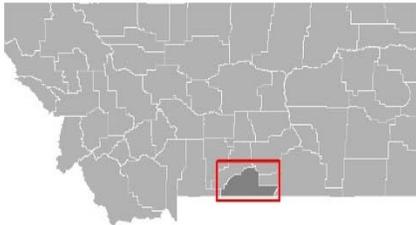


# FLOOD INSURANCE STUDY

## FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 1



## CARBON COUNTY, MONTANA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BEARCREEK, TOWN OF	300071
BRIDGER, TOWN OF*	300083
CARBON COUNTY UNINCORPORATED AREAS	300139
FROMBERG, TOWN OF	300005
JOLIET, TOWN OF	300006
RED LODGE, CITY OF	300007

\*No Special Flood Hazard Areas Identified



# FEMA

**REVISED:**

**MONTH DAY, YEAR**

**PRELIMINARY: DECEMBER 11, 2015**

FLOOD INSURANCE STUDY NUMBER  
**30009CV000B**

Version Number 2.3.3.2

# TABLE OF CONTENTS

## Volume 1

	<u>Page</u>
<b>SECTION 1.0 – INTRODUCTION</b>	<b>1</b>
1.1 The National Flood Insurance Program	1
1.2 Purpose of this Flood Insurance Study Report	2
1.3 Jurisdictions Included in the Flood Insurance Study Project	2
1.4 Considerations for using this Flood Insurance Study Report	5
<b>SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS</b>	<b>15</b>
2.1 Floodplain Boundaries	15
2.2 Floodways	16
2.3 Base Flood Elevations	33
2.4 Non-Encroachment Zones	33
2.5 Coastal Flood Hazard Areas	33
2.5.1 Water Elevations and the Effects of Waves	33
2.5.2 Floodplain Boundaries and BFEs for Coastal Areas	33
2.5.3 Coastal High Hazard Areas	33
2.5.4 Limit of Moderate Wave Action	33
<b>SECTION 3.0 – INSURANCE APPLICATIONS</b>	<b>34</b>
3.1 National Flood Insurance Program Insurance Zones	34
3.2 Coastal Barrier Resources System	34
<b>SECTION 4.0 – AREA STUDIED</b>	<b>35</b>
4.1 Basin Description	35
4.2 Principal Flood Problems	35
4.3 Non-Levee Flood Protection Measures	37
4.4 Levees	37
<b>SECTION 5.0 – ENGINEERING METHODS</b>	<b>38</b>
5.1 Hydrologic Analyses	38
5.2 Hydraulic Analyses	41
5.3 Coastal Analyses	44
5.3.1 Total Stillwater Elevations	44
5.3.2 Waves	44
5.3.3 Coastal Erosion	44
5.3.4 Wave Hazard Analyses	44
5.4 Alluvial Fan Analyses	45
<b>SECTION 6.0 – MAPPING METHODS</b>	<b>45</b>
6.1 Vertical and Horizontal Control	45
6.2 Base Map	46
6.3 Floodplain and Floodway Delineation	47
6.4 Coastal Flood Hazard Mapping	59
6.5 FIRM Revisions	59
6.5.1 Letters of Map Amendment	59

6.5.2	Letters of Map Revision Based on Fill	59
6.5.3	Letters of Map Revision	60
6.5.4	Physical Map Revisions	60
6.5.5	Contracted Restudies	60
6.5.6	Community Map History	61
<b>SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION</b>		<b>62</b>
7.1	Contracted Studies	62
7.2	Community Meetings	63
<b>SECTION 8.0 – ADDITIONAL INFORMATION</b>		<b>66</b>
<b>SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES</b>		<b>67</b>

### Figures

Figure 1:	FIRM Index	7
Figure 2:	FIRM Notes to Users	9
Figure 3:	Map Legend for FIRM	12
Figure 4:	Floodway Schematic	17
Figure 5:	Wave Runup Transect Schematic	33
Figure 6:	Coastal Transect Schematic	33
Figure 7:	Frequency Discharge-Drainage Area Curves	40
Figure 8:	1% Annual Chance Total Stillwater Elevations for Coastal Areas	44
Figure 9:	Transect Location Map	45

**TABLE OF CONTENTS (continued)**  
**Volume 1 (continued)**

Tables

Table 1: Listing of NFIP Jurisdictions	2
Table 2: Flooding Sources Included in this FIS Report	18
Table 3: Flood Zone Designations by Community	34
Table 4: Coastal Barrier Resources System Information	34
Table 5: Basin Characteristics	35
Table 6: Principal Flood Problems	35
Table 7: Historic Flooding Elevations	36
Table 8: Non-Levee Flood Protection Measures	37
Table 9: Levees	37
Table 10: Summary of Discharges	39
Table 11: Summary of Non-Coastal Stillwater Elevations	40
Table 12: Stream Gage Information used to Determine Discharges	40
Table 13: Summary of Hydrologic and Hydraulic Analyses	42
Table 14: Roughness Coefficients	44
Table 15: Summary of Coastal Analyses	44
Table 16: Tide Gage Analysis Specifics	44
Table 17: Coastal Transect Parameters	45
Table 18: Summary of Alluvial Fan Analyses	45
Table 19: Results of Alluvial Fan Analyses	45
Table 20: Countywide Vertical Datum Conversion	46
Table 21: Stream-Based Vertical Datum Conversion	46
Table 22: Base Map Sources	47
Table 23: Summary of Topographic Elevation Data used in Mapping	48
Table 24: Floodway Data	49
Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams	59
Table 26: Summary of Coastal Transect Mapping Considerations	59
Table 27: Incorporated Letters of Map Change	60
Table 28: Community Map History	62
Table 29: Summary of Contracted Studies Included in this FIS Report	62
Table 30: Community Meetings	64
Table 31: Map Repositories	66
Table 32: Additional Information	67
Table 33: Bibliography and References	68

**TABLE OF CONTENTS (continued)**  
**Volume 1 (continued)**

Exhibits

	<u>Panel</u>
Flood Profiles	
Clarks Fork Yellowstone River	01-07 P
Rock Creek (Lower)	08-21 P
Rock Creek (Middle)	22-30 P
Rock Creek (Upper)	31-48 P
Yellowstone River	49-57 P

**Published Separately**

Flood Insurance Rate Map (FIRM)

# FLOOD INSURANCE STUDY REPORT CARBON COUNTY, MONTANA

## SECTION 1.0 – INTRODUCTION

### 1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60.3, *Criteria for land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as "Post-FIRM" buildings.

## 1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) Report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community's regulations.

## 1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Carbon County, Montana.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 1. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

The location of flood hazard data for participating communities in multiple jurisdictions is also indicated in the table.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

**Table 1: Listing of NFIP Jurisdictions**

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Bearcreek, Town of	300071	10070006	30009C0720D	
Bridger, Town of <sup>1</sup>	300083	10070006	30009C0520D	
Carbon County, Unincorporated Areas	300139	10070004, 10070005, 10070006, 10070008, 10080010, 10080014	30009C0020E 30009C0035E 30009C0050E <sup>2</sup> 30009C0055E 30009C0060E 30009C0065D <sup>2</sup> 30009C0070D <sup>2</sup> 30009C0080E 30009C0085E 30009C0090D <sup>2</sup> 30009C0093D 30009C0094D 30009C0095D <sup>2</sup> 30009C0105E 30009C0110E	

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Carbon County, Unincorporated Areas	300139	10070004, 10070005, 10070006, 10070008, 10080010, 10080014	30009C0113D 30009C0114D 30009C0115D 30009C0120D 30009C0140D 30009C0175D 30009C0200D 30009C0215D 30009C0220D 30009C0225D 30009C0240D 30009C0244D 30009C0245D 30009C0250D 30009C0255D 30009C0260D 30009C0265D 30009C0270D 30009C0276D 30009C0277D 30009C0280D 30009C0281D 30009C0285D 30009C0290D 30009C0293D 30009C0294D 30009C0295D 30009C0305D 30009C0310D 30009C0315D 30009C0320D 30009C0330D 30009C0350D 30009C0400D 30009C0425D 30009C0430D 30009C0435D 30009C0440D 30009C0445D 30009C0454D 30009C0455D 30009C0456D 30009C0457D 30009C0458D 30009C0459D <sup>2</sup> 30009C0461D <sup>2</sup> 30009C0462D 30009C0463D 30009C0464D	

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Carbon County, Unincorporated Areas	300139	10070004, 10070005, 10070006, 10070008, 10080010, 10080014	30009C0470D <sup>2</sup> 30009C0480D 30009C0485D 30009C0490D 30009C0495D <sup>2</sup> 30009C0505D 30009C0510D 30009C0515D <sup>2</sup> 30009C0518D 30009C0519D 30009C0520D 30009C0530D 30009C0550D <sup>2</sup> 30009C0575D <sup>2</sup> 30009C0675D <sup>2</sup> 30009C0680D <sup>2</sup> 30009C0684D <sup>2</sup> 30009C0685D <sup>2</sup> 30009C0692D 30009C0695D 30009C0701D 30009C0703D 30009C0705D <sup>2</sup> 30009C0710D <sup>2</sup> 30009C0711D 30009C0715D <sup>2</sup> 30009C0720D 30009C0730D 30009C0735D 30009C0740D 30009C0745D 30009C0755D 30009C0756D 30009C0760D 30009C0765D 30009C0770D 30009C0780D 30009C0790D 30009C0800D 30009C0825D 30009C0850D <sup>2</sup> 30009C0900D <sup>2</sup> 30009C0925D <sup>2</sup> 30009C0950D <sup>2</sup> 30009C1060D 30009C1100D <sup>2</sup> 30009C1125D 30009C1150D	

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Carbon County, Unincorporated Areas	300139	10070004, 10070005, 10070006, 10070008, 10080010, 10080014	30009C1175D 30009C1200D 30009C1225D 30009C1250D 30009C1275D 30009C1300D <sup>2</sup> 30009C1325D 30009C1350D <sup>2</sup> 30009C1375D <sup>2</sup> 30009C1425D <sup>2</sup> 30009C1450D <sup>2</sup> 30009C1475D 30009C1500D <sup>2</sup>	
Fromberg, Town of	300005	10070006	30009C0293D 30009C0294D	
Joliet, Town of	300006	10070006	30009C0276D 30009C0277D	
Red Lodge, City of	300007	10070006	30009C0684D <sup>2</sup> 30009C0685D <sup>2</sup> 30009C0692D 30009C0701D 30009C0703D 30009C0711D	

<sup>1</sup> No Special Flood Hazard Areas Identified

<sup>2</sup> Panel Not Printed

#### 1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 31, “Map Repositories,” within this FIS Report.

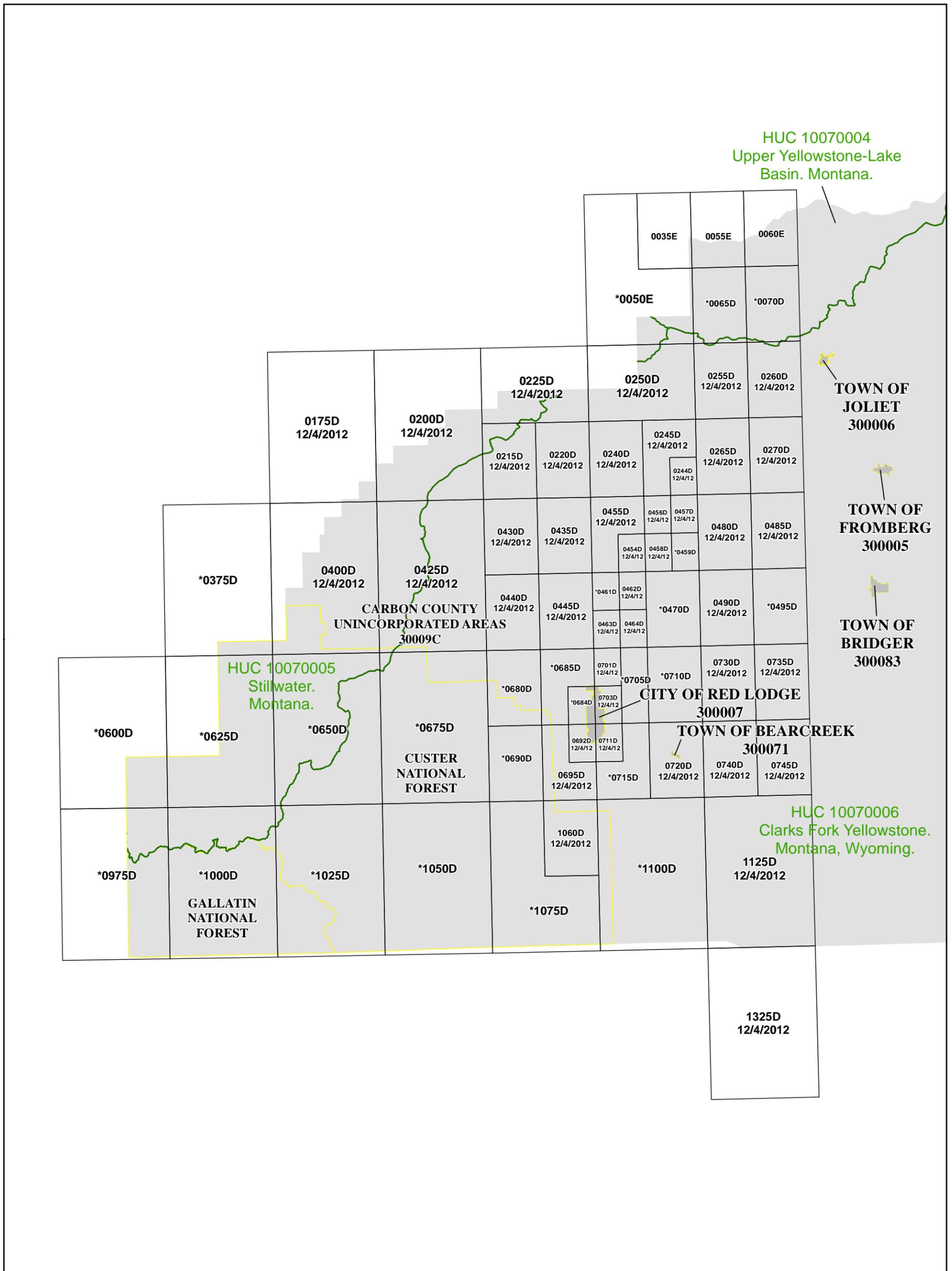
- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.
- The initial Countywide FIS Report for Carbon County became effective on December 4, 2012. Refer to Table 28 for information about subsequent revisions to the FIRMs.
- Selected FIRM panels for the community may contain information (such as floodways and cross sections) that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels. In addition, former flood hazard zone designations have been changed as follows:

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X (unshaded)

- Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled “Mapping of Areas Protected by Levee Systems.”

Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in Table 9 of this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE national levee database. For all other levees, the user is encouraged to contact the appropriate local community.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at <http://www.fema.gov>.



Map Projection:  
 Universal Transverse Mercator Zone 12 North, Meters;  
 North American Datum 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING  
 DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT  
[HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

\*PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS IDENTIFIED



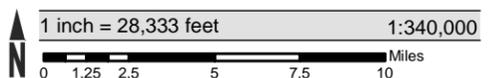
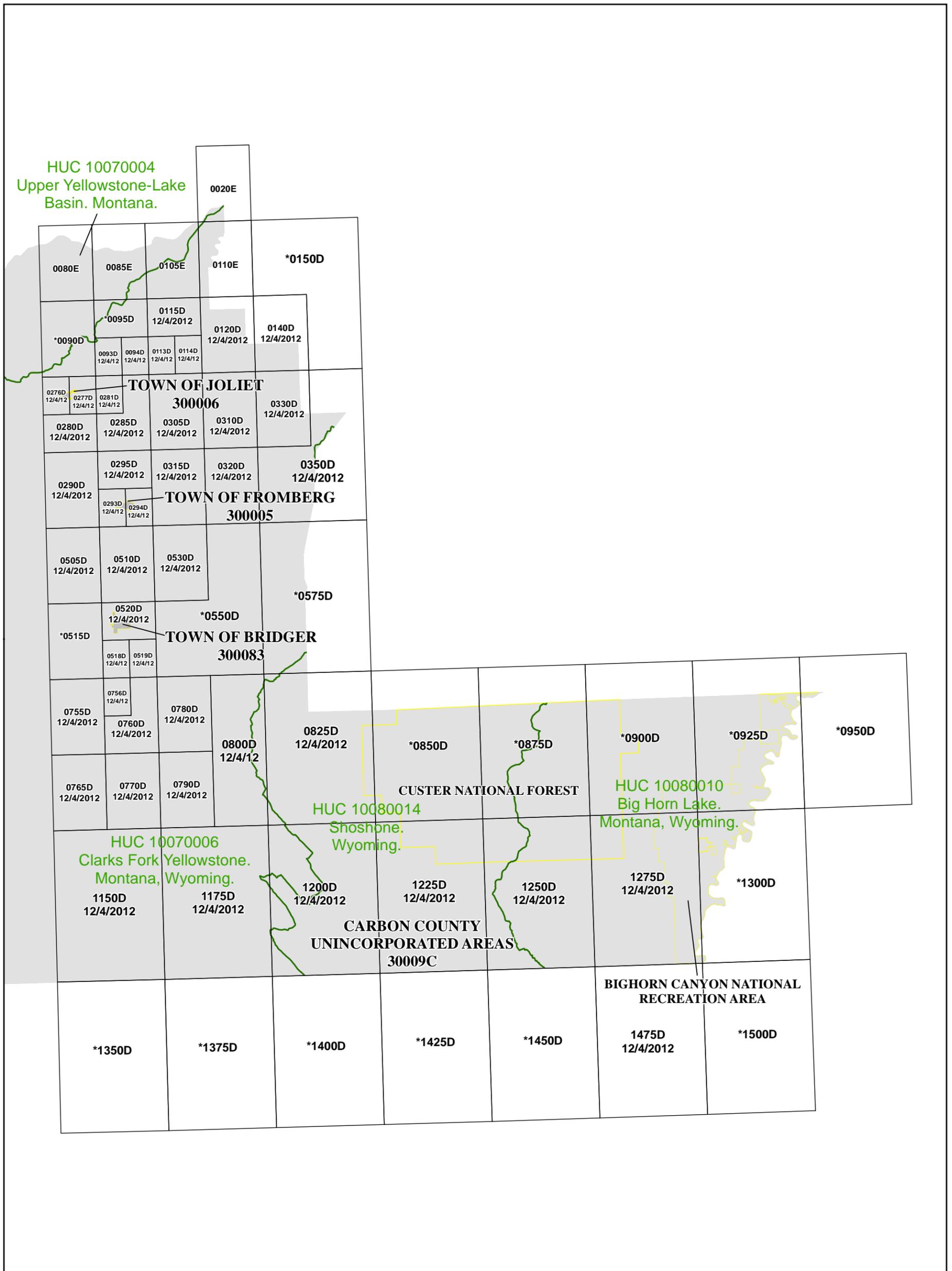
**NATIONAL FLOOD INSURANCE PROGRAM**  
 FLOOD INSURANCE RATE MAP INDEX (Sheet 1 of 2)

CARBON COUNTY, MONTANA

PANELS PRINTED:  
 0035, 0055, 0060, 0175, 0200, 0215, 0220, 0225, 0240, 0244, 0245, 0250,  
 0255, 0260, 0265, 0270, 0400, 0425, 0430, 0435, 0440, 0445, 0454, 0455,  
 0456, 0457, 0458, 0462, 0463, 0464, 0480, 0485, 0490, 0692, 0695, 0701,  
 0703, 0711, 0720, 0730, 0735, 0740, , 0745, 1060, 1125, 1325



**FEMA**  
 MAP NUMBER  
 30009CIND1B  
 MAP REVISED



Map Projection:  
 Universal Transverse Mercator Zone 12 North, Meters;  
 North American Datum 1983

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT [HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION  
 \*PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS IDENTIFIED



**NATIONAL FLOOD INSURANCE PROGRAM**  
 FLOOD INSURANCE RATE MAP INDEX (Sheet 2 of 2)

CARBON COUNTY, MONTANA  
 PANELS PRINTED:  
 0020, 0080, 0085, 0093, 0094, 0105, 0110, 0113, 0114, 0115, 0120, 0140, 0276, 0277, 0280, 0281, 0285, 0290, 0293, 0294, 0295, 0305, 0310, 0315, 0320, 0330, 0350, 0505, 0510, 0518, 0519, 0520, 0530, 0755, 0756, 0760, 0765, 0770, 0780, 0790, 0800, 0825, 1150, 1175, 1200, 1225, 1250, 1275, 1475



**FEMA**  
 MAP NUMBER  
 30009CIND2B  
 MAP REVISED

**Figure 2: FIRM Notes to Users**

## **NOTES TO USERS**

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

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

For community and countywide map dates, refer to Table 28 in this FIS Report.

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

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

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

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

Coastal Base Flood Elevations shown on the map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the FIS Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

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

**FLOOD CONTROL STRUCTURE INFORMATION:** Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

**PROJECTION INFORMATION:** The projection used in the preparation of the map was Universal Transverse Mercator Zone 12. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or Universal Transverse Mercator zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

**ELEVATION DATUM:** Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

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

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 31 of this FIS Report.

**BASE MAP INFORMATION:** Base map information shown on this FIRM was provided in digital format by NAIP. This information was derived from the U.S. Department of Agriculture Farm Service Agency dated 2013. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

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

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

**NOTES FOR FIRM INDEX**

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Carbon County, Montana, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 28 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

**SPECIAL NOTES FOR SPECIFIC FIRM PANELS**

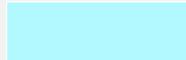
This Notes to Users section was created specifically for Carbon County, MT, effective <date>.

There are currently no Special Notes for the FIRM Panels.

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

**Figure 3: Map Legend for FIRM**

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



Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)

Zone A The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone.

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

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

Zone AR The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

Zone A99 The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.

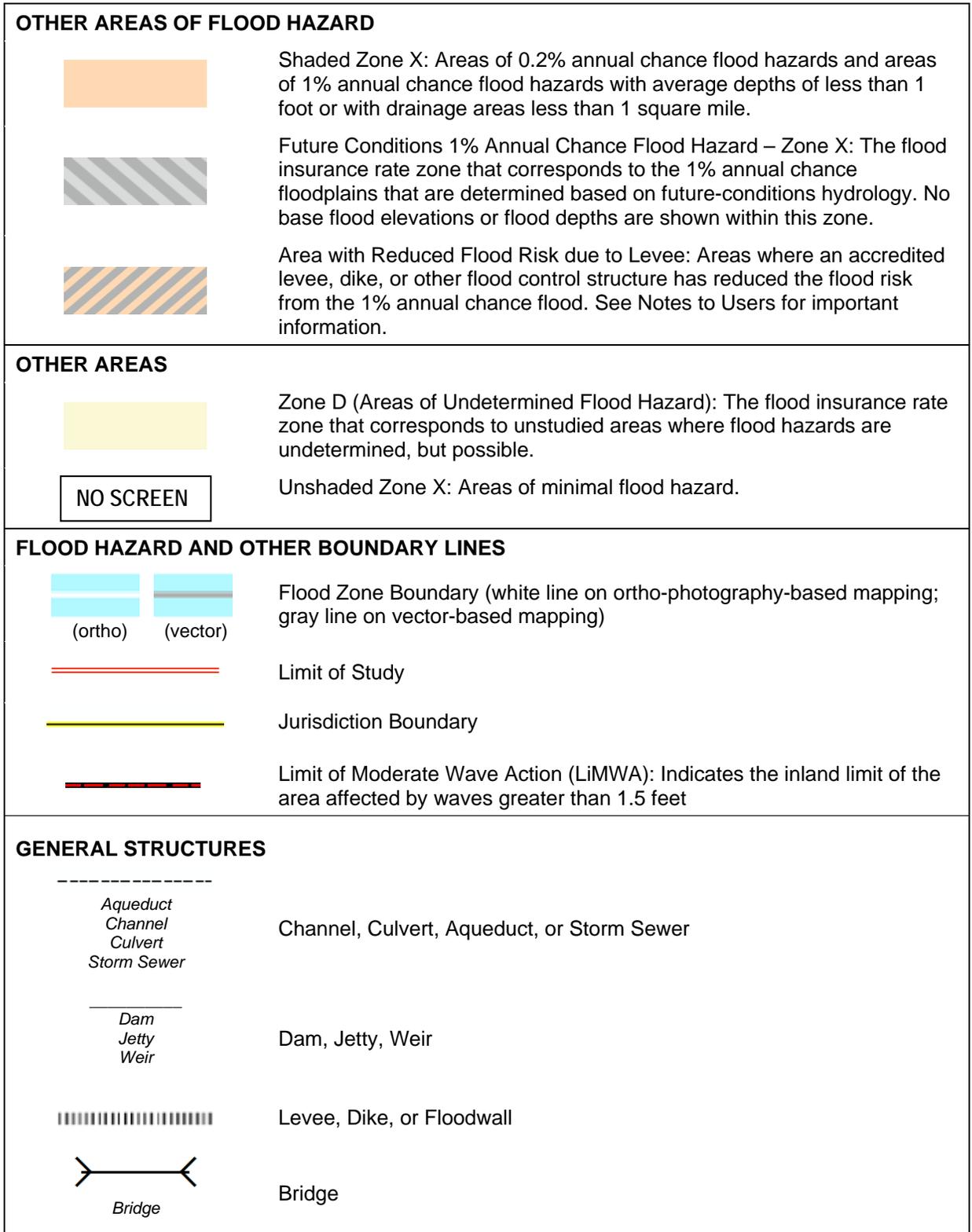
Zone V The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.

Zone VE Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

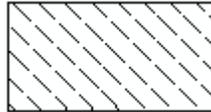
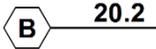
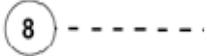


Regulatory Floodway determined in Zone AE.

**Figure 3: Map Legend for FIRM (continued)**



**Figure 3: Map Legend for FIRM (continued)**

<p><b>COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA):</b> <i>CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas. See Notes to Users for important information.</i></p>	
 <b>CBRS AREA</b> 09/30/2009	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
 <b>OTHERWISE PROTECTED AREA</b> 09/30/2009	Otherwise Protected Area
<p><b>REFERENCE MARKERS</b></p>	
 22.0	River mile Markers
<p><b>CROSS SECTION &amp; TRANSECT INFORMATION</b></p>	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
	Base Flood Elevation Line
<b>ZONE AE</b> (EL 16)	Static Base Flood Elevation value (shown under zone label)
<b>ZONE AO</b> (DEPTH 2)	Zone designation with Depth
<b>ZONE AO</b> (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity

**Figure 3: Map Legend for FIRM (continued)**

<b>BASE MAP FEATURES</b>	
 <i>Missouri Creek</i>	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway
	County Highway
	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
<b>4276<sup>000</sup>mE</b>	Horizontal Reference Grid Coordinates (UTM)
<b>365000 FT</b>	Horizontal Reference Grid Coordinates (State Plane)
<b>80° 16' 52.5"</b>	Corner Coordinates (Latitude, Longitude)

## **SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS**

### **2.1 Floodplain Boundaries**

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Carbon County as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each

studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 23), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, “Map Legend for FIRM”, describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Carbon County, MT, respectively.

Table 2, “Flooding Sources Included in this FIS Report,” lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 13. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

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. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

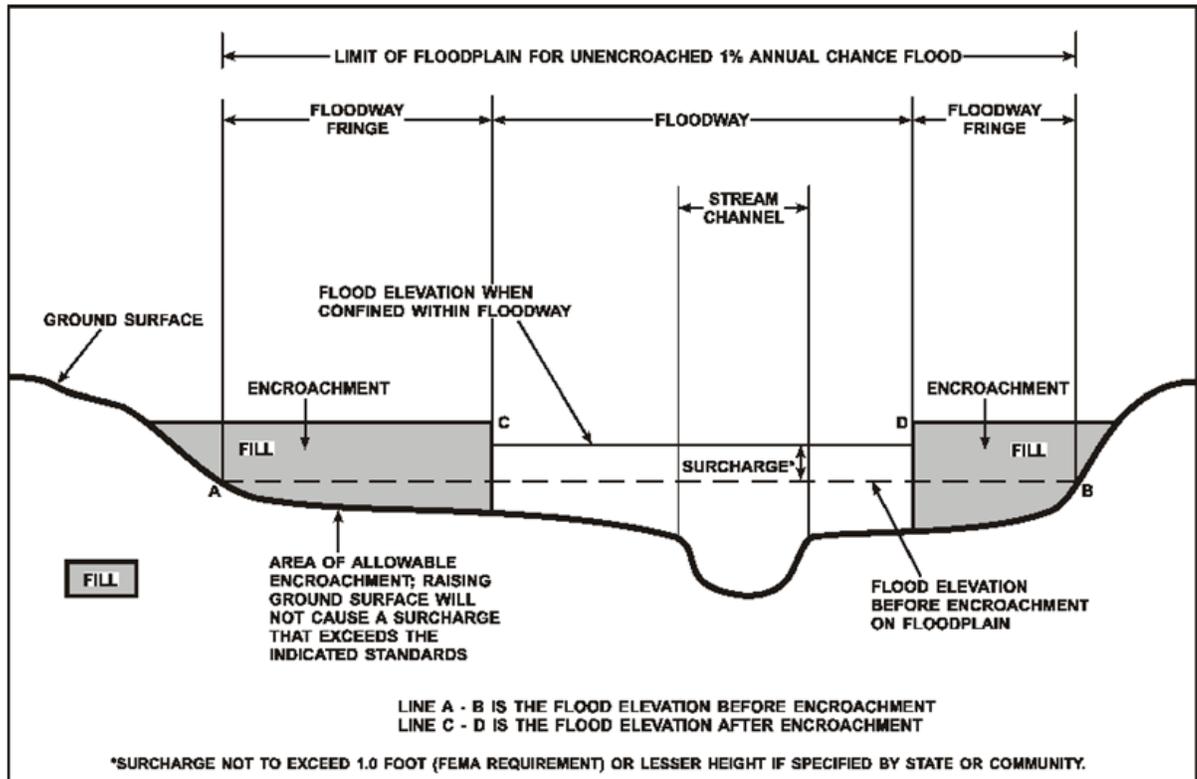
## **2.2 Floodways**

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard.

For purposes of the NFIP, a floodway is used as a tool to assist local communities in balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

**Figure 4: Floodway Schematic**



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 24, "Floodway Data."

**Table 2: Flooding Sources Included in this FIS Report**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Allen Creek	Carbon County (Unincorporated Areas)	Confluence with Yellowstone River	Approximately 300 feet upstream of the confluence with Yellowstone River	10070004	0.05	*	N	A	*
Antelope Creek	Carbon County (Unincorporated Areas)	Confluence with East Rosebud Creek	Carbon County Boundary	10070005	0.71	*	N	A	*
Bachelor Canyon	Carbon County (Unincorporated Areas)	Confluence with Bluewater Creek	Approximately 800 feet upstream of the confluence with Bluewater Creek	10070006	0.15	*	N	A	*
Barlow Creek	Carbon County (Unincorporated Areas)	Confluence with West Red Lodge Creek	Approximately 1,100 feet upstream of the confluence with West Red Lodge Creek	10070006	0.21	*	N	A	*
Bear Canyon	Carbon County (Unincorporated Areas)	Confluence with Sage Creek	Approximately 1,200 feet upstream of the confluence with Sage Creek	10080014	0.24	*	N	A	*
Bear Creek	Carbon County (Unincorporated Areas), Town of Bear Creek	Confluence with Clarks Fork Yellowstone River	Approximately 1,500 feet upstream of State Highway 308	10080006	12.20	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Bellion Creek	Carbon County (Unincorporated Areas)	Confluence with Yellowstone River	Approximately 900 feet upstream of the confluence with the Yellowstone River	10070004	0.17	*	N	A	*
Big Sand Coulee	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 700 feet upstream of the confluence with the Clarks Fork Yellowstone River	10070006	0.13	*	N	A	*
Bluewater Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 4 miles upstream of Bluewater Road	10070006	12.30	*	N	A	*
Bridger Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 0.8 miles upstream of Pryor Mountain Road	10070006	6.91	*	N	A	*
Bull Creek	Carbon County (Unincorporated Areas)	Confluence with Willow Creek	Approximately 600 feet upstream of the confluence with Willow Creek	10070006	0.11	*	N	A	*
Burnt Timber Canyon	Carbon County (Unincorporated Areas)	Confluence with Crooked Creek	Approximately 400 feet upstream of the confluence with Burnt Timber Creek	10070006	0.08	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Butcher Creek	Carbon County (Unincorporated Areas)	Confluence with East Rosebud Creek	Approximately 1,000 feet upstream of Luther Roscoe Road	10070005	0.19	17.5	N	A	*
Butte Creek	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	Approximately 4,400 feet upstream of Red Lodge Creek Road	10070006	0.83	*	N	A	*
Castle Coulee	Carbon County (Unincorporated Areas)	Confluence with Cottonwood Creek	Approximately 500 feet upstream of the confluence with Cottonwood Creek	10070006	0.10	*	N	A	*
Chapman Creek	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	Approximately 2,200 feet upstream of the confluence with Red Lodge Creek	10070006	0.21	*	N	A	*
Cherry Spring Creek	Carbon County (Unincorporated Areas)	Confluence with Elbow Creek	Approximately 200 feet upstream of the confluence with Elbow Creek	10070006	0.04	*	N	A	*
Clarks Fork – Silver Tip Ditch	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Divergence from Hunt Creek	10070006	0.82	*	N	A	*
Clarks Fork Yellowstone River	Carbon County (Unincorporated Areas), Town of Fromberg	Confluence with Yellowstone River	Approximately 1.5 miles upstream of U.S. Highway 310	10070006	69.49	*	Y	A, AE	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Cole Creek	Carbon County (Unincorporated Areas)	Confluence with Yellowstone River	Approximately 200 feet upstream of the confluence with the Yellowstone River	10070004	0.06	*	N	A	*
Cottonwood Coulee	Carbon County (Unincorporated Areas)	Confluence with Sage Creek	Approximately 1,600 feet upstream of the confluence with Sage Creek	10080014	0.30	*	N	A	*
Cottonwood Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 2 miles downstream of the Carbon County border	10070006	31.21	*	N	A	*
Cow Creek	Carbon County (Unincorporated Areas)	Confluence with Rock Creek	Approximately 1.1 miles upstream of Carbonado Road	10070004	3.44	*	N	A	*
Crooked Creek	Carbon County (Unincorporated Areas)	At Carbon County Border	Approximately 4.5 miles upstream of Carbon County Border	10080010	4.42	*	N	A	*
Cub Creek	Carbon County (Unincorporated Areas)	Confluence with Silver Tip Creek	Approximately 3.6 miles upstream of South Silvertip Road	10070006	3.95	*	N	A	*
Dilworth Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 1,000 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.18	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Dry Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 3.4 miles upstream of the confluence with Clarks Fork Yellowstone River	10070006	4.61	*	N	A	*
East Fork Butcher Creek	Carbon County (Unincorporated Areas)	Confluence with Butcher Creek	Approximately 3,800 feet upstream of the confluence with Butcher Creek	10070005	0.73	*	N	A	*
East Red Lodge Creek	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	Approximately 2.0 miles upstream of Red Lodge Creek Road	10070006	3.67	*	N	A	*
East Rosebud Creek	Carbon County (Unincorporated Areas)	At the Carbon County boundary	Approximately 0.90 miles upstream of Black Butte View Road	10070005	15.86	*	N	A	*
Elbow Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 1.5 miles upstream of Elbow Creek Road	10070006	27.40	*	N	A	*
Espeland-Ostrum George Ditch	Carbon County (Unincorporated Areas)	Confluence with Morris Creek	Approximately 100 feet upstream of the confluence with Morris Creek	10070005	0.03	*	N	A	*
Fivemile Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 2.3 miles upstream of East Pryor Road	10070006	6.47	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Foster Gulch	Carbon County (Unincorporated Areas), Town of Bearcreek	Confluence with Bear Creek	Approximately 700 feet upstream of the confluence with Bear Creek	10070006	0.14	*	N	A	*
Grove Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 2.9 miles upstream of the confluence with Clarks Fork Yellowstone River	10070006	2.88	*	N	A	*
Grove Creek Canal	Carbon County (Unincorporated Areas)	Confluence with Grove Creek	Approximately 1,300 feet upstream of the confluence with Grove Creek	10070006	0.25	*	N	A	*
Harney Creek	Carbon County (Unincorporated Areas)	Confluence with East Red Lodge Creek	Approximately 2,000 feet upstream of the confluence with Red Lodge Creek	10070006	0.37	*	N	A	*
Hogan Creek	Carbon County (Unincorporated Areas)	Confluence with West Red Lodge Creek	Approximately 600 feet upstream of the confluence West Red Lodge Creek	10070006	0.12	*	N	A	*
Hollenbeck Draw	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 900 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.17	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Hoyle Ditch	Carbon County (Unincorporated Areas)	Confluence with Rock Creek	Approximately 1,100 feet upstream of the confluence with Rock Creek	10070006	0.21	*	N	A	*
Hunt Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	*	10070006	5.49	*	N	A	*
Hunters Creek	Carbon County (Unincorporated Areas)	Confluence with Cottonwood Creek	Approximately 2.0 miles upstream of the confluence with Cottonwood Creek	10070006	2.04	*	N	A	*
Inderland-Ramsland Ditch	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	Approximately 600 feet upstream of the confluence with Red Lodge Creek	10070006	0.10	*	N	A	*
Inferno Canyon	Carbon County (Unincorporated Areas)	Confluence with Sage Creek	Approximately 600 feet upstream of the confluence with Sage Creek	10080014	0.11	*	N	A	*
Ingersoll Creek	Carbon County (Unincorporated Areas)	At Carbon County boundary	At Carbon County boundary	10070005	1.24	*	N	A	*
Jack Creek	Carbon County (Unincorporated Areas)	Confluence with Bridger Creek	At U.S. Highway 310	10070006	8.34	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
John George Ditch	Carbon County (Unincorporated Areas)	Confluence with Morris Creek	Approximately 900 feet of the confluence with Morris Creek	10070005	0.16	*	N	A	*
King Canyon	Carbon County (Unincorporated Areas)	Confluence with Sage Creek	Approximately 400 feet upstream of the confluence with Sage Creek	10070006	0.08	*	N	A	*
Larkin Coulee	Carbon County (Unincorporated Areas)	Confluence with Bear Creek	Approximately 300 feet upstream of the confluence with Bear Creek	10070006	0.05	*	N	A	*
Little Cottonwood Creek	Carbon County (Unincorporated Areas)	Confluence with Cottonwood Creek	Approximately 500 feet upstream of the confluence with Cottonwood Creek	10070006	0.10	*	N	A	*
Lone Tree Creek	Carbon County (Unincorporated Areas)	Confluence with Rock Creek	Approximately 600 feet upstream of the confluence with Rock Creek	10070006	0.11	*	N	A	*
Long Draw	Carbon County (Unincorporated Areas)	Confluence with Silver Tip Creek	Approximately 400 feet upstream of the confluence with Silver Tip Creek	10070006	0.08	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Main Canal	Carbon County (Unincorporated Areas)	Confluence with East Rosebud Creek	Approximately 1,900 feet upstream of the confluence with East Rosebud Creek	10070005	0.36	*	N	A	*
Mill Draw	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 600 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.11	*	N	A	*
Morris Creek	Carbon County (Unincorporated Areas)	Confluence with East Rosebud Creek	Approximately 2.56 miles upstream of the confluence with East Rosebud Creek	10070005	2.58	*	N	A	*
Mutual Ditch	Carbon County (Unincorporated Areas)	Confluence with Hunt Creek	Divergence from Clarks Fork Yellowstone River	10070006	0.33	*	N	A	*
North Fork Bridger Creek	Carbon County (Unincorporated Areas)	Confluence with Bridger Creek	Approximately 2,000 feet upstream of the confluence with Bridger Creek	10070006	0.38	*	N	A	*
North Fork Dry Creek	Carbon County (Unincorporated Areas)	Confluence with Dry Creek	Approximately 1.3 miles upstream of North Dry Creek Road	10070006	5.79	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
North Fork Fivemile Creek	Carbon County (Unincorporated Areas)	Confluence with Fivemile Creek	Approximately 1.76 miles upstream of the confluence with Fivemile Creek	10070006	1.74	*	N	A	*
Olson Ditch	Carbon County (Unincorporated Areas)	Confluence with Butcher Creek	Approximately 500 feet upstream of Butcher Creek	10070005	0.04	*	N	A	*
Orchard Canal	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 4,000 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.83	*	N	A	*
Peabody Ditch	Carbon County (Unincorporated Areas)	Confluence with East Rosebud Creek	Approximately 400 feet upstream of the confluence with East Rosebud Creek	10070005	0.07	*	N	A	*
Piney Creek	Carbon County (Unincorporated Areas)	Confluence with Sage Creek	Approximately 2,400 feet upstream of the confluence with Sage Creek	10080014	0.44	*	N	A	*
Red Lodge Creek	Carbon County (Unincorporated Areas)	Confluence with Rock Creek	At confluence of East Red Lodge Creek and West Red Lodge Creek	10070006	30.65	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Riverview Ditch	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 700 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.09	*	N	A	*
Rock Creek	Carbon County (Unincorporated Areas)	At upstream limit of Rock Creek (Lower) detailed study	At downstream limit of Rock Creek (Middle) detailed study	10070006	11.13	*	N	A	*
Rock Creek (Lower)	Carbon County (Unincorporated Areas), Town of Joliet	Approximately 2,500 feet upstream of confluence with Clarks Fork Yellowstone River	Approximately 3,800 feet upstream of U.S. Highway 212	10070006	12.07	*	Y	AE	*
Rock Creek (Middle)	Carbon County (Unincorporated Areas)	Approximately 4,035 feet downstream of U.S. Highway 212	Approximately 2.6 miles upstream of County Road	10070006	8.46	*	Y	AE	*
Rock Creek (Upper)	Carbon County (Unincorporated Areas), City of Red Lodge	Confluence with Rock Creek (Middle)	Approximately 1.1 miles upstream of Piney Dell Foot Bridge	10070006	15.72	*	Y	AE	*
Rosebud Creek	Carbon County (Unincorporated Areas)	*	*	*	*	*	N	A	*
Rushwater Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 1,300 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.24	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Sage Creek	Carbon County (Unincorporated Areas)	At the northern Carbon County boundary	At the southern Carbon County boundary	10080014	21.39	*	N	A	*
Sand Coulee	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 700 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.13	*	N	A	*
Sand Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 2,700 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	5.56	*	N	A	*
Scotch Coulee	Carbon County (Unincorporated Areas)	Confluence with Bear Creek	Approximately 900 feet upstream of the confluence with Bear Creek	10070006	0.17	*	N	A	*
Selleck-Espelund Ditch	Carbon County (Unincorporated Areas)	Confluence with East Rosebud Creek	Approximately 300 feet upstream of the confluence with East Rosebud Creek	10070005	0.06	*	N	A	*
Silver Tip Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	*	10070006	15.9	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Skunk Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 1,500 feet upstream of the confluence with Clarks Fork Yellowstone River	10070006	0.29	*	N	A	*
South Fork Bridger Creek	Carbon County (Unincorporated Areas)	Confluence with Bridger Creek	Approximately 2,900 feet upstream of the confluence with Bridger Creek	10070006	0.55	*	N	A	*
South Fork Dry Creek	Carbon County (Unincorporated Areas)	Confluence with Dry Creek	*	10070006	5.88	*	N	A	*
Spring Creek	Carbon County (Unincorporated Areas)	Confluence with Willow Creek	Approximately 500 feet upstream of the confluence with Willow Creek	10070006	.013	*	N	A	*
Stanley Creek	Carbon County (Unincorporated Areas)	Confluence with Cow Creek	*	10070006	NA	*	N	A	*
Thiel Creek	Carbon County (Unincorporated Areas)	Confluence with East Red Lodge Creek	Approximately 1.0 miles upstream of the confluence with East Red Lodge Creek	10070006	1.03	*	N	A	*
Virtue Gulch	Carbon County (Unincorporated Areas)	Confluence with Bear Creek	Approximatey 1,800 feet upstream of the confluence with Bear Creek	10070006	0.35	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Volney Creek	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	*	10070006	13.18	*	N	A	*
Wallila Coulee	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	Approximately 800 feet upstream of the confluence with Red Lodge Creek	10070006	0.15	*	N	A	*
Wapel Ditch	Carbon County (Unincorporated Areas)	Confluence with West Fork Rock Creek	Approximately 300 feet upstream of the confluence with West Fork Rock Creek	10070006	0.17	*	N	A	*
Weatherman Draw	Carbon County (Unincorporated Areas)	Confluence with Cottonwood Creek	Approximately 500 feet upstream of the confluence with Cottonwood Creek	10070006	0.09	*	N	A	*
West Fork Rock Creek	Carbon County (Unincorporated Areas)	Confluence with Rock Creek (Upper)	Approximately 1.96 miles upstream of the confluence with Rock Creek (Upper)	10070006	1.92	*	N	A	*
West Fork Butcher Creek	Carbon County (Unincorporated Areas)	Confluence with Butcher Creek	Approximately 4,700 feet upstream of the confluence with Butcher Creek	10070005	0.88	*	N	A	*

**Table 2: Flooding Sources Included in this FIS Report (continued)**

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi <sup>2</sup> ) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
West Fork Volney Creek	Carbon County (Unincorporated Areas)	Confluence with Volney Creek	Approximately 1.36 miles upstream of the confluence with Volney Creek	10070006	1.34	*	N	A	*
West Red Lodge Creek	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	*	10070006	8.13	*	N	A	*
Williams Draw	Carbon County (Unincorporated Areas)	Confluence with Silver Tip Creek	Approximately 400 feet upstream of the confluence with Silver Tip Creek	10070006	.07	*	N	A	*
Willow Creek	Carbon County (Unincorporated Areas)	Confluence with Red Lodge Creek	*	10070006	22.34	*	N	A	*
Wolf Canyon	Carbon County (Unincorporated Areas)	Confluence with Yellowstone River	Approximately 1,200 feet upstream of the confluence with Yellowstone River	10070004	0.16	*	N	A	*
Wolf Creek	Carbon County (Unincorporated Areas)	Confluence with Clarks Fork Yellowstone River	Approximately 500 feet upstream of the confluence with the Clarks Fork Yellowstone River	10070006	0.42	*	N	A	*
Yellowstone River	Carbon County (Unincorporated Areas)	Just north of the Carbon County Boundary within the Yellowstone River Split Flow Reach	Stillwater County Boundary	10070004	17.01	*	Y	AE	2007, 2013

\*Data Not Available

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and 1% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

### **2.3 Base Flood Elevations**

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs 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.

### **2.4 Non-Encroachment Zones**

This section is not applicable to this Flood Risk Project.

### **2.5 Coastal Flood Hazard Areas**

This section is not applicable to this Flood Risk Project.

#### **2.5.1 Water Elevations and the Effects of Waves**

This section is not applicable to this Flood Risk Project.

#### **Figure 5: Wave Runup Transect Schematic**

[Not applicable to this Flood Risk Project]

#### **2.5.2 Floodplain Boundaries and BFEs for Coastal Areas**

This section is not applicable to this Flood Risk Project.

#### **2.5.3 Coastal High Hazard Areas**

This section is not applicable to this Flood Risk Project.

#### **Figure 6: Coastal Transect Schematic**

[Not applicable to this Flood Risk Project]

#### **2.5.4 Limit of Moderate Wave Action**

This section is not applicable to this Flood Risk Project.

## SECTION 3.0 – INSURANCE APPLICATIONS

### 3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, “Map Legend for FIRM.” Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in the unincorporated and incorporated areas of Carbon County.

**Table 3: Flood Zone Designations by Community**

Community	Flood Zone(s)
Bearcreek, Town of	A
Bridger, Town of	N/A
Carbon County, Unincorporated Areas	A, AE, X
Fromberg, Town of	AE, X
Joliet, Town of	AE, X
Red Lodge, City of	AE, X

### 3.2 Coastal Barrier Resources System

The Coastal Barrier Resources Act (CBRA) of 1982 was established by Congress to create areas along the Atlantic and Gulf coasts and the Great Lakes, where restrictions for Federal financial assistance including flood insurance are prohibited. In 1990, Congress passed the Coastal Barrier Improvement Act (CBIA), which increased the extent of areas established by the CBRA and added “Otherwise Protected Areas” (OPA) to the system. These areas are collectively referred to as the John. H Chafee Coastal Barrier Resources System (CBRS). The CBRS boundaries that have been identified in the project area are in Table 4, “Coastal Barrier Resource System Information.”

**Table 4: Coastal Barrier Resources System Information**

[Not applicable to this Flood Risk Project]

## SECTION 4.0 – AREA STUDIED

### 4.1 Basin Description

Table 5 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

**Table 5: Basin Characteristics**

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Upper Yellowstone – Lake Basin	10070004	Yellowstone River	Far northern tip of Carbon County	1570
Stillwater	10070005	Stillwater River	Includes the northwestern boundary of Carbon County	1066
Clarks Fork Yellowstone	10070006	Clarks Fork Yellowstone River	Encompasses a majority of Carbon County	2793
Pryor	10070008	Pryor Creek	Includes a very small portion of northeastern Carbon County	602
Big Horn Lake	10080010	Dry Head Creek	Extreme eastern part of Carbon County. This HUC-8 is located in Montana and Wyoming, and the majority is in Wyoming.	1802
Shoshone	10080014	Sage Creek	Eastern section of Carbon County. This HUC-8 is located in Montana and Wyoming, and the majority is in Wyoming.	1485

### 4.2 Principal Flood Problems

Table 6 contains a description of the principal flood problems that have been noted for Carbon County by flooding source.

**Table 6: Principal Flood Problems**

Flooding Source	Description of Flood Problems
All sources	The valleys along the rivers and creeks in the study area are subject to periodic flooding in the spring. The flooding is generally caused by rapid snowmelt or a combination of rapid snowmelt and rain. Streamflow normally follows a seasonal pattern, with low discharges during the winter. During May, June, and early July, mountain snowmelt runoff combined

**Table 6: Principal Flood Problems (continued)**

Flooding Source	Description of Flood Problems
	with rains usually produces the highest discharges of the year. Relatively high flows last several months, but rise and fall slowly. Major floods occurred along Rock Creek in 1952, 1957, 1967, 1975 and 2011, all of which affected Joliet and Red Lodge, as well as portions of Carbon County. In May 2011, the Town of Joliet experienced flooding covering Highway 221, Main Street, and properties throughout its downtown with approximately 18 inches of water. The flooding was the result of debris caught on the piers of the abandoned railroad bridge piers in Rock Creek. At the U.S. Geological Survey (USGS) gaging station on Rock Creek near Red Lodge (gage No. 62095), the maximum discharge in 51 years of record occurred in June 1957 when a flow of 3,110 cubic feet per second (cfs) was recorded.
Clark Fork Yellowstone River	Clark Fork Yellowstone River had major floods in 1967 and 1975, both of which affected Fromberg, as well as portions of Carbon County. The discharge for the July 1975 flood as recorded at the USGS gaging station near Belfry was 12,700 cfs, which was the maximum discharge recorded in 56 years of record.

Table 7 contains information about historic flood elevations in the communities within Carbon County.

**Table 7: Historic Flooding Elevations**

**[Not applicable to this Flood Risk Project]**

### 4.3 Non-Levee Flood Protection Measures

Table 8 contains information about non-levee flood protection measures within Carbon County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

**Table 8: Non-Levee Flood Protection Measures**

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Red Lodge Creek	Cooney Reservoir	Reservoir	*	Provides some control of floodwater along Red Lodge Creek
Rock Creek	*	Channel Maintenance	*	Rock Creek channel maintenance at the upstream end of the City of Red Lodge
Rock Creek	*	Non-Levee Embankments	*	Some small non-levee embankments have been built and channel work has been undertaken throughout Carbon County on Rock Creek, but the non-levee embankments are not high enough to keep out any large recurrence-interval flood. These levees are also discontinuous and allow floodwaters out of the channel even for the smaller recurrence-interval floods.

\*Data Not Available

### 4.4 Levees

This section is not applicable to this Flood Risk Project.

**Table 9: Levees**

**[Not applicable to this Flood Risk Project]**

## SECTION 5.0 – ENGINEERING METHODS

For the flooding sources 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 at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% 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 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 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.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 27, “Incorporated Letters of Map Change”, which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, “FIRM Revisions.”

### 5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 13. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 10. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure 7 for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 11. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 17.) Stream gage information is provided in Table 12.

**Table 10: Summary of Discharges**

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharges (cfs)				
			10% Annual Chance	2% Annual Chance	4% Annual Chance	1% Annual Chance	0.2% Annual Chance
Clarks Fork Yellowstone River	At Fromberg	1,940	10,870	13,080	*	14,130	16,590
	Near Bridger	1,940	10,870	13,080	*	14,130	16,590
Rock Creek (Above Red Lodge)	At Highway 218	216.8	3,280	4,643	*	5,413	7,298
	Above the confluence with West Fork	137.0	2,134	2,868	*	3,183	3,922
	At USGS Gage 62095	124.0	2,010	2,706	*	3,003	3,700
Rock Creek (Lower)	Approximately 1,200 feet downstream of Burlington Northern Railroad	569	5,852	8,338	*	9,655	13,020
Rock Creek (Upper)	Approximately 2,700 feet downstream of Diversion Dam	257	3,634	5,178	*	5,995	8,085
	Approximately 1,970 feet upstream of County Road to cemetery	228	3,378	4,813	*	5,573	7,515
	Approximately 1,610 feet downstream of 19 <sup>th</sup> Street	202	3,144	4,450	*	5,188	6,995
Yellowstone River	Approximately 1,400 feet downstream of confluence of Yellowstone River with White Horse Canal	11,783	58,500	72,000	*	80,000	96,000
	Just downstream of the confluence with Stillwater River	*	43,200	48,700	52,900	56,700	65,100

\*Data Not Available

**Figure 7: Frequency Discharge-Drainage Area Curves**

[Not applicable to this Flood Risk Project]

**Table 11: Summary of Non-Coastal Stillwater Elevations**

[Not applicable to this Flood Risk Project]

**Table 12: Stream Gage Information used to Determine Discharges**

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Boulder River	06200000	USGS	Boulder River at Big Timber, MT	532	1925	1977
Clarks Fork Yellowstone River	*	USGS	Near Belfrey (56 years of record)	*	*	*
Clarks Fork Yellowstone River	*	USGS	Clarks Fork Yellowstone River at Edgar, MT	2,022	1922 1934 1987	1932 1969 2010
Clarks Fork Yellowstone River	*	USGS	Near Silesia (8 years of record)	*	*	*
Red Lodge Creek	*	USGS	Below Coney Reservoir (40 years of record)	*	*	*
Rock Creek	*	USGS	Near Red Lodge	*	1934	1977
Rock Creek	*	USGS	Rock Creek near Rockvale, MT	569	1921 1932 1934 1985	1922 1940 1990
Red Lodge Creek	*	USGS	Below Coney Reservoir (40 years of record)	*	*	*

\*Data Not Available

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Shields River	06195600	USGS	Shields River near Livingston, MT	852	1979	2010
Stillwater Creek	06205000	USGS	Stillwater Creek near Absarokee, MT	975	1911 1935	1914 2010
Yellowstone River	06192500	USGS	Yellowstone River near Livingston, MT	3,551	1897 1929	1905 2010
Yellowstone River	06214500	USGS	Yellowstone River at Billings, MT	11,805	1904 1918 1929	1905 2010

\*Data Not Available

## 5.2 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. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 24, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 13. Roughness coefficients are provided in Table 14. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

**Table 13: Summary of Hydrologic and Hydraulic Analyses**

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Clarks Fork Yellowstone River	Confluence with Yellowstone River	Approximately 1.5 miles upstream of U.S. Highway 310	Discharge- Frequency based on log- Pearson Type III analysis	HEC-RAS	*	A, AE w/ Floodway	
Rock Creek (Lower)	Approximately 2,500 feet upstream of confluence with Clarks Fork Yellowstone River	Approximately 3,800 feet upstream of U.S. Highway 212	Discharge- Frequency based on log- Pearson Type III analysis	HEC-2	*	AE w/ Floodway	
Rock Creek (Middle)	Approximately 4,035 feet downstream of U.S. Highway 212	Approximately 2.6 miles upstream of County Road	Discharge- Frequency based on log- Pearson Type III analysis	HEC-2	*	AE w/ Floodway	
Rock Creek (Upper)	Confluence with Rock Creek (Middle)	Approximately 1.1 miles upstream of Piney Dell Foot Bridge	Discharge- Frequency based on log- Pearson Type III analysis	HEC-2	*	AE w/ Floodway	
Yellowstone River (Stillwater County Model)	At Stillwater County- Yellowstone County Boundary	At Stillwater County – Sweet Grass County Boundary	Discharge- Frequency based on log- Pearson Type III analysis	HEC-RAS	March 2007	AE w/ Floodway	

**Table 13: Summary of Hydrologic and Hydraulic Analyses (continued)**

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Yellowstone River (Yellowstone County Model)	At Yellowstone County – Stillwater County Boundary	At Stillwater County - Carbon County Boundary	Discharge- Frequency based on log- Pearson Type III analysis	HEC-RAS	October 2013	AE w/ Floodway	

\*Data Not Available

**Table 14: Roughness Coefficients**

Flooding Source	Channel “n”	Overbank “n”
Clarks Fork Yellowstone River (near Bridger)	0.032 – 0.050	0.042 – 0.090
Clarks Fork Yellowstone River (at Fromberg)	0.028 – 0.055	0.050 – 0.080
Rock Creek (Lower)	0.050 – 0.065	0.060 – 0.085
Rock Creek (Upper)	0.045 – 0.080	0.050 – 0.100
Yellowstone River	0.028	0.035 – 0.100

### 5.3 Coastal Analyses

This section is not applicable to this Flood Risk Project.

**Table 15: Summary of Coastal Analyses**

[Not applicable to this Flood Risk Project]

#### 5.3.1 Total Stillwater Elevations

This section is not applicable to this Flood Risk Project.

**Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas**

[Not applicable to this Flood Risk Project]

**Table 16: Tide Gage Analysis Specifics**

[Not applicable to this Flood Risk Project]

#### 5.3.2 Waves

This section is not applicable to this Flood Risk Project.

#### 5.3.3 Coastal Erosion

This section is not applicable to this Flood Risk Project.

#### 5.3.4 Wave Hazard Analyses

This section is not applicable to this Flood Risk Project.

**Table 17: Coastal Transect Parameters**

[Not applicable to this Flood Risk Project]

**Figure 9: Transect Location Map**

[Not applicable to this Flood Risk Project]

**5.4 Alluvial Fan Analyses**

This section is not applicable to this Flood Risk Project.

**Table 18: Summary of Alluvial Fan Analyses**

[Not applicable to this Flood Risk Project]

**Table 19: Results of Alluvial Fan Analyses**

[Not applicable to this Flood Risk Project]

**SECTION 6.0 – MAPPING METHODS**

**6.1 Vertical and Horizontal Control**

All FIS Reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS Reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS Reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS Report and on the FIRMs are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between NGVD29 and NAVD88 or other datum conversion, visit the National Geodetic Survey website at [www.ngs.noaa.gov](http://www.ngs.noaa.gov), or contact the National Geodetic Survey at the following address:

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

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 archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please contact information services Branch of the NGS at (301) 713-3242, or visit their website at [www.ngs.noaa.gov](http://www.ngs.noaa.gov).

The datum conversion locations and values that were calculated for Carbon County are provided in Table 21.

**Table 20: Countywide Vertical Datum Conversion**

[Not applicable to this Flood Risk Project]

**Table 21: Stream-Based Vertical Datum Conversion**

Flooding Source	Average Vertical Datum Conversion Factor (feet)
Clarks Fork Yellowstone River	+2.65
Rock Creek (Lower)	+2.72
Rock Creek (Middle)	+3.11
Rock Creek (Upper)	+3.40
Yellowstone River*	N/A

\*A datum conversion factor for the Yellowstone River was not calculated because the restudy of the flooding source was completed in NAVD 1988 datum.

**6.2 Base Map**

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA’s FIRM database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs. Additional information about the FIRM Database and its contents can be found in FEMA’s *Guidelines and Standards for Flood Risk Analysis and Mapping*, <http://www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping>.

Base map information shown on the FIRM was derived from the sources described in Table 22.

**Table 22: Base Map Sources**

Data Type	Data Provider	Data Date	Data Scale	Data Description
Digital Orthophoto	USDA/NAIP	2013	1-meter	Orthophotography
Digital Orthophoto	USDA/NAIP	2009	1-meter	Orthophotography
Base map files	Montana Geographic Information Clearinghouse	2015	*	Political boundaries, rivers, lakes, streams, in digital format
Base map files	Montana Geographic Information Clearinghouse	2012	*	Political boundaries, rivers, lakes, streams, in digital format

### 6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 23.

In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% 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.

The floodway widths presented in this FIS Report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 24, "Floodway Data."

Certain flooding sources may have been studied that do not have published BFEs on the FIRMs, or for which there is a need to report the 1% annual chance flood elevations at selected cross sections because a published Flood Profile does not exist in this FIS Report. These streams may have also been studied using methods to determine non-encroachment zones rather than floodways. For these flooding sources, the 1% annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 23. All topographic data used for modeling or mapping has been converted as necessary to NAVD 88. The 1% annual chance elevations for selected cross sections along these flooding sources, along with their non-encroachment widths, if calculated, are shown in Table 25, "Flood Hazard and Non-Encroachment Data for Selected Streams."

In Montana, however, encroachment in the floodplain is limited to that which will cause an increase in flood heights of 0.5 foot. Thus, at the recommendation of the Montana Department of Natural Resources, Floodplain Management Bureau, a floodway having no more than a 0.5-foot surcharge was delineated for the Clarks Fork Yellowstone River and the Yellowstone River studies.

**Table 23: Summary of Topographic Elevation Data used in Mapping**

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Scale	Contour Interval	Citation
Carbon County (Unincorporated Areas)	Clarks Fork Yellowstone River	Between cross sections, boundaries were interpolated using topographic maps	1:24,000	20 feet	US Department of Interior 1960
Carbon County/Stillwater County	Yellowstone River	Between cross sections, boundaries were interpolated using topographic maps	1:4,800	2 feet	LiDAR Collection in May 2004 by Merrick and Company
Carbon County/Yellowstone County	Yellowstone River	Between cross sections, boundaries were interpolated using topographic maps	1: 4,800	4 feet	LiDAR Collection in May 2004 by Merrick and Company

\*Data Not Available

BFEs shown at cross sections on the FIRM represent the 1% annual chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations.

**Table 24: Floodway Data**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	29,366	1,085 <sup>2</sup>	3,134	4.5	3,306.5	3,306.5	3,306.6	0.1
B	31,700	770 <sup>2</sup>	2,238	6.3	3,310.9	3,310.9	3,310.9	0.0
C	33,885	714 <sup>2</sup>	2,569	5.5	3,315.9	3,315.9	3,316.1	0.2
D	35,078	383 <sup>2</sup>	2,200	6.4	3,318.3	3,318.3	3,318.7	0.4
E	37,399	970 <sup>2</sup>	3,358	4.2	3,323.2	3,323.2	3,323.6	0.4
F	38,730	348 <sup>2</sup>	2,130	6.6	3,325.6	3,325.6	3,325.9	0.3
G	40,724	702 <sup>2</sup>	3,856	3.7	3,328.5	3,328.5	3,328.8	0.3
H	42,899	812 <sup>2</sup>	1,787	7.9	3,333.8	3,333.8	3,333.9	0.1
I	44,502	1,143 <sup>2</sup>	4,478	3.2	3,339.0	3,339.0	3,339.4	0.4
J	46,065	1,244	2,873	4.9	3,341.9	3,341.9	3,342.1	0.2
K	47,371	3,638	3,712	3.8	3,345.3	3,345.3	3,345.3	0.0
L	47,787	1,904	1,918	7.4	3,346.5	3,346.5	3,346.5	0.0
M	50,742	3,137	4,842	2.9	3,354.2	3,354.2	3,354.3	0.1
N	52,655	2,410	3,695	3.8	3,358.3	3,358.3	3,358.6	0.3
O	53,658	2,148	4,947	2.9	3,360.9	3,360.9	3,361.3	0.4
P	54,572	1,150	2,084	6.8	3,362.5	3,362.5	3,362.6	0.1
Q	55,548	1,035	4,094	3.5	3,364.4	3,364.4	3,364.6	0.2
R	56,745	580	1,566	9.0	3,365.8	3,365.8	3,365.8	0.0
S	58,511	942	2,974	4.8	3,371.9	3,371.9	3,372.2	0.3
T	59,923	427	2,167	6.5	3,374.0	3,374.0	3,374.5	0.5
U	60,914	269	1,860	7.6	3,376.1	3,376.1	3,376.5	0.4
V	62,030	248	2,069	6.8	3,378.8	3,378.8	3,378.8	0.0

<sup>1</sup>Feet above confluence with Yellowstone River

<sup>2</sup>Width extends beyond county limits

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MONTANA**  
 AND INCORPORATED AREAS

**FLOODWAY DATA**

**FLOODING SOURCE: CLARKS FORK YELLOWSTONE RIVER**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
W	62,555	758	3,313	4.3	3,379.7	3,379.7	3,380.1	0.4
X	63,158	752	2,669	5.3	3,381.1	3,381.1	3,381.2	0.1
Y	66,184	1,093	3,689	3.8	3,386.5	3,386.5	3,386.6	0.1
Z	67,544	1,085	3,525	4.0	3,388.2	3,388.2	3,388.6	0.4
AA	68,980	424	2,143	6.6	3,391.0	3,391.0	3,391.4	0.4
AB	70,050	511	3,069	4.6	3,393.0	3,393.0	3,393.4	0.5
AC	71,763	290	1,723	8.2	3,396.0	3,396.0	3,396.1	0.1
AD	73,567	451	2,536	5.6	3,400.6	3,400.6	3,400.6	0.0
AE	74,046	237	1,891	7.5	3,401.3	3,401.3	3,401.3	0.0
AF	75,030	280	2,106	6.7	3,403.1	3,403.1	3,403.3	0.2
AG	75,917	237	1,810	7.8	3,404.6	3,404.6	3,404.9	0.3
AH	152,894	707	3,202	4.4	3,508.0	3,508.0	3,508.5	0.5
AI	155,784	288	2,292	6.2	3,513.8	3,513.8	3,514.1	0.3
AJ	157,764	902	4,180	3.4	3,517.3	3,517.3	3,517.6	0.3
AK	158,714	370	2,485	5.7	3,518.4	3,518.4	3,518.8	0.4
AL	159,994	1,748	3,146	4.5	3,520.7	3,520.7	3,521.2	0.5
AM	161,194	776	2,582	5.5	3,523.4	3,523.4	3,523.8	0.4
AN	161,943	405	3,202	4.4	3,525.9	3,525.9	3,526.3	0.4
AO	163,643	289	2,363	6.0	3,528.1	3,528.1	3,528.6	0.5
AP	165,543	1,032	4,963	2.8	3,530.3	3,530.3	3,530.8	0.5
AQ	168,594	555	1,474	9.6	3,535.1	3,535.1	3,535.4	0.3
AR	228,791	222	1,591	8.9	3,648.6	3,648.6	3,648.6	0.0
AS	231,091	443	2,729	5.2	3,655.5	3,655.5	3,655.7	0.2

<sup>1</sup>Feet above confluence with Yellowstone River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MONTANA**  
AND INCORPORATED AREAS

**FLOODWAY DATA**

**FLOODING SOURCE: CLARKS FORK YELLOWSTONE RIVER**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AT	232,347	288	2,183	6.5	3,657.6	3,657.6	3,657.9	0.3
AU	233,301	231	1,649	8.6	3,658.9	3,658.9	3,659.1	0.2
AV	235,522	1,500	5,932	2.4	3,663.5	3,663.5	3,663.8	0.3
AW	238,532	1,060/143 <sup>2</sup>	3,899	3.6	3,668.4	3,668.4	3,668.8	0.4

<sup>1</sup>Feet above confluence with Yellowstone River

<sup>2</sup>Left channel/right channel

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

**CARBON COUNTY, MONTANA**

AND INCORPORATED AREAS

**FLOODWAY DATA**

**FLOODING SOURCE: CLARKS FORK YELLOWSTONE RIVER**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	2,400	1,450	2,709	3.6	3,417.4	3,417.4	3,417.9	0.5
B	4,790	1,430	5,351	1.8	3,431.4	3,431.4	3,431.5	0.1
C	7,240	930	2,943	3.3	3,446.6	3,446.6	3,447.0	0.4
D	8,710	1,256	2,108	4.6	3,455.5	3,455.5	3,455.9	0.4
E	10,330	1,150	2,864	3.4	3,467.9	3,467.9	3,468.4	0.5
F	12,680	600	3,289	2.9	3,485.2	3,485.2	3,485.3	0.1
G	13,790	500	1,317	7.3	3,487.7	3,487.7	3,488.2	0.5
H	15,240	600	2,641	3.7	3,498.2	3,498.2	3,498.2	0.0
I	17,380	548	1,577	6.1	3,510.3	3,510.3	3,510.7	0.4
J	19,730	500	2,113	4.6	3,530.9	3,530.9	3,531.2	0.3
K	23,530	692	1,718	5.6	3,559.6	3,559.6	3,559.9	0.3
L	25,080	1,100	5,457	1.8	3,574.7	3,574.7	3,575.1	0.4
M	27,830	569	1,161	8.3	3,588.5	3,588.5	3,588.5	0.0
N	31,190	765	3,107	3.1	3,616.2	3,616.2	3,616.6	0.4
O	32,390	391	1,508	6.4	3,622.5	3,622.5	3,622.9	0.4
P	36,430	468	2,123	4.5	3,647.7	3,647.7	3,648.2	0.5
Q	42,270	804	1,898	5.1	3,686.3	3,686.3	3,686.5	0.2
R	44,490	604	2,179	4.4	3,708.3	3,708.3	3,708.8	0.5
S	47,270	407	1,539	6.3	3,726.6	3,726.6	3,726.9	0.3
T	47,960	500	1,851	5.2	3,730.0	3,730.0	3,730.3	0.3
U	49,520	333	1,623	6.0	3,739.9	3,739.9	3,740.4	0.5
V	54,380	853	2,497	3.9	3,770.5	3,770.5	3,770.9	0.4

<sup>1</sup>Feet above confluence with Clarks Fork Yellowstone River

TABLE 24

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**CARBON COUNTY, MONTANA**

**AND INCORPORATED AREAS**

**FLOODWAY DATA**

**FLOODING SOURCE: ROCK CREEK (LOWER)**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
W	56,180	403	1,524	6.3	3,783.6	3,783.6	3,784.0	0.4
X	59,010	379	1,017	9.5	3,803.9	3,803.9	3,803.9	0.0
Y	61,010	882	3,328	2.9	3,818.1	3,818.1	3,818.6	0.5

<sup>1</sup>Feet above confluence with Clarks Fork Yellowstone River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MONTANA**  
 AND INCORPORATED AREAS

**FLOODWAY DATA**

**FLOODING SOURCE: ROCK CREEK (LOWER)**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	0	576	1,421	4.2	4,369.6	4,369.6	4,370.0	0.4
B	2,360	389	1,211	5.0	4,397.4	4,397.4	4,397.4	0.0
C	3,970	224	663	9.0	4,413.0	4,413.0	4,413.0	0.0
D	5,580	500	1,067	5.6	4,430.8	4,430.8	4,430.8	0.0
E	7,300	211	760	7.9	4,448.7	4,448.7	4,448.7	0.0
F	9,100	474	1,109	5.4	4,468.4	4,468.4	4,468.9	0.5
G	11,850	137	580	10.3	4,503.1	4,503.1	4,503.1	0.0
H	14,450	120	645	9.3	4,532.3	4,532.3	4,532.3	0.0
I	16,090	178	684	8.1	4,547.9	4,547.9	4,548.0	0.1
J	17,820	304	810	6.9	4,567.6	4,567.6	4,567.6	0.0
K	19,680	263	679	8.2	4,593.6	4,593.6	4,593.6	0.0
L	23,430	395	813	6.9	4,638.0	4,638.0	4,638.0	0.0
M	26,290	730	1,328	4.2	4,674.0	4,674.0	4,674.3	0.3
N	29,500	291	639	8.7	4,709.9	4,709.9	4,709.9	0.0
O	34,170	500	1,332	4.2	4,759.6	4,759.6	4,759.9	0.3
P	38,100	437	1,015	5.5	4,802.9	4,802.9	4,803.2	0.3
Q	39,800	412	1,115	5.0	4,821.8	4,821.8	4,822.2	0.4
R	41,170	329	713	7.8	4,838.7	4,838.7	4,838.9	0.2
S	42,540	618	1,352	4.1	4,855.4	4,855.4	4,855.4	0.0
T	44,330	267	702	7.9	4,878.0	4,878.0	4,878.1	0.1

<sup>1</sup>Feet above limit of detailed study\*

\*Limit of detailed study is approximately 4,035 feet downstream of U.S. Highway 212

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARBON COUNTY, MONTANA

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: ROCK CREEK (MIDDLE)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	3,680	421	915	6.1	4,941.0	4,941.0	4,941.4	0.4
B	5,230	565	1,180	4.7	4,961.4	4,961.4	4,961.6	0.2
C	7,000	695	968	5.8	4,985.4	4,985.4	4,985.8	0.4
D	8,340	412	1,495	3.7	5,002.5	5,002.5	5,002.5	0.0
E	10,260	461	782	7.1	5,030.2	5,030.2	5,030.3	0.1
F	12,750	284	1,021	5.5	5,057.6	5,057.6	5,057.9	0.3
G	15,340	427	750	7.4	5,101.2	5,101.2	5,102.2	1.0
H	16,820	541	1,277	4.4	5,123.3	5,123.3	5,123.5	0.2
I	18,820	440	888	6.3	5,149.1	5,149.1	5,149.2	0.1
J	20,460	411	1,072	5.2	5,172.7	5,172.7	5,172.8	0.1
K	23,590	476	976	5.7	5,213.7	5,213.7	5,213.9	0.2
L	25,690	493	1,140	4.9	5,244.5	5,244.5	5,244.6	0.1
M	27,270	512	1,061	5.3	5,264.7	5,264.7	5,264.8	0.1
N	28,950	609	1,461	3.8	5,287.3	5,287.3	5,287.5	0.2
O	30,310	250	679	8.2	5,308.9	5,308.9	5,308.9	0.0
P	31,400	340	948	5.9	5,325.0	5,325.0	5,325.5	0.5
Q	32,810	347	867	6.4	5,345.2	5,345.2	5,345.2	0.0
R	35,280	380	1,450	3.8	5,388.8	5,388.8	5,388.8	0.0
S	36,940	492	1,272	4.4	5,407.0	5,407.0	5,407.2	0.2
T	40,850	600	3,636	1.5	5,474.3	5,474.3	5,474.3	0.0
U	41,130	279	1,222	4.6	5,474.4	5,474.4	5,474.4	0.0
V	41,830	150	1,796	3.1	5,490.3	5,490.3	5,490.3	0.0

<sup>1</sup>Feet above Rock Creek (Middle)

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MONTANA**  
AND INCORPORATED AREAS

**FLOODWAY DATA**

**FLOODING SOURCE: ROCK CREEK (UPPER)**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
W	44,010	113	477	11.7	5,516.8	5,516.8	5,516.8	0.0
X	45,950	140	699	7.4	5,546.9	5,546.9	5,546.9	0.0
Y	47,380	150	694	8.0	5,568.5	5,568.5	5,568.5	0.0
Z	49,010	721	1,857	2.8	5,594.9	5,594.9	5,595.4	0.5
AA	49,910	63/80 <sup>2</sup>	555	9.3	5,610.9	5,610.9	5,611.1	0.2
AB	50,910	63	373	13.9	5,630.8	5,630.8	5,630.8	0.0

<sup>1</sup>Feet above Rock Creek (Middle)

<sup>2</sup>Left Channel/Right Channel

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARBON COUNTY, MONTANA

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: ROCK CREEK (UPPER)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET) <sup>2</sup>	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	3,386	2,312	9,739	5.8	3,292.2	3,292.2	3,292.4	0.2
B	6,979	1,407	7,901	7.6	3,300.1	3,300.1	3,300.4	0.3
C	9,610	1,636	9,360	6.1	3,304.2	3,304.2	3,304.6	0.4
D	14,293	991	7,869	7.2	3,311.1	3,311.1	3,311.3	0.2
E	18,859	1,866	7,501	7.6	3,318.1	3,318.1	3,318.5	0.4
F	21,378	2,017	8,900	6.4	3,322.7	3,322.7	3,323.1	0.4
G	22,217	2,066	9,962	5.7	3,324.2	3,324.2	3,324.6	0.4
H	25,057	858	6,033	9.4	3,328.0	3,328.0	3,328.4	0.4
I	29,826	2,684 <sup>3</sup>	6,001	9.5	3,337.1	3,337.1	3,337.5	0.4
J	34,362	2,820 <sup>3</sup>	8,079	7.0	3,346.8	3,346.8	3,347.0	0.2
K	37,570	1,228	6,002	9.5	3,353.2	3,353.2	3,353.5	0.3
L	38,966	2,175	7,931	7.2	3,357.8	3,357.8	3,357.8	0.0
M	42,765	2,855	8,106	7.0	3,362.5	3,362.5	3,362.7	0.2
N	45,013	2,051	8,427	6.7	3,367.1	3,367.1	3,367.4	0.3
O	48,328	1,597	7,120	8.0	3,373.1	3,373.1	3,373.4	0.3
P	51,794	883	6,497	8.7	3,378.8	3,378.8	3,379.3	0.5
Q	55,079	781	7,387	7.7	3,385.7	3,385.7	3,385.9	0.2
R	57,665	928	6,469	8.8	3,389.4	3,389.4	3,389.5	0.1
S	59,988	1,567	7,603	7.5	3,393.4	3,393.4	3,393.5	0.1
T	61,914	863	5,138	11.0	3,397.1	3,397.1	3,397.2	0.1
U	64,117	549	6,151	9.2	3,402.6	3,402.6	3,402.9	0.3
V	66,474	492	5,612	10.1	3,406.9	3,406.9	3,407.0	0.1

<sup>1</sup>Feet above limit of detailed study. Limit of detailed study is located just north of the Carbon County boundary within the Yellowstone River Split Flow Reach.

<sup>2</sup>Floodway width extends beyond county limits

<sup>3</sup>Floodway topwidth includes width of high ground area

TABLE 24

**FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MONTANA  
AND INCORPORATED AREAS**

**FLOODWAY DATA**

**FLOODING SOURCE: YELLOWSTONE RIVER**

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
W	67,427	1,031	7,039	8.1	3,409.1	3,409.1	3,409.1	0.0
X	68,956	995	5,595	10.1	3,411.1	3,411.1	3,411.1	0.0
Y	71,539	509	4,606	12.3	3,415.7	3,415.7	3,416.1	0.4
Z	74,980	1,407	5,056	11.2	3,422.2	3,422.2	3,422.2	0.0
AA	79,378	1,417	6,819	8.3	3,429.7	3,429.7	3,430.2	0.5
AB	82,490	627	5,429	10.4	3,436.3	3,436.3	3,436.3	0.0
AC	84,698	1,048	8,573	6.6	3,441.2	3,441.2	3,441.2	0.0
AD	86,771	1,538	4,390	13.4	3,443.5	3,443.5	3,443.6	0.1
AE	89,320	1,309	6,252	9.8	3,449.6	3,449.6	3,450.1	0.5
AF	91,866	1,356	9,139	7.2	3,455.4	3,455.4	3,455.7	0.3
AG	93,240	2,076	7,342	10.3	3,456.6	3,456.6	3,456.9	0.3
AH	95,151	2,183 <sup>3</sup>	7,637	8.6	3,459.9	3,459.9	3,460.2	0.3
AI	96,898	1,428 <sup>3</sup>	5,954	9.5	3,463.6	3,463.6	3,463.7	0.1
AJ	100,051	2,165 <sup>3</sup>	7,189	8.0	3,470.6	3,470.6	3,470.6	0.0
AK	103,871	1,011	8,098	7.1	3,479.3	3,479.3	3,479.3	0.0
AL	106,147	1,706	8,524	6.7	3,482.6	3,482.6	3,482.7	0.1
AM	108,423	1,273	5,702	9.9	3,486.2	3,486.2	3,486.2	0.0

<sup>1</sup>Feet above limit of detailed study. Limit of detailed study is located just north of the Carbon County boundary within the Yellowstone River Split Flow Reach.

<sup>2</sup>Floodway width extends beyond county limits

<sup>3</sup>Floodway topwidth includes width of high ground area

TABLE 24

**FEDERAL EMERGENCY MANAGEMENT AGENCY**

**CARBON COUNTY, MONTANA**

**AND INCORPORATED AREAS**

**FLOODWAY DATA**

**FLOODING SOURCE: YELLOWSTONE RIVER**

## **Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams**

[Not applicable to this Flood Risk Project]

### **6.4 Coastal Flood Hazard Mapping**

This section is not applicable to this Flood Risk Project

## **Table 26: Summary of Coastal Transect Mapping Considerations**

[Not applicable to this Flood Risk Project]

### **6.5 FIRM Revisions**

This FIS Report and the FIRM are based on the most up-to-date information available to FEMA at the time of its publication; however, flood hazard conditions change over time. Communities or private parties may request flood map revisions at any time. Certain types of requests require submission of supporting data. FEMA may also initiate a revision. Revisions may take several forms, including Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs) (referred to collectively as Letters of Map Change (LOMCs)), Physical Map Revisions (PMRs), and FEMA-contracted restudies. These types of revisions are further described below. Some of these types of revisions do not result in the republishing of the FIS Report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data (shown in Table 31, “Map Repositories”).

#### **6.5.1 Letters of Map Amendment**

A LOMA is an official revision by letter to an effective NFIP map. A LOMA results from an administrative process that involves the review of scientific or technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a specific property is not located in a SFHA. A LOMA cannot be issued for properties located on the PFD (primary frontal dune).

To obtain an application for a LOMA, visit <http://www.fema.gov> and download the form “MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill”. Visit the “Flood Map-Related Fees” section to determine the cost, if any, of applying for a LOMA.

FEMA offers a tutorial on how to apply for a LOMA. The LOMA Tutorial Series can be accessed at [http://www.fema.gov/plan/prevent/fhm/ot\\_lmreq.shtm](http://www.fema.gov/plan/prevent/fhm/ot_lmreq.shtm).

For more information about how to apply for a LOMA, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627).

#### **6.5.2 Letters of Map Revision Based on Fill**

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states FEMA’s determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

Information about obtaining an application for a LOMR-F can be obtained in the same manner as that for a LOMA, by visiting <http://www.fema.gov> for the “MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill” or by calling the FEMA Map Information eXchange, toll free, at 1-877-FEMA MAP (1-877-336-2627). Fees for applying for a LOMR-F, if any, are listed in the “Flood Map-Related Fees” section.

A tutorial for LOMR-F is available at [http://www.fema.gov/plan/prevent/fhm/ot\\_lmreq.shtm](http://www.fema.gov/plan/prevent/fhm/ot_lmreq.shtm).

### **6.5.3 Letters of Map Revision**

A LOMR is an official revision to the currently effective FEMA map. It is used to change flood zones, floodplain and floodway delineations, flood elevations and planimetric features. All requests for LOMRs should be made to FEMA through the chief executive officer of the community, since it is the community that must adopt any changes and revisions to the map. If the request for a LOMR is not submitted through the chief executive officer of the community, evidence must be submitted that the community has been notified of the request.

To obtain an application for a LOMR, visit <http://www.fema.gov> and download the form “MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision”. Visit the “Flood Map-Related Fees” section to determine the cost of applying for a LOMR. For more information about how to apply for a LOMR, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627) to speak to a Map Specialist.

Please note that Table 27 only includes LOMCs that have been issued on the FIRM panels updated by this map revision. For all other areas within this county, users should be aware that revisions to the FIS Report made by prior LOMRs may not be reflected herein and users will need to continue to use the previously issued LOMRs to obtain the most current data.

### **Table 27: Incorporated Letters of Map Change**

**[Not applicable to this Flood Risk Project]**

### **6.5.4 Physical Map Revisions**

PMRs are an official republication of a community’s NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

The community’s chief executive officer must submit scientific and technical data to FEMA to support the request for a PMR. The data will be analyzed and the map will be revised if warranted. The community is provided with copies of the revised information and is afforded a review period. When the base flood elevations are changed, a 90-day appeal period is provided. A 6-month adoption period for formal approval of the revised map(s) is also provided.

For more information about the PMR process, please visit <http://www.fema.gov> and visit the “Flood Map Revision Processes” section.

### **6.5.5 Contracted Restudies**

The NFIP provides for a periodic review and restudy of flood hazards within a given community.

FEMA accomplishes this through a national watershed-based mapping needs assessment strategy, known as the Coordinated Needs Management Strategy (CNMS). The CNMS is used by FEMA to assign priorities and allocate funding for new flood hazard analyses used to update the FIS Report and FIRM. The goal of CNMS is to define the validity of the engineering study data within a mapped inventory. The CNMS is used to track the assessment process, document engineering gaps and their resolution, and aid in prioritization for using flood risk as a key factor for areas identified for flood map updates. Visit [www.fema.gov](http://www.fema.gov) to learn more about the CNMS or contact the FEMA Regional Office listed in Section 8 of this FIS Report.

### 6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of Carbon County. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBM) and/or Flood Boundary and Floodway Maps (FBFM) may have been prepared for the incorporated communities and the unincorporated areas in the county that had identified SFHAs. Current and historical data relating to the maps prepared for the project area are presented in 8, “Community Map History.” A description of each of the column headings and the source of the date is also listed below.

- *Community Name* includes communities falling within the geographic area shown on the FIRM, including those that fall on the boundary line, nonparticipating communities, and communities with maps that have been rescinded. Communities with No Special Flood Hazards are indicated by a footnote. If all maps (FHBM, FBFM, and FIRM) were rescinded for a community, it is not listed in this table unless SFHAs have been identified in this community.
- *Initial Identification Date (First NFIP Map Published)* is the date of the first NFIP map that identified flood hazards in the community. If the FHBM has been converted to a FIRM, the initial FHBM date is shown. If the community has never been mapped, the upcoming effective date or “pending” (for Preliminary FIS Reports) is shown. If the community is listed in Table 28 but not identified on the map, the community is treated as if it were unmapped.
- *Initial FHBM Effective Date* is the effective date of the first Flood Hazard Boundary Map (FHBM). This date may be the same date as the Initial NFIP Map Date.
- *FHBM Revision Date(s)* is the date(s) that the FHBM was revised, if applicable.
- *Initial FIRM Effective Date* is the date of the first effective FIRM for the community. This is the first effective date that is shown on the FIRM panel.
- *FIRM Revision Date(s)* is the date(s) the FIRM was revised, if applicable. This is the revised date that is shown on the FIRM panel, if applicable. As countywide studies are completed or revised, each community listed should have its FIRM dates updated accordingly to reflect the date of the countywide study. Once the FIRMs exist in countywide format, as Physical Map Revisions (PMR) of FIRM panels within the county are completed, the FIRM Revision Dates in the table for each community affected by the PMR are updated with the date of the PMR, even if the PMR did not revise all the panels within that community.

The initial effective date for the Carbon County FIRMs in countywide format was 12/04/2012.

**Table 28: Community Map History**

Community Name	Initial Identification Date (First NFIP Map Published)	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Bearcreek, Town of	12/04/2012	None	None	12/04/2012	None
Bridger, Town of <sup>1</sup>	None	None	None	None	None
Carbon County, Unincorporated Areas	01/02/1979	None	None	11/04/1981	TBD 12/04/2012 08/15/1990
Fromberg, Town of	11/22/1974	None	None	11/04/1981	12/04/2012
Joliet, Town of	12/27/1974	None	None	05/19/1981	12/04/2012
Red Lodge, City of	05/24/1974	05/24/1974	11/14/1975	05/19/1981	12/04/2012

<sup>1</sup> No Special Flood Hazard Areas Identified

## SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

### 7.1 Contracted Studies

Table 29 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

**Table 29: Summary of Contracted Studies Included in this FIS Report**

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
All significant flooding sources	August 15, 1990	Morrison-Maierle, Inc..	H-4027	October 1977	Carbon County, Town of Fromberg, Town of Joliet, City of Red Lodge
	August 15, 1990	U.S. Bureau of Reclamation, Billings, MT	IAA No. EMW-87-E-2551	September 1988	Carbon County
Clarks Fork Yellowstone River	December 4, 2012	USACE	IAA No. EMW-97-IA-0154, Project Order No. 6	*	Carbon County
Yellowstone River	TBD	USACE – Omaha District	*	March 2007	Carbon County

**Table 29: Summary of Contracted Studies Included in this FIS Report (continued)**

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Yellowstone River	TBD	USACE – Omaha District	*	March 2008	Carbon County
Yellowstone River	TBD	USACE – Omaha District	FEMA/MT DNRC Mapping Activity Statement No. 2010-01	July 31, 2011	Carbon County
Yellowstone River	TBD	USACE – Omaha District	FEMA/MT DNRC Mapping Activity Statement No. 2010-01	October 2013	Carbon County

\*Data Not Available

## 7.2 Community Meetings

The dates of the community meetings held for this Flood Risk Project and any previous Flood Risk Projects are shown in Table 30. These meetings may have previously been referred to by a variety of names (Community Coordination Officer (CCO), Scoping, Discovery, etc.), but all meetings represent opportunities for FEMA, community officials, study contractors, and other invited guests to discuss the planning for and results of the project.

**Table 30: Community Meetings**

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Bearcreek, Town of	12/04/2012	04/27/2006	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
		09/22/2011	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
Bridger, Town of	12/04/2012	04/27/2006	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
		09/22/2011	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
Carbon County, Unincorporated Areas	11/04/1981	05/04/1976	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation
		05/13/1980	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation, FEMA
	08/15/1990	09/29/1987	Initial CCO	Carbon County, Montana Department of Natural Resources and Conservation, FEMA, USBR
		12/1/1988	Final CCO	Carbon County, Montana Department of Natural Resources and Conservation, FEMA, USBR
Carbon County, Unincorporated Areas	12/04/2012	04/27/2006	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
		09/22/2011	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
	TBD		Initial CCO	
			Final CCO	

**Table 30: Community Meetings (continued)**

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Fromberg, Town of	11/04/1981	05/04/1976	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation
		05/13/1980	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation, FEMA
	12/04/2012	04/27/2006	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
		09/22/2011	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
Joliet, Town of	05/19/1981	05/04/1976	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation
		05/13/1980	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation, FEMA
Joliet, Town of	12/04/2012	04/27/2006	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
		09/22/2011	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
Red Lodge, City of	05/19/1981	05/04/1976	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation
		05/13/1980	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Montana Department of Natural Resources and Conservation, FEMA
	12/04/2012	04/27/2006	Initial CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA
		09/22/2011	Final CCO	Carbon County, Red Lodge, Fromberg, Joliet, Bearcreek, Montana Department of Natural Resources and Conservation, FEMA

## SECTION 8.0 – ADDITIONAL INFORMATION

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see <http://www.fema.gov>.

The additional data that was used for this project includes the FIS Report and FIRM that were previously prepared for Carbon County (FEMA 2012).

Table 31 is a list of the locations where FIRMs for Carbon County can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

**Table 31: Map Repositories**

Community	Address	City	State	Zip Code
Bearcreek, Town of	17 West 11 <sup>th</sup> Street	Red Lodge	MT	59068
Bridger, Town of	119 West Broadway Avenue	Bridger	MT	59014
Carbon County, Unincorporated Areas	17 West 11 <sup>th</sup> Street	Red Lodge	MT	59068
Fromberg, Town of	118 West River Street	Fromberg	MT	59029
Joliet, Town of	116 South Main	Joliet	MT	59041
Red Lodge, City of	1 South Platte Avenue	Red Lodge	MT	59068

The National Flood Hazard Layer (NFHL) dataset is a compilation of effective FIRM databases and LOMCs. Together they create a GIS data layer for a State or Territory. The NFHL is updated as studies become effective and extracts are made available to the public monthly. NFHL data can be viewed or ordered from the website shown in Table 32.

Table 32 contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the State NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of State and local GIS data in their state.

**Table 32: Additional Information**

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	<a href="http://www.fema.gov">http://www.fema.gov</a>
NFIP website	<a href="http://www.fema.gov/national-flood-insurance-program">http://www.fema.gov/national-flood-insurance-program</a>
NFHL Dataset	<a href="http://msc.fema.gov">http://msc.fema.gov</a>
FEMA Region VIII	Denver Federal Center, Building 710, Box 25267, Denver, CO 80225-0267 303-235-4800
Other Federal Agencies	
USGS website	<a href="http://www.usgs.gov">http://www.usgs.gov</a>
Hydraulic Engineering Center website	<a href="http://www.hec.usace.army.mil">http://www.hec.usace.army.mil</a>
State Agencies and Organizations	
State NFIP Coordinator	Traci Sears MT DNRC, State NFIP Coordinator MT Floodplain Management Program 1492 9 <sup>th</sup> Avenue Helena, MT 59620-1601
State GIS Coordinator	Stuart Kirkpatrick Montana State Library Digital Library Division 1515 East Sixth Avenue PO Box 201800 Helena, MT 59620-1800 Phone: (406) 444-9013 skirkpatrick@mt.gov

## **SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES**

Table 33 includes sources used in the preparation of and cited in this FIS Report as well as additional studies that have been conducted in the study area.

**Table 33: Bibliography and References**

Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/ Editor	Place of Publication	Publication Date/ Date of Issuance	Link
Billings Gazette, 2011	Billings Gazette	<i>Debris built up under bridge causes flood in Joliet</i>		Billings, MT	May 25, 2011	<a href="http://billingsgazette.com/news/state-and-regional/montana/article_76929322-5687-5968-8b8c-le9b50f4bbb4.html">http://billingsgazette.com/news/state-and-regional/montana/article_76929322-5687-5968-8b8c-le9b50f4bbb4.html</a>
FEMA, 1981		<i>Flood Insurance Study, Carbon County, Montana (Unincorporated Areas)</i>			1981	
FEMA, 1990		<i>National Flood Insurance Program – Regulations for Flood plain Management and Flood Hazard Identification</i>			October 1990	
FEMA, 1990	FEMA	<i>Flood Insurance Study, Carbon County, Montana – Unincorporated Areas</i>			August 15, 1990	
FEMA, 2000	FEMA	<i>Flood Insurance Study, Yellowstone County, Montana – Unincorporated Areas</i>			March 21, 2000	
Fromberg Service Club, 1976		<i>Frombera – The Fruit Basket of Carbon County</i>			August 1976	
Montana Department of Community Affairs, 1975		<i>Montana Population Projections 1975-2000</i>	Richard Dodge		August 1975	

**Table 33: Bibliography and References (continued)**

Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/ Editor	Place of Publication	Publication Date/ Date of Issuance	Link
Montana Department of Highways		<i>Aerial Photographs</i>			Rock Creek, Carbon County, Montana (July 10, 1973 and June 18, 1974); Clarks Fork Yellowstone River, At Fromberg (June 18, 1974); Clarks Fork Yellowstone River, Near Bridger (July 10, 1973)	
US Army Corps of Engineers, 2007	USACE, Omaha District	<i>Yellowstone River Corridor Study, Hydrology Draft</i>			March 2007	
US Army Corps of Engineers, 2008	USACE	<i>HEC-River Analysis System, Computer Program, Version 4.0</i>			March 2008	
US Army Corps of Engineers, 2011	USACE, Omaha District	<i>Hydrology Design Report – Yellowstone River, Stillwater County and Sweet Grass County</i>			July 31, 2011	
US Army Corps of Engineers, 2013	USACE, Omaha District	<i>Hydraulic Analysis Report – Yellowstone River, Stillwater County, Montana</i>			October 2013	
US Department of Agriculture, 1975	Soil Conservation Service	<i>Soils Survey, Carbon County Area, Montana</i>			February 1975	

**Table 33: Bibliography and References (continued)**

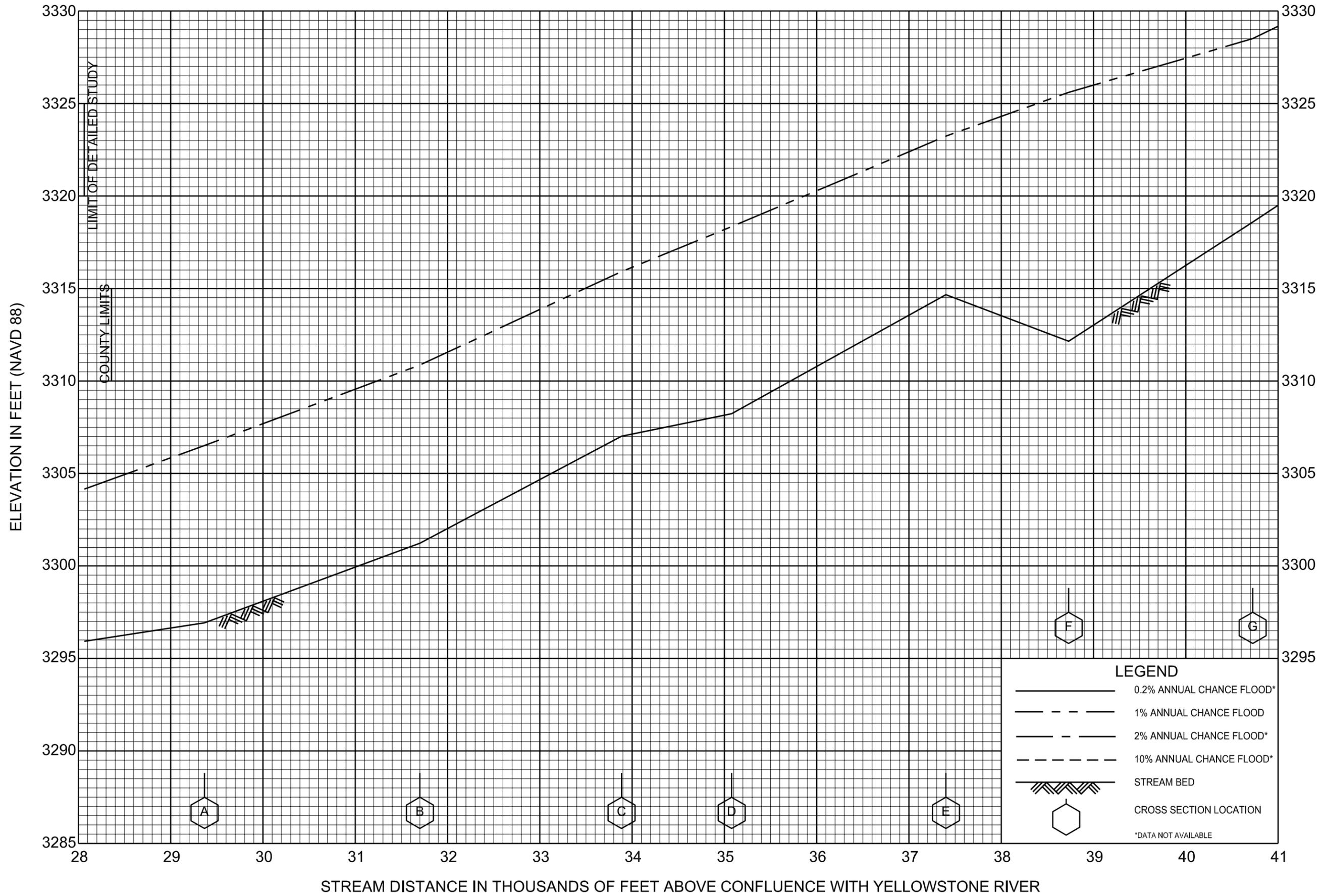
Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/ Editor	Place of Publication	Publication Date/ Date of Issuance	Link
US Department of Agriculture, 1975	Soil Conservation Service	<i>Flood Hazard Analysis, Rosebud Creek Tributaries, Stillwater County, MT</i>			August 1975	
US Department of the Army, 1973	USACE	<i>HEC-2, Water-Surface Profiles, Generalized Computer Program</i>		Davis, California	October 1973	
US Department of Commerce, 1981	Bureau of the Census	<i>1980 Census of Population, Number of Inhabitants, Montana</i>			October 1981	
US Department of Commerce, 2009	Bureau of the Census	<i>2009 Census of Population, Number of Inhabitants, Montana</i>			2009	
US Department of Housing and Urban Development, 1974	Federal Insurance Administration	<i>Flood Hazard Boundary Map, Town of Fromberg, Montana</i>			November 1974	
US Department of Housing and Urban Development, 1974	Federal Insurance Administration	<i>Flood Hazard Boundary Map, Town of Joliet, Montana</i>			December 1974	

**Table 33: Bibliography and References (continued)**

Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/ Editor	Place of Publication	Publication Date/ Date of Issuance	Link
US Department of Housing and Urban Development, 1975	Federal Insurance Administration	<i>Flood Hazard Boundary Map, City of Red Lodge, Montana</i>			November 1975	
US Department of Housing and Urban Development, 1979	Federal Insurance Administration	<i>Flood Hazard Boundary Map, Carbon County, Montana (Unincorporated Areas)</i>			January 1979	
US Department of the Interior, 1960	Geological Survey	<i>7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Intervals 10 and 20 feet; Silensia, Montana; Roscoe NW, Montana; Cooney Reservoir, Montana; Boyd, Montana; Fromberg, Montana; Mackay Ranch, Montana; Bridger, Montana; Red Lodge East, Montana</i>			1956 for all except Red Lodge East (1969)	
US Department of the Interior, 1974	Geological Survey, Montana Department of Natural Resources and Conservation	<i>100-Year Floodplain, Cross Sections and Profiles, Rock Creek near Rockvale, Carbon County, Montana</i>			1974	

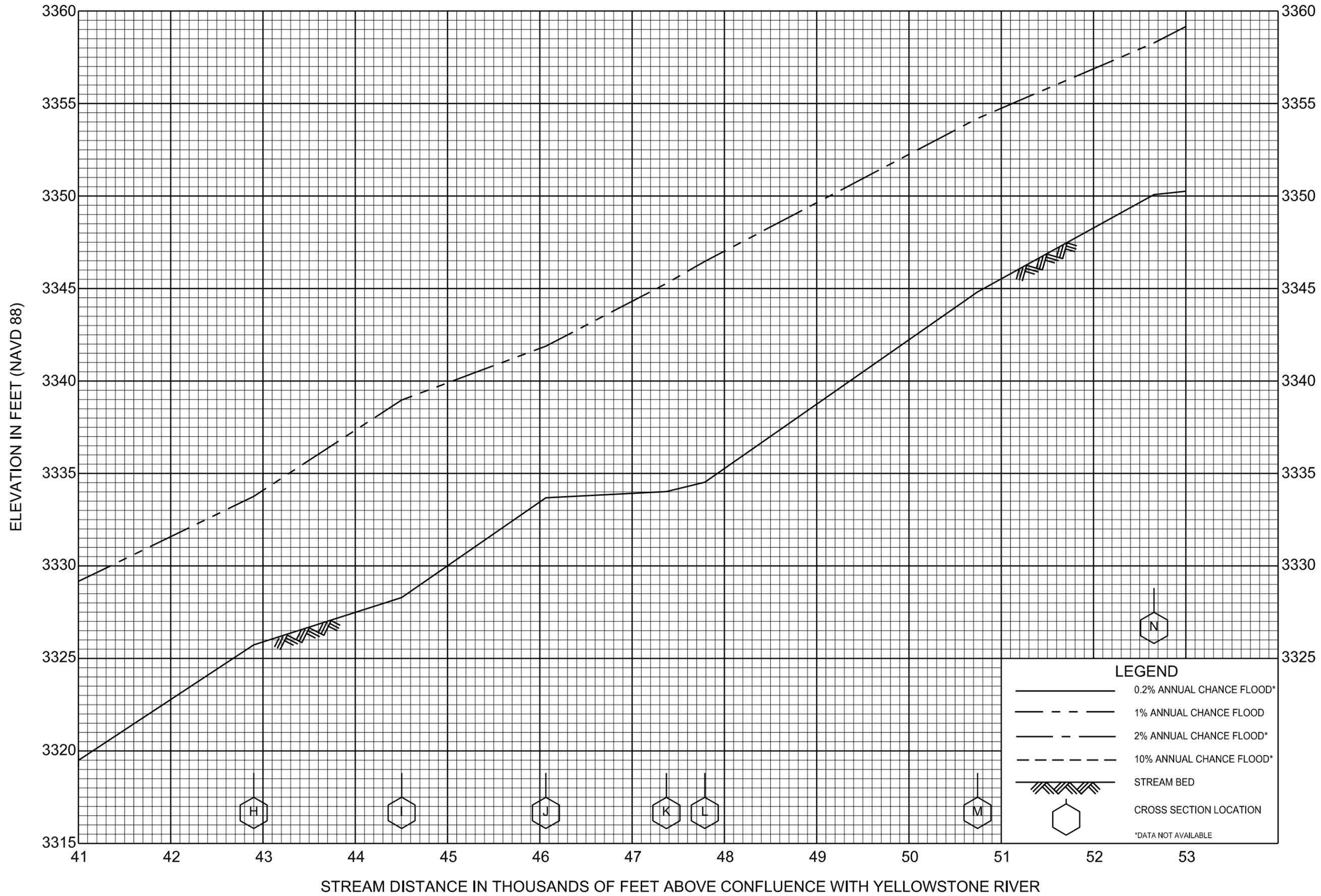
**Table 33: Bibliography and References (continued)**

Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/ Editor	Place of Publication	Publication Date/ Date of Issuance	Link
US Department of the Interior	Geological Survey	<i>1.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Intervals 20 and 40 feet; Red Lodge East; Red Lodge West; Mountmaurice</i>				
US Forest Service		<i>Aerial Photograph-Rock Creek</i>				
US Water Resources Council		<i>A Uniform Technique for Determining Flood Flow Frequencies – Bulletin 15</i>			December 1967	



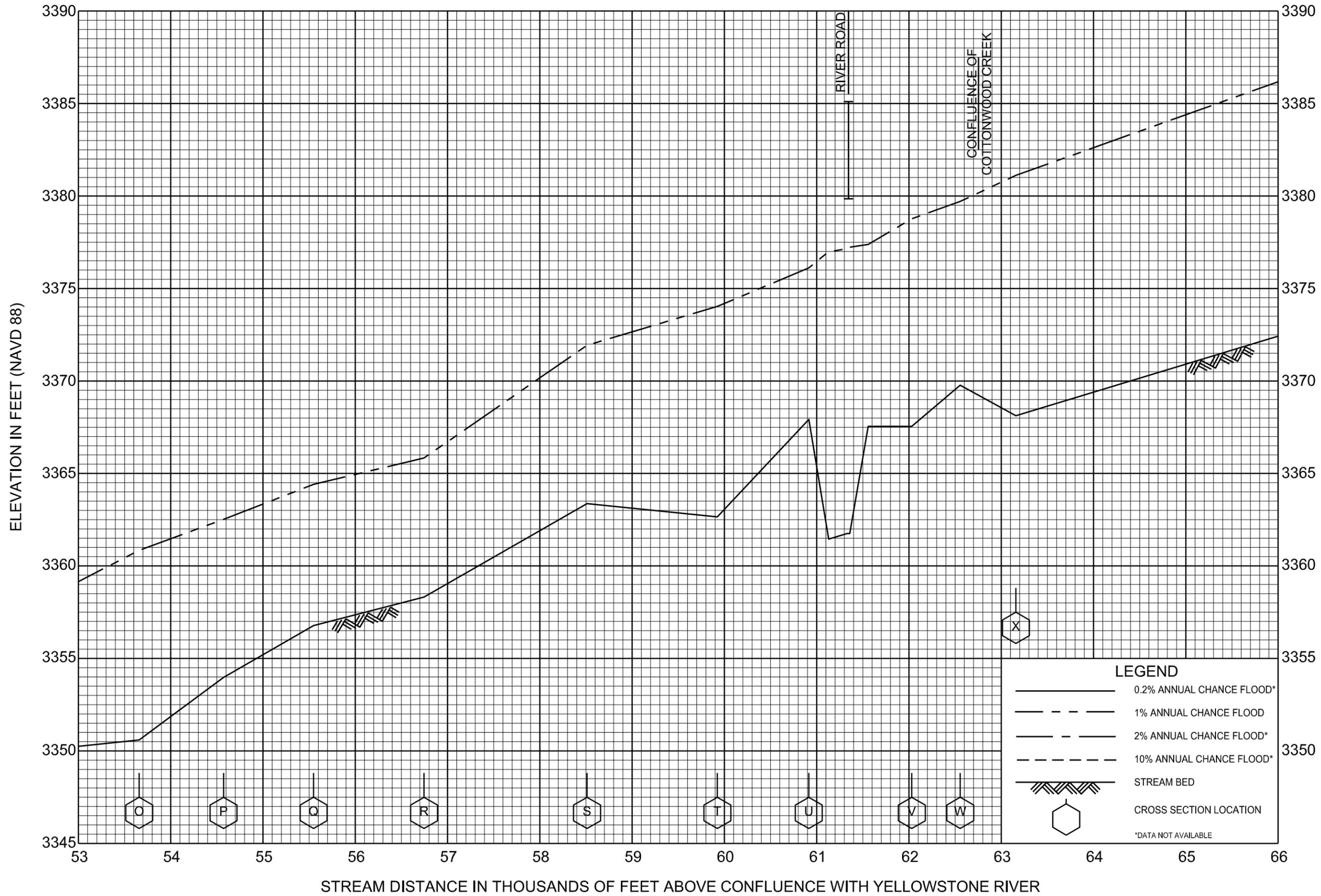
**FLOOD PROFILES**  
**CLARKS FORK YELLOWSTONE RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



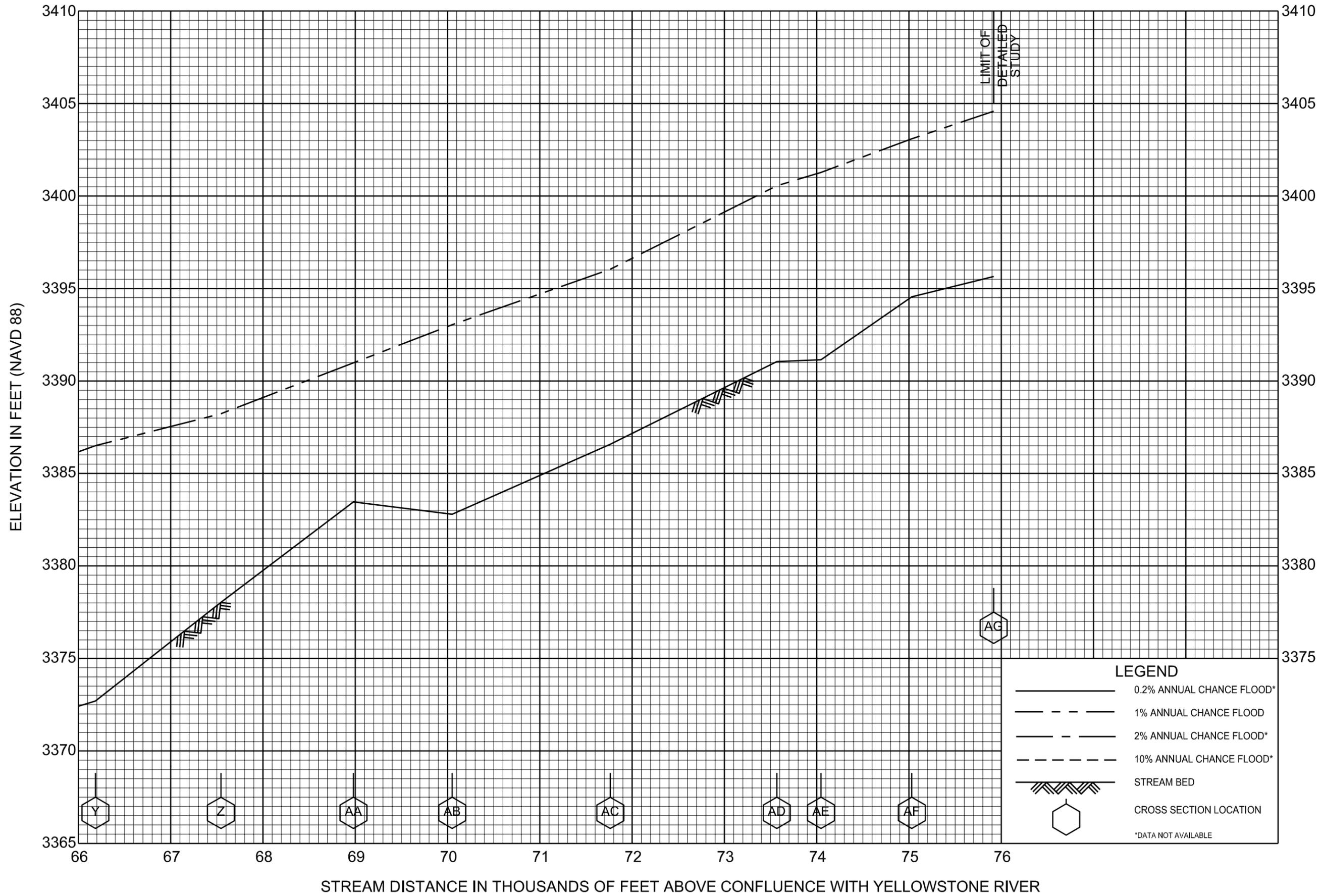
**FLOOD PROFILES**  
**CLARKS FORK YELLOWSTONE RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



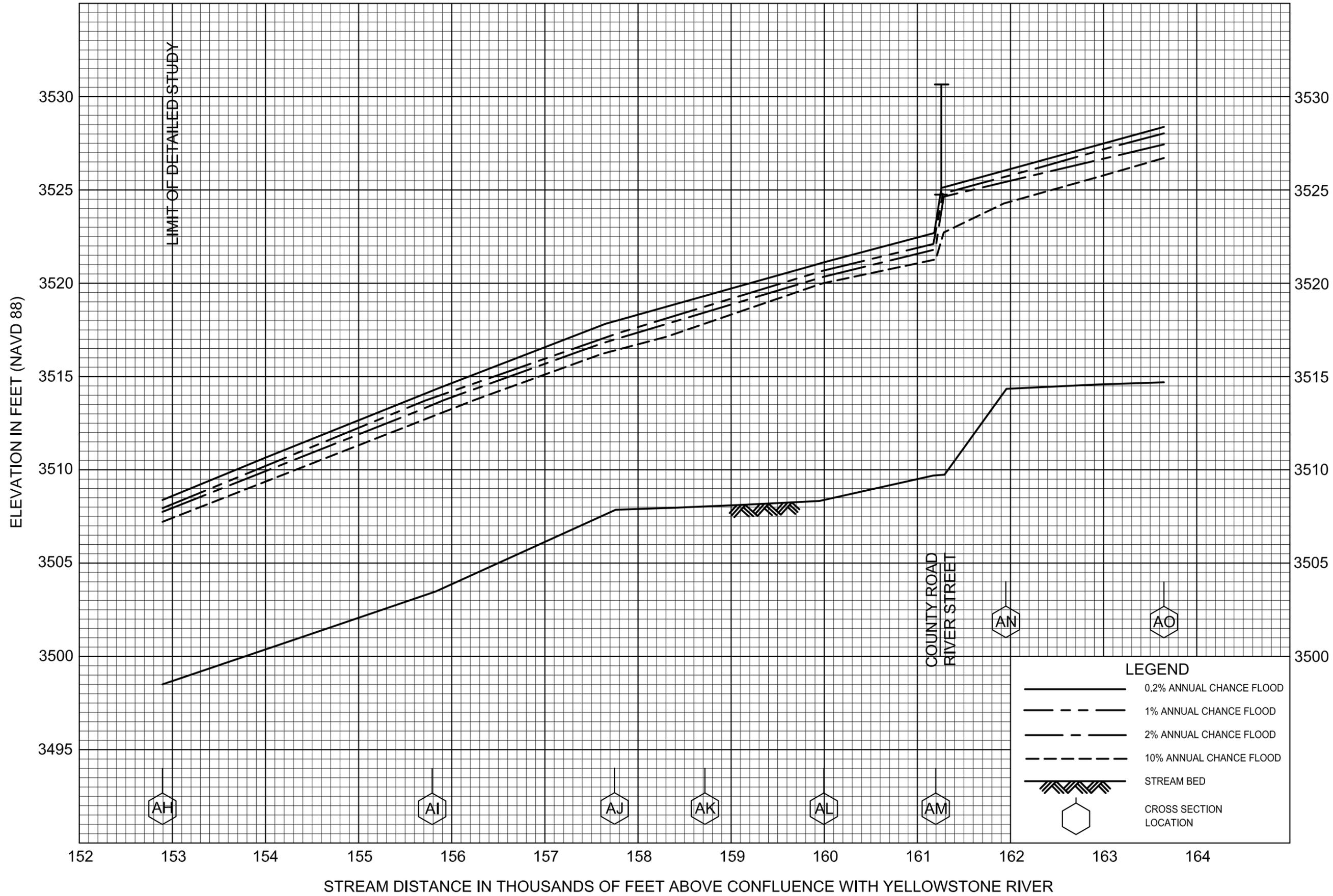
**FLOOD PROFILES**  
**CLARKS FORK YELLOWSTONE RIVER**

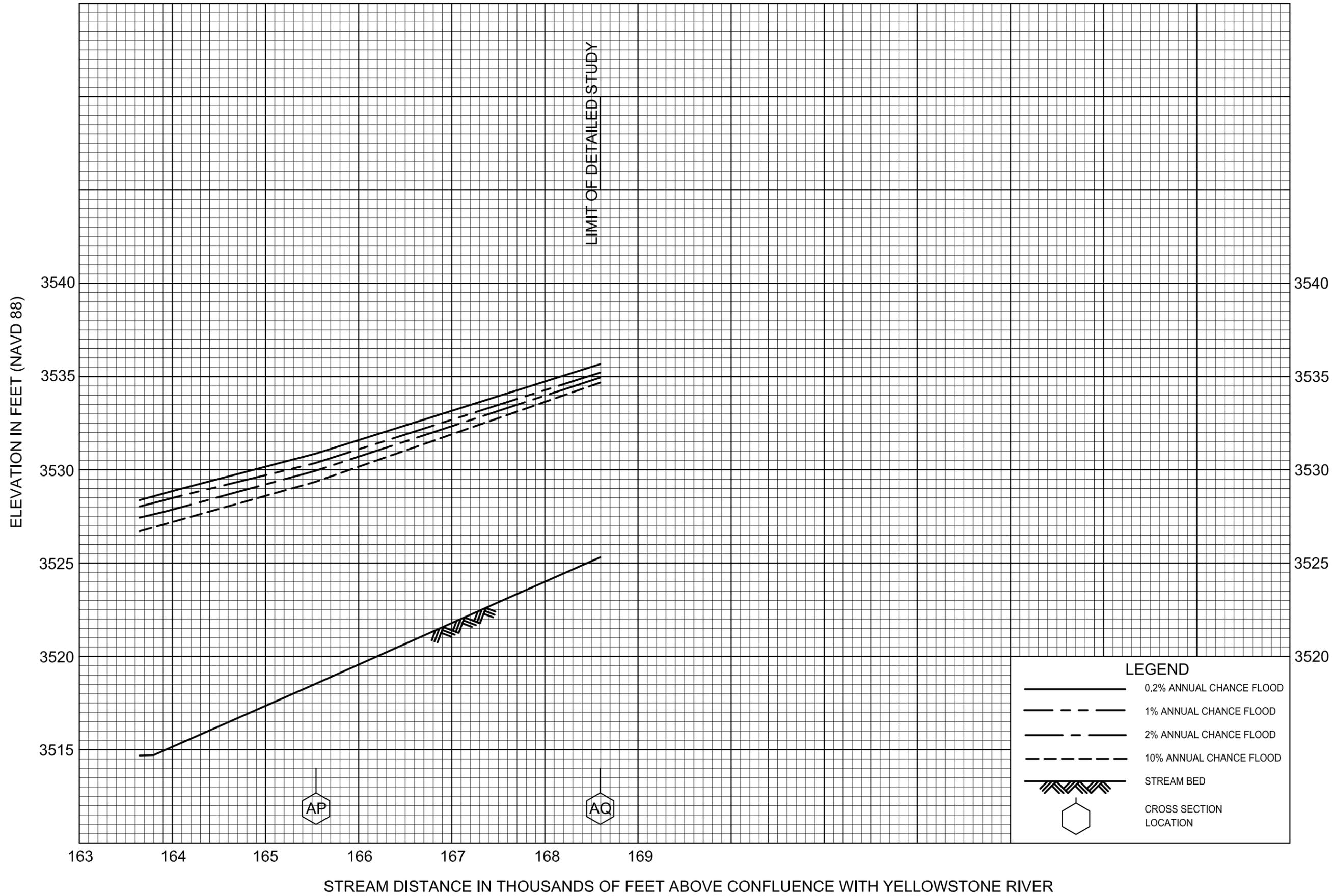
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
 AND INCORPORATED AREAS

**FLOOD PROFILES**  
 CLARKS FORK YELLOWSTONE RIVER

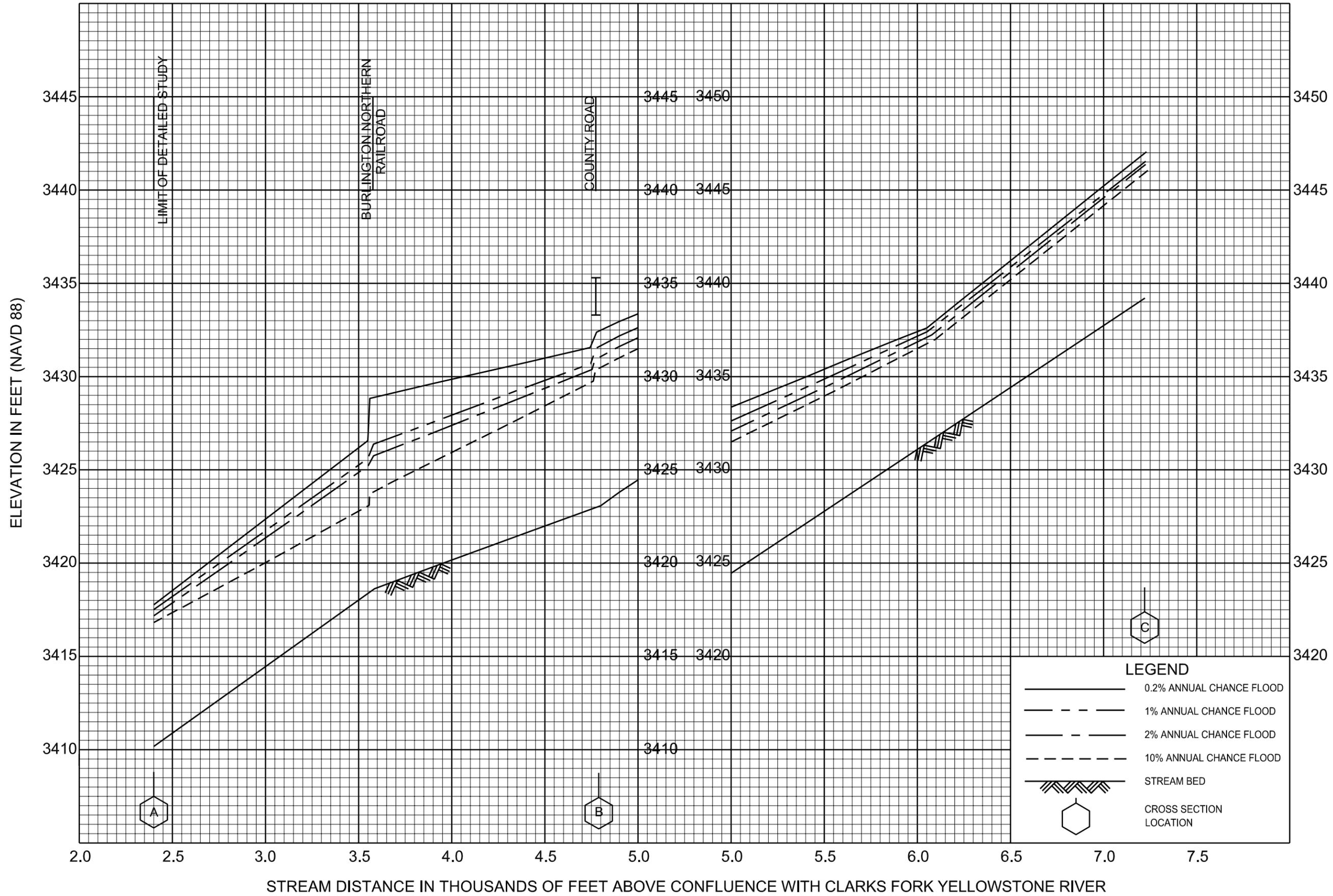




**FLOOD PROFILES**  
CLARKS FORK YELLOWSTONE RIVER

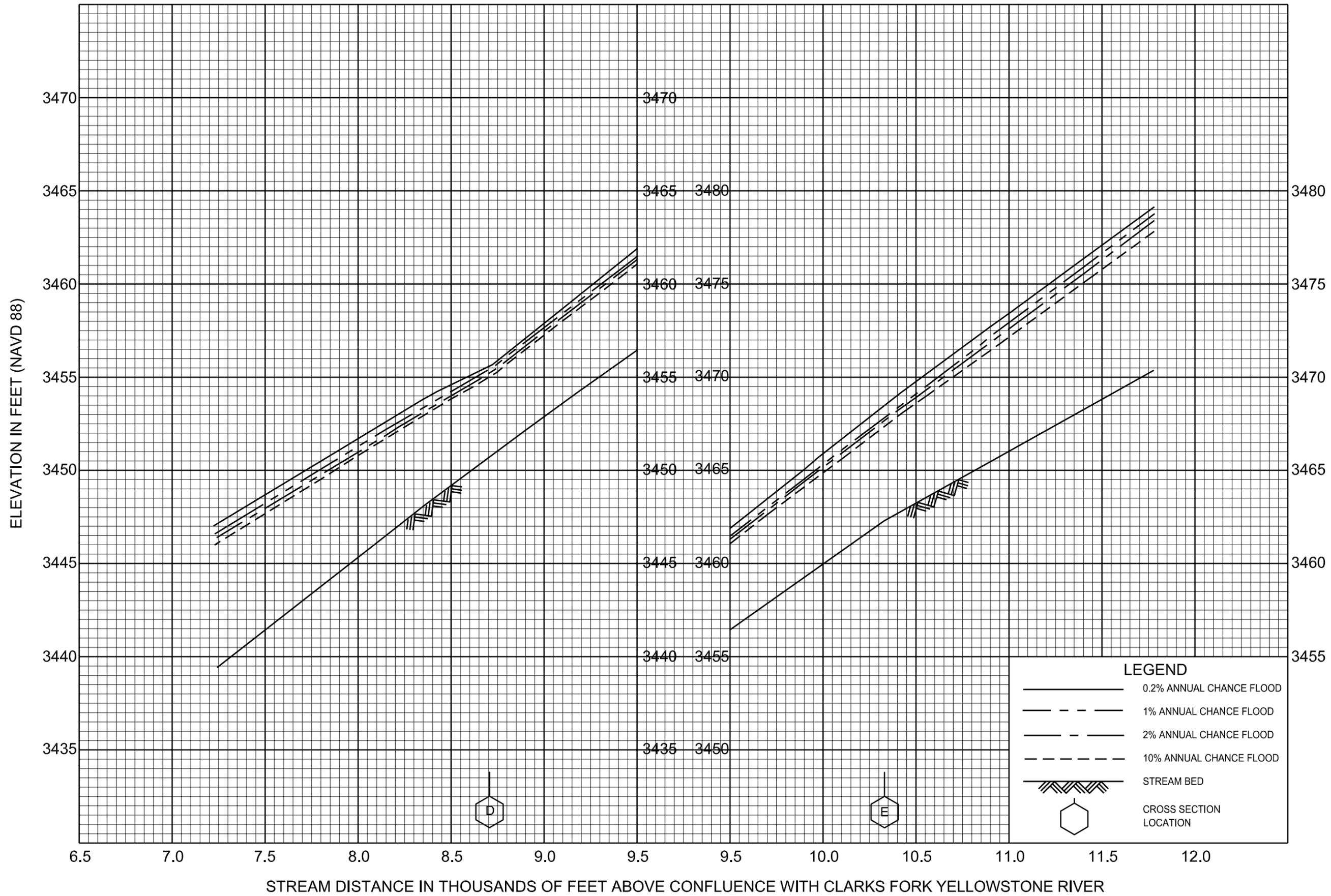
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS





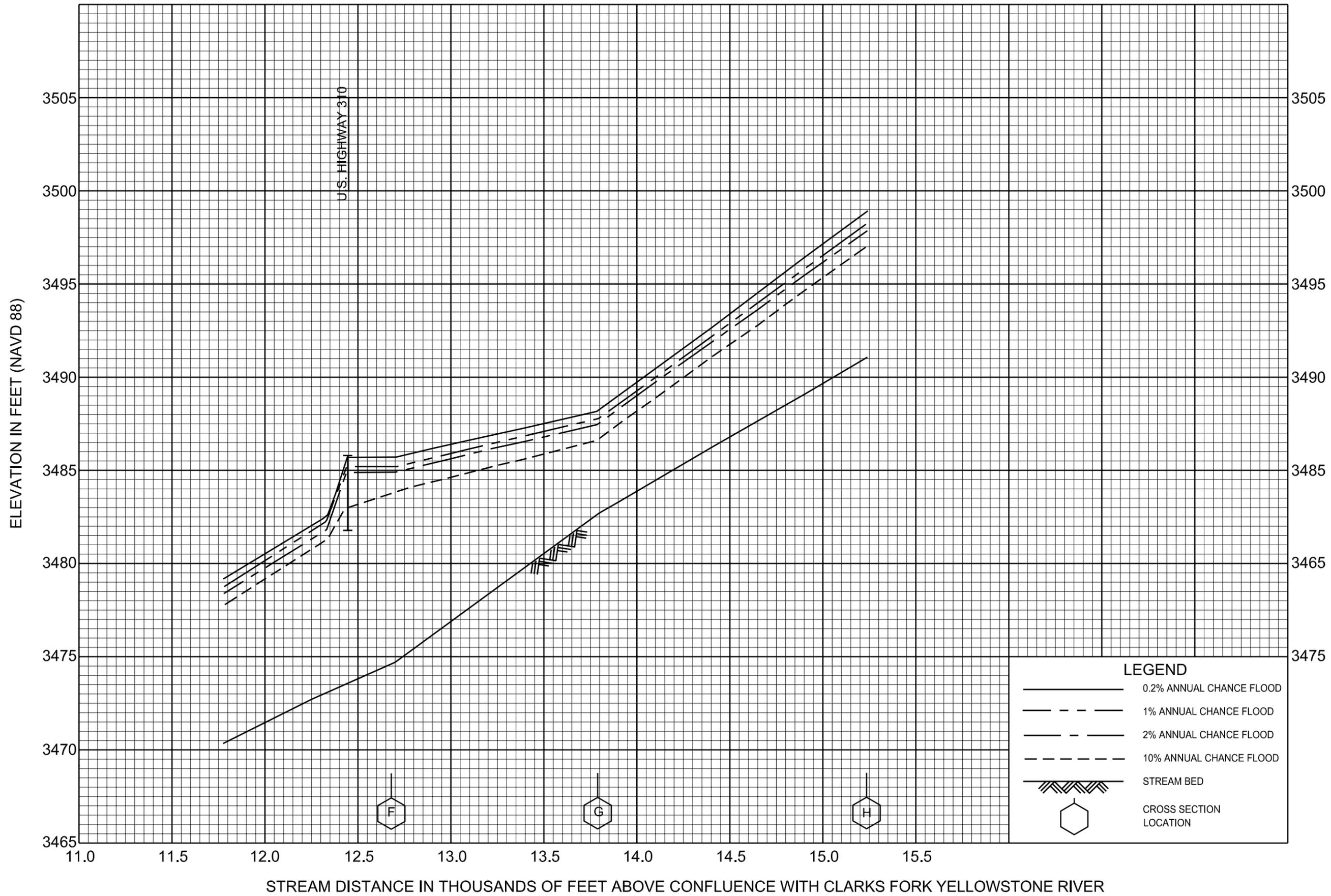
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



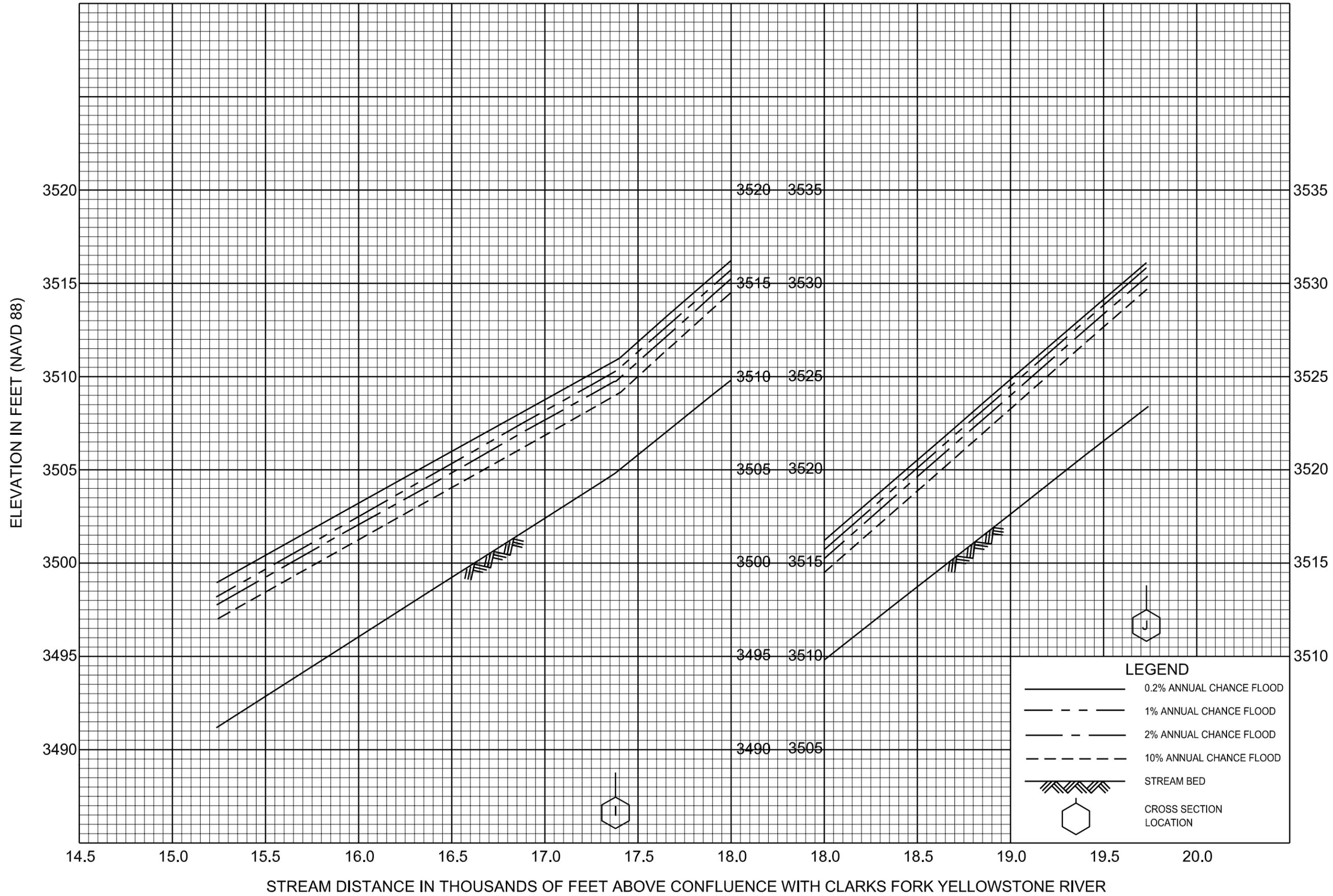
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



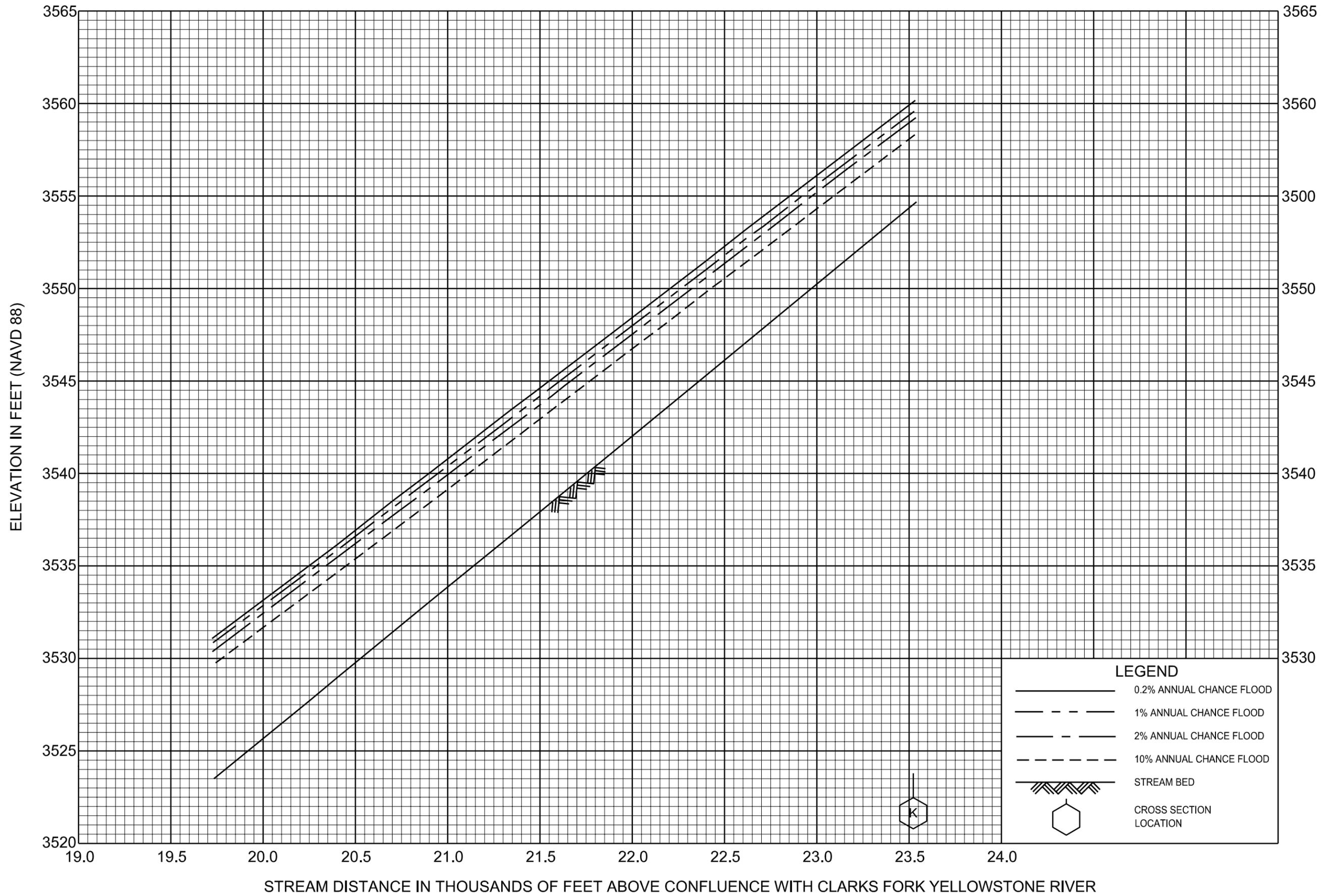
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



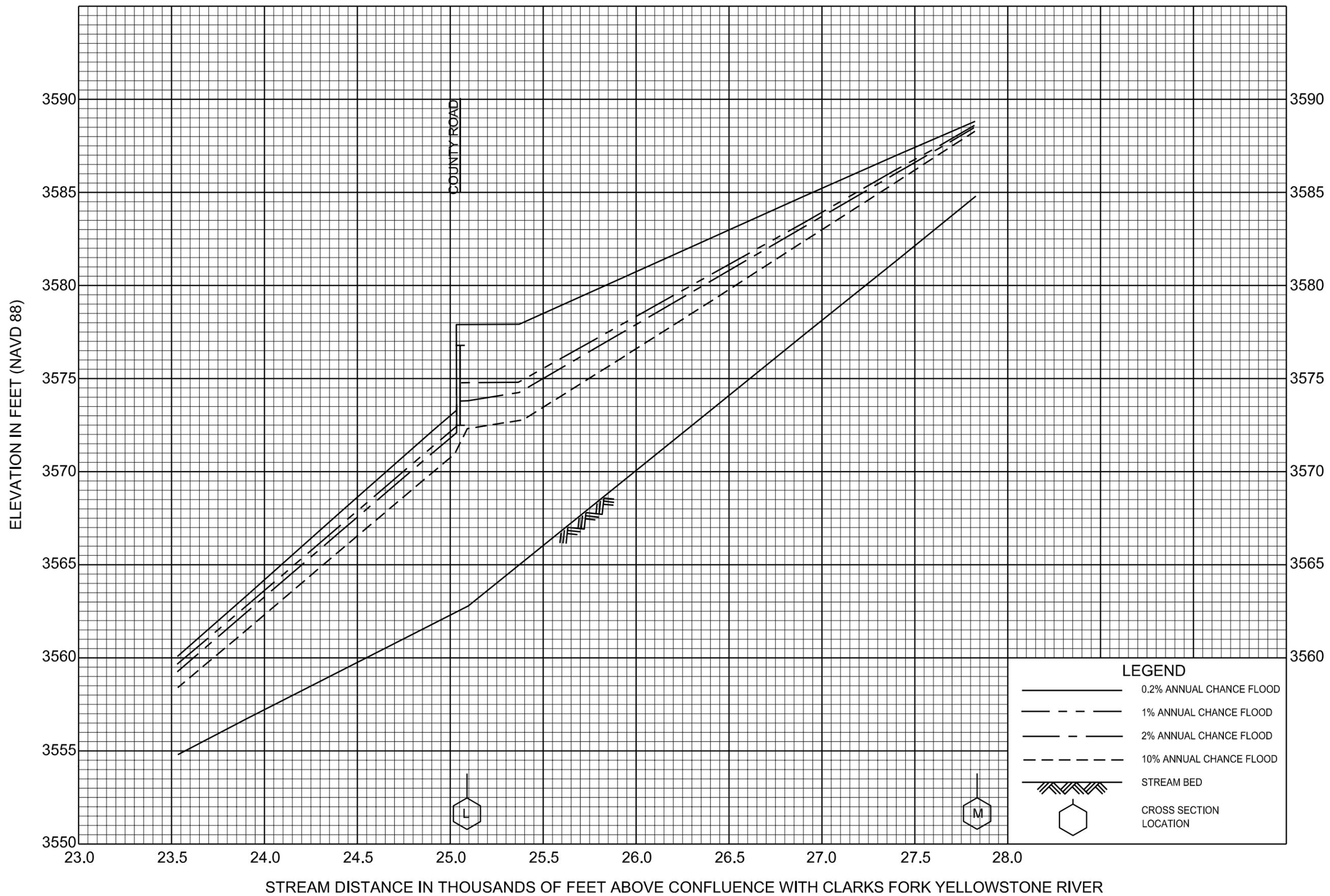
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



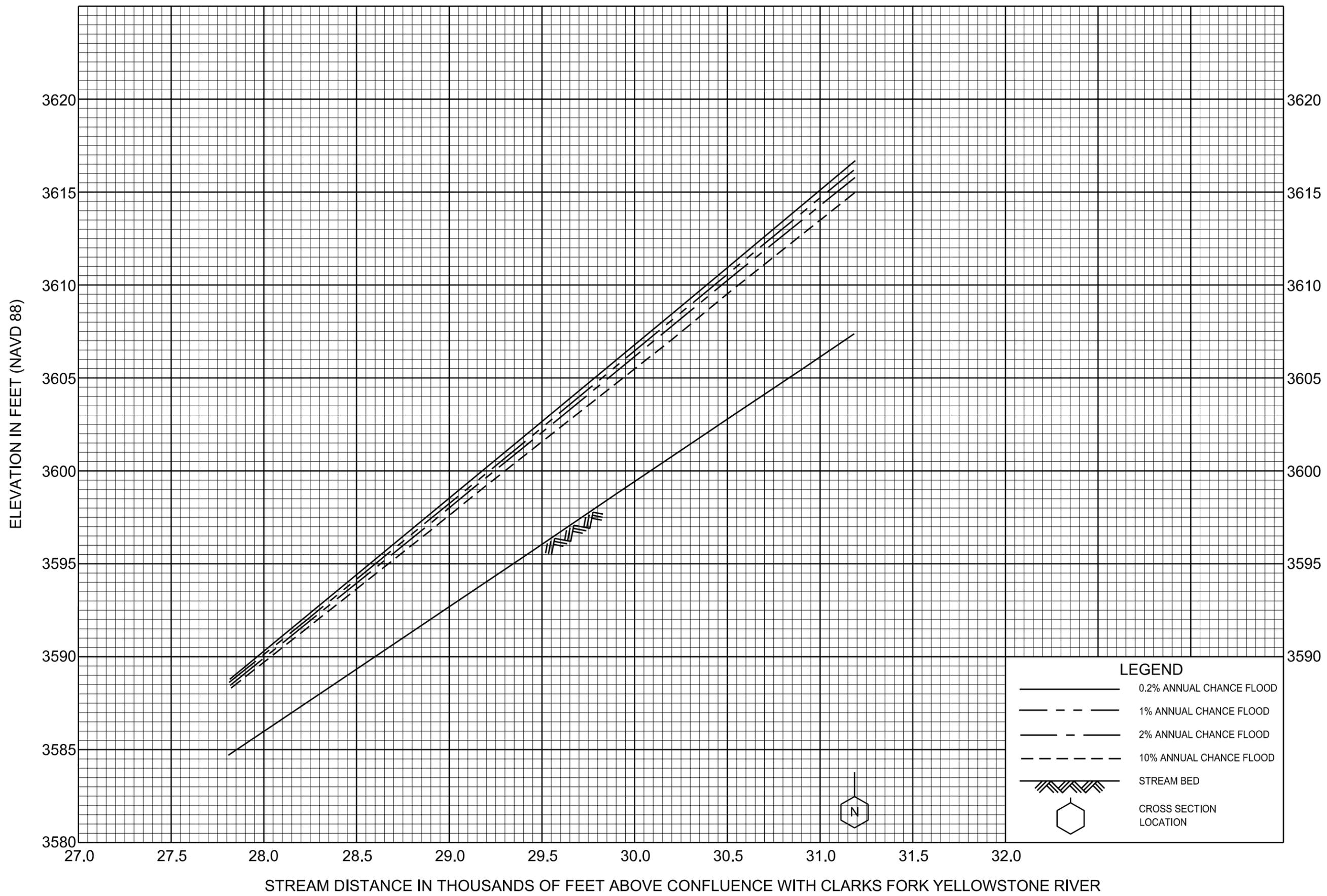
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



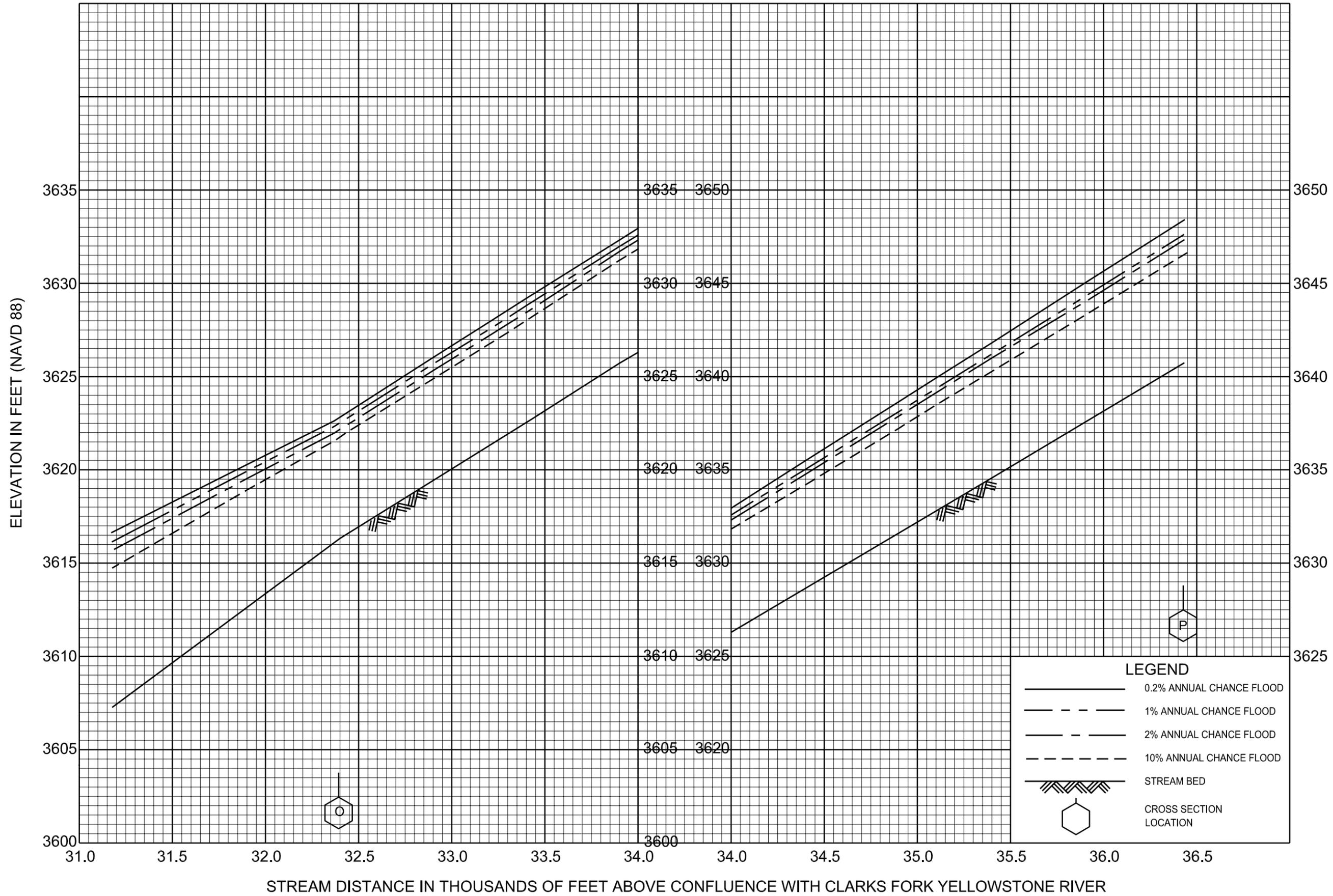
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
 AND INCORPORATED AREAS



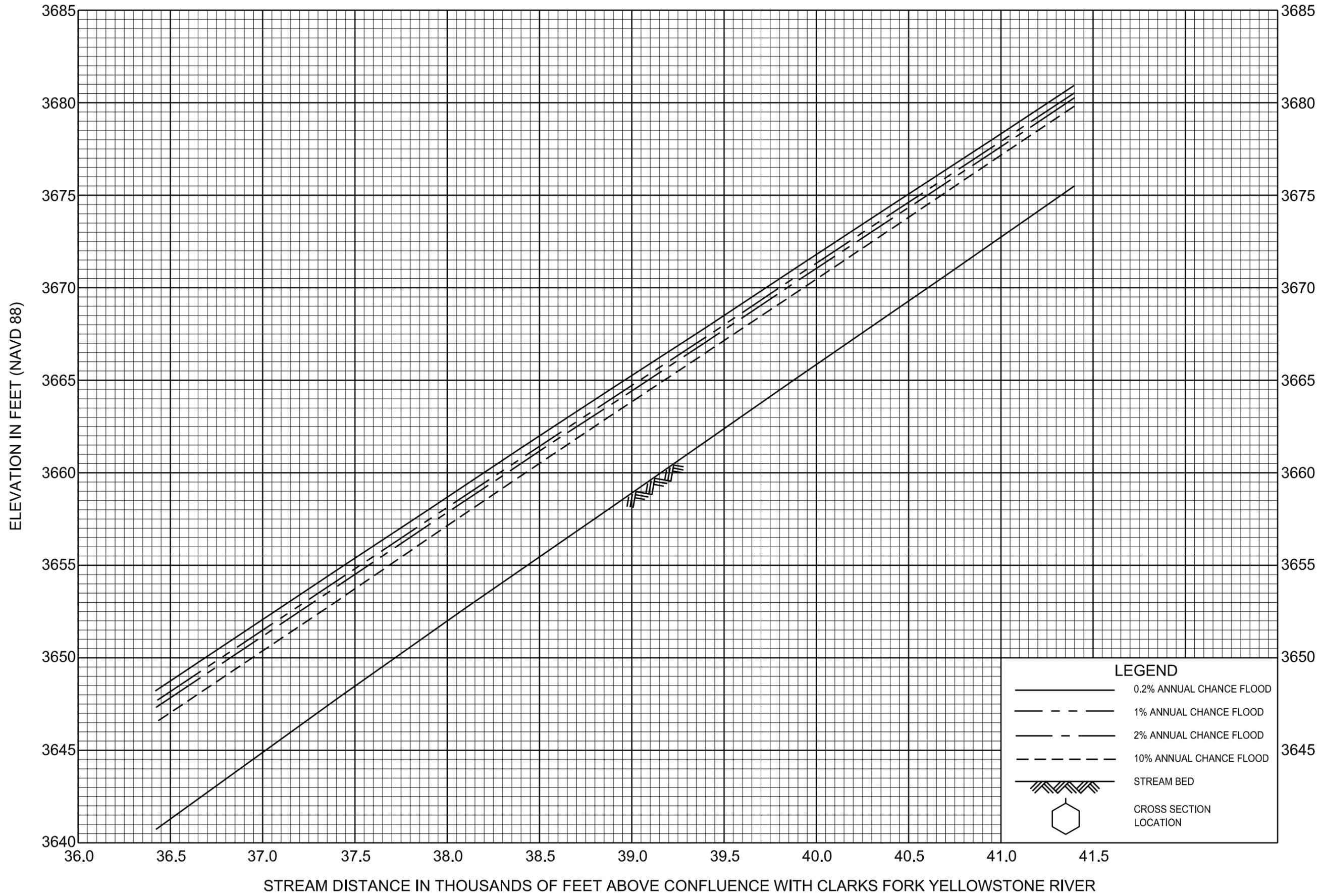
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

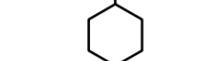


**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

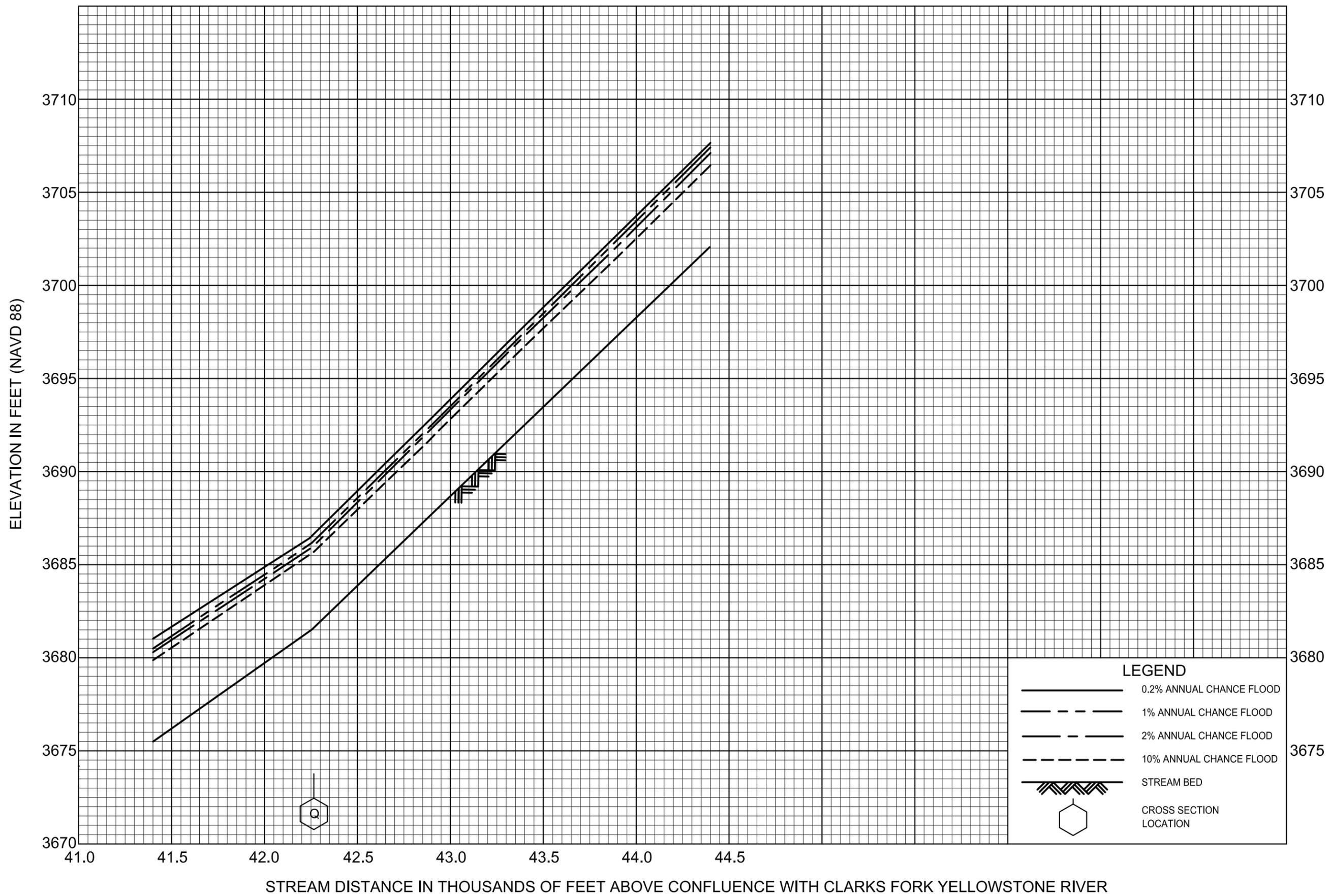


**LEGEND**

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

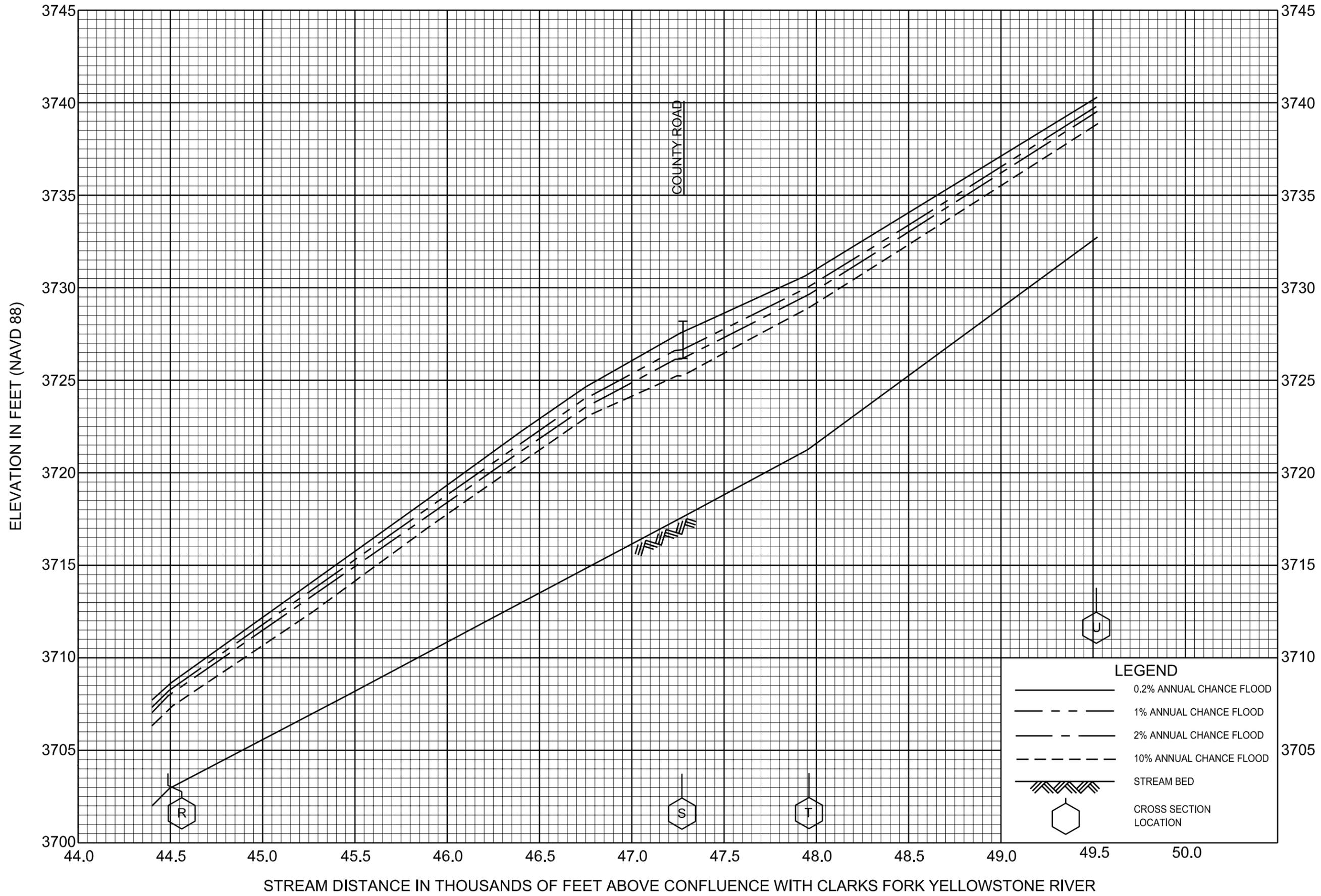
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



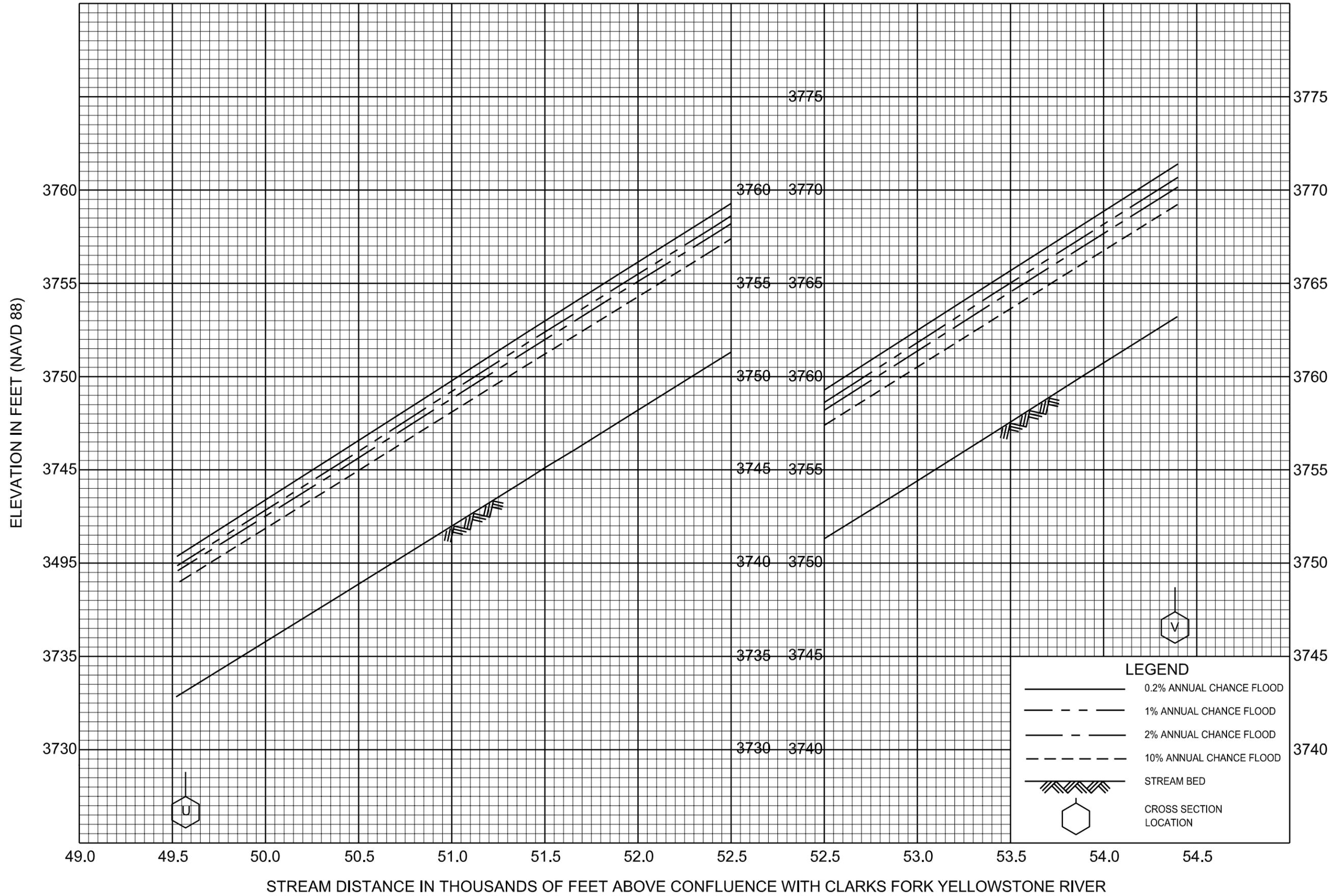
**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
 AND INCORPORATED AREAS



**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

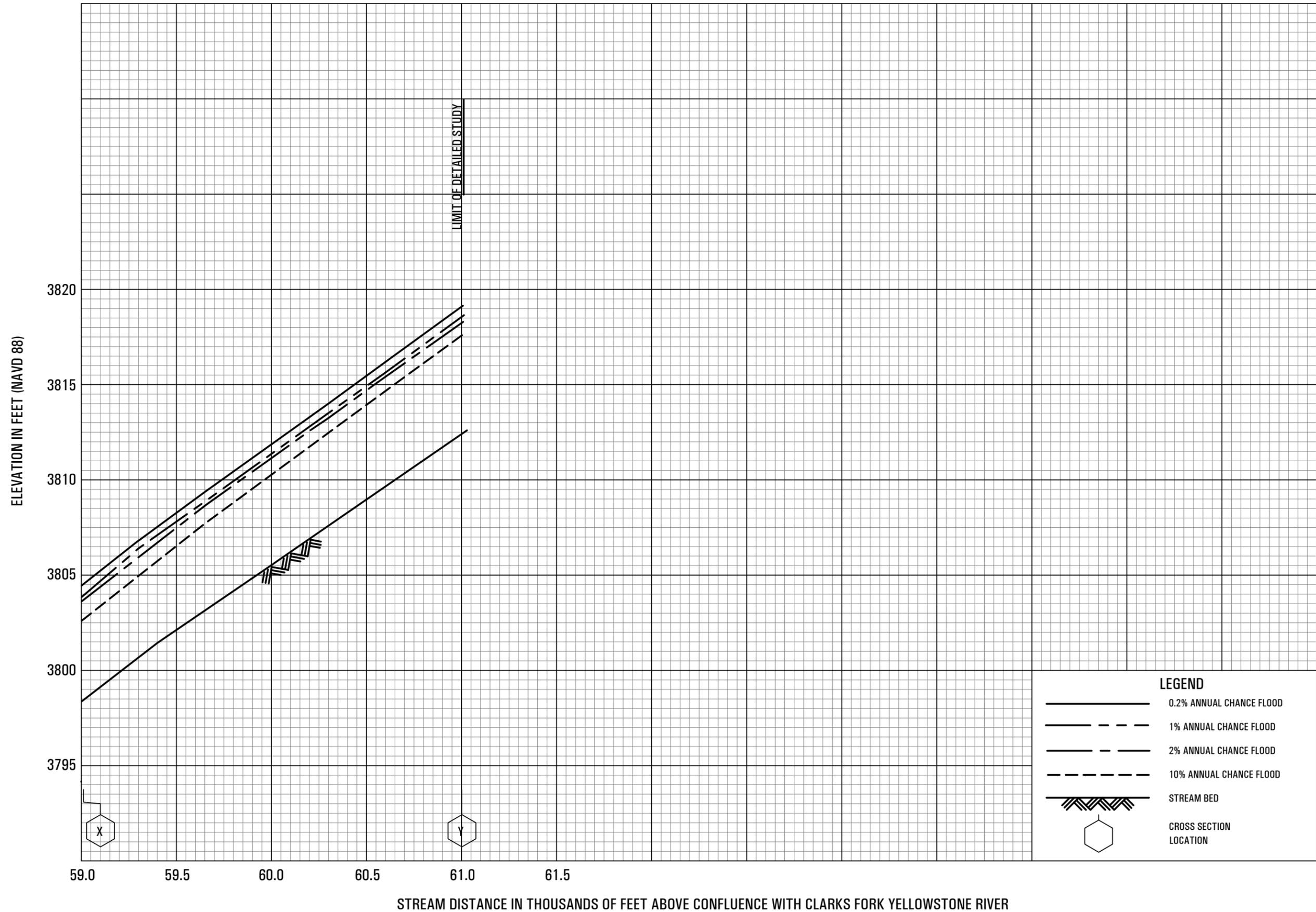
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS





**FLOOD PROFILES**  
**ROCK CREEK (LOWER)**

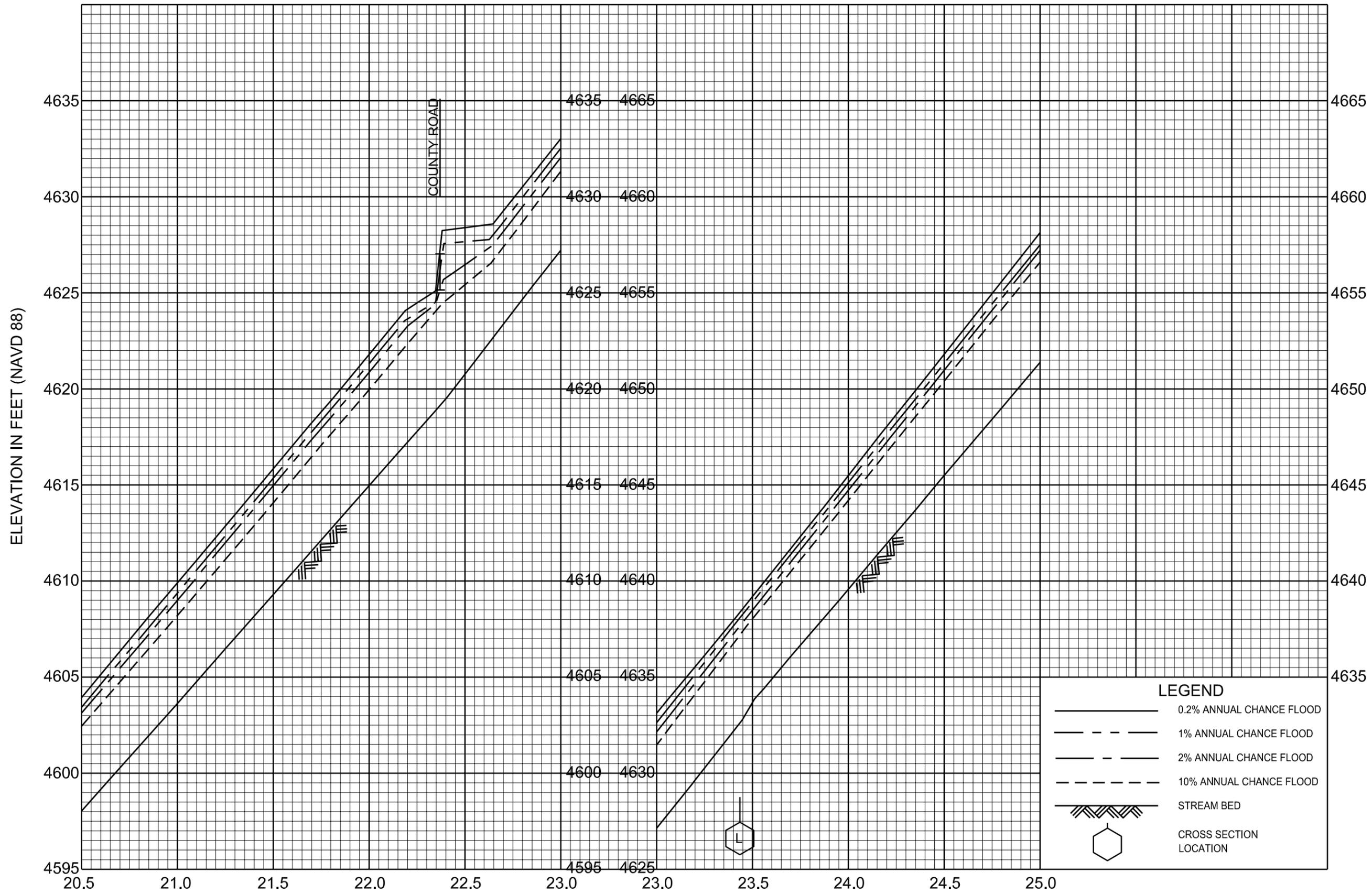
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS









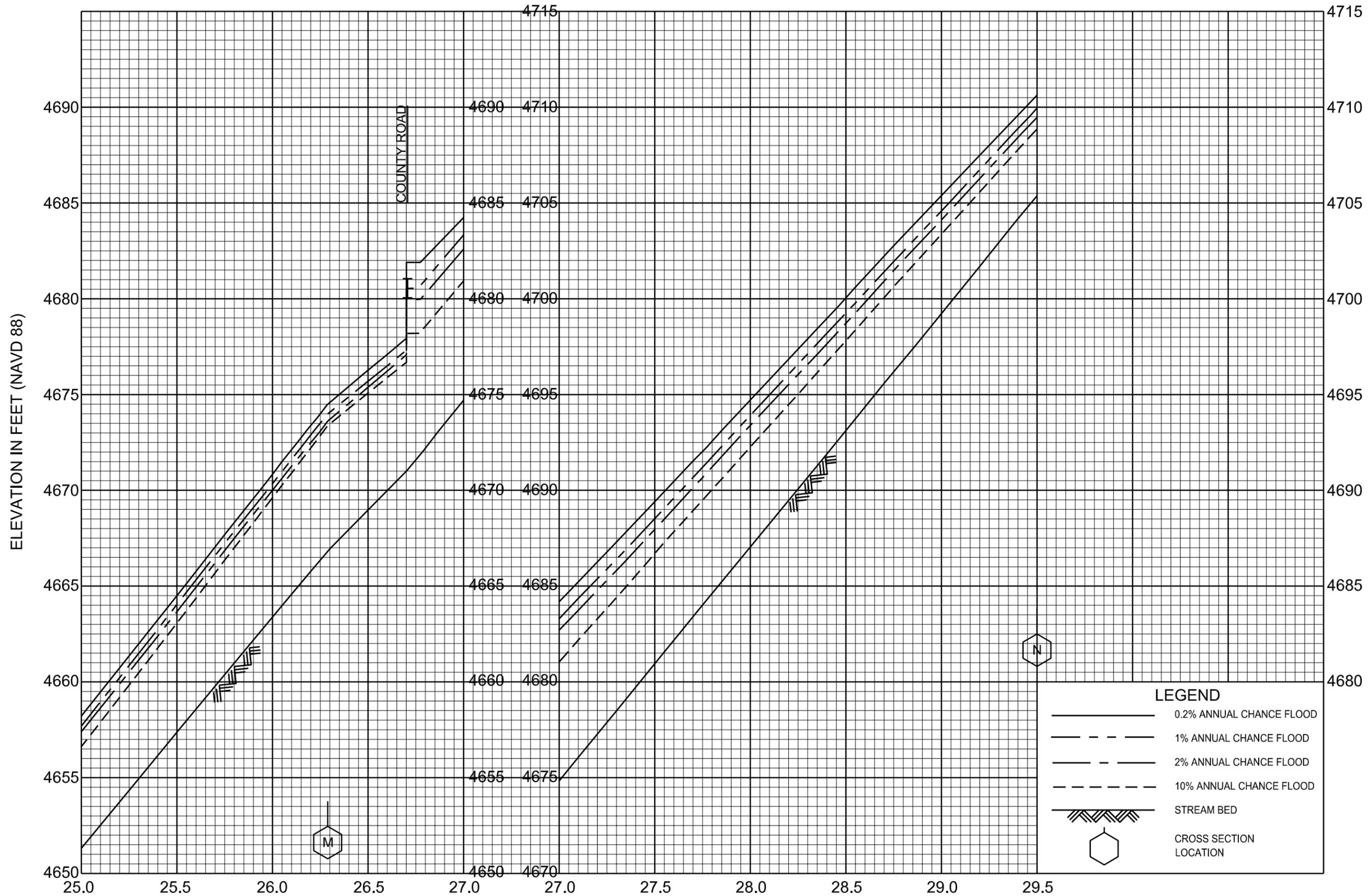


**FLOOD PROFILES**  
**ROCK CREEK (MIDDLE)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE LIMIT OF DETAILED STUDY\*

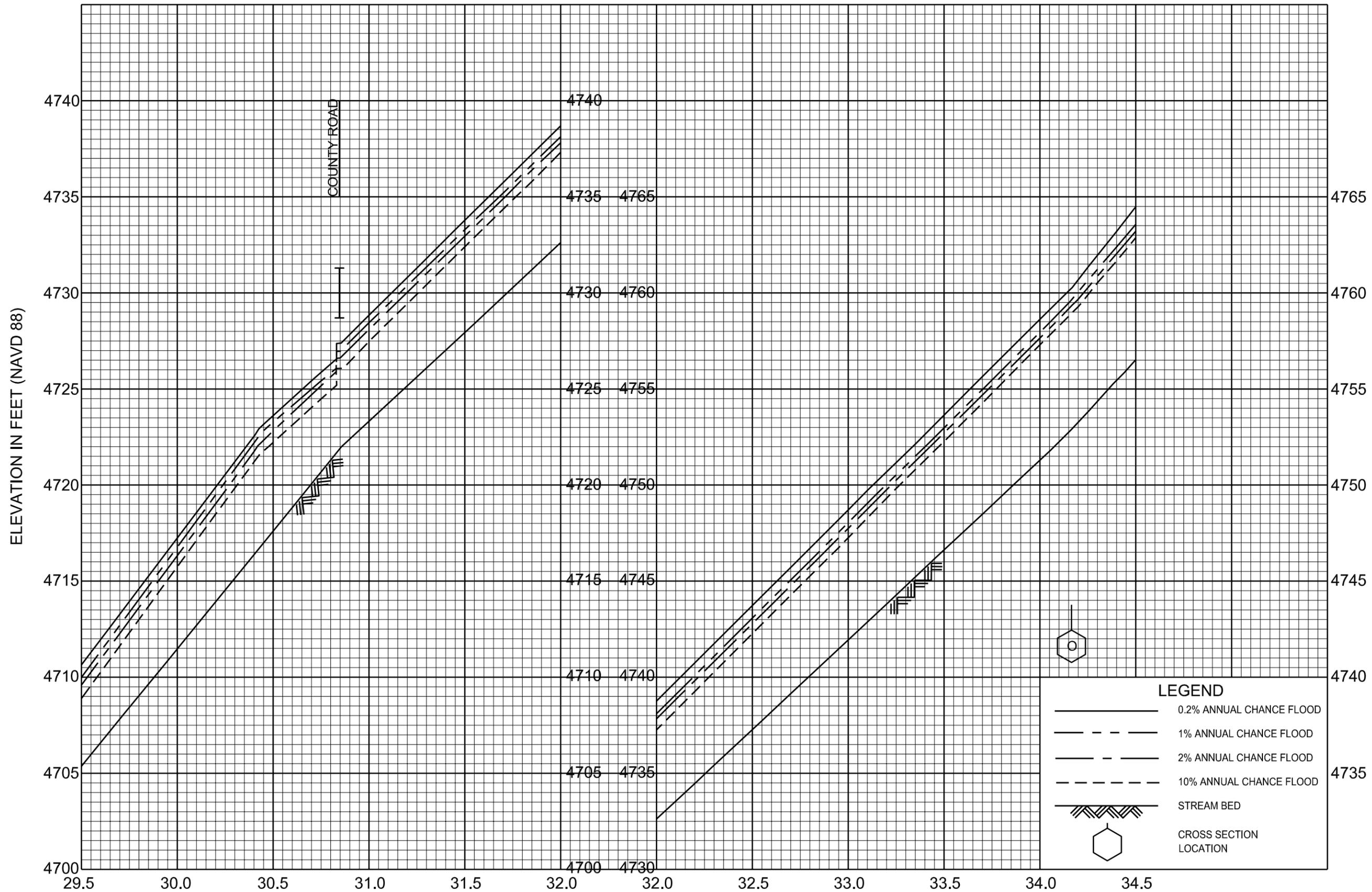
\*LIMIT OF DETAILED STUDY IS APPROXIMATELY 4035 FEET DOWNSTREAM OF U.S. HIGHWAY 212



**FLOOD PROFILES**  
**ROCK CREEK (MIDDLE)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

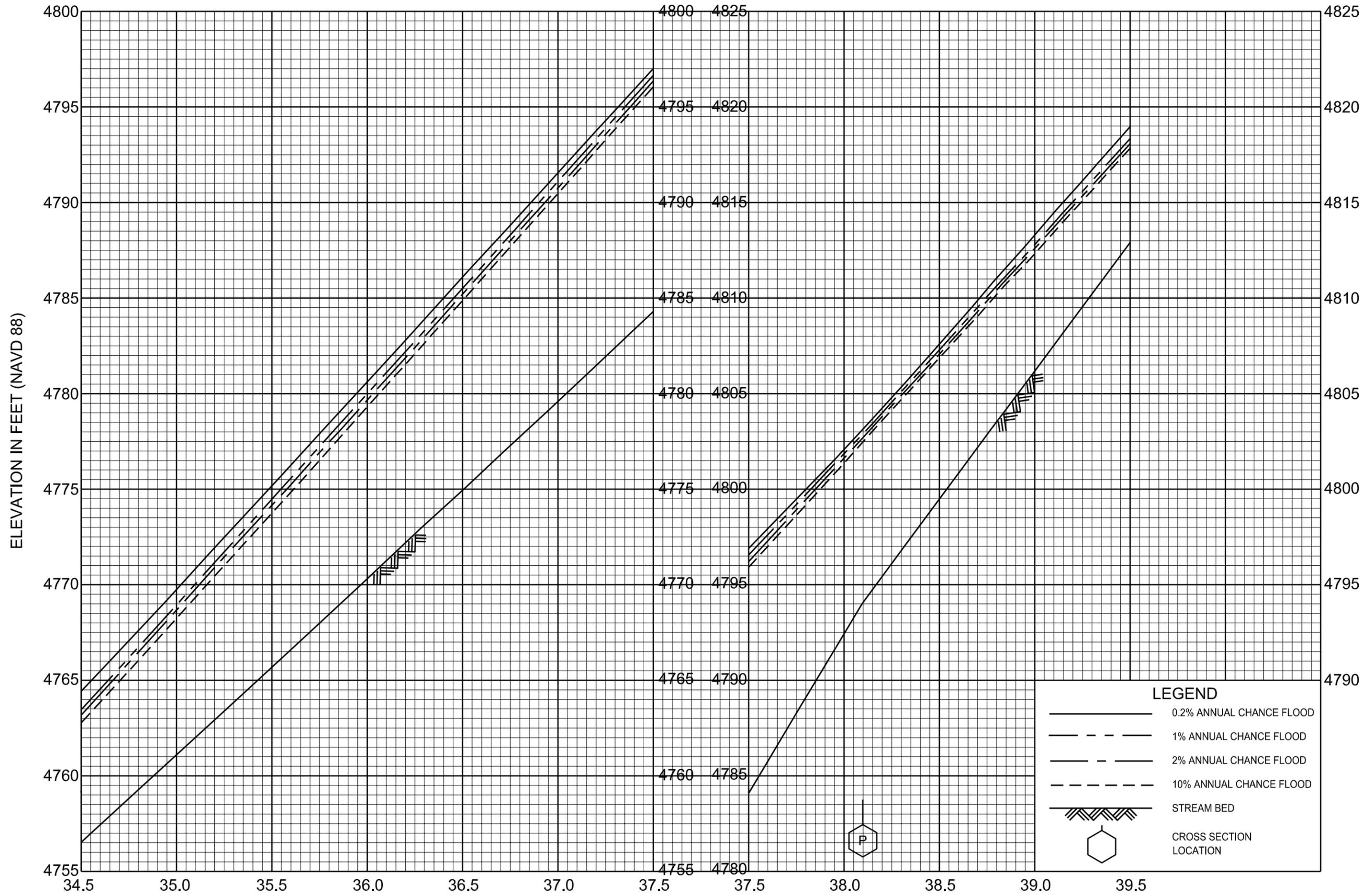
\*LIMIT OF DETAILED STUDY IS APPROXIMATELY 4035 FEET DOWNSTREAM OF U.S. HIGHWAY 212



FLOOD PROFILES  
ROCK CREEK (MIDDLE)

FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MT  
AND INCORPORATED AREAS

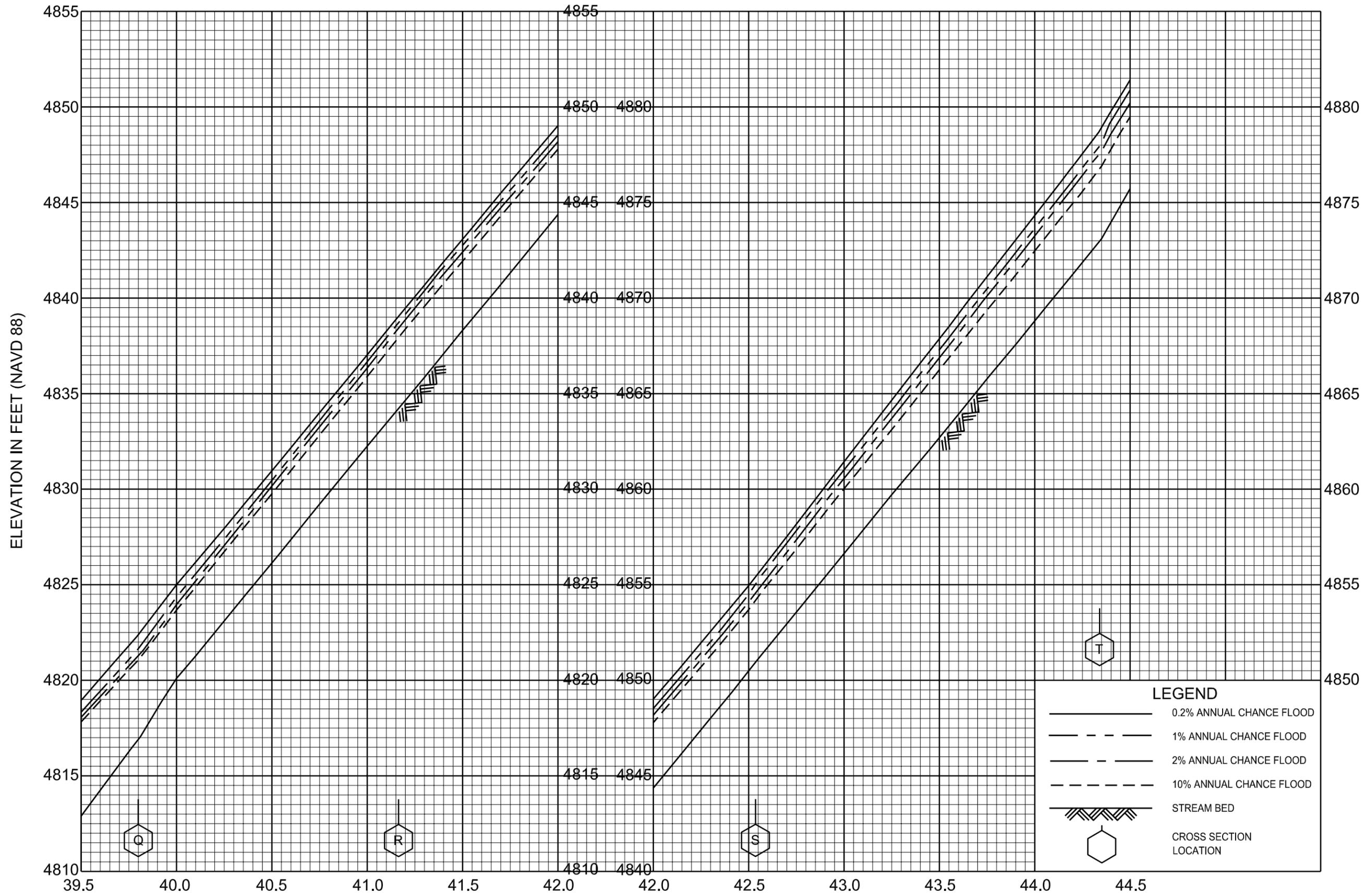
\*LIMIT OF DETAILED STUDY IS APPROXIMATELY 4035 FEET DOWNSTREAM OF U.S. HIGHWAY 212



**FLOOD PROFILES**  
**ROCK CREEK (MIDDLE)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

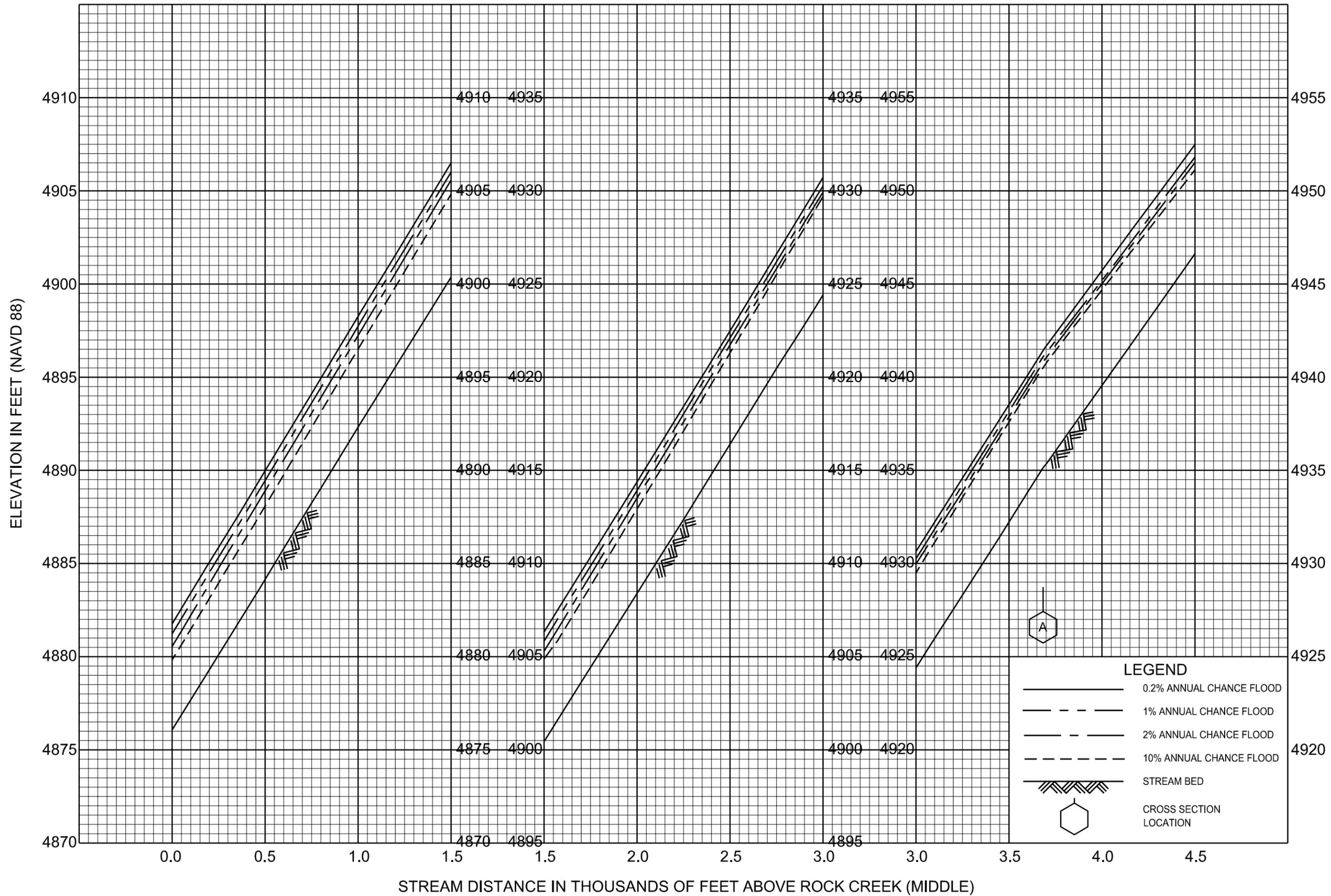
\*LIMIT OF DETAILED STUDY IS APPROXIMATELY 4035 FEET DOWNSTREAM OF U.S. HIGHWAY 212



**FLOOD PROFILES**  
**ROCK CREEK (MIDDLE)**

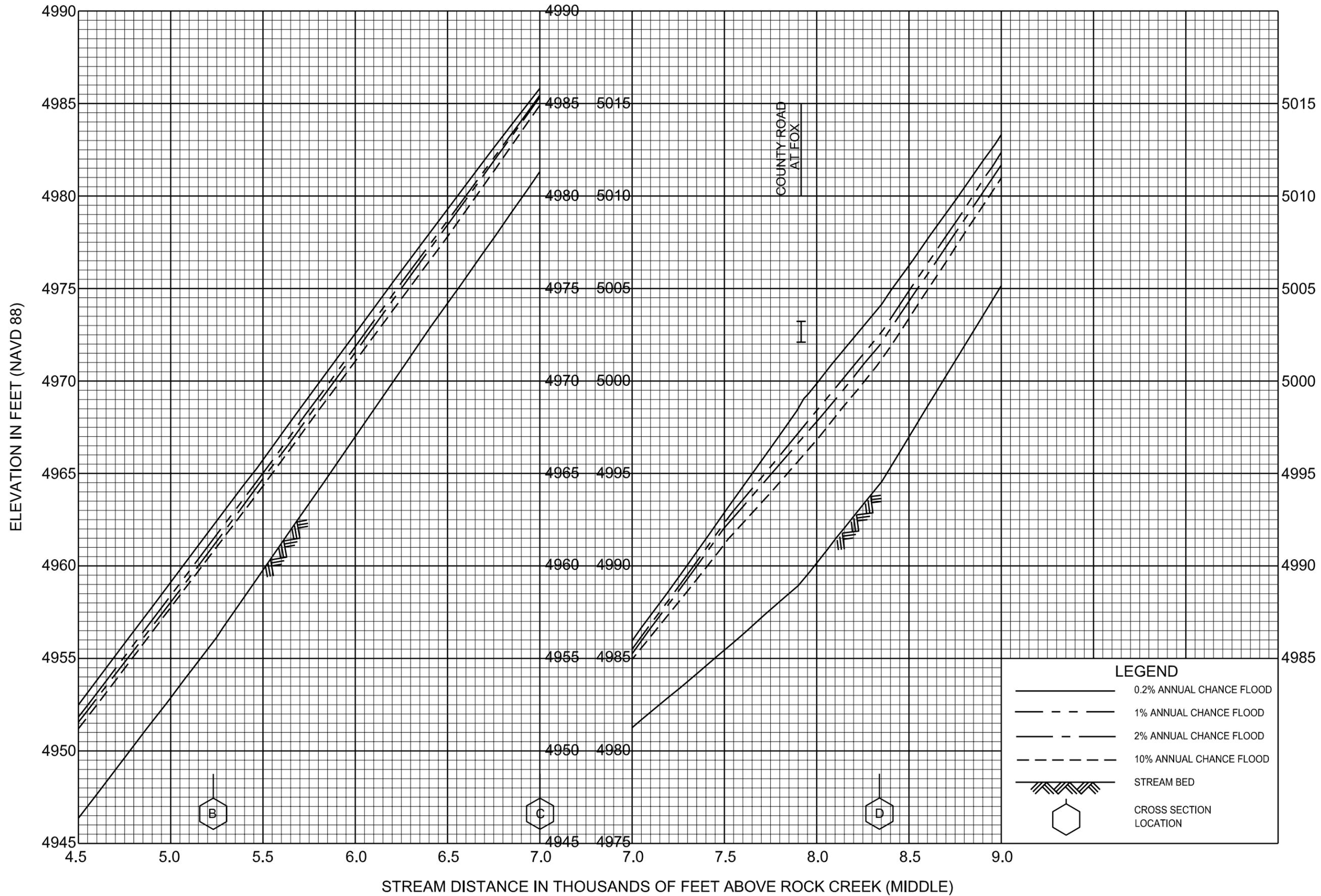
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

\*LIMIT OF DETAILED STUDY IS APPROXIMATELY 4035 FEET DOWNSTREAM OF U.S. HIGHWAY 212



**FLOOD PROFILES**  
**ROCK CREEK (UPPER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

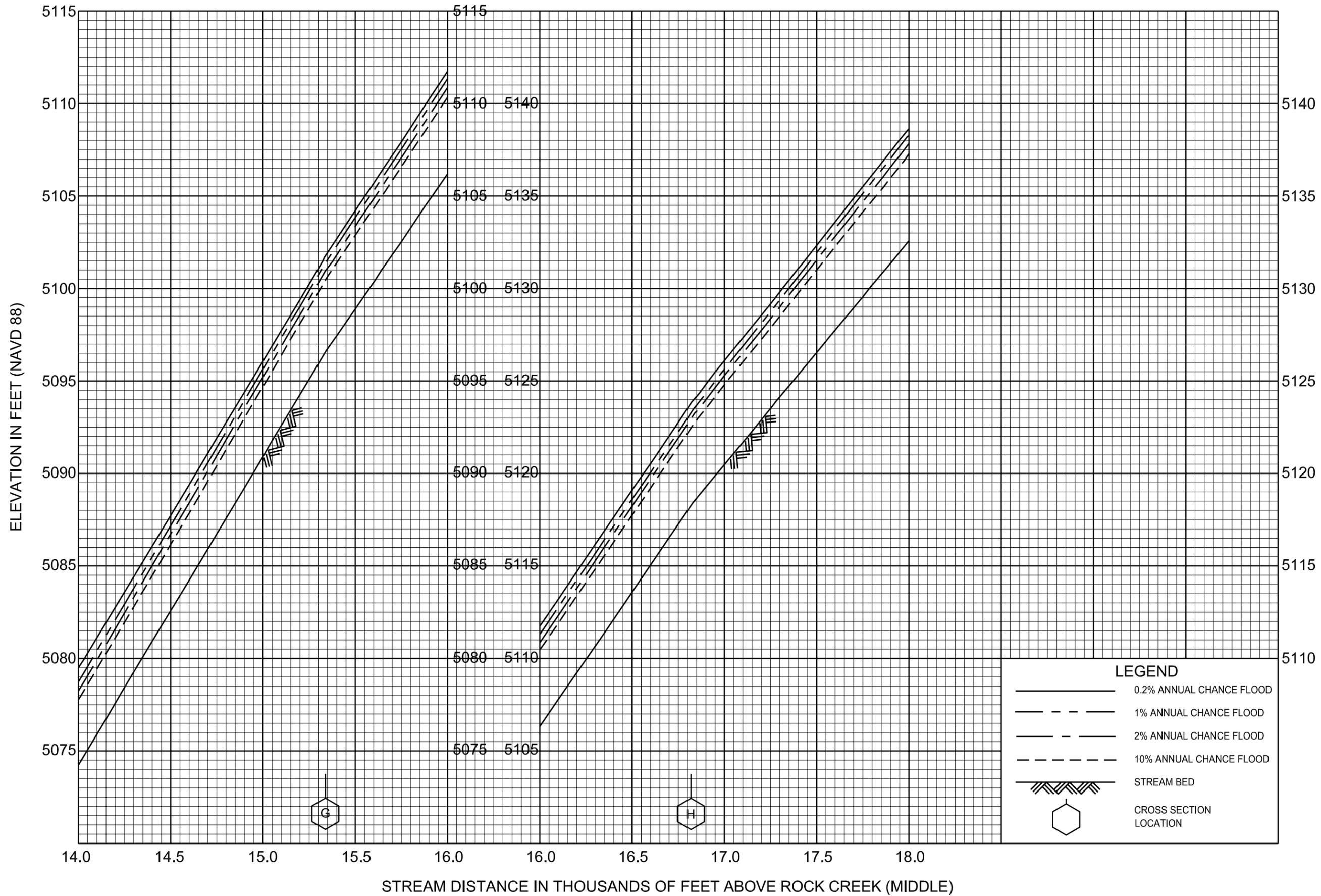


**FLOOD PROFILES**  
ROCK CREEK (UPPER)

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

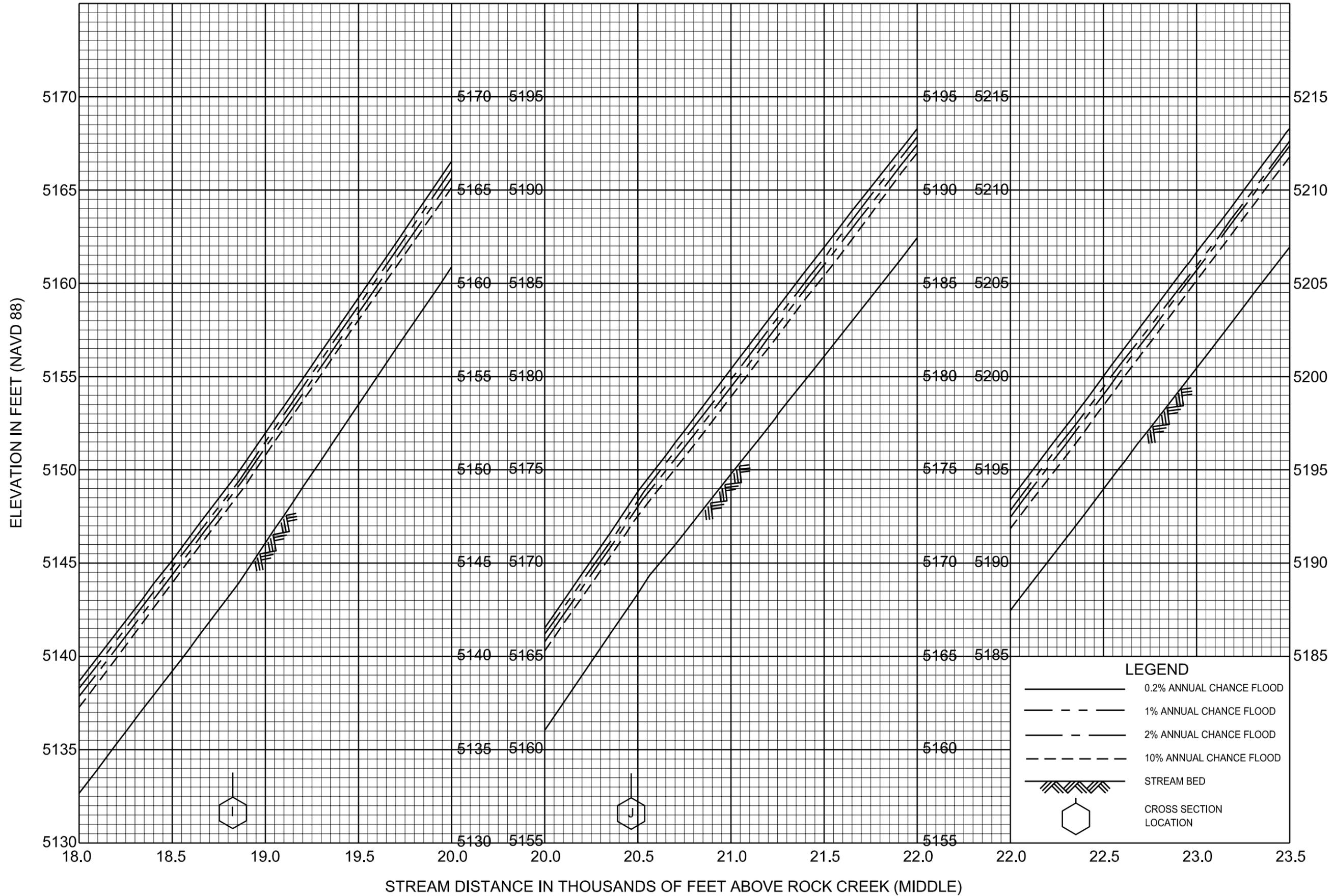
**32P**





**FLOOD PROFILES**  
**ROCK CREEK (UPPER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS



**LEGEND**

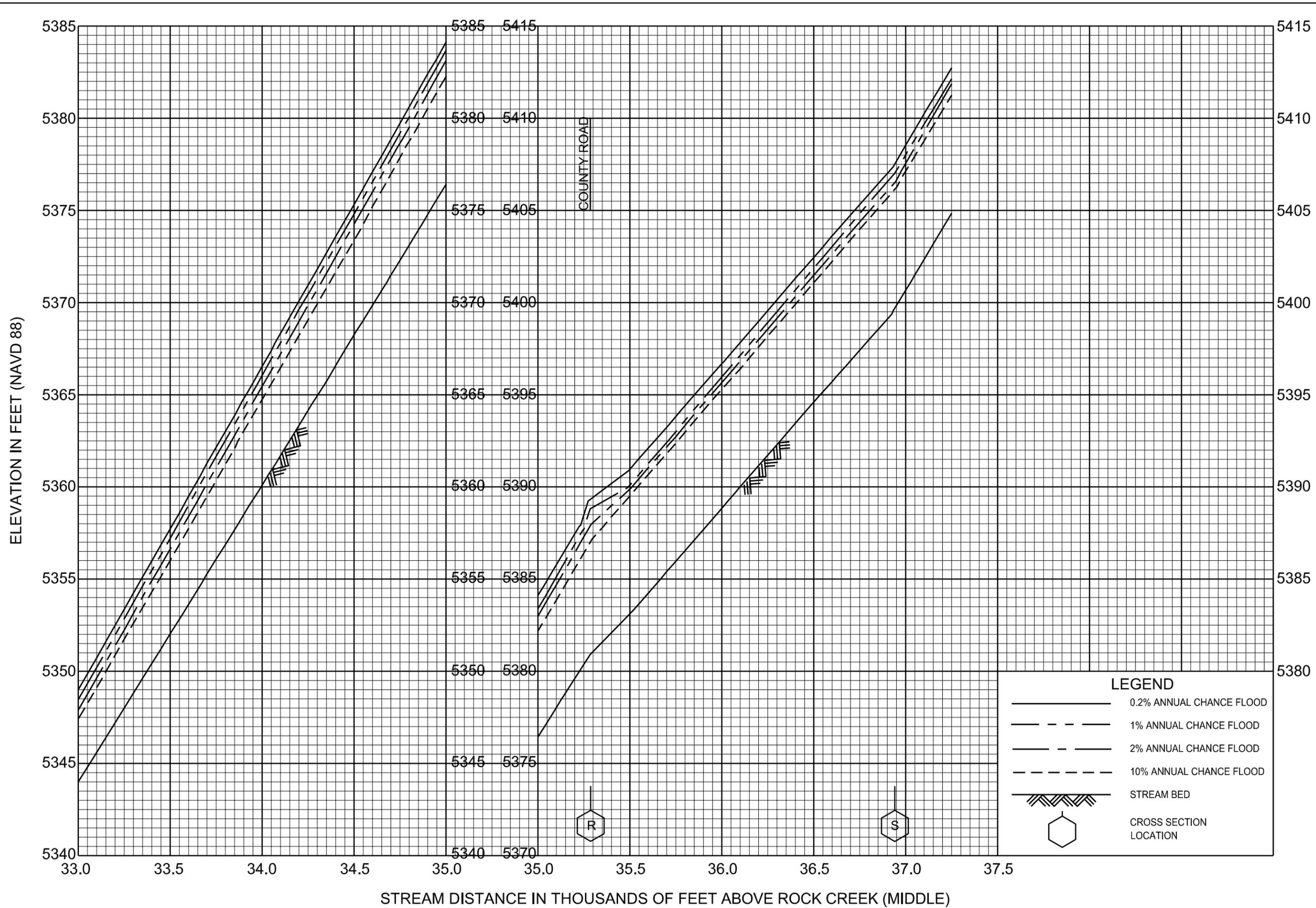
- 0.2% ANNUAL CHANCE FLOOD
- - - 1% ANNUAL CHANCE FLOOD
- · - 2% ANNUAL CHANCE FLOOD
- - - 10% ANNUAL CHANCE FLOOD
- ▨ STREAM BED
- ⬡ CROSS SECTION LOCATION

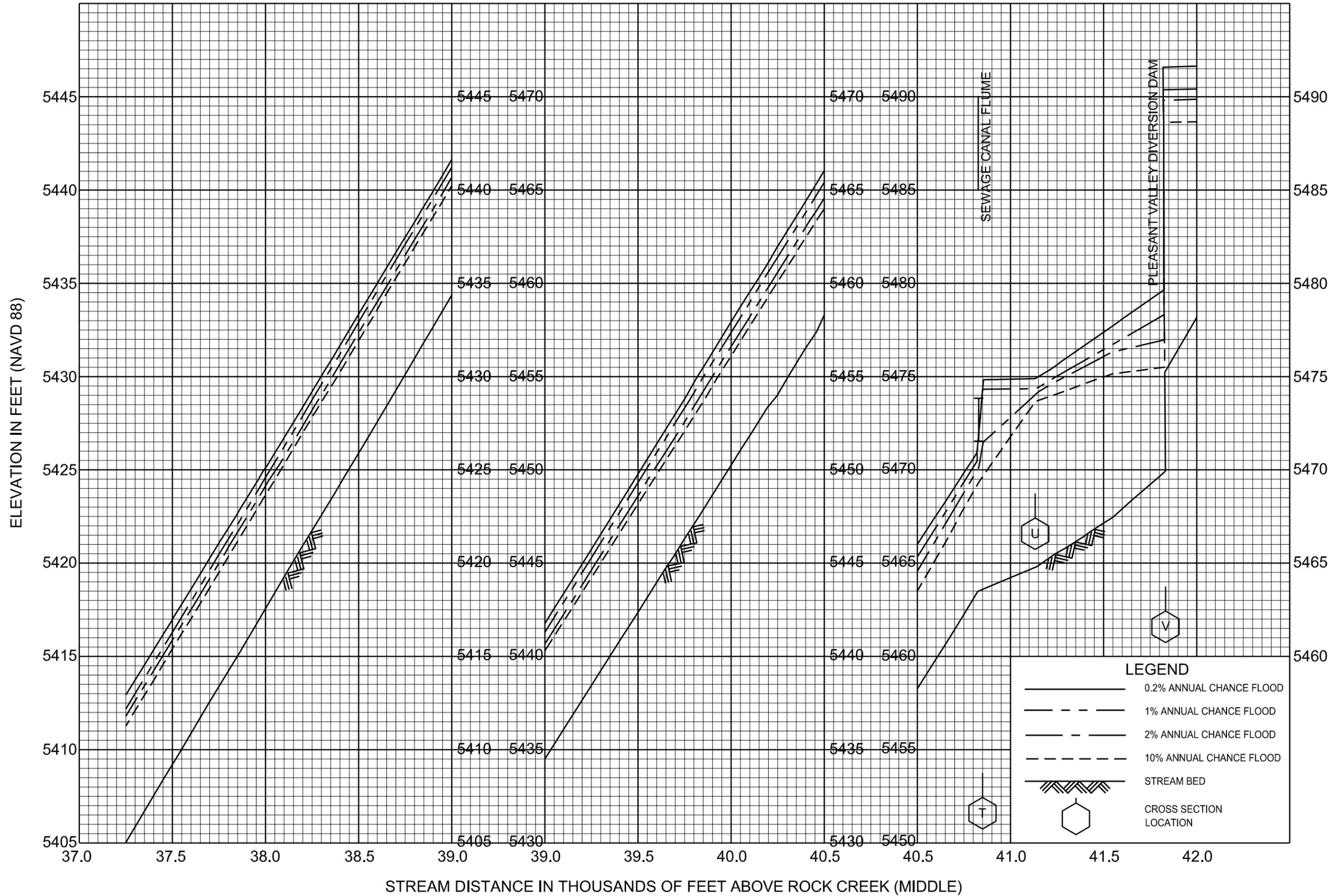
**FLOOD PROFILES**  
**ROCK CREEK (UPPER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS





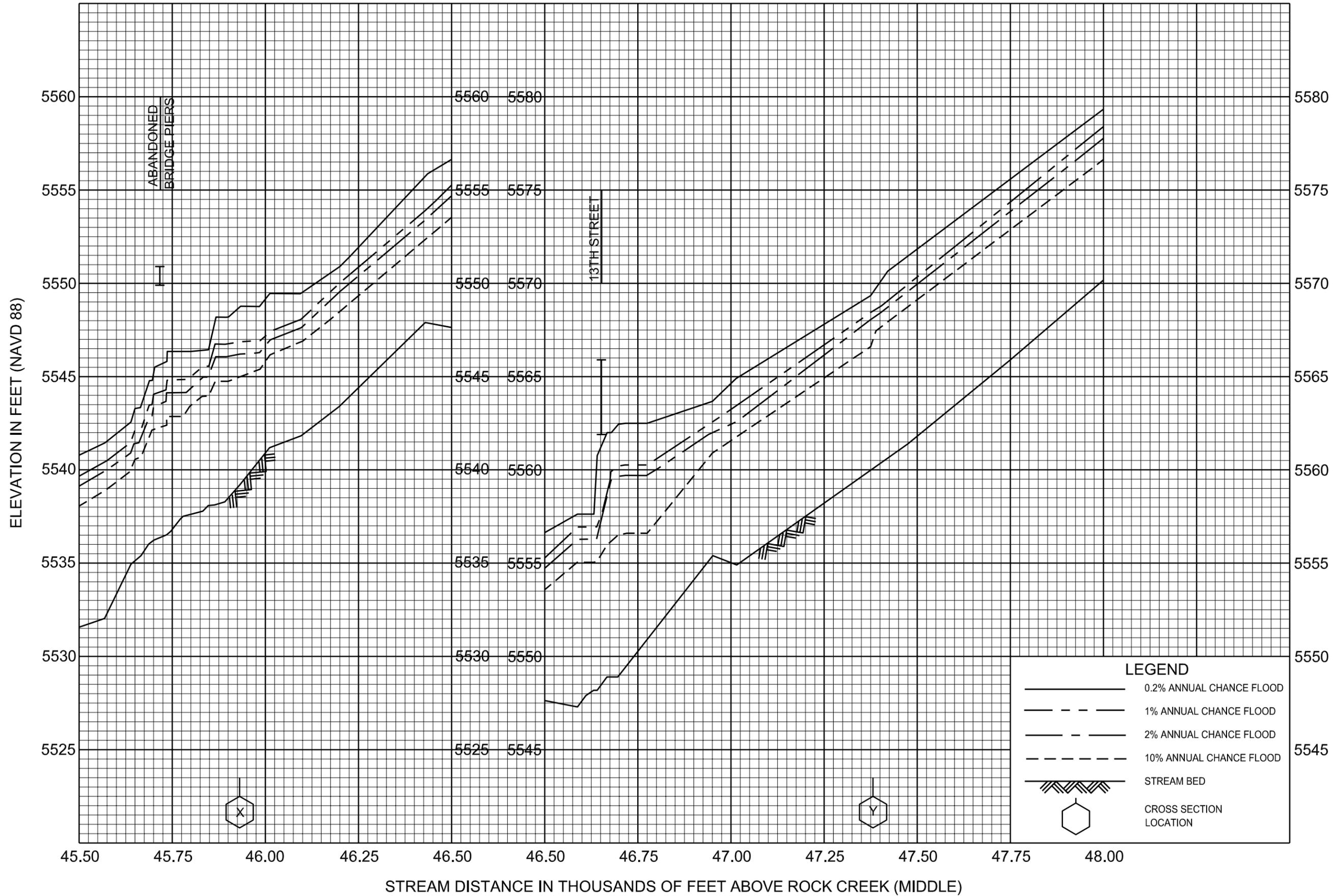




**FLOOD PROFILES**  
**ROCK CREEK (UPPER)**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

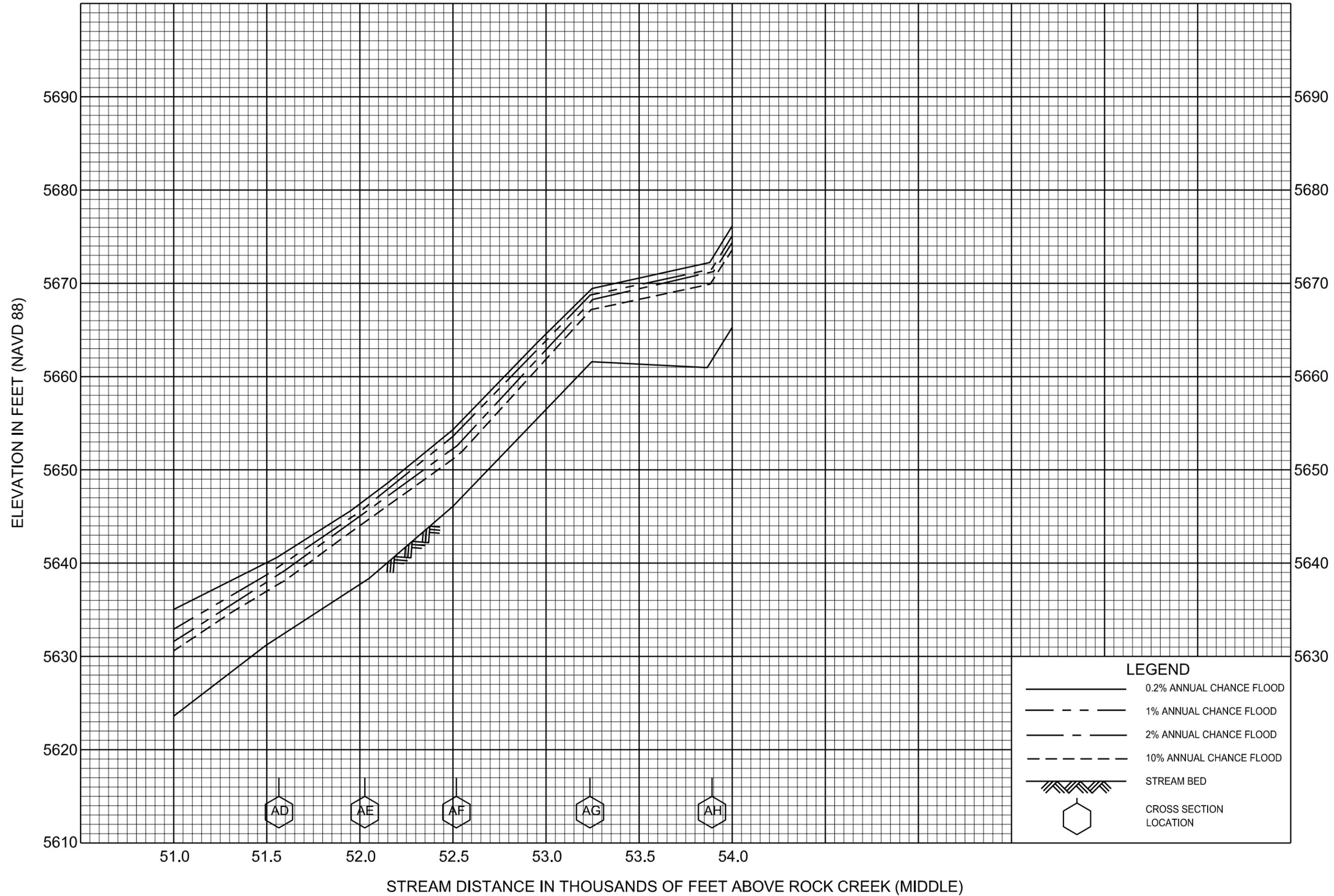




**FLOOD PROFILES**  
**ROCK CREEK (UPPER)**

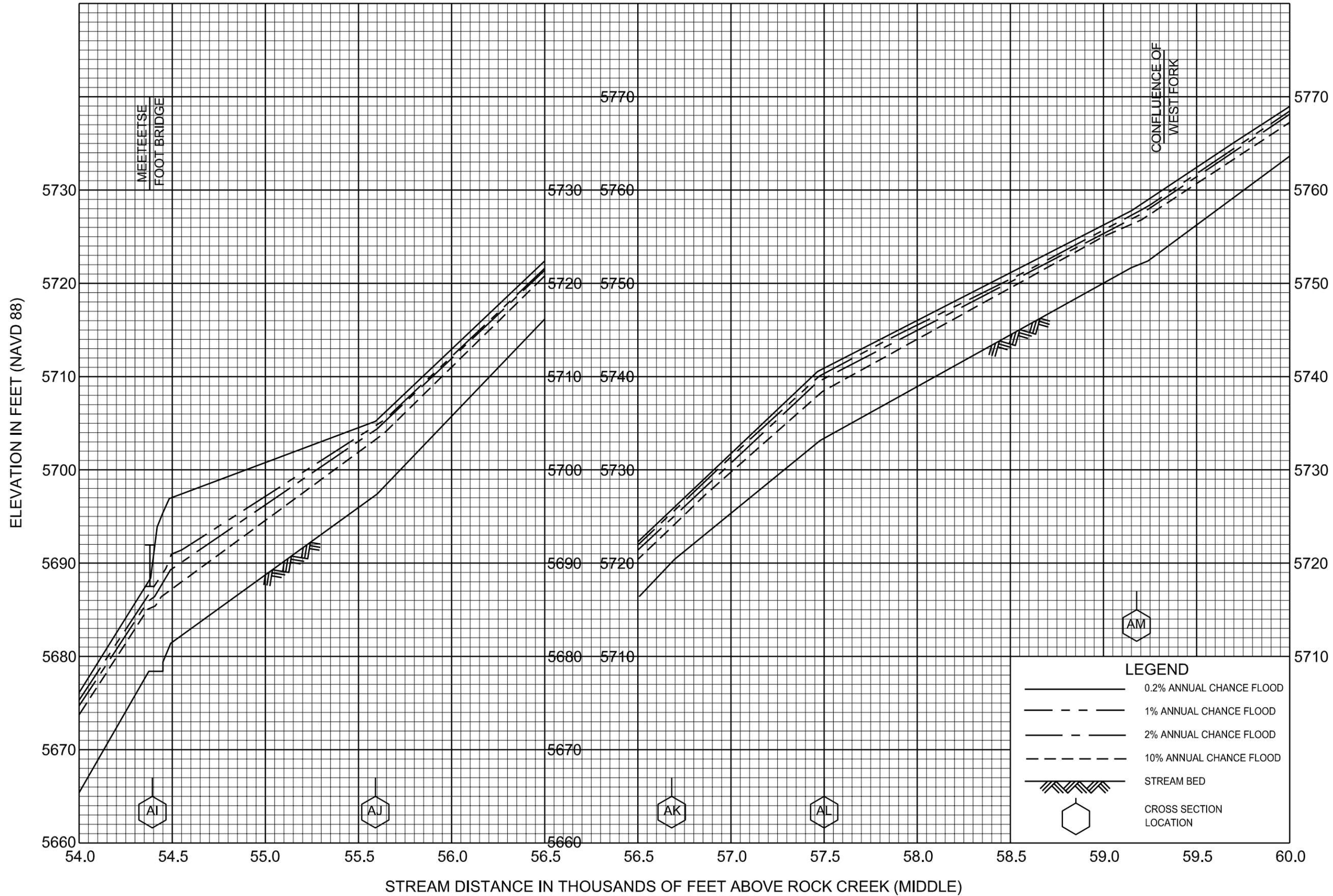
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS





**FLOOD PROFILES**  
**ROCK CREEK (UPPER)**

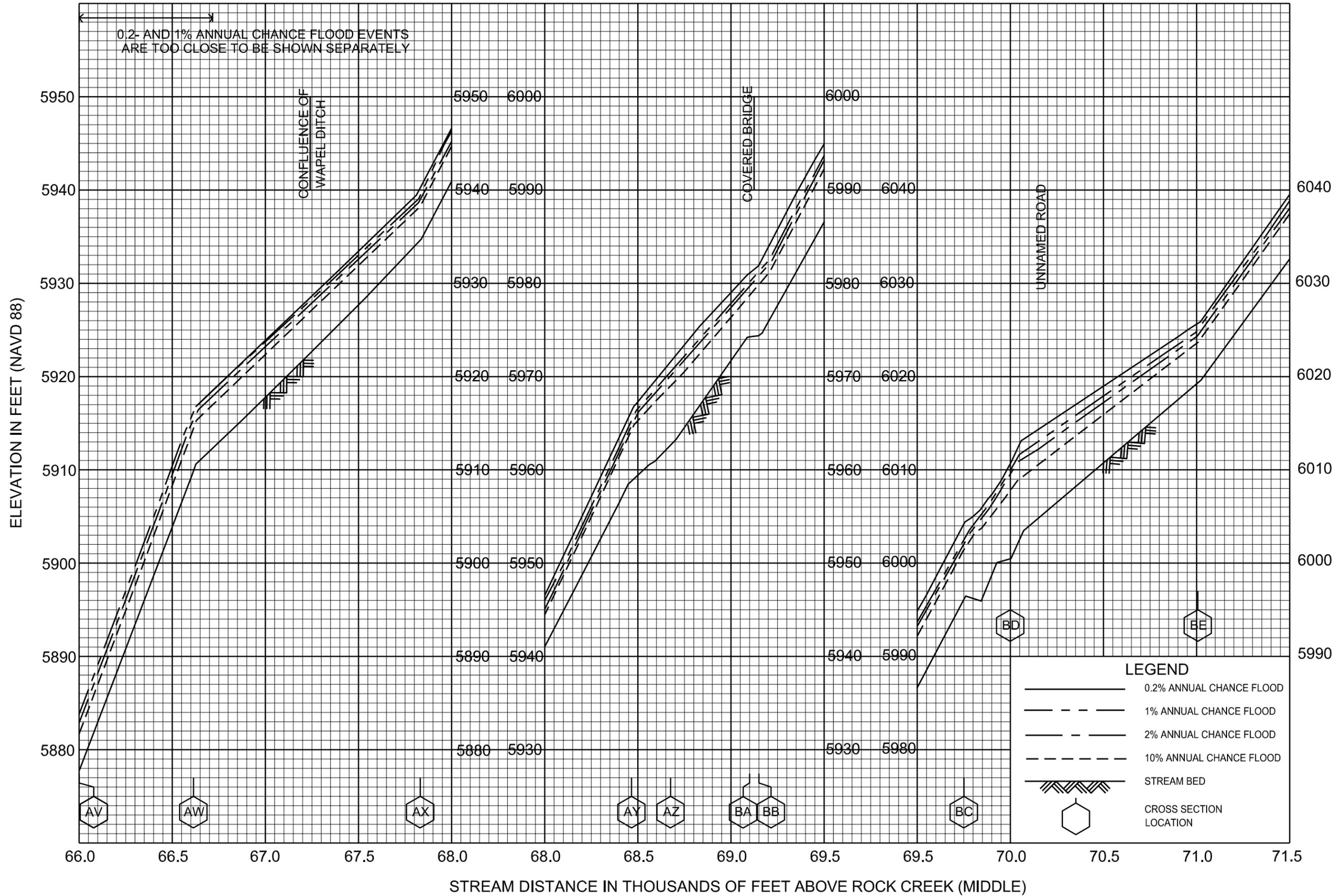
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
 AND INCORPORATED AREAS



**FLOOD PROFILES**  
**ROCK CREEK (UPPER)**

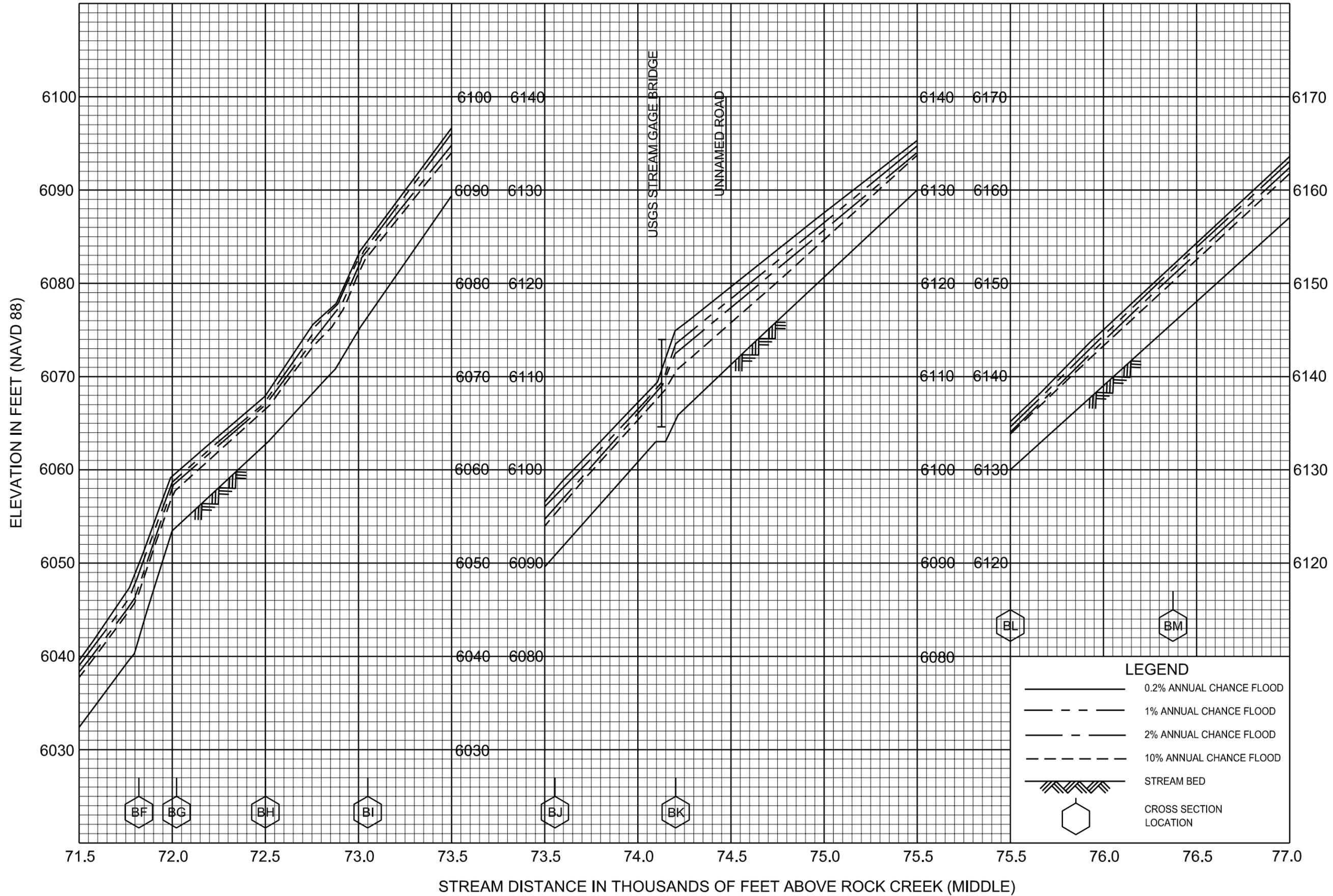
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
 AND INCORPORATED AREAS





FLOOD PROFILES  
ROCK CREEK (UPPER)

FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MT  
AND INCORPORATED AREAS

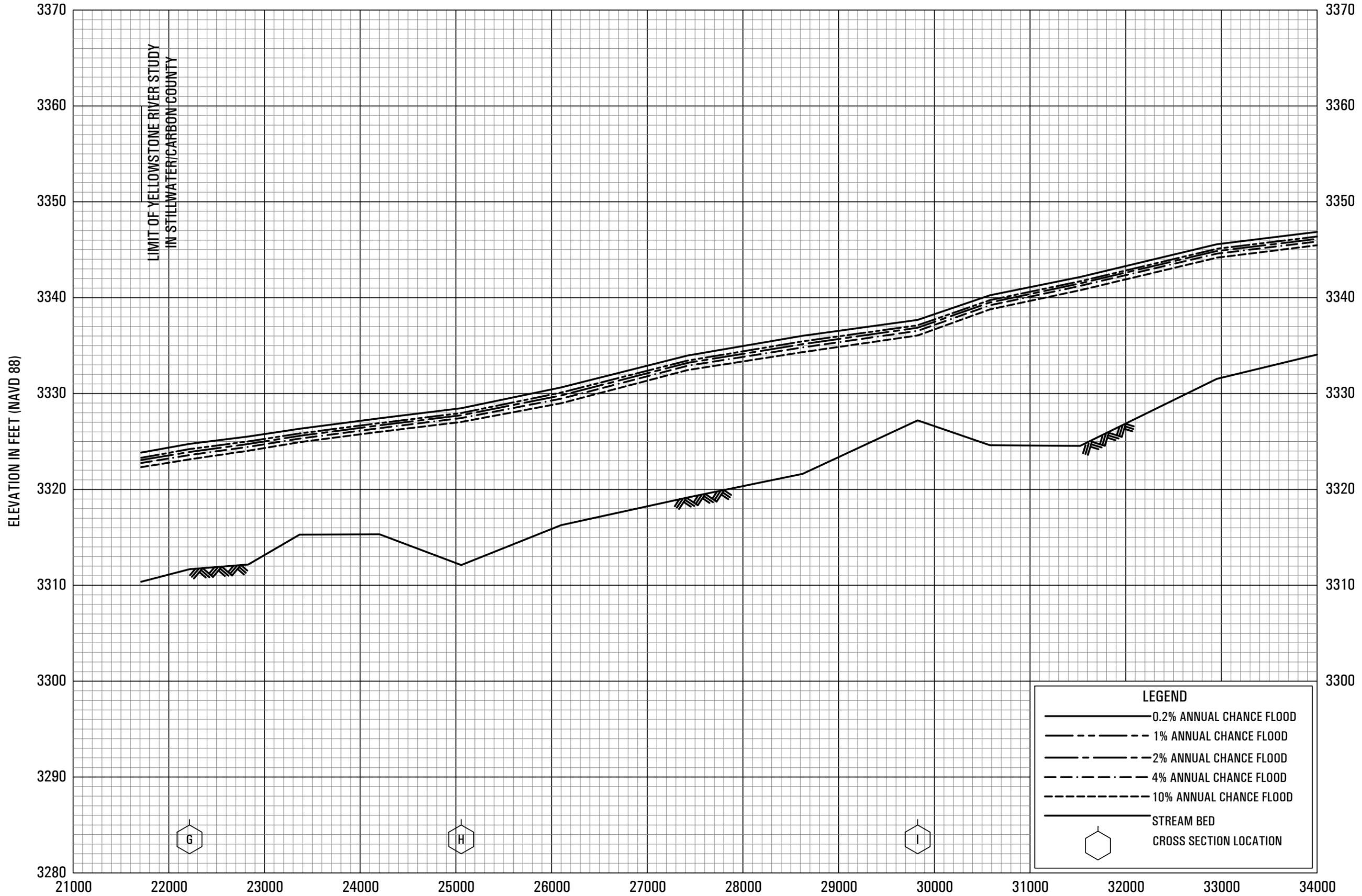


FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS







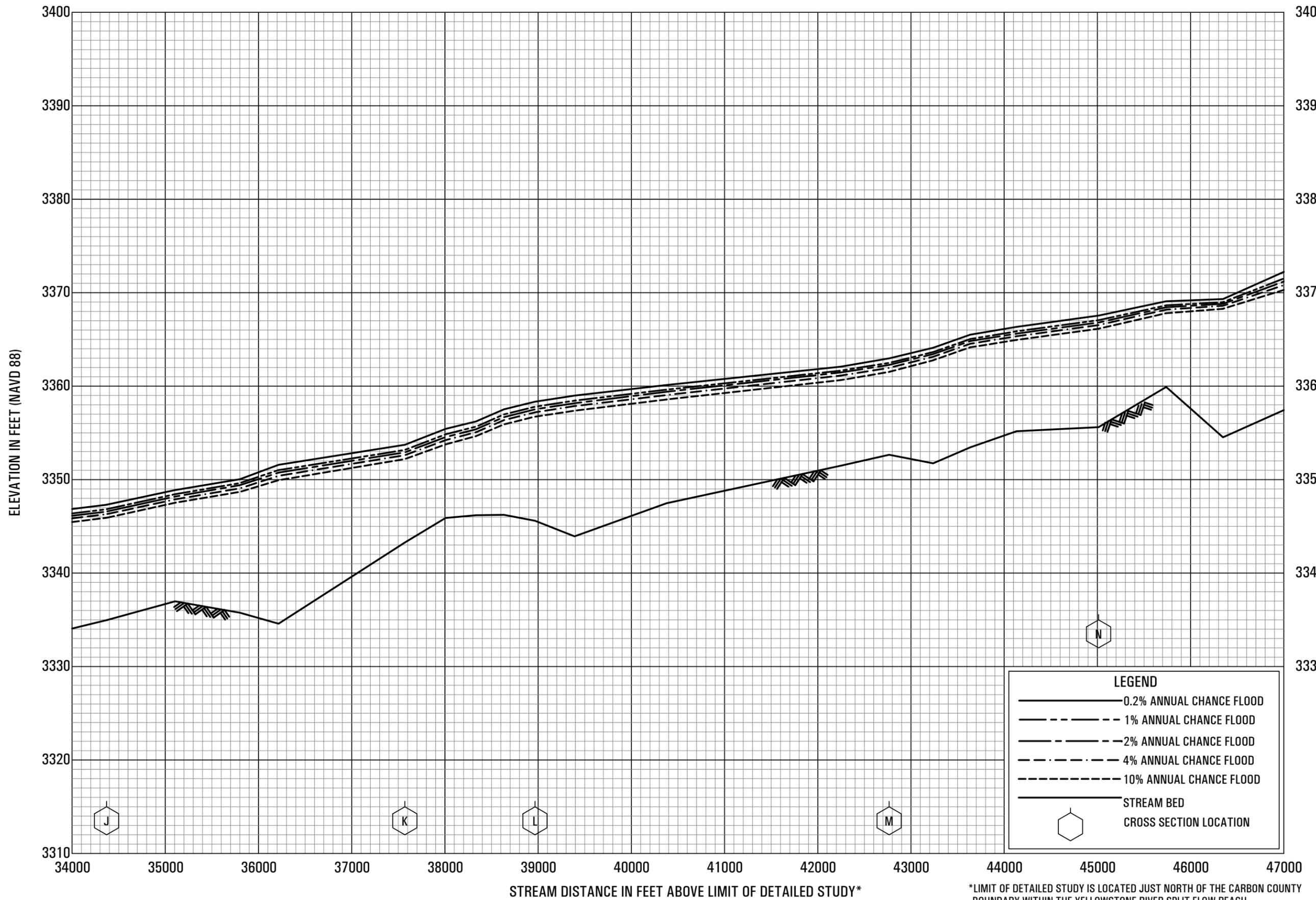


STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY\*

\*LIMIT OF DETAILED STUDY IS LOCATED JUST NORTH OF THE CARBON COUNTY BOUNDARY WITHIN THE YELLOWSTONE RIVER SPLIT FLOW REACH.

FLOOD PROFILES  
YELLOWSTONE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MT  
AND INCORPORATED AREAS



**LEGEND**

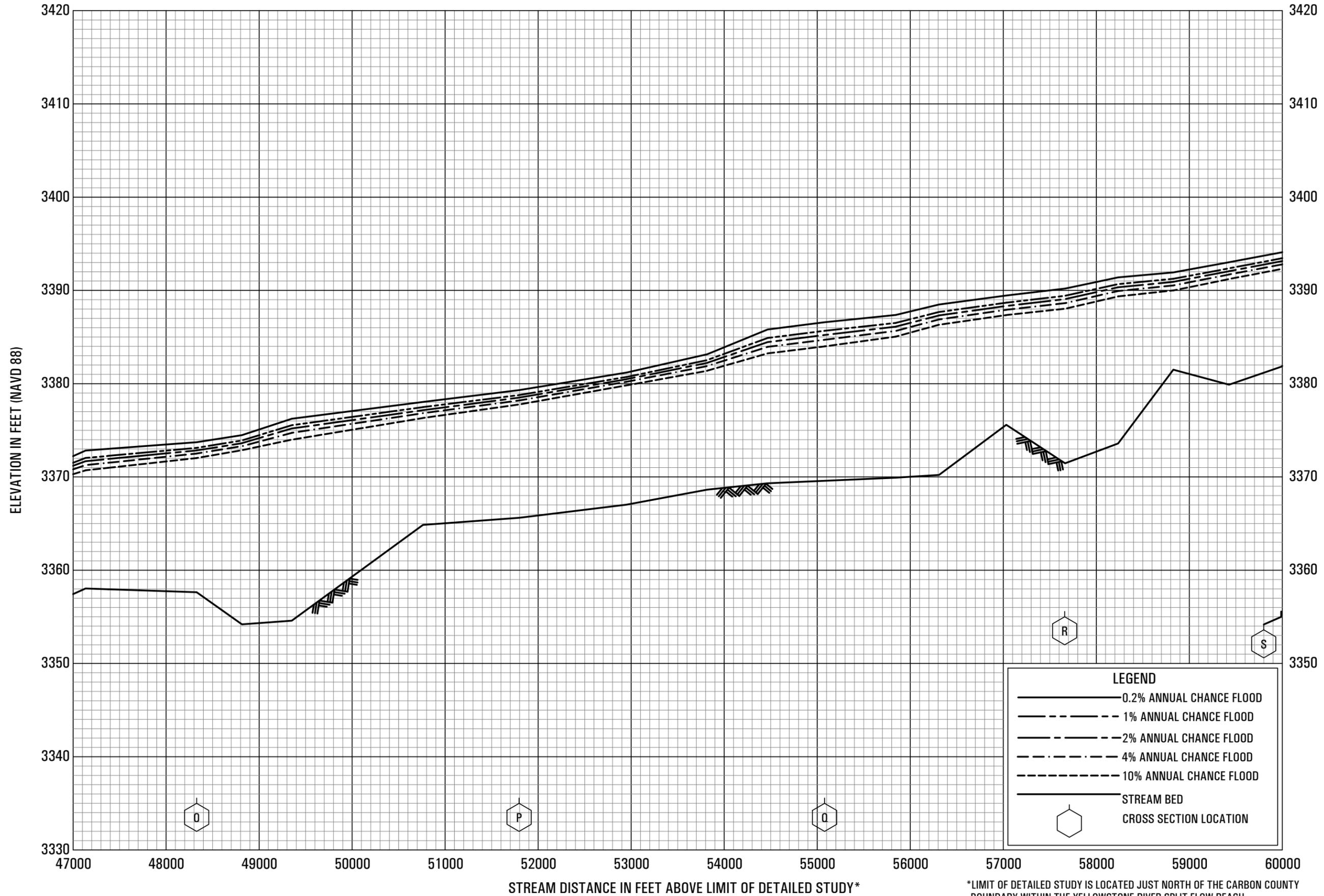
- 0.2% ANNUAL CHANCE FLOOD
- - - 1% ANNUAL CHANCE FLOOD
- - - 2% ANNUAL CHANCE FLOOD
- · - · 4% ANNUAL CHANCE FLOOD
- · · · 10% ANNUAL CHANCE FLOOD
- STREAM BED
- ⬡ CROSS SECTION LOCATION

**FLOOD PROFILES**  
**YELLOWSTONE RIVER**

**FEDERAL EMERGENCY MANAGEMENT AGENCY**  
**CARBON COUNTY, MT**  
**AND INCORPORATED AREAS**

STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY\*

\*LIMIT OF DETAILED STUDY IS LOCATED JUST NORTH OF THE CARBON COUNTY BOUNDARY WITHIN THE YELLOWSTONE RIVER SPLIT FLOW REACH.



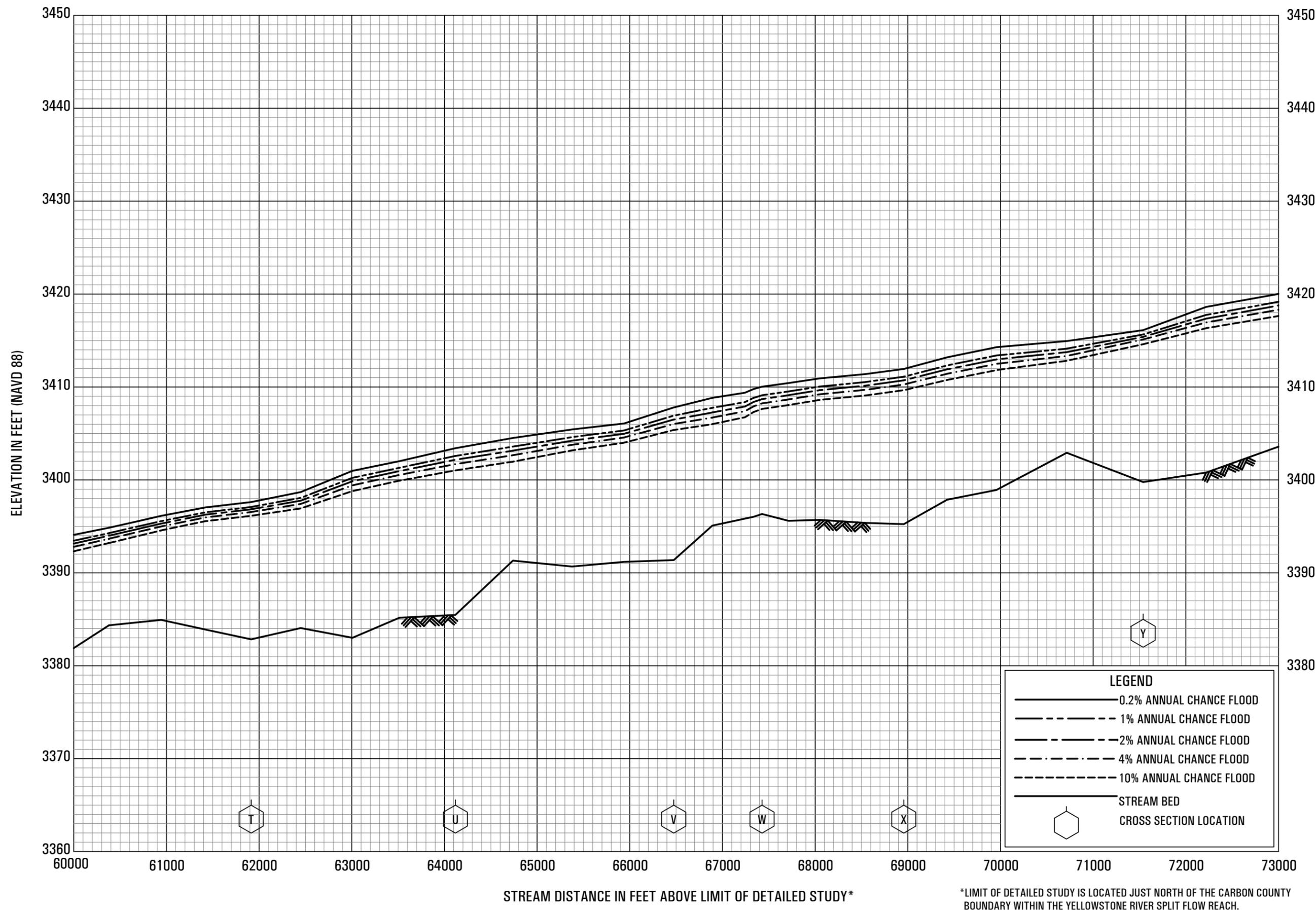
**LEGEND**

- 0.2% ANNUAL CHANCE FLOOD
- - - 1% ANNUAL CHANCE FLOOD
- - - 2% ANNUAL CHANCE FLOOD
- . - . 4% ANNUAL CHANCE FLOOD
- - - 10% ANNUAL CHANCE FLOOD
- STREAM BED
- ⬡ CROSS SECTION LOCATION

\*LIMIT OF DETAILED STUDY IS LOCATED JUST NORTH OF THE CARBON COUNTY BOUNDARY WITHIN THE YELLOWSTONE RIVER SPLIT FLOW REACH.

**FLOOD PROFILES  
YELLOWSTONE RIVER**

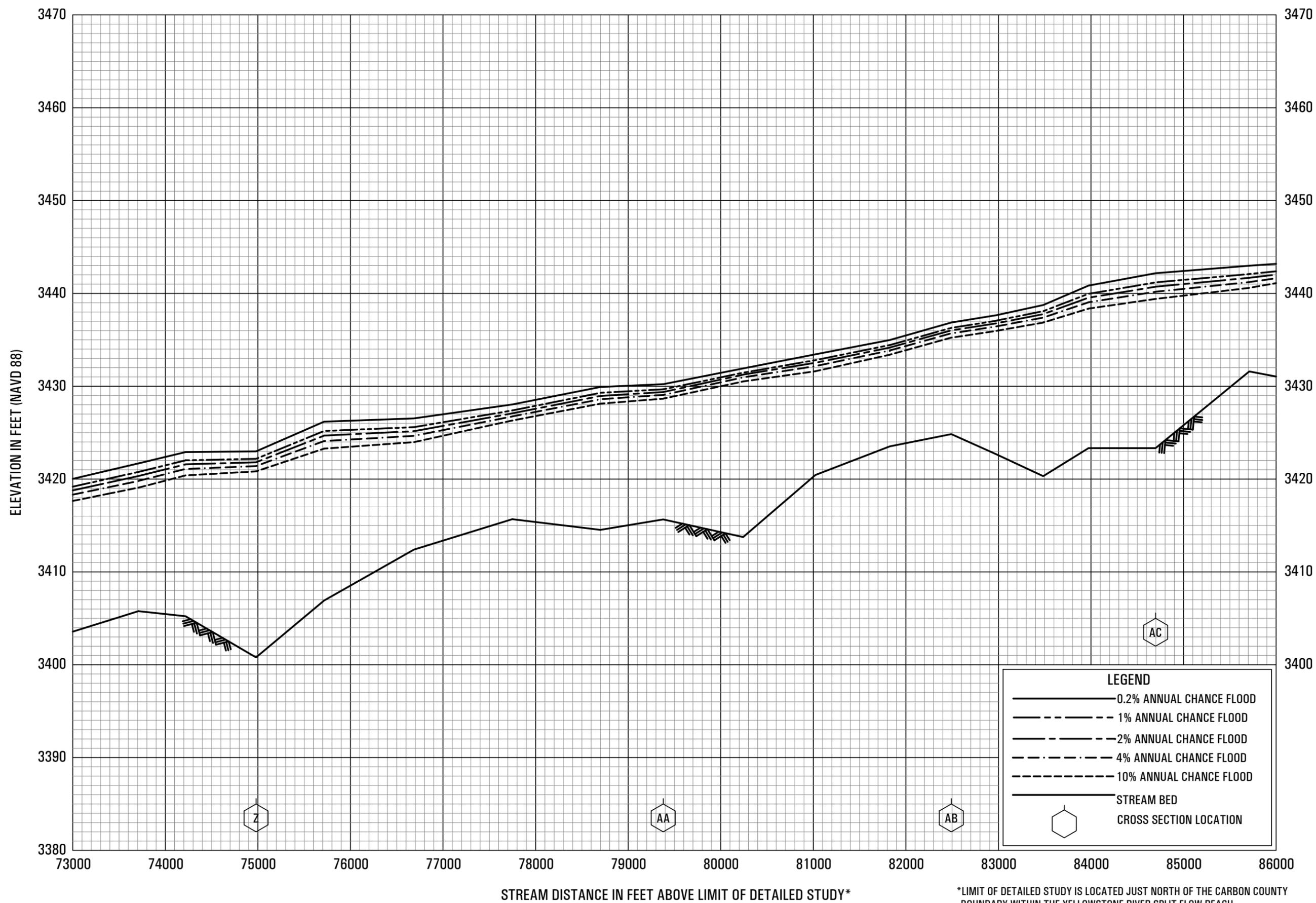
**FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MT  
AND INCORPORATED AREAS**



**FLOOD PROFILES  
YELLOWSTONE RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**CARBON COUNTY, MT**  
AND INCORPORATED AREAS

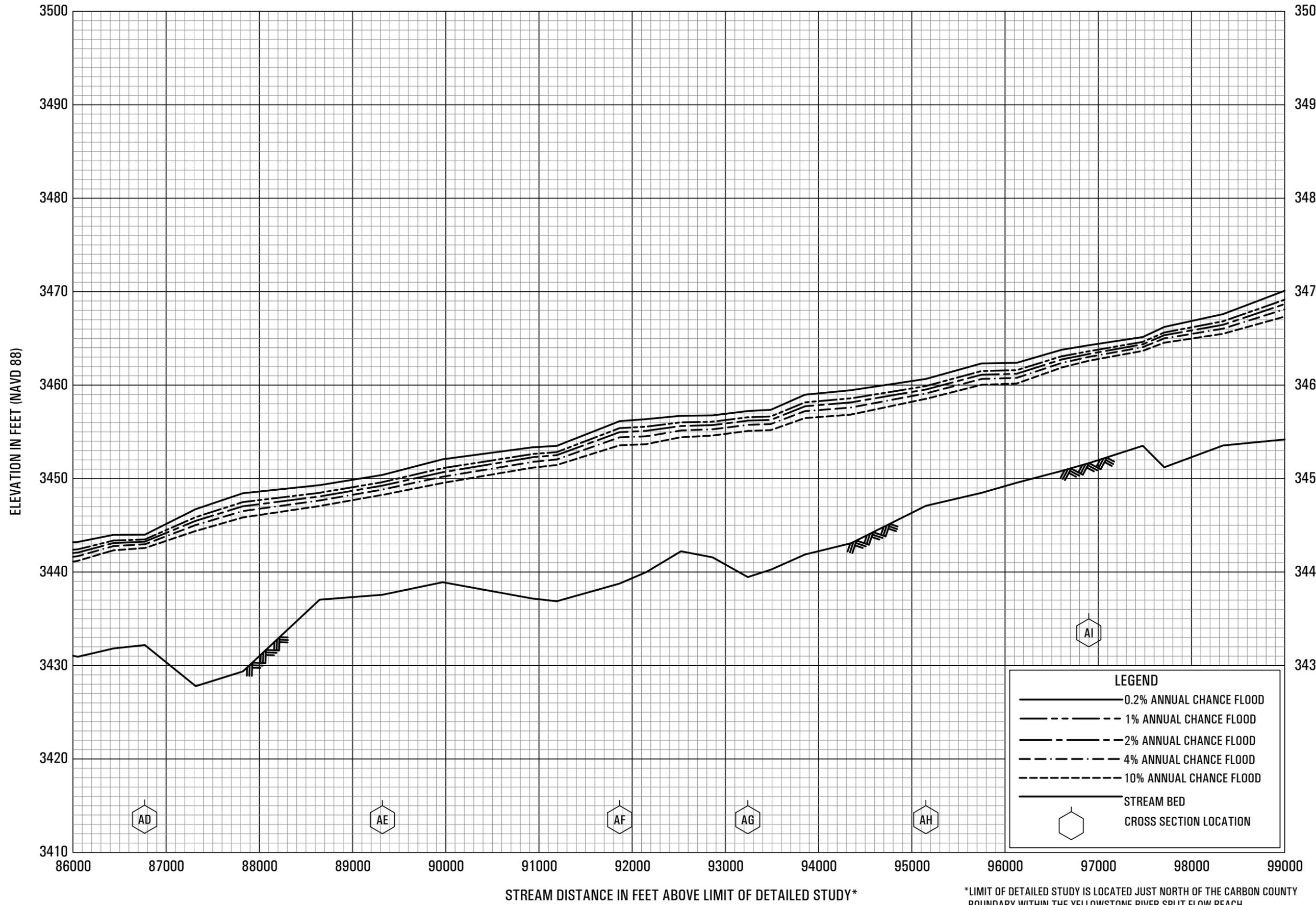
\*LIMIT OF DETAILED STUDY IS LOCATED JUST NORTH OF THE CARBON COUNTY BOUNDARY WITHIN THE YELLOWSTONE RIVER SPLIT FLOW REACH.



\*LIMIT OF DETAILED STUDY IS LOCATED JUST NORTH OF THE CARBON COUNTY BOUNDARY WITHIN THE YELLOWSTONE RIVER SPLIT FLOW REACH.

FLOOD PROFILES  
YELLOWSTONE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MT  
AND INCORPORATED AREAS



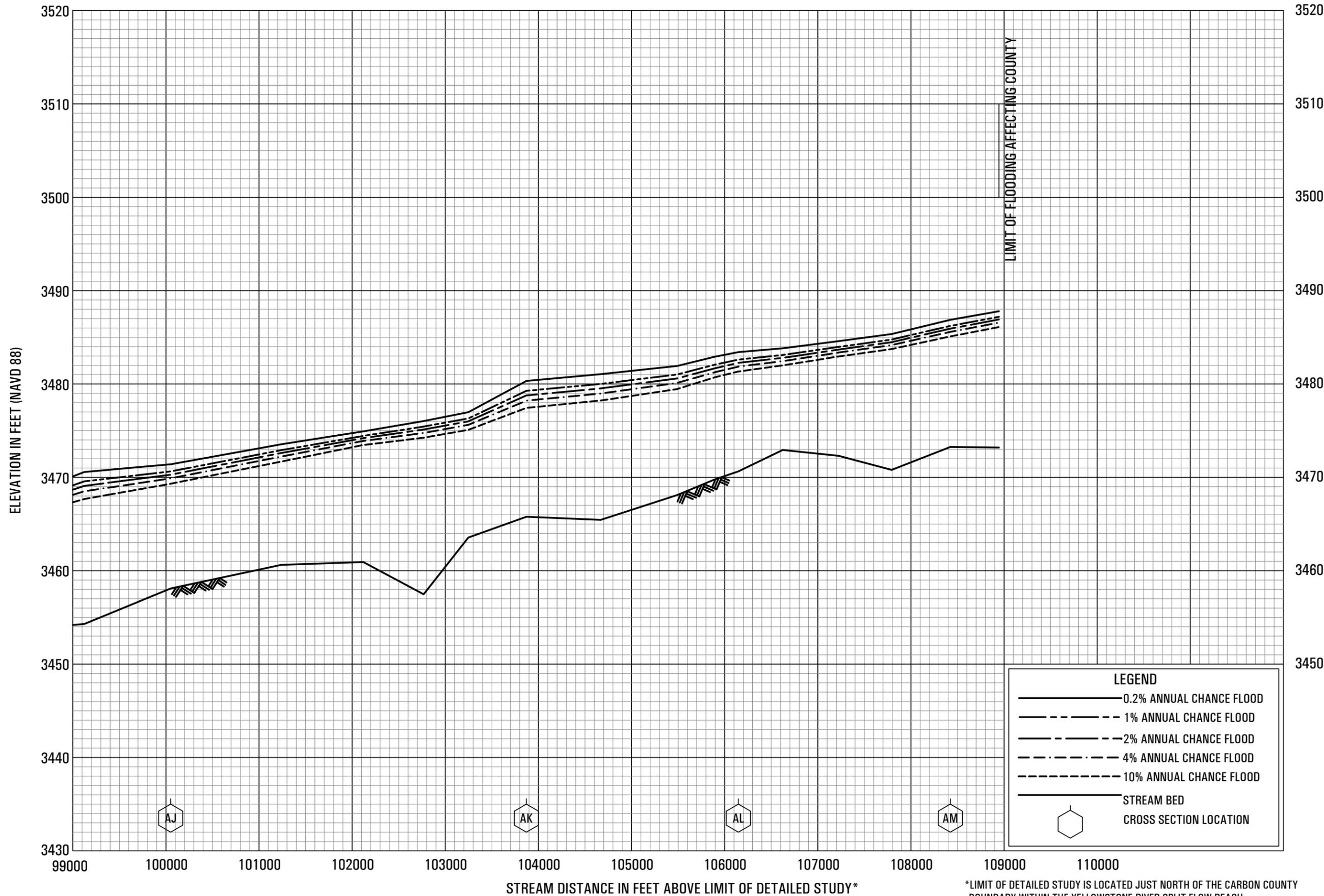
**LEGEND**

- 0.2% ANNUAL CHANCE FLOOD
- - - 1% ANNUAL CHANCE FLOOD
- · - · 2% ANNUAL CHANCE FLOOD
- · - · 4% ANNUAL CHANCE FLOOD
- - - 10% ANNUAL CHANCE FLOOD
- STREAM BED
- ⬡ CROSS SECTION LOCATION

\*LIMIT OF DETAILED STUDY IS LOCATED JUST NORTH OF THE CARBON COUNTY BOUNDARY WITHIN THE YELLOWSTONE RIVER SPLIT FLOW REACH.

FLOOD PROFILES  
YELLOWSTONE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MT  
AND INCORPORATED AREAS



**FLOOD PROFILES  
YELLOWSTONE RIVER**

**FEDERAL EMERGENCY MANAGEMENT AGENCY  
CARBON COUNTY, MT  
AND INCORPORATED AREAS**

\*LIMIT OF DETAILED STUDY IS LOCATED JUST NORTH OF THE CARBON COUNTY BOUNDARY WITHIN THE YELLOWSTONE RIVER SPLIT FLOW REACH.