan for the City of Rifle, Colorado, Volume I Storm Drainage Master Plan, January 1982

44. U.S. Department of Agriculture, Soil Conservation Service, Floodplain Management Study:

Parachute Creek in the vicinity of Parachute, Colorado, and Roan Creek in the vicinity of DeBeque, Colorado; August 1985

45. J.E. Langford and Associates, Inc., prepared for Colorado Water Conservation Board and Town of Parachute, Floodplain Information Report in the Town of Parachute, Colorado, October 1989

46. Federal Emergency Management Agency, Flood Hazard Boundary Map, Town of Carbondale, Colorado, February 5, 1986

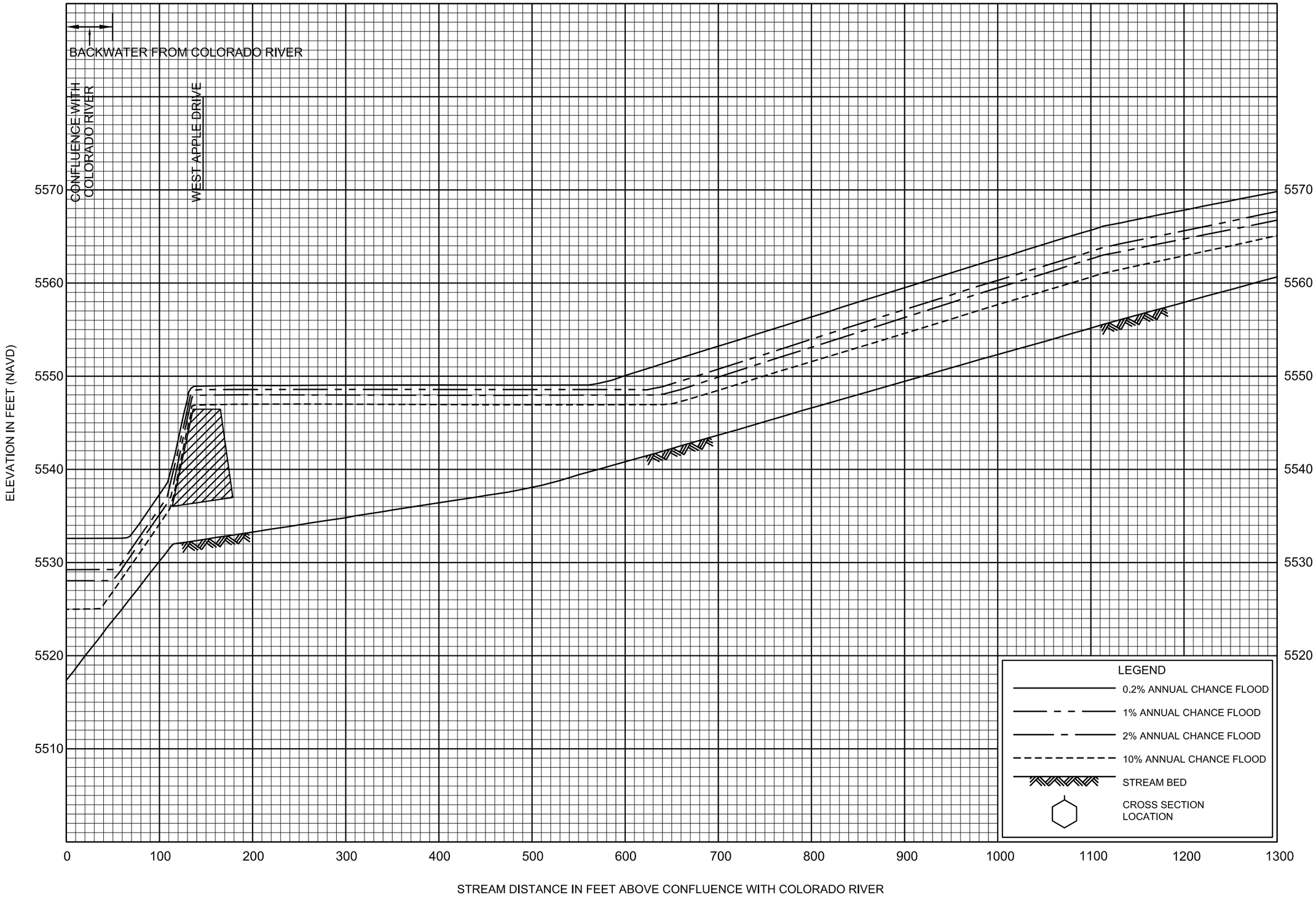
47. Federal Emergency Management Agency, Flood Hazard Boundary Map, Garfield County, Colorado (Unincorporated Areas), January 3, 1986

48. Federal Emergency Management Agency, Flood Hazard Boundary Map, City of Glenwood Springs, Colorado, October 15, 1985

49. Federal Emergency Management Agency, Flood Hazard Boundary Map, City of Rifle, Colorado, January 3, 1986

50. Federal Emergency Management Agency, Flood Hazard Boundary Map, Town of New Castle, Colorado July 25, 1975

51. PBS&J Inc., prepared for Colorado Water Conservation Board, Colorado River Downstream of Glenwood Springs Technical Support Data Notebook, Garfield County, Colorado, May 2007



FLOOD PROFILES

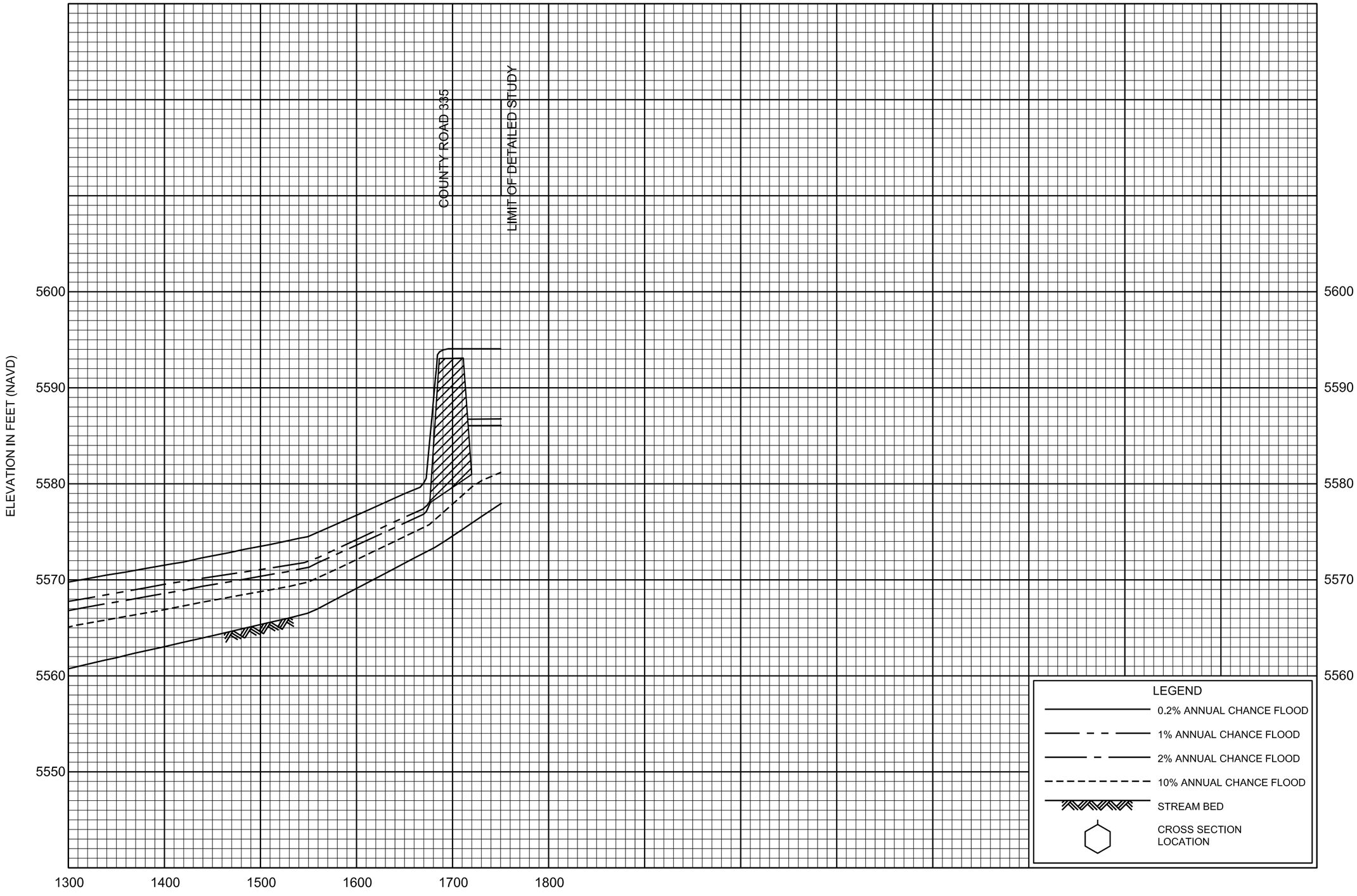
ALKALI CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

01P



FLOOD PROFILES

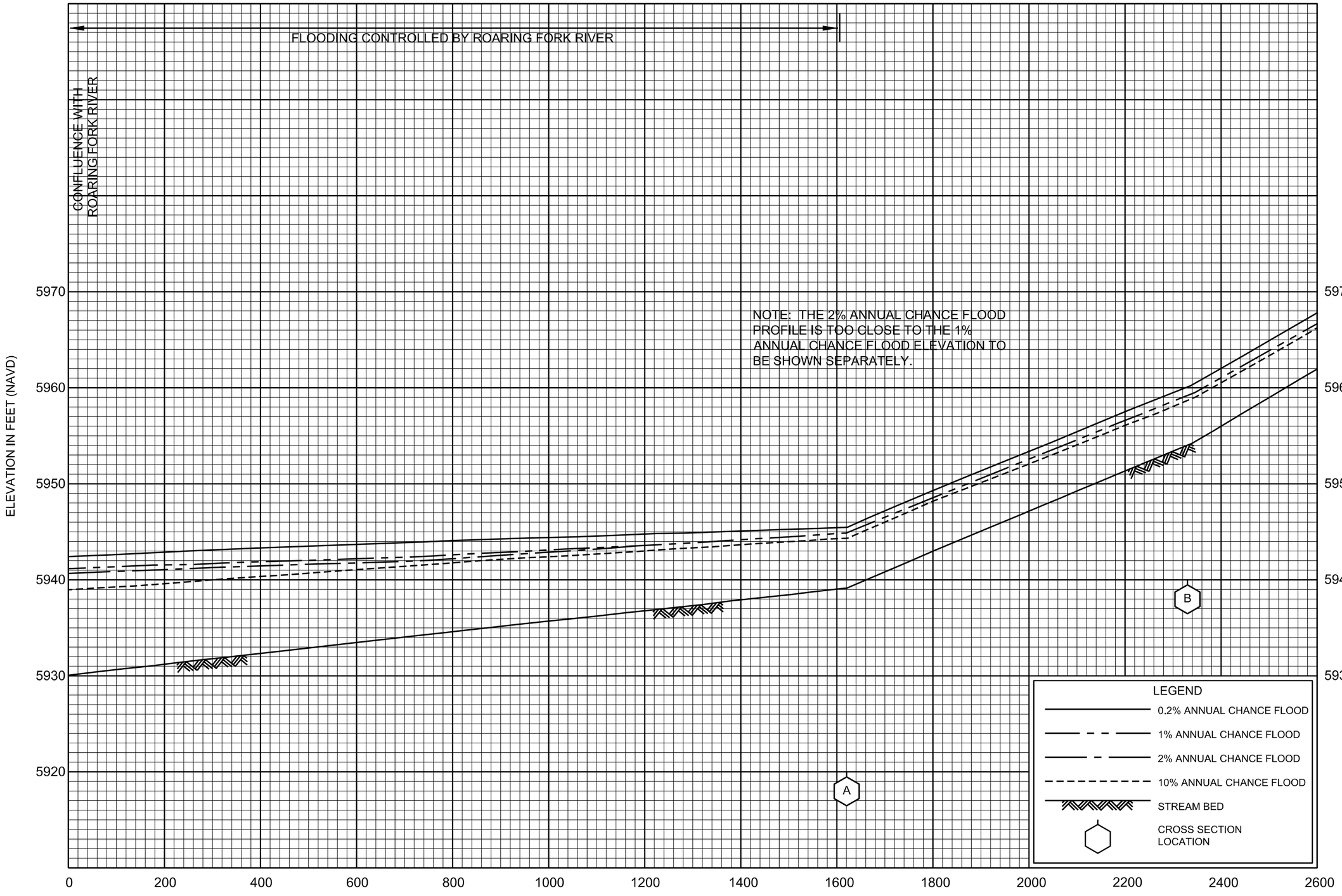
ALKALI CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

02P



FLOOD PROFILES

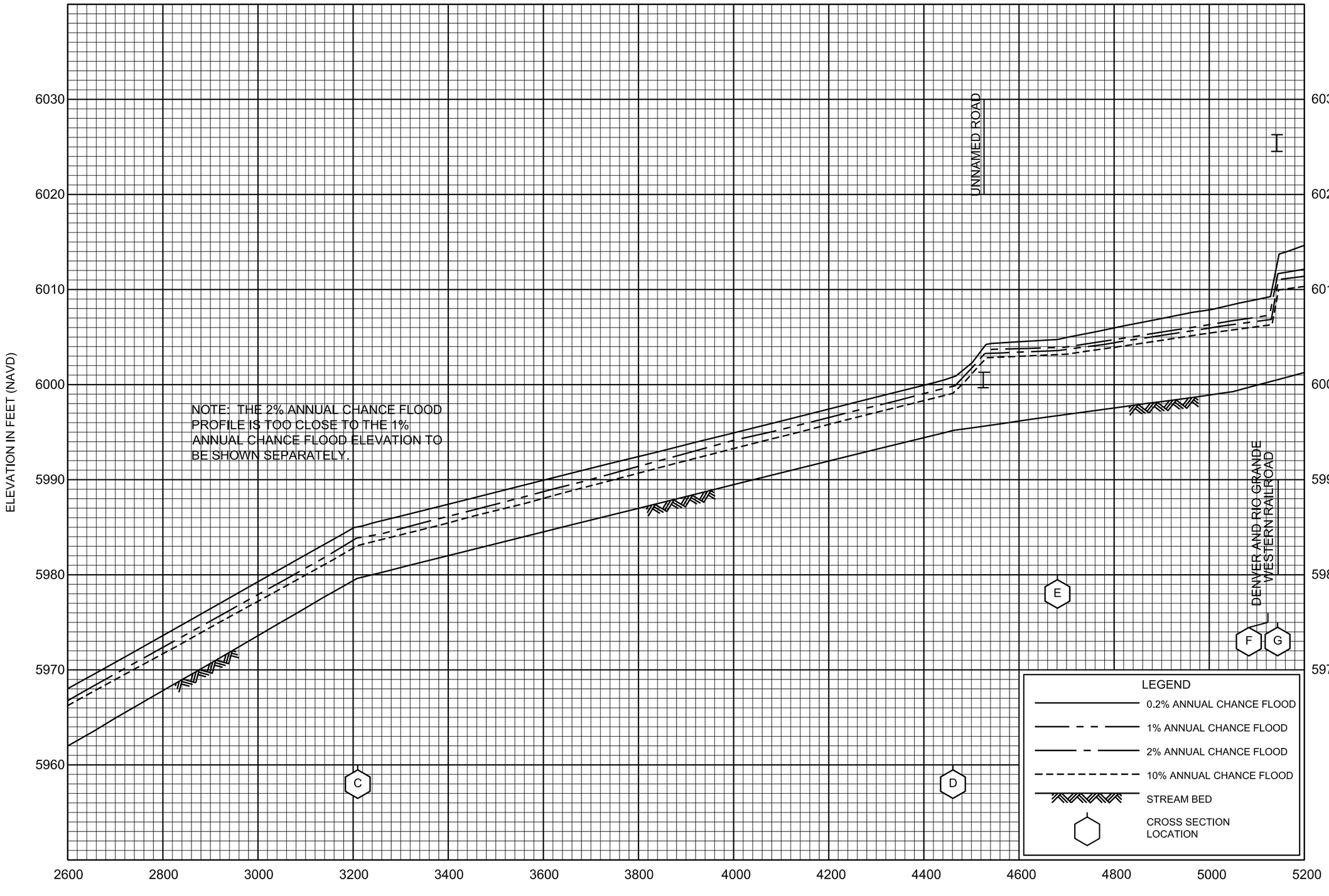
CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

03P



FLOOD PROFILES

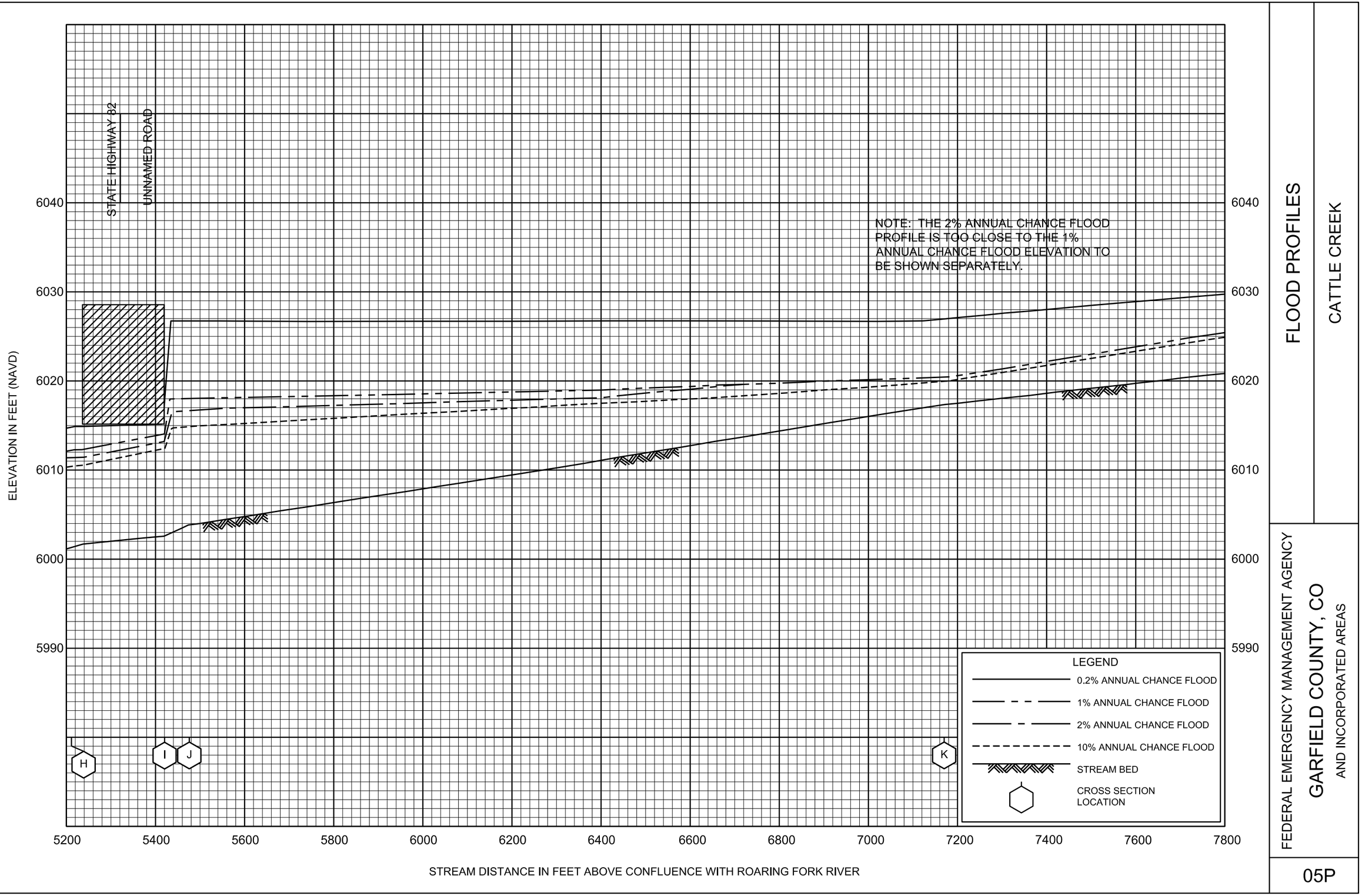
CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

04P



FLOOD PROFILES

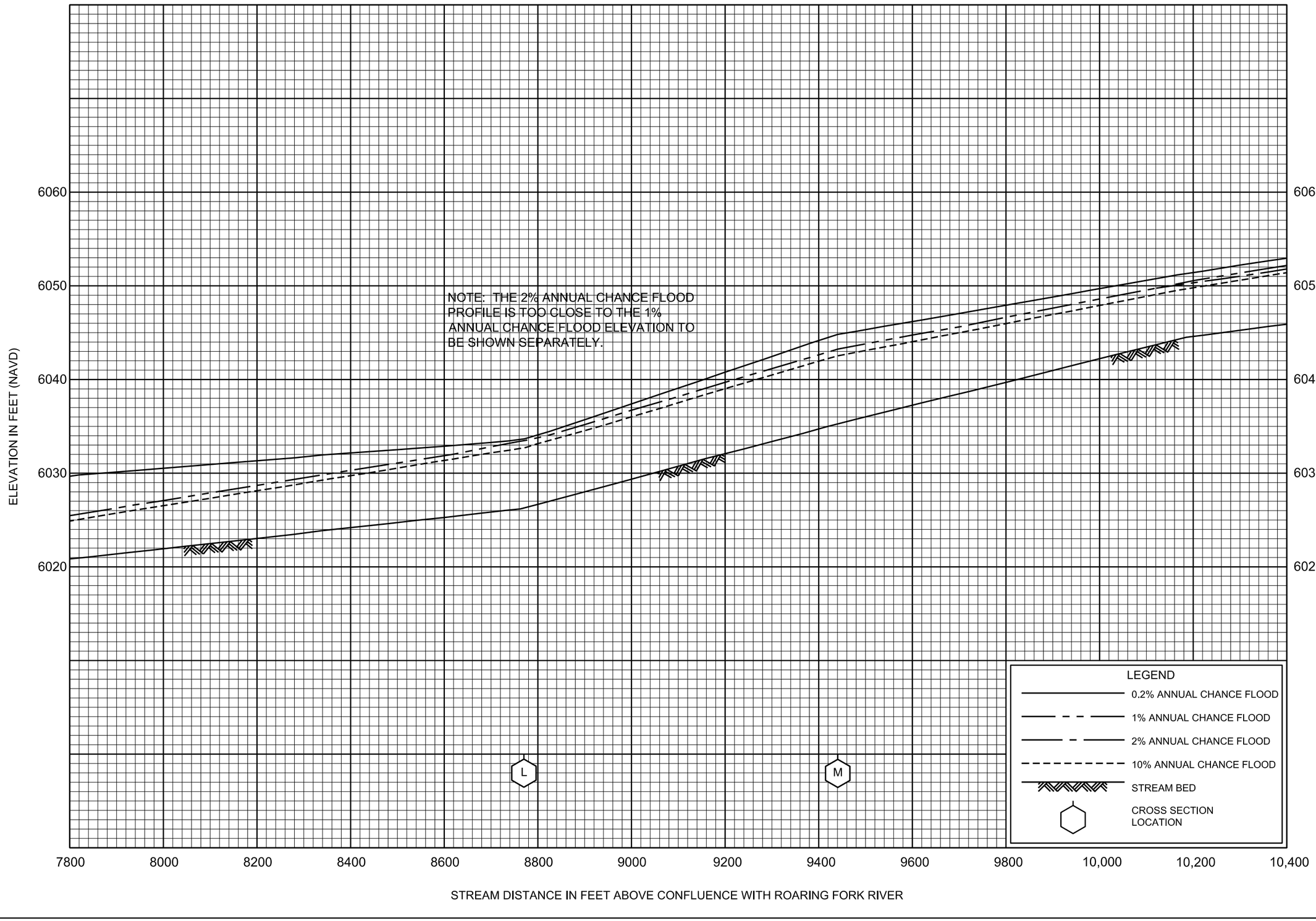
CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

05P



FLOOD PROFILES

CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

06P

NOTE: THE 2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY.

ELEVATION IN FEET (NAVD)

6080
6070
6060
6050
6040

10,400 10,600 10,800 11,000 11,200 11,400 11,600 11,800 12,000 12,200 12,400 12,600 12,800 13,000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ROARING FORK RIVER

N O P

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

FLOOD PROFILES

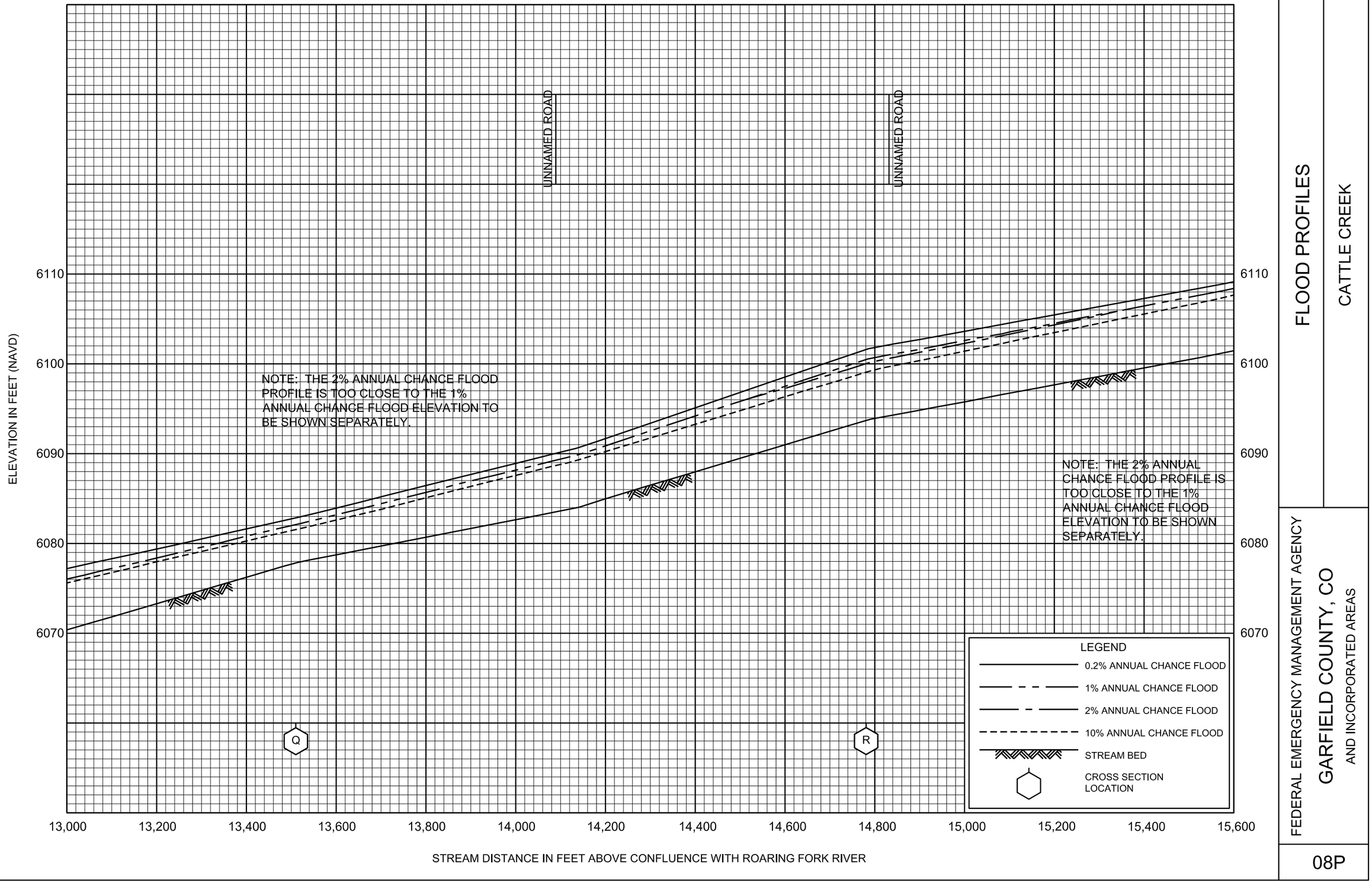
CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

07P



FLOOD PROFILES

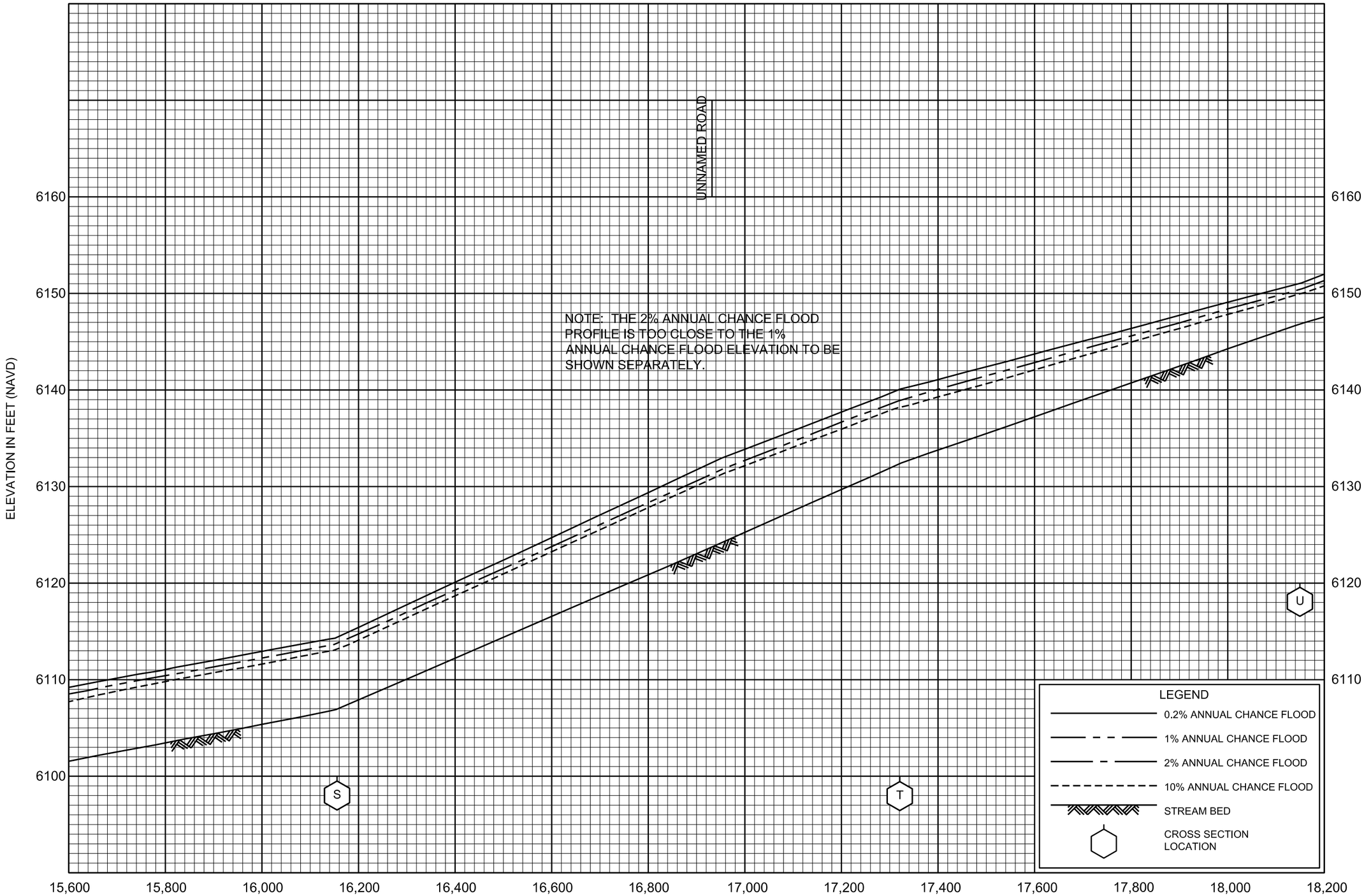
CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

08P



FLOOD PROFILES

CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

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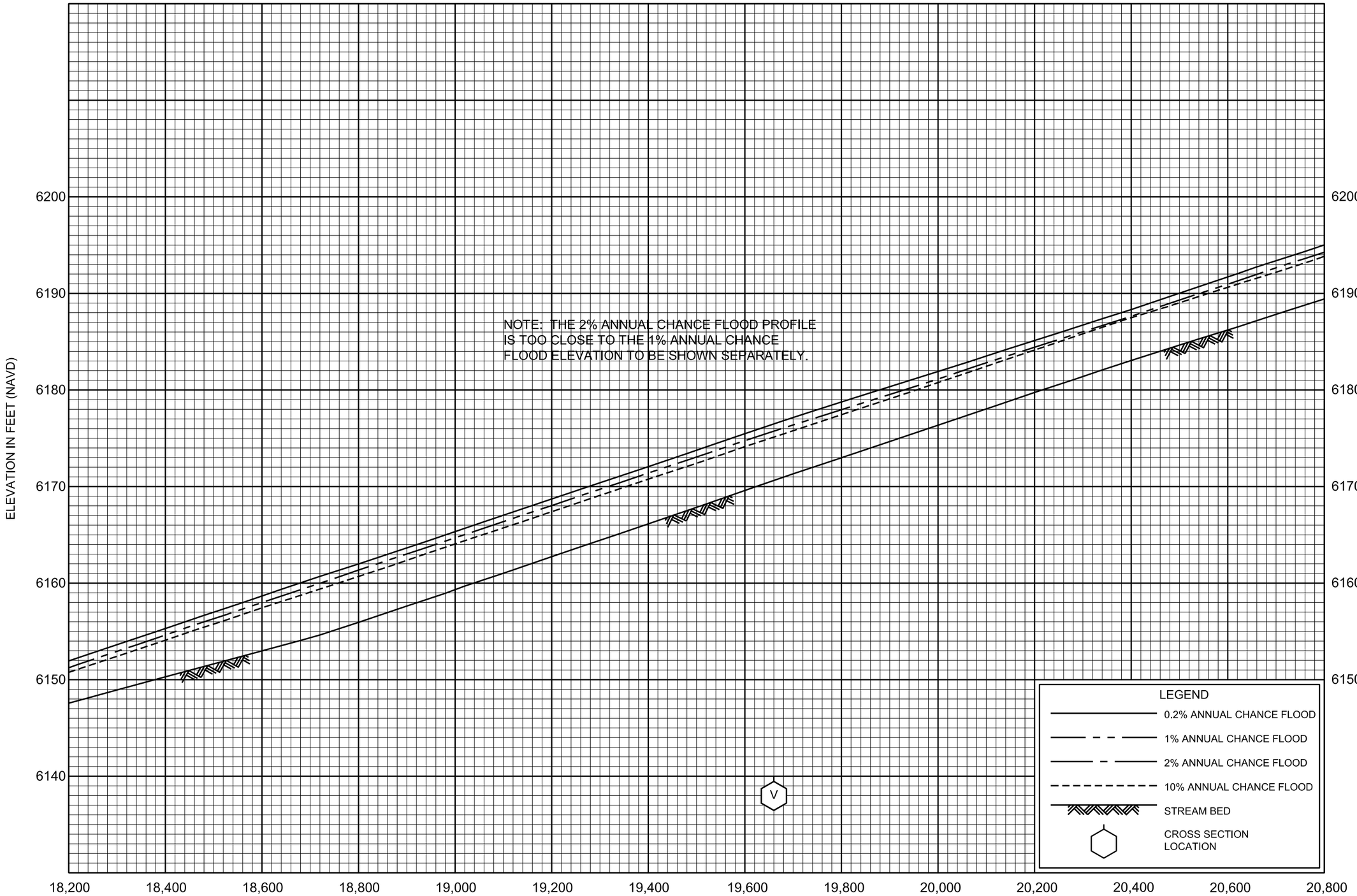

FLOOD PROFILES

CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

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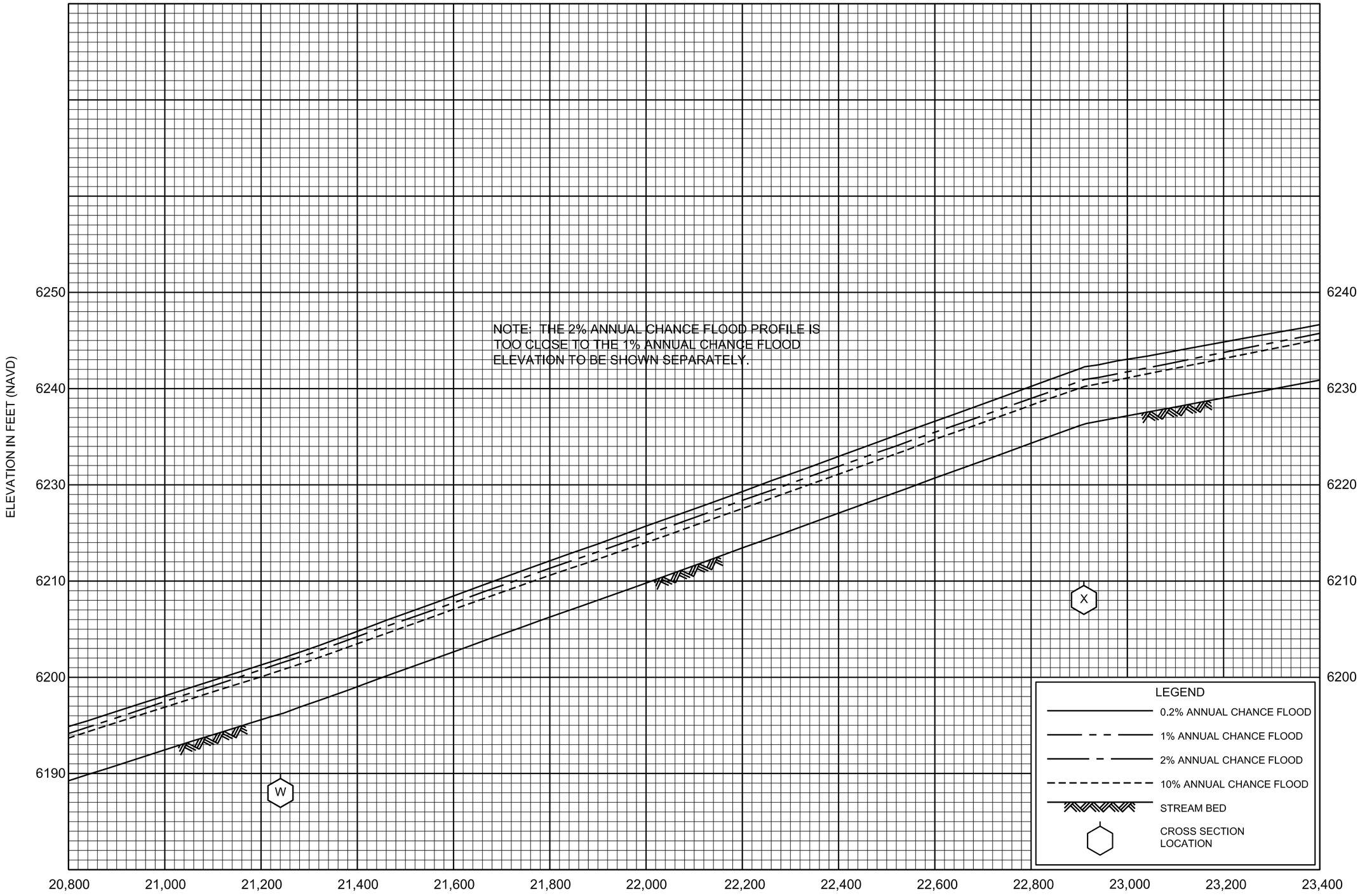


FLOOD PROFILES

CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

NOTE: THE 2% ANNUAL CHANCE FLOOD PROFILE IS TOO CLOSE TO THE 1% ANNUAL CHANCE FLOOD ELEVATION TO BE SHOWN SEPARATELY.

ELEVATION IN FEET (NAVD)

6280
6270
6260
6250
6240
6230

23,400 23,600 23,800 24,000 24,200 24,400 24,600 24,800 25,000 25,200 25,400 25,600 25,800 26,000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ROARING FORK RIVER

Y

Z

LEGEND

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

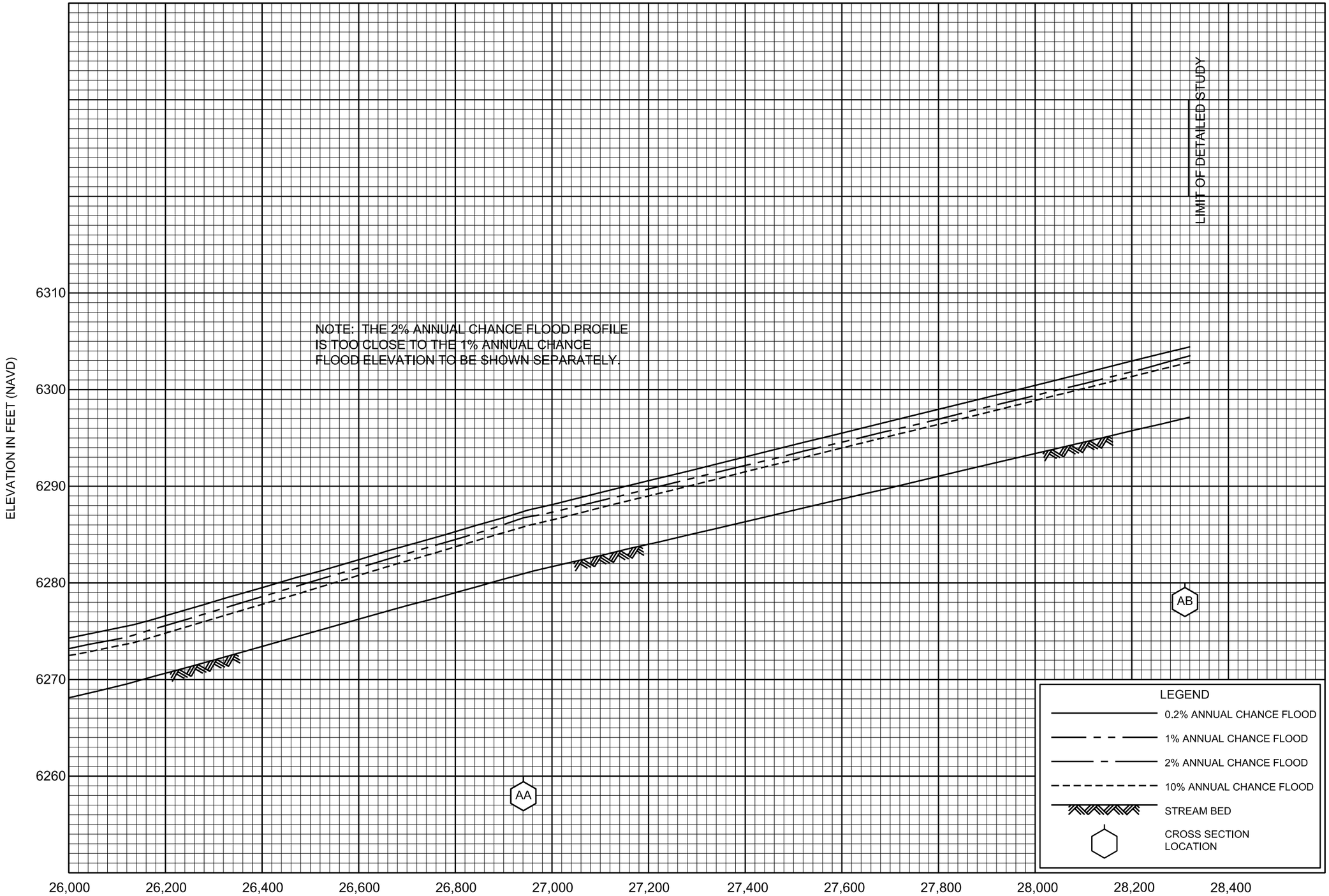
FLOOD PROFILES

CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



FLOOD PROFILES

CATTLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

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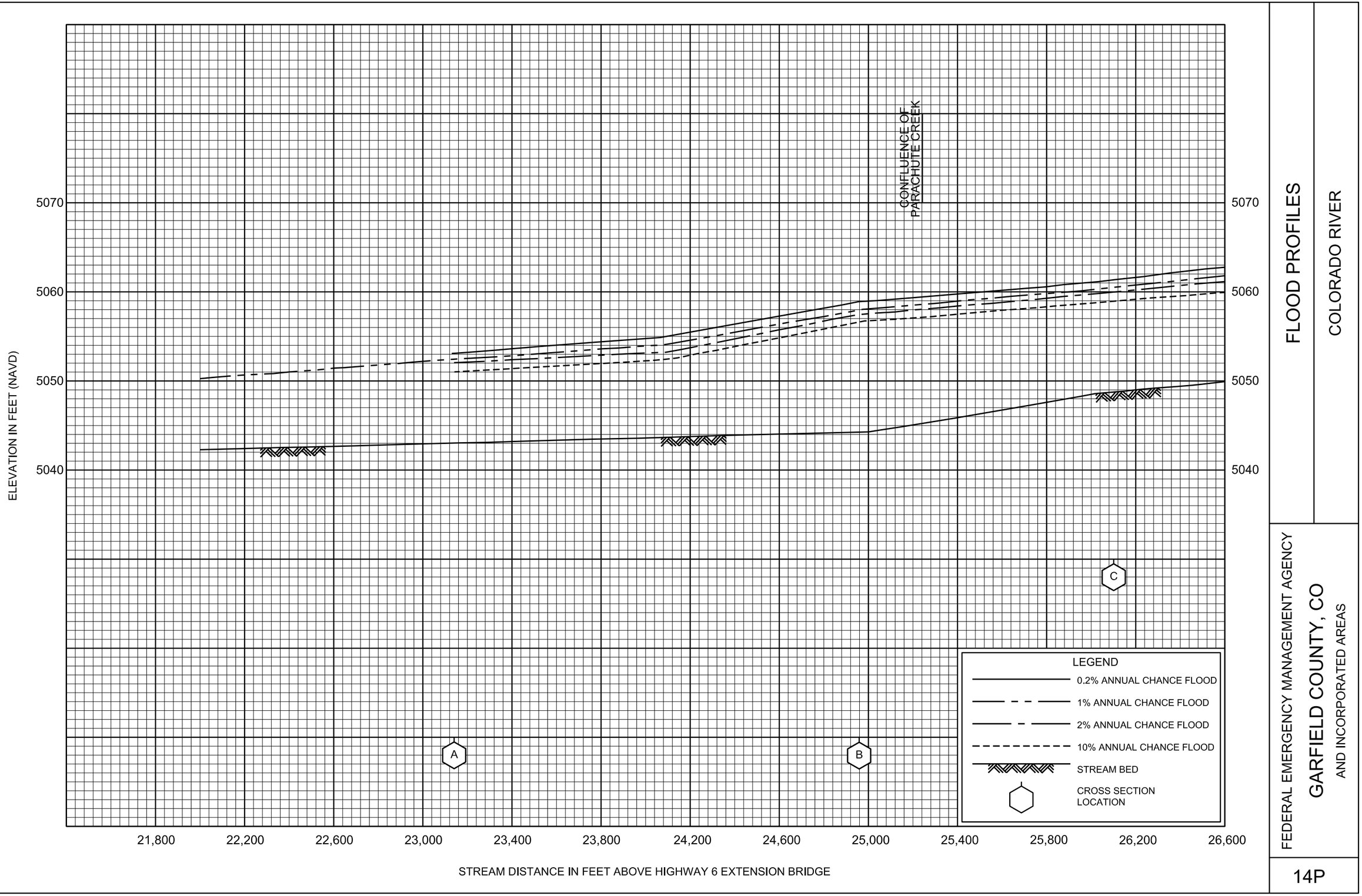


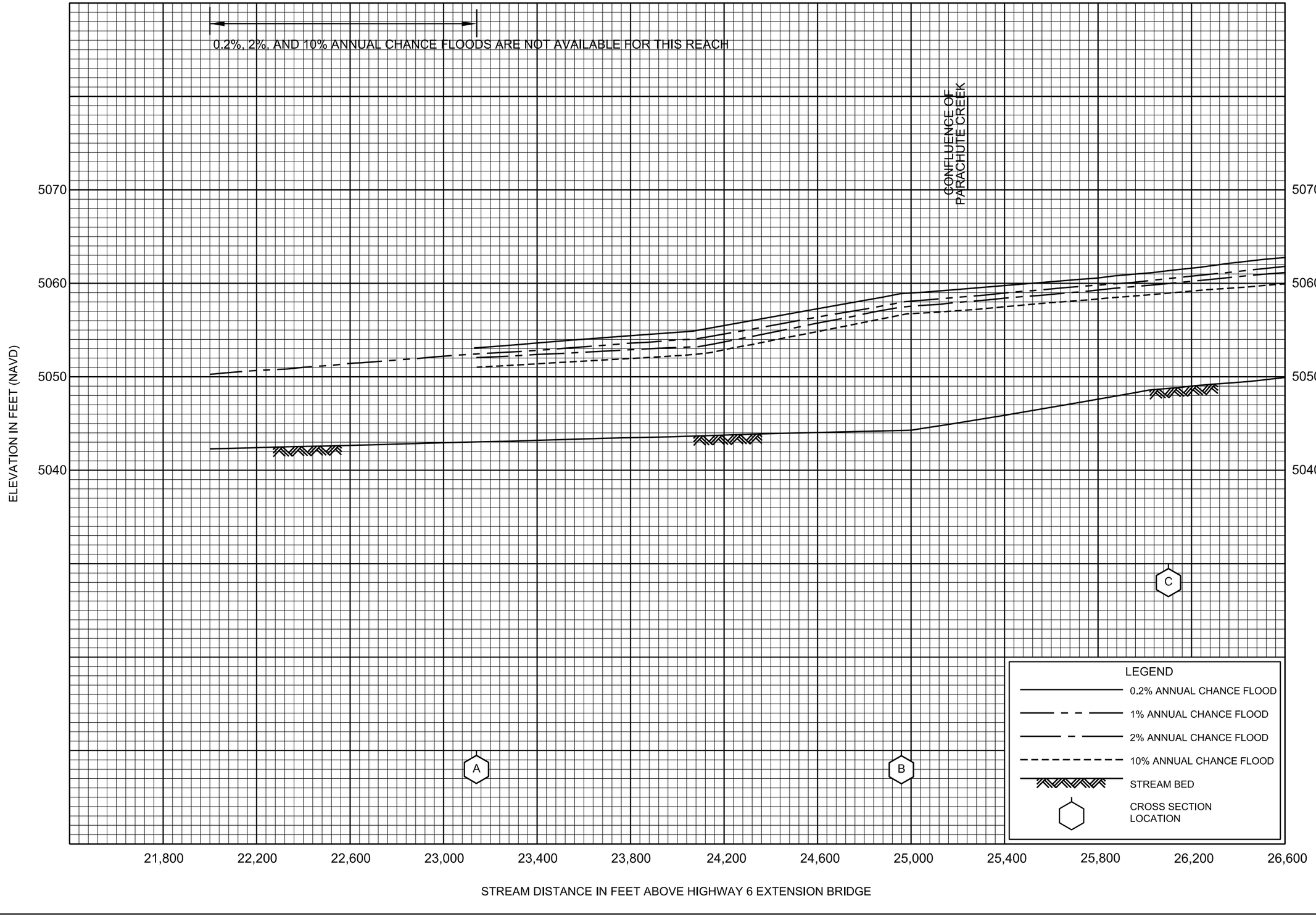
FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



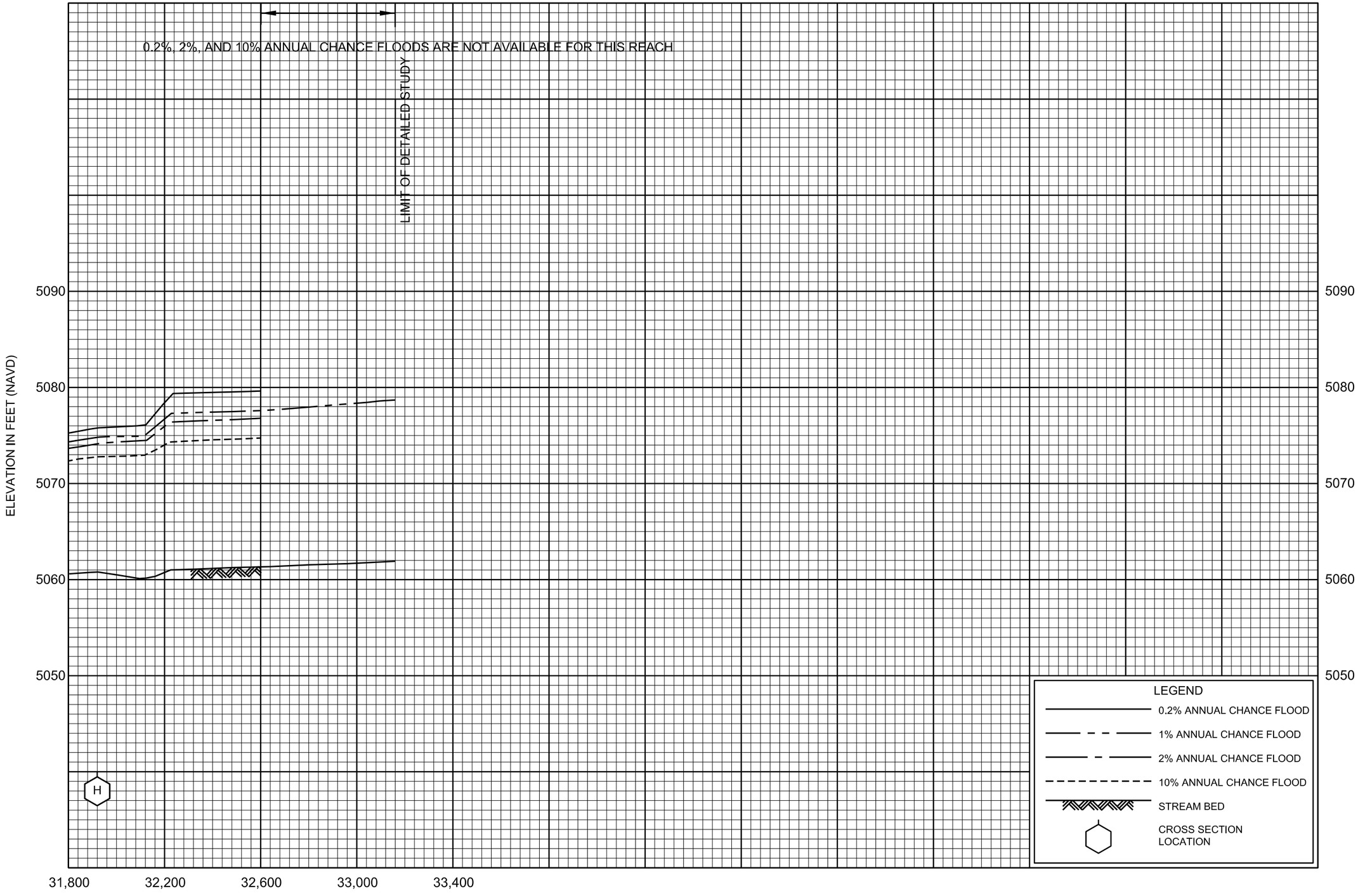
FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



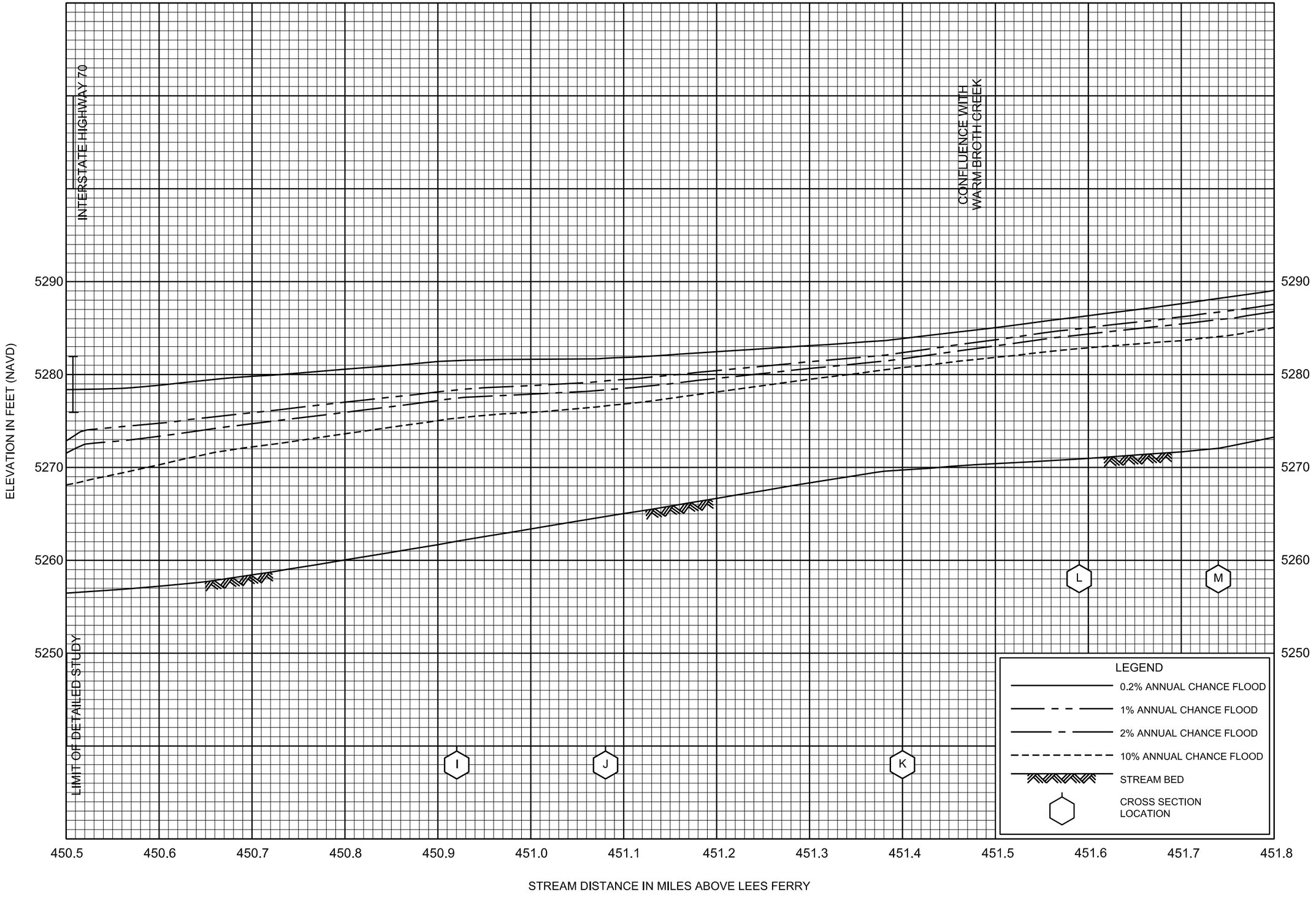
FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

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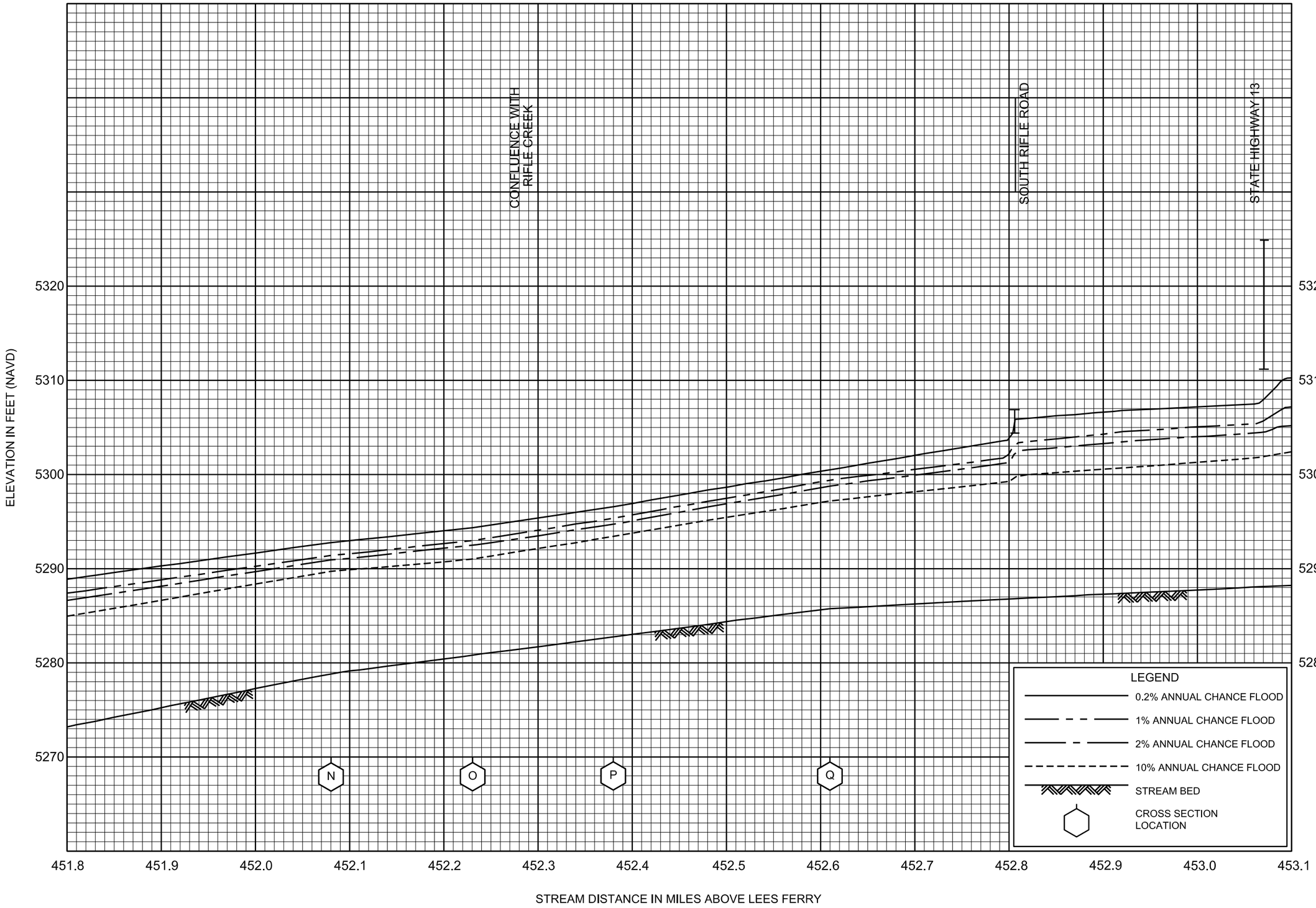

FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

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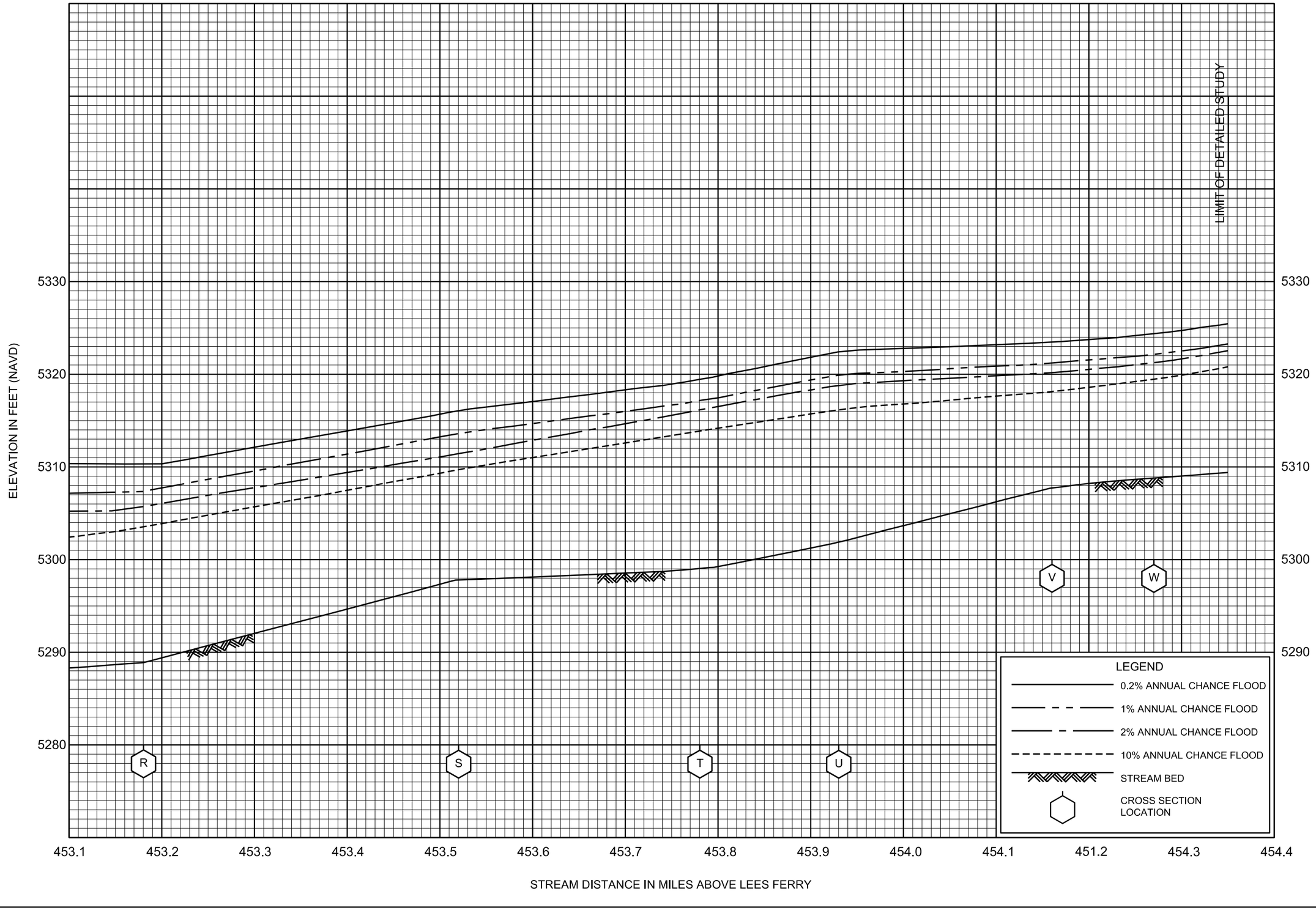

FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

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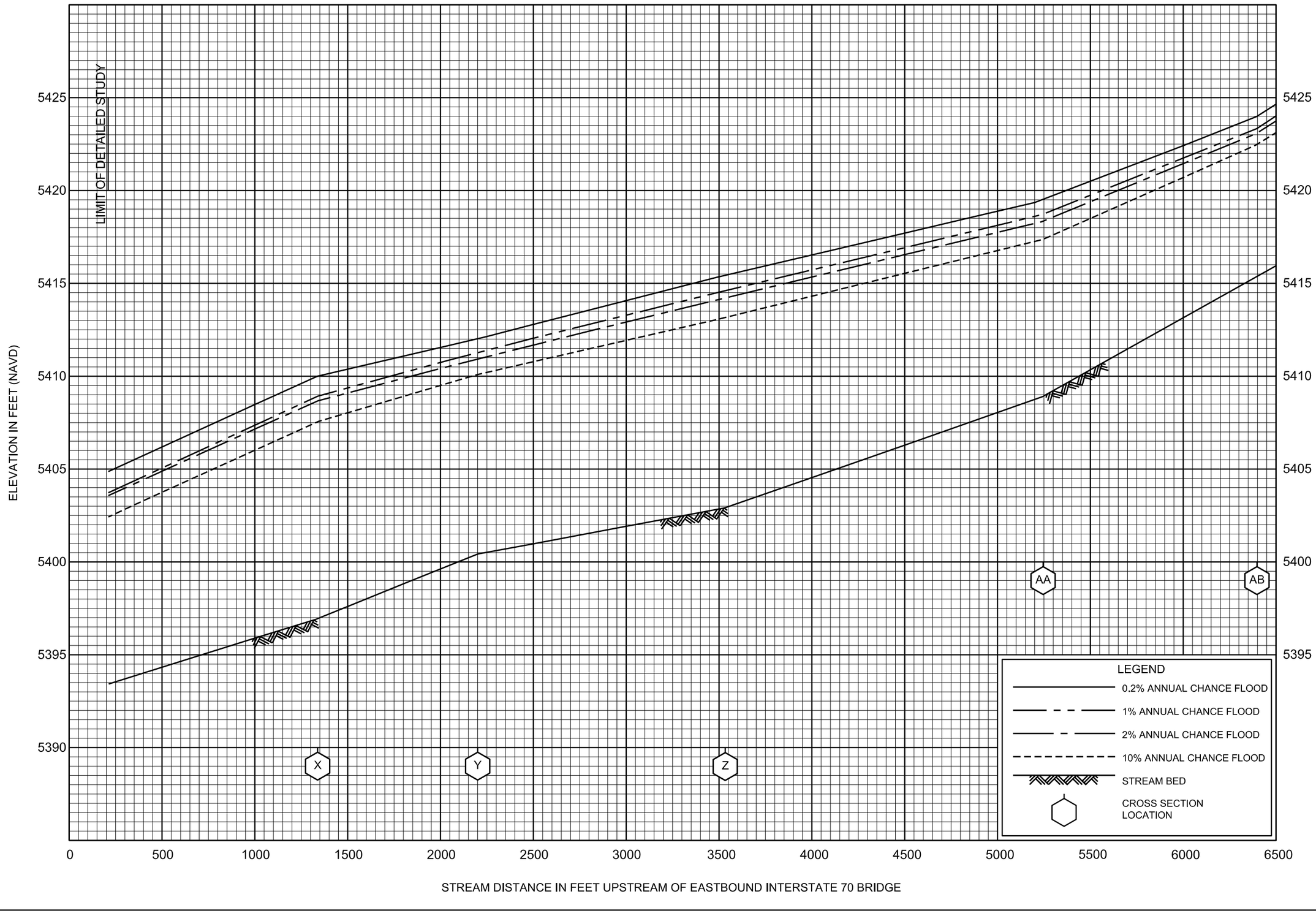


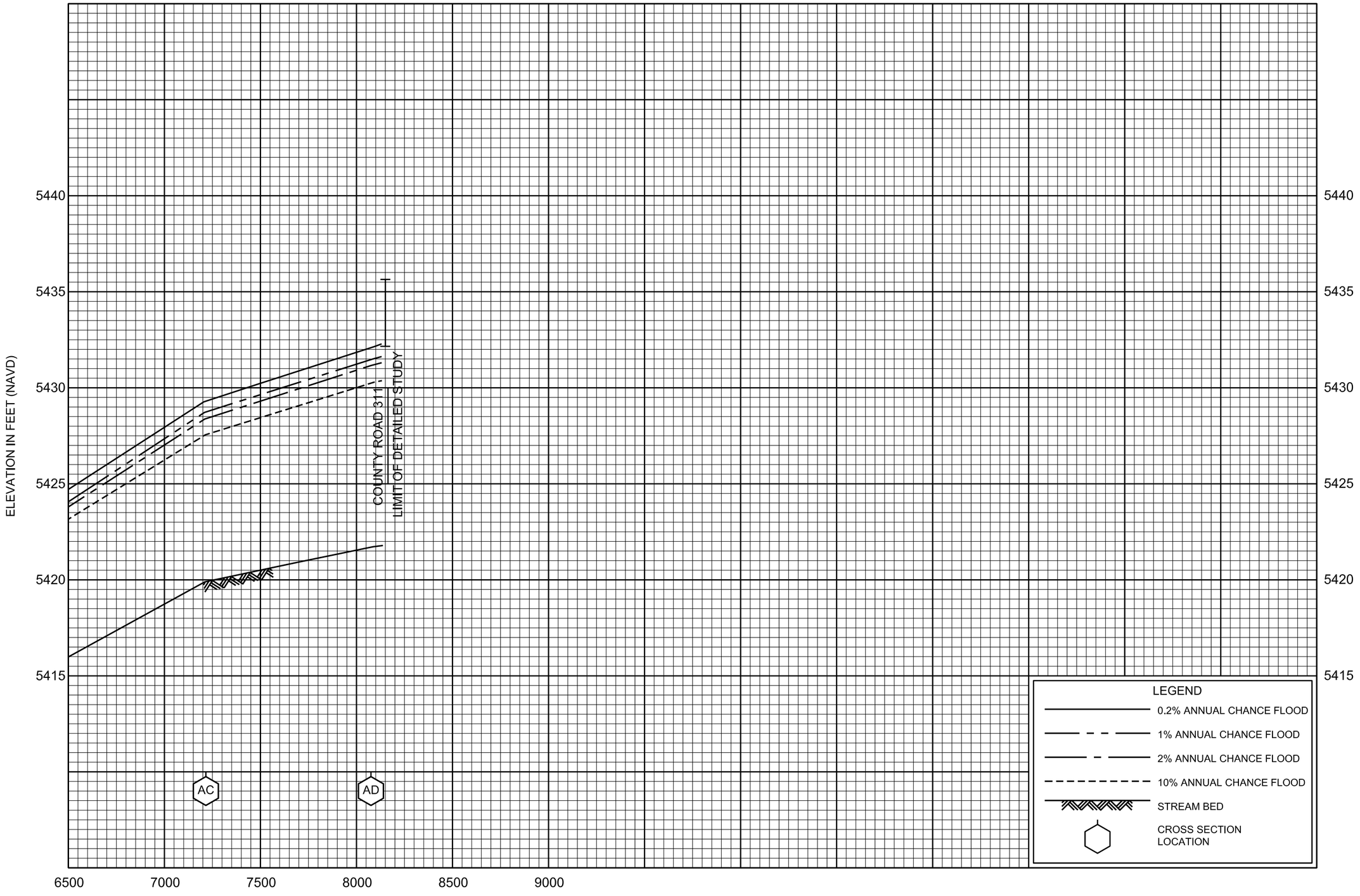
FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



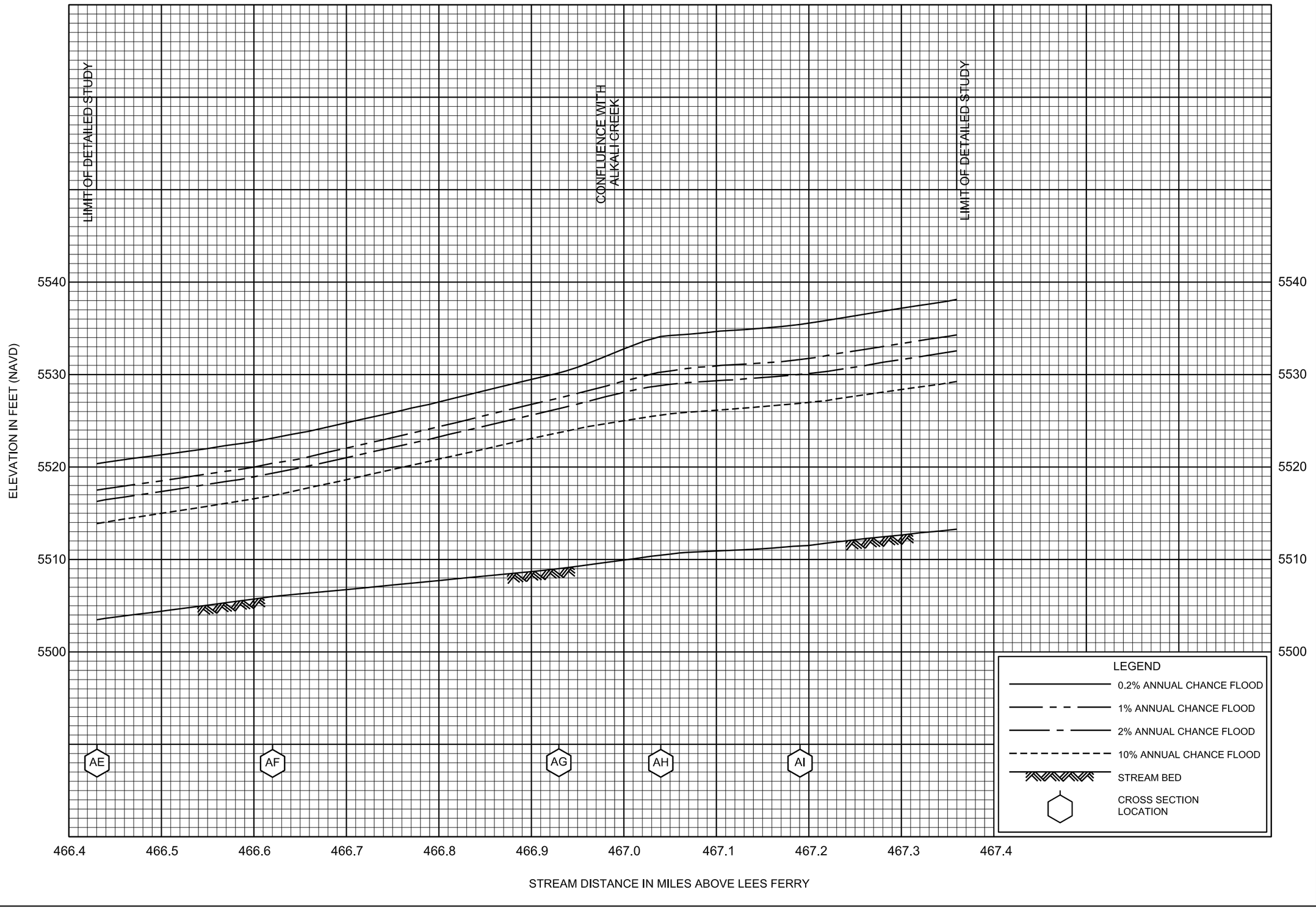
FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



FLOOD PROFILES

COLORADO RIVER

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GARFIELD COUNTY, CO

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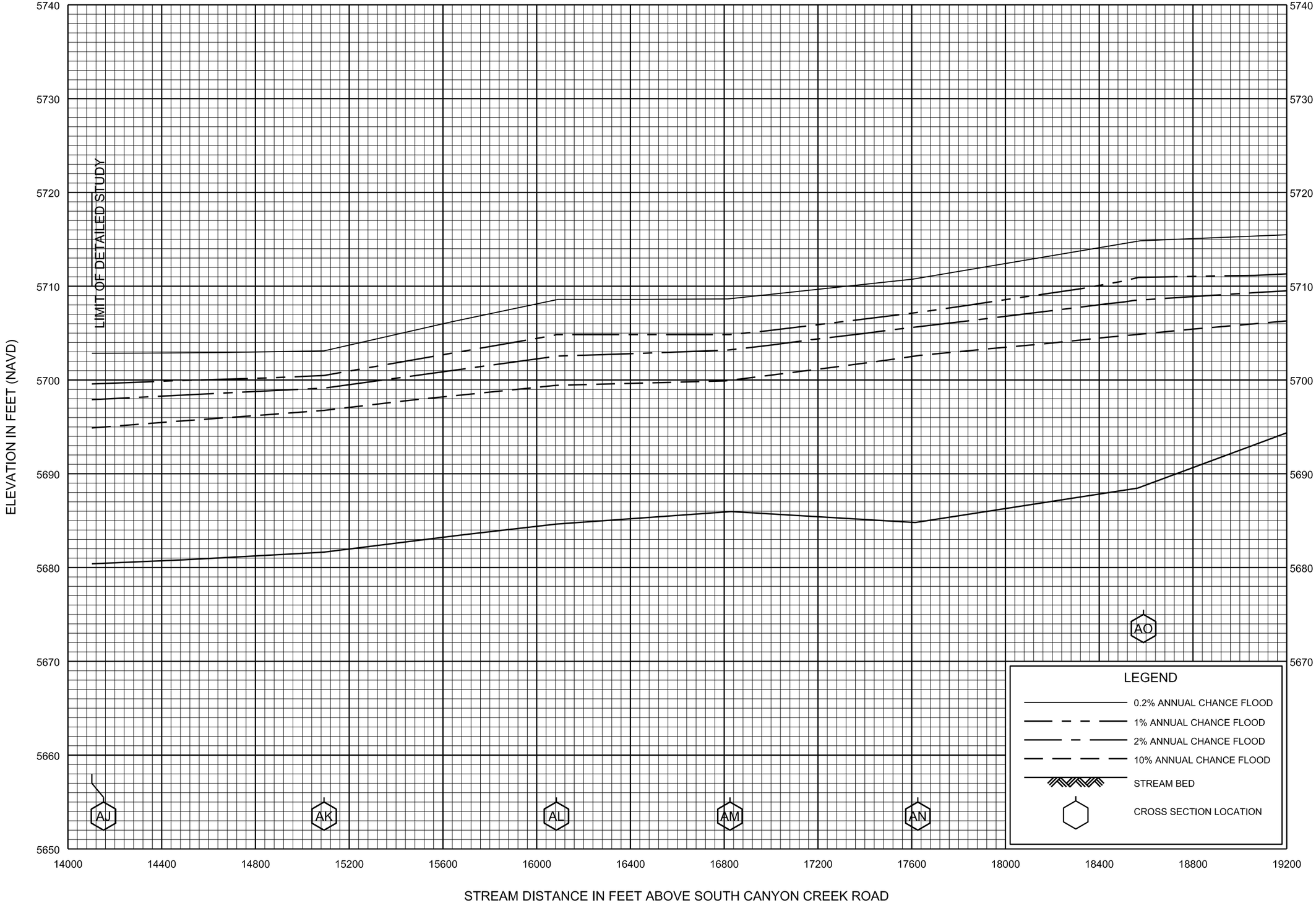


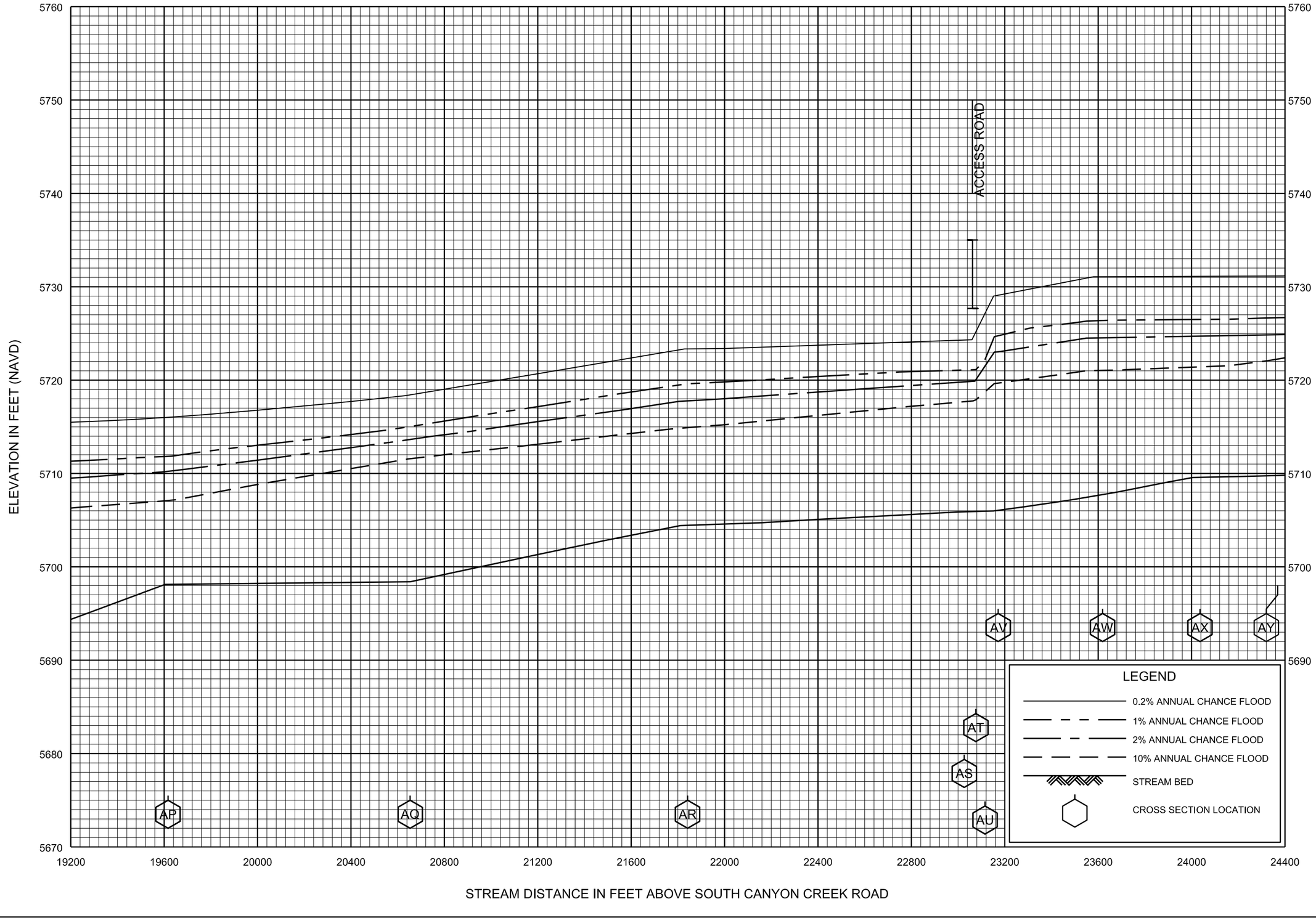
FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

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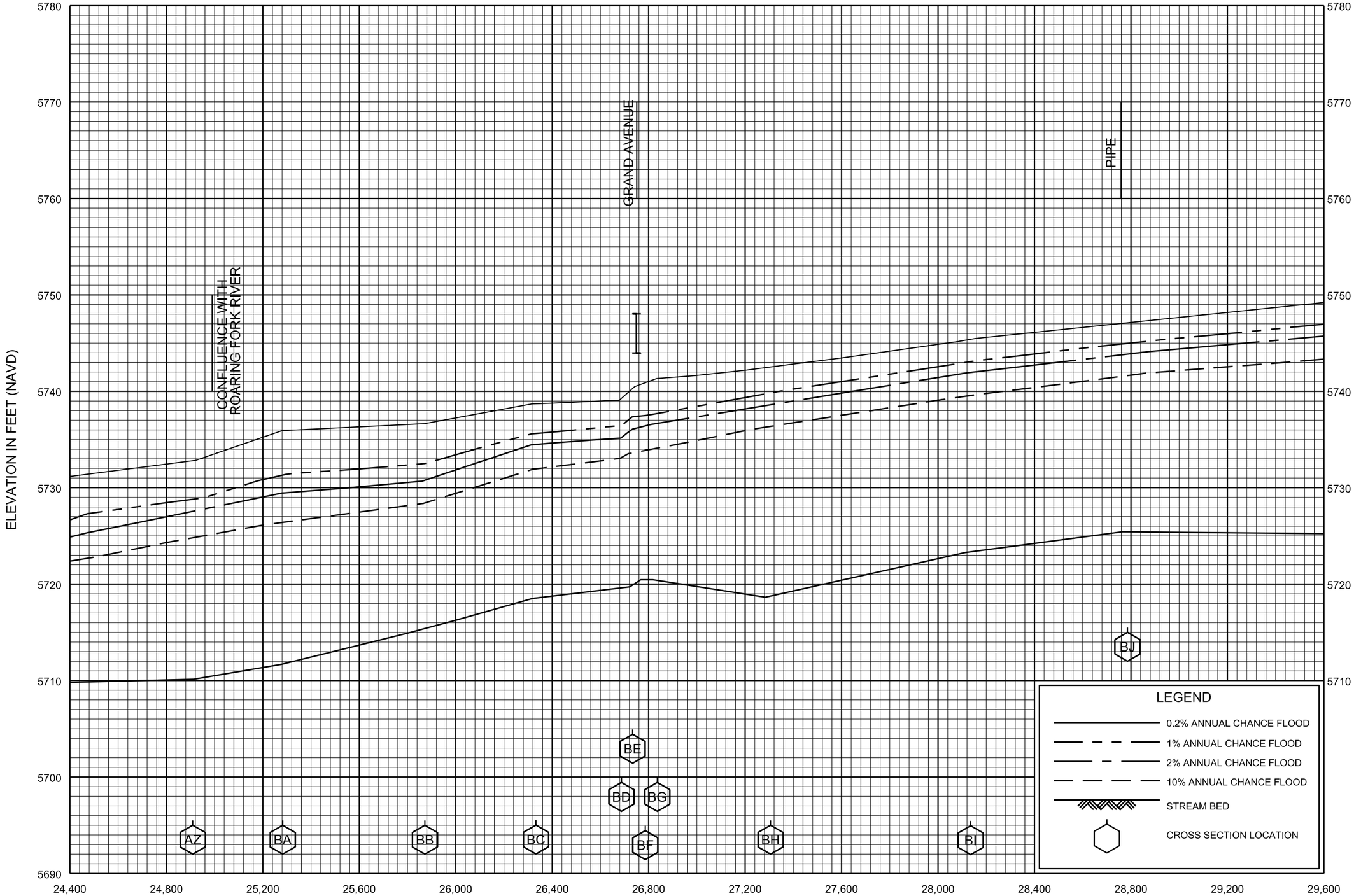
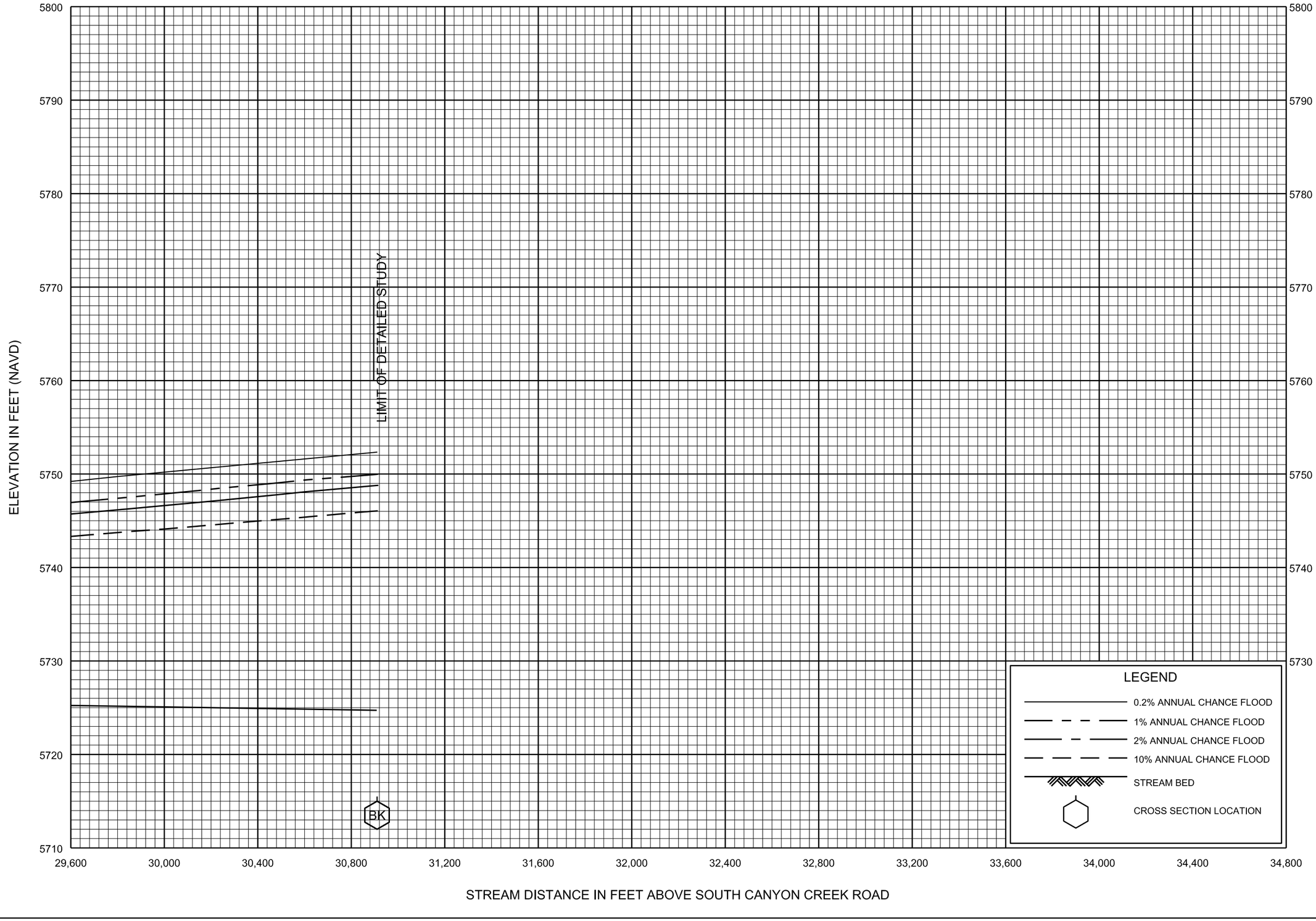


FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO
AND INCORPORATED AREAS



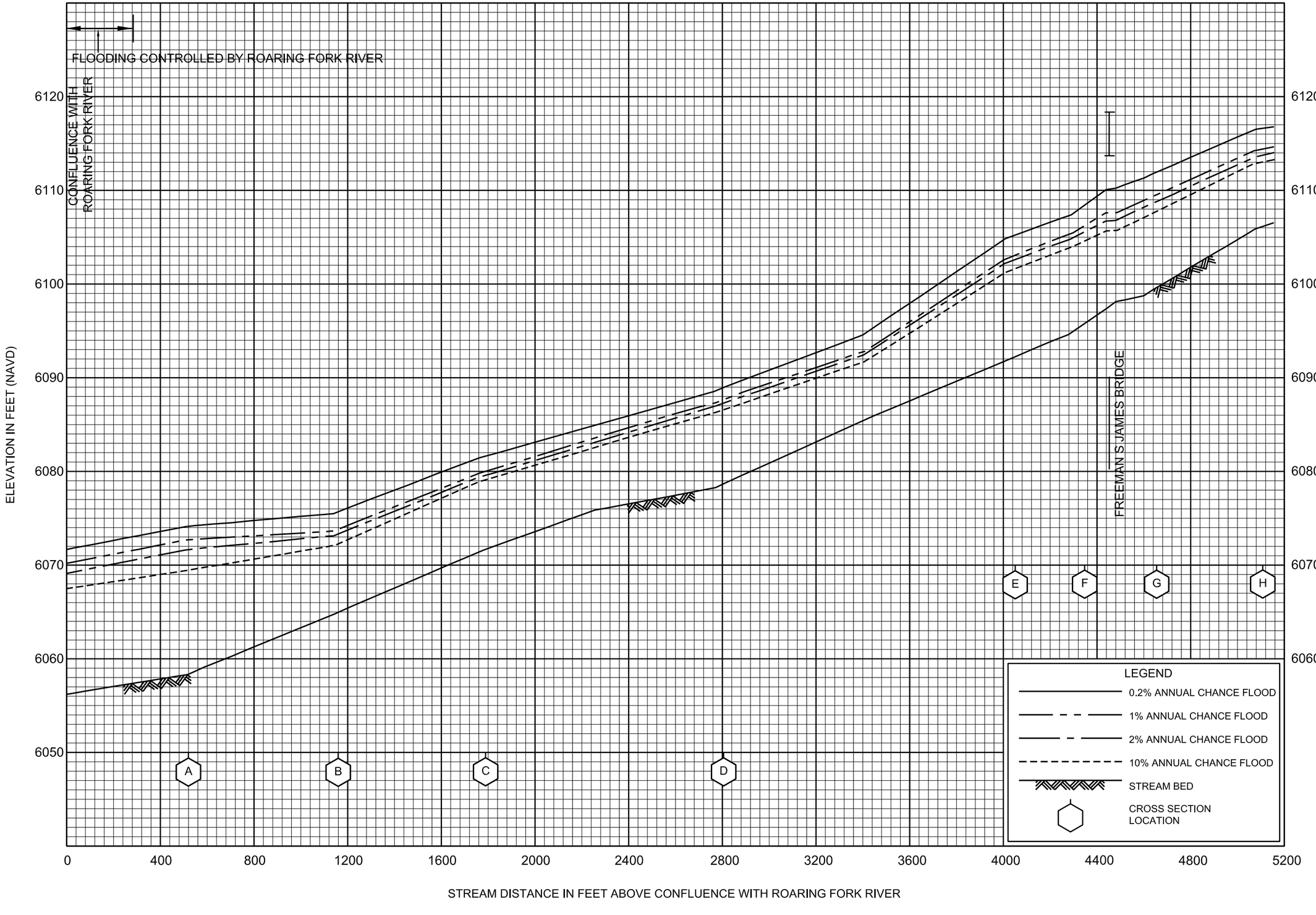
FLOOD PROFILES

COLORADO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS



FLOOD PROFILES

CRYSTAL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

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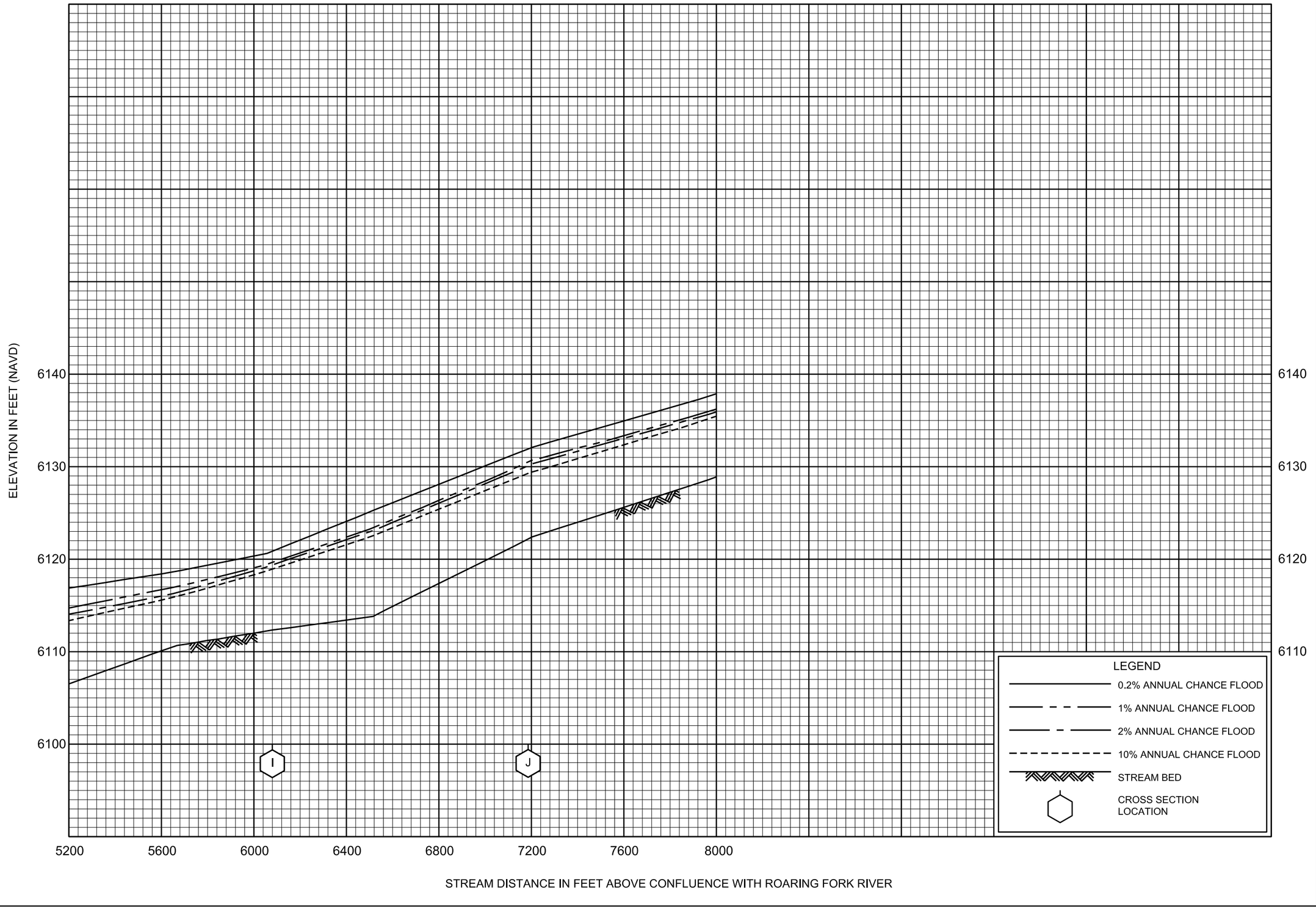


FLOOD PROFILES

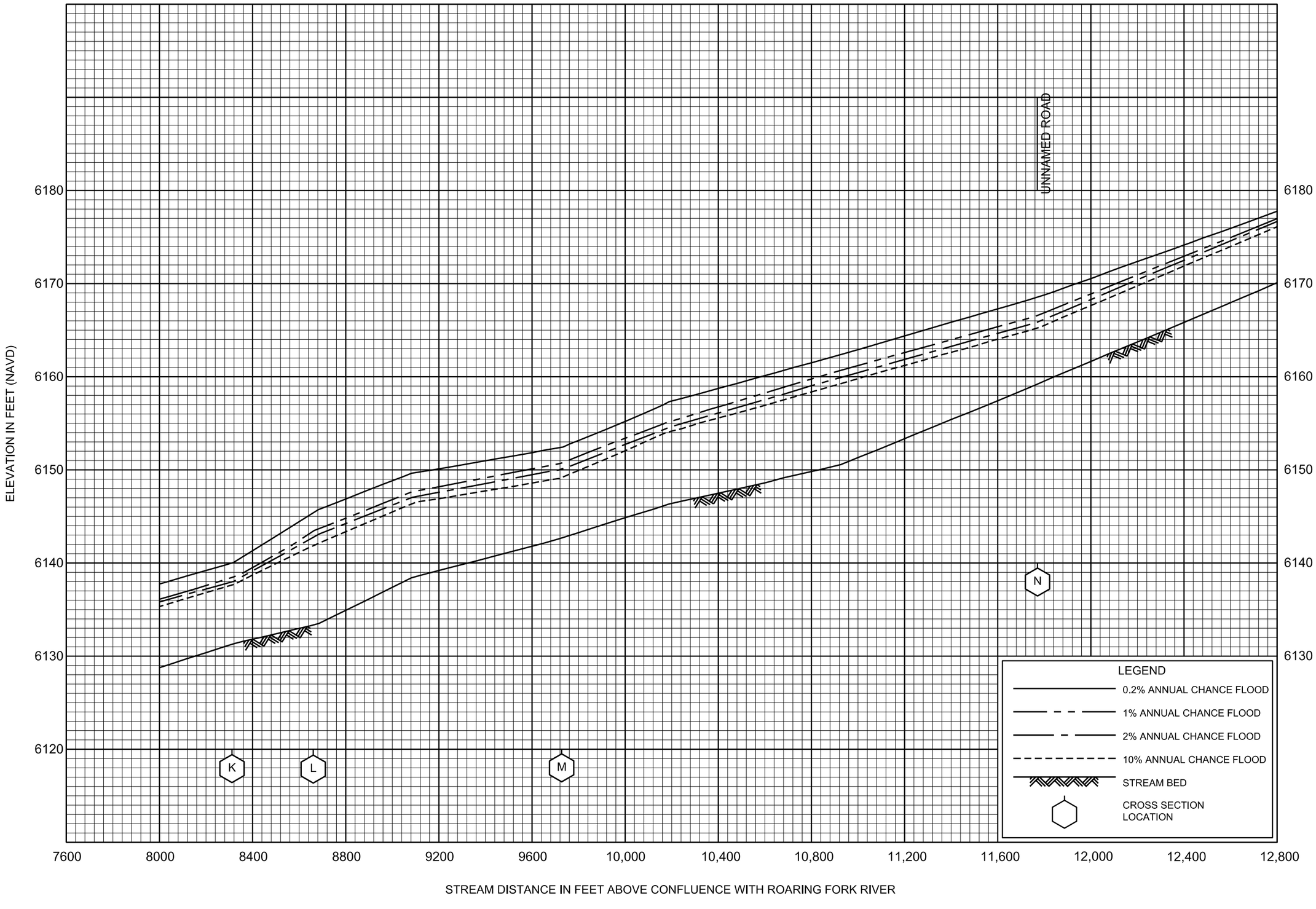
CRYSTAL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

28P



FLOOD PROFILES

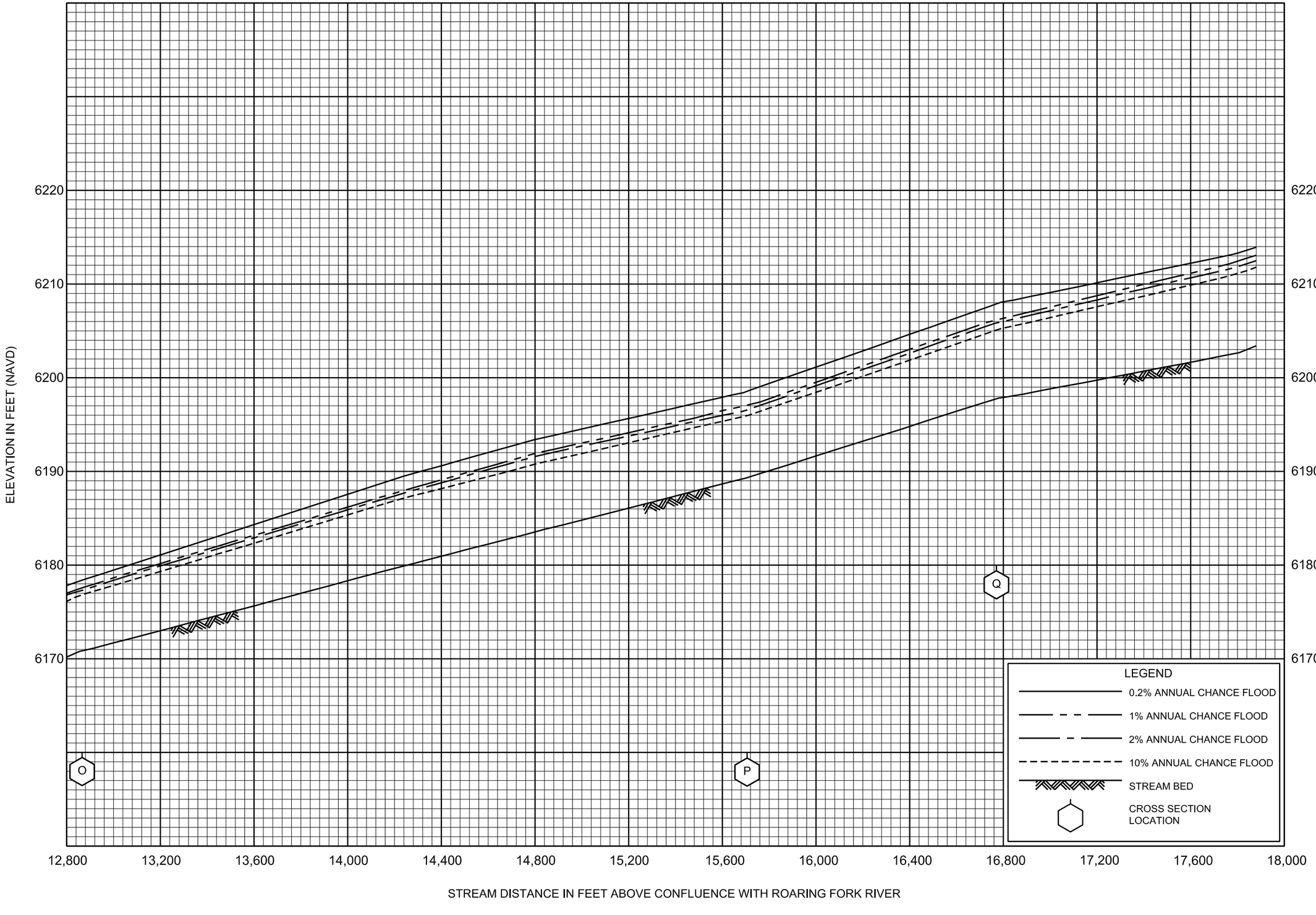
CRYSTAL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

GARFIELD COUNTY, CO

AND INCORPORATED AREAS

29P



FLOOD PROFILES

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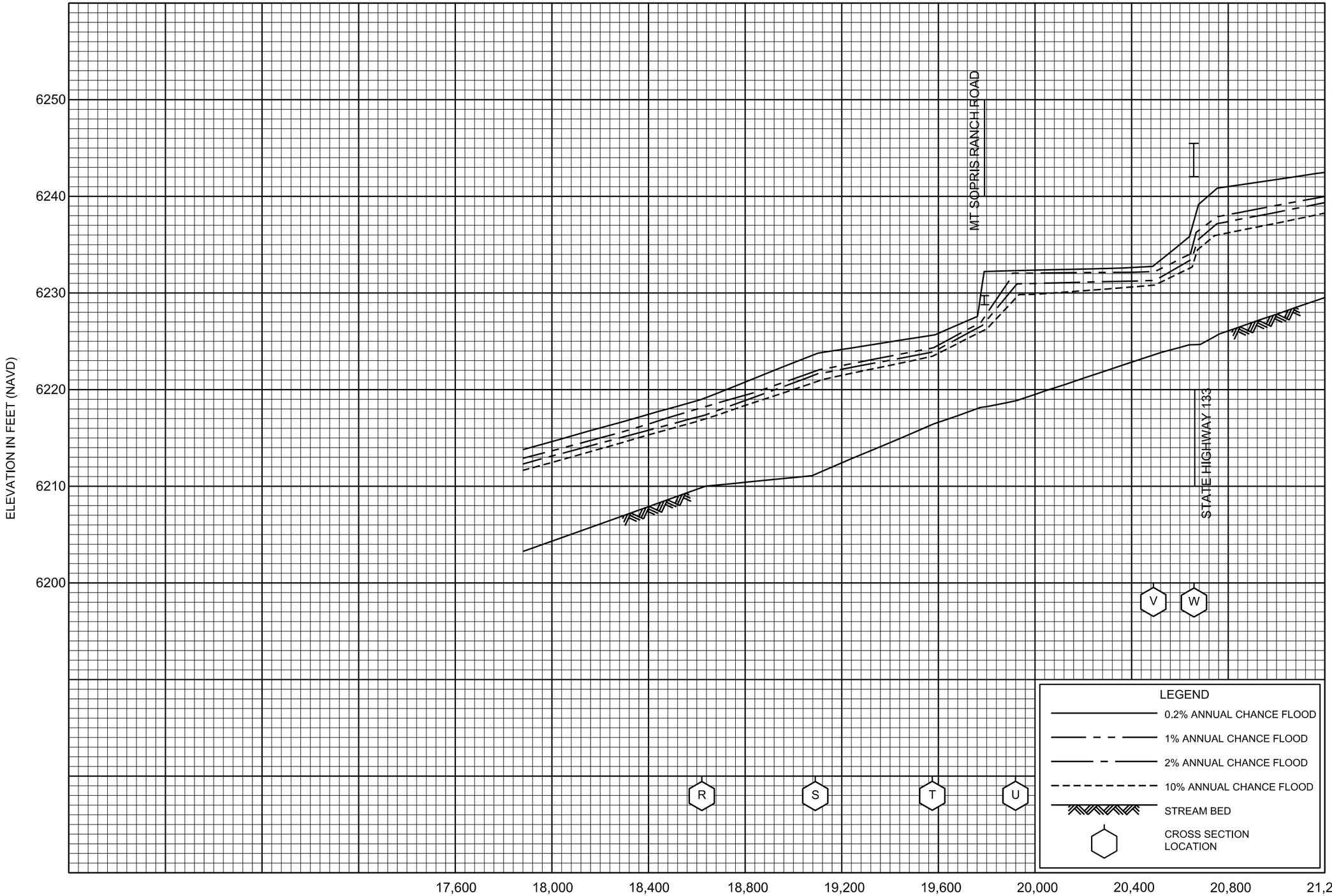
30P



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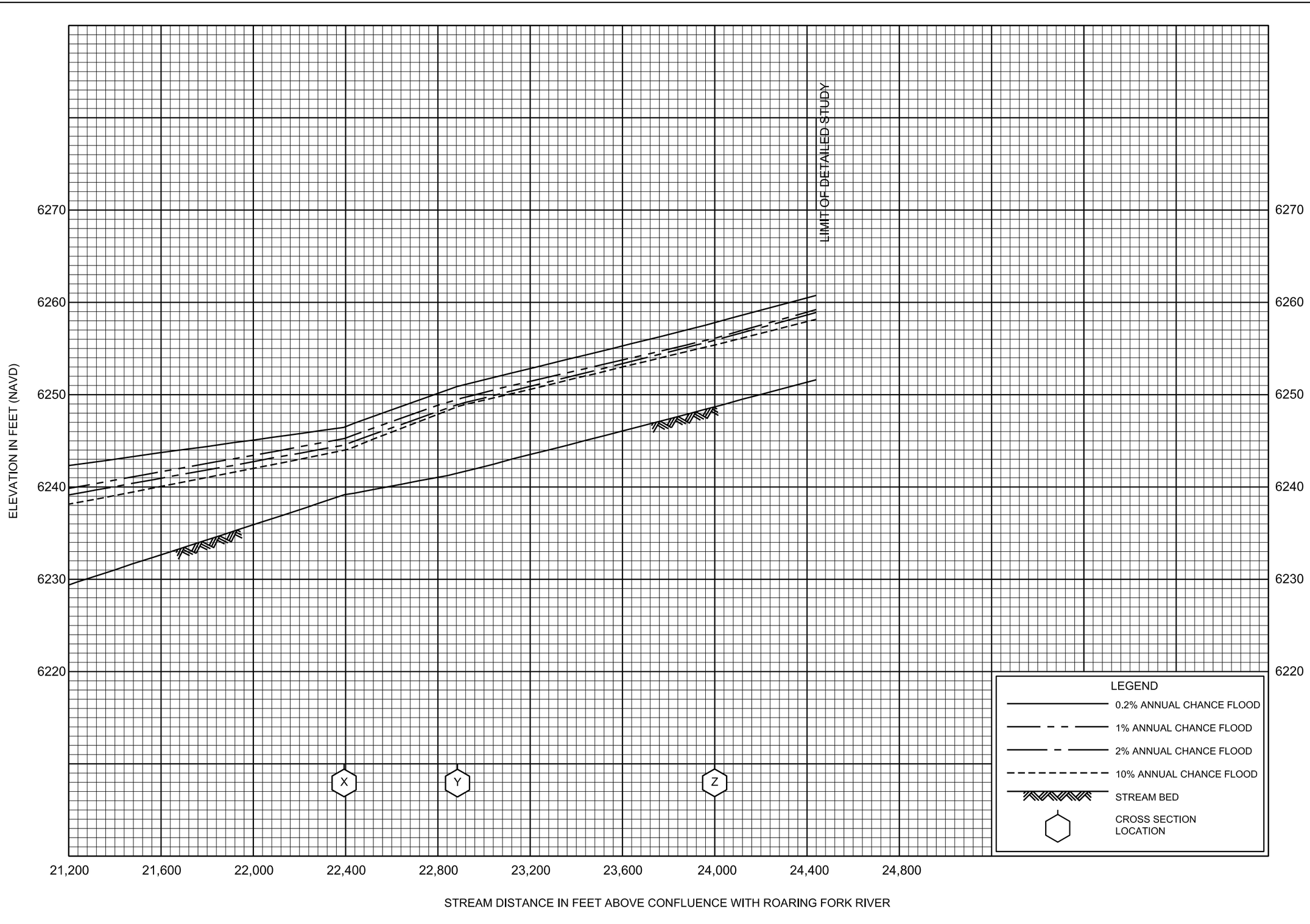

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