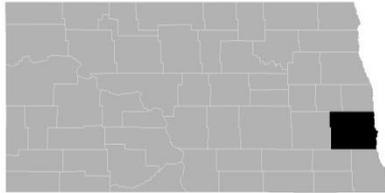


FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 3



CASS COUNTY, NORTH DAKOTA

ALL JURISDICTIONS

COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER
Addison, Township of	380THR	Fargo, City of	385364	North River, City of	380623
Alice, City of*	380363	Frontier, City of	380347	Oxbow, City of	380681
Amenia, City of	380019	Gardner, City of*	385412	Page, City of*	380193
Amenia, Township of	380686	Gardner, Township of*	380266	Page, Township of*	380THR
Argusville, City of	380639	Gill, Township of*	380THR	Pleasant, Township of	380263
Arthur, City of	380156	Grandin, City of*	380335	Pontiac, Township of*	380THR
Arthur, Township of	380THR	Gunkel, Township of*	380THR	Prairie Rose, City of*	380655
Ayr, City of*	380350	Harmony, Township of	380THR	Raymond, Township of	380261
Ayr, Township of*	380THR	Harwood, City of	380338	Reed, Township of	380257
Bell, Township of*	380THR	Harwood, Township of	380259	Reiles Acres, City of	380324
Berlin, Township of	380620	Highland, Township of	380THR	Rich, Township of*	380THR
Briarwood, City of	380651	Hill, Township of*	380THR	Rochester, Township of*	380THR
Buffalo, City of*	380160	Horace, City of	380022	Rush River, Township of	380THR
Buffalo, Township of*	380THR	Howes, Township of*	380THR	Stanley, Township of	380258
Casselton, City of	380020	Hunter, City of	380181	Tower City, City of*	380210
Casselton, Township of	380THR	Hunter, Township of	380THR	Tower, Township of*	380THR
Clifton, Township of*	380THR	Kindred, City of	380182	Walburg, Township of	380652
Cornell, Township of*	380THR	Kinyon, Township of*	380THR	Warren, Township of	380265
Davenport, City of	380717	Lake, Township of*	380THR	Watson, Township of	380THR
Davenport, Township of	380690	Leonard, City of*	380185	West Fargo, City of	380024
Dows, Township of*	380THR	Leonard, Township of*	380THR	Wheatland, Township of*	380THR
Durbin, Township of	380325	Maple River, Township of	380THR	Wiser, Township of	380267
Eldred, Township of*	380THR	Mapleton, City of	380023		
Empire, Township of*	380366	Mapleton, Township of	380262		
Erie, Township of*	380THR	Noble, Township of	380268		
Everest, Township of	380352	Normanna, Township of	380264		

*No Special Flood Hazards Identified

REVISED:

PRELIMINARY
1/29/2016

FLOOD INSURANCE STUDY NUMBER
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FEMA

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FLOOD INSURANCE STUDY REPORT CASS COUNTY, NORTH DAKOTA

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 flood prone 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 Cass County, North Dakota.

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
Addison, Township of	380THR	09020205	38017C0720H 38017C0740H 38017C0745H 38017C0925H 38017C0930H 38017C0935H	
Alice, City of ¹	380363	09020205	38017C0650G ²	
Amenia, City of	380019	09020204	38017C0313H 38017C0314H 38017C0505H	

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
Amenia, Township of	380686	09020204	38017C0285H ² 38017C0294H 38017C0295H ² 38017C0300H ² 38017C0305G ² 38017C0313H 38017C0314H 38017C0315H ² 38017C0482H 38017C0485H ² 38017C0500H ² 38017C0505H	
Argusville, City of	380639	09020107 09020204	38017C0355H 38017C0360H 38017C0362H 38017C0365H 38017C0370H	
Arthur, City of	380156	09020107	38017C0301H 38017C0302H 38017C0305G ²	
Arthur, Township of	38OTHR	09020107 09020204	38017C0100G ² 38017C0115G ² 38017C0285H ² 38017C0300H ² 38017C0301H 38017C0302H 38017C0305G ²	
Ayr, City of ¹	380350	09020205	38017C0275G ²	
Ayr, Township of ¹	38OTHR	09020204 09020205	38017C0250G ² 38017C0275G ² 38017C0450G ² 38017C0475G ²	
Bell, Township of ¹	38OTHR	09020107	38017C0104H 38017C0105G ² 38017C0112H 38017C0115G ² 38017C0125G ² 38017C0150G ²	

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
Berlin, Township of	380620	09020107 09020204	38017C0330H ² 38017C0335H ² 38017C0339H 38017C0340H ² 38017C0343H 38017C0345H ² 38017C0355H 38017C0365H 38017C0530H 38017C0535H 38017C0555H	
Briarwood, City of	380651	09020104	38017C0791G	
Buffalo, City of ¹	380160	09020205	38017C0450G ²	
Buffalo, Township of ¹	380THR	09020205	38017C0450G ² 38017C0475G ²	
Casselton, City of	380020	09020204 09020205	38017C0492H 38017C0495H 38017C0511H 38017C0512H 38017C0513H 38017C0514H 38017C0520H 38017C0710H 38017C0725H	
Casselton, Township of	380THR	09020204 09020205	38017C0482H 38017C0485H ² 38017C0492H 38017C0495H 38017C0505H 38017C0510H 38017C0511H 38017C0512H 38017C0520H	
Clifton, Township of ¹	380THR	09020205	38017C0625G ² 38017C0650G ² 38017C0825G ² 38017C0850H	
Cornell, Township of ¹	380THR	09020205	38017C0225G ² 38017C0250G ² 38017C0425G ² 38017C0450G ²	

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
Davenport, City of	380717	09020205	38017C0930H 38017C0935H	
Davenport, Township of	380690	09020205	38017C0925H 38017C0930H 38017C0935H 38017C0940H 38017C0945H	
Dows, Township of ¹	380THR	09020107 09020204	38017C0075G ² 38017C0100G ²	
Durbin, Township of	380325	09020204 09020205	38017C0520H 38017C0540H 38017C0710H 38017C0720H 38017C0730H 38017C0735H 38017C0740H 38017C0745H	
Eldred, Township of ¹	380THR	09020205	38017C0650G ² 38017C0675G ² 38017C0850H 38017C0875H	
Empire, Township of ¹	380366	09020204 09020205	38017C0275G ² 38017C0300G ² 38017C0475G ² 38017C0500G ²	
Enderlin, City of	385363	09020205	N/A	Ransom County FIS Report, 2011
Erie, Township of ¹	380THR	09020107 09020204	38017C0075G ² 38017C0100G ² 38017C0275G ² 38017C0300H ²	
Everest, Township of	380352	09020205	38017C0495H 38017C0513H 38017C0520H 38017C0700H 38017C0710H 38017C0720H 38017C0725H	

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
Fargo, City of	385364	09020104 09020105 09020204	38017C0559H 38017C0567H 38017C0569H 38017C0576G 38017C0577G 38017C0578G 38017C0579G 38017C0583G 38017C0586G 38017C0587G 38017C0588G 38017C0589G 38017C0591G 38017C0592G 38017C0593G 38017C0594G 38017C0757H 38017C0759H 38017C0767H 38017C0769G 38017C0776G 38017C0777G 38017C0778G 38017C0779G 38017C0781G 38017C0782G 38017C0783G 38017C0784G 38017C0786G 38017C0787G 38017C0790G 38017C0791G 38017C0795G 38017C0957H 38017C0960H 38017C0980G 38017C0985G	
Frontier, City of	380347	09020104	38017C0787G	
Gardner, City of ¹	385412	09020107	38017C0165G	

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
Gardner, Township of ¹	380266	09020107	38017C0150G ² 38017C0165G 38017C0330H ² 38017C0335H ² 38017C0355H	
Gill, Township of ¹	380THR	09020205	38017C0475G ² 38017C0495H 38017C0500H ² 38017C0675G ² 38017C0700H	
Grandin, City of ¹	380335	09020107	38017C0150G ² 38017C0155G ²	
Gunkel, Township of ¹	380THR	09020107 09020204	38017C0115G ² 38017C0125G ² 38017C0150G ² 38017C0302H 38017C0305G ² 38017C0310H ² 38017C0330H ²	
Harmony, Township of	380THR	09020204 09020205	38017C0510H 38017C0520H 38017C0530H 38017C0535H 38017C0540H 38017C0545H	
Harwood, City of	380338	09020104 09020204	38017C0370H 38017C0390G 38017C0556H 38017C0557H 38017C0558H 38017C0559H 38017C0576G 38017C0578G	

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
Harwood, Township of	380259	09020104 09020107 09020204	38017C0360H 38017C0365H 38017C0370H 38017C0380H 38017C0390G 38017C0395G 38017C0555H 38017C0556H 38017C0557H 38017C0576G 38017C0577G	
Highland, Township of	380THR	09020205	38017C0850H 38017C0875H	
Hill, Township of ¹	380THR	09020205	38017C0425G ² 38017C0450G ² 38017C0625G ² 38017C0650G ²	
Horace, City of	380022	09020104 09020105 09020204	38017C0762H 38017C0764H 38017C0766H 38017C0767H 38017C0768H 38017C0769G 38017C0790G 38017C0955H 38017C0957H 38017C0960H 38017C0980G	
Howes, Township of ¹	380THR	09020205	38017C0450G ² 38017C0475G ² 38017C0650G ² 38017C0675G ²	
Hunter, City of	380181	09020107	38017C0103H 38017C0104H 38017C0112H	
Hunter, Township of	380THR	09020107 09020204	38017C0100G ² 38017C0103H 38017C0104H 38017C0105G ² 38017C0111H 38017C0112H 38017C0115G ²	

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
Kindred, City of	380182	09020204 09020205	38017C0945H 38017C0965H	
Kinyon, Township of ¹	380THR	09020107	38017C0150G ² 38017C0155G ² 38017C0165G	
Lake, Township of ¹	380THR	09020107 09020205	38017C0025G ² 38017C0050G ² 38017C0225G ² 38017C0250G ²	
Leonard, City of ¹	380185	09020205	38017C0900H 38017C0925H	
Leonard, Township of ¹	380THR	09020204 09020205	38017C0900H 38017C0925H	
Maple River, Township of	380THR	09020205	38017C0700H 38017C0720H 38017C0725H 38017C0900H 38017C0925H	
Mapleton, City of	380023	09020204 09020205	38017C0539H 38017C0540H 38017C0543H 38017C0545H 38017C0730H 38017C0735H	
Mapleton, Township of	380262	09020204 09020205	38017C0735H 38017C0745H 38017C0754H 38017C0755H 38017C0762H 38017C0765H	
Noble, Township of	380268	09020107	38017C0155G ² 38017C0160H 38017C0165G 38017C0170H 38017C0180H 38017C0190H	
Normanna, Township of	380264	09020105 09020204 09020205	38017C0935H 38017C0945H 38017C0955H 38017C0960H 38017C0965H 38017C0970H	

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
North River, City of	380623	09020104	38017C0583G	
Oxbow, City of	380681	09020104 09020105	38017C0990G 38017C0995G	
Page, City of ¹	380193	09020107	38017C0050G ²	
Page, Township of ¹	380THR	09020107 09020109	38017C0050G ² 38017C0075G ²	
Pleasant, Township of	380263	09020104 09020105	38017C0960H 38017C0970H 38017C0980G 38017C0985G 38017C0990G 38017C0995G	
Pontiac, Township of ¹	380THR	09020205	38017C0825G ² 38017C0850H	
Prairie Rose, City of	380655	09020104	38017C0779G	
Raymond, Township of	380261	09020204 09020205	38017C0535H 38017C0545H 38017C0555H 38017C0556H 38017C0558H 38017C0565H	
Reed, Township of	380257	09020204	38017C0556H 38017C0558H 38017C0559H	
Reiles Acres, City of	380324	09020104	38017C0559H 38017C0567H 38017C0578G 38017C0586G	
Rich, Township of ¹	380THR	09020107 09020204 09020205	38017C0050G ² 38017C0075G ² 38017C0250G ² 38017C0275G ²	
Rochester, Township of ¹	380THR	09020107 09020109 09020205	38017C0025G ² 38017C0050G ²	

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
Rush River, Township of	380THR	09020107 09020204	38017C0305G ² 38017C0310H ² 38017C0314H 38017C0315H ² 38017C0316H 38017C0317H ² 38017C0318H 38017C0319H 38017C0330H ² 38017C0338H 38017C0339H 38017C0340H ² 38017C0505H 38017C0510H 38017C0530H	
Stanley, Township of	380258	09020104 09020105 09020204	38017C0957H 38017C0960H 38017C0980G 38017C0985G	
Tower, City of ¹	380210	09020205	38017C0425G ²	
Tower, Township of ¹	380THR	09020205	38017C0425G ² 38017C0450G ²	
Walburg, Township of	380652	09020205	38017C0675G ² 38017C0700H 38017C0875H 38017C0900H	
Warren, Township of	380265	09020204 09020205	38017C0745H 38017C0762H 38017C0764H 38017C0765H 38017C0768H 38017C0935H 38017C0955H	
Watson, Township of	380THR	09080205	38017C0875H 38017C0900H	

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
West Fargo, City of	380024	09020104 09020204 09020205	38017C0545H 38017C0555H 38017C0558H 38017C0559H 38017C0565H 38017C0566H 38017C0567H 38017C0568H 38017C0569H 38017C0588G 38017C0735H 38017C0754H 38017C0755H 38017C0756H 38017C0757H 38017C0758H 38017C0759H 38017C0762H 38017C0766H 38017C0767H 38017C0776G	
Wheatland, Township of ¹	380THR	09020204 09020205	38017C0475G ² 38017C0485H ² 38017C0495H 38017C0500H ²	
Wiser, Township of	380267	09020104 09020107	38017C0165G 38017C0170H 38017C0190H 38017C0355H 38017C0360H 38017C0380H	

¹ No Special Flood Hazard Areas Identified

² 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 Cass County became effective on January 16, 2015. Refer to Table 28 for information about subsequent revisions to the FIRMs.

- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is shown on the FIRM, it is being provided by FEMA as information only. For communities that do adopt Zone VE building standards in the area defined by the LiMWA, additional Community Rating System (CRS) credits are available. Refer to Section 2.5.4 for additional information about the LiMWA.

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at <http://www.fema.gov> or contact your appropriate FEMA Regional Office for more information about this program.

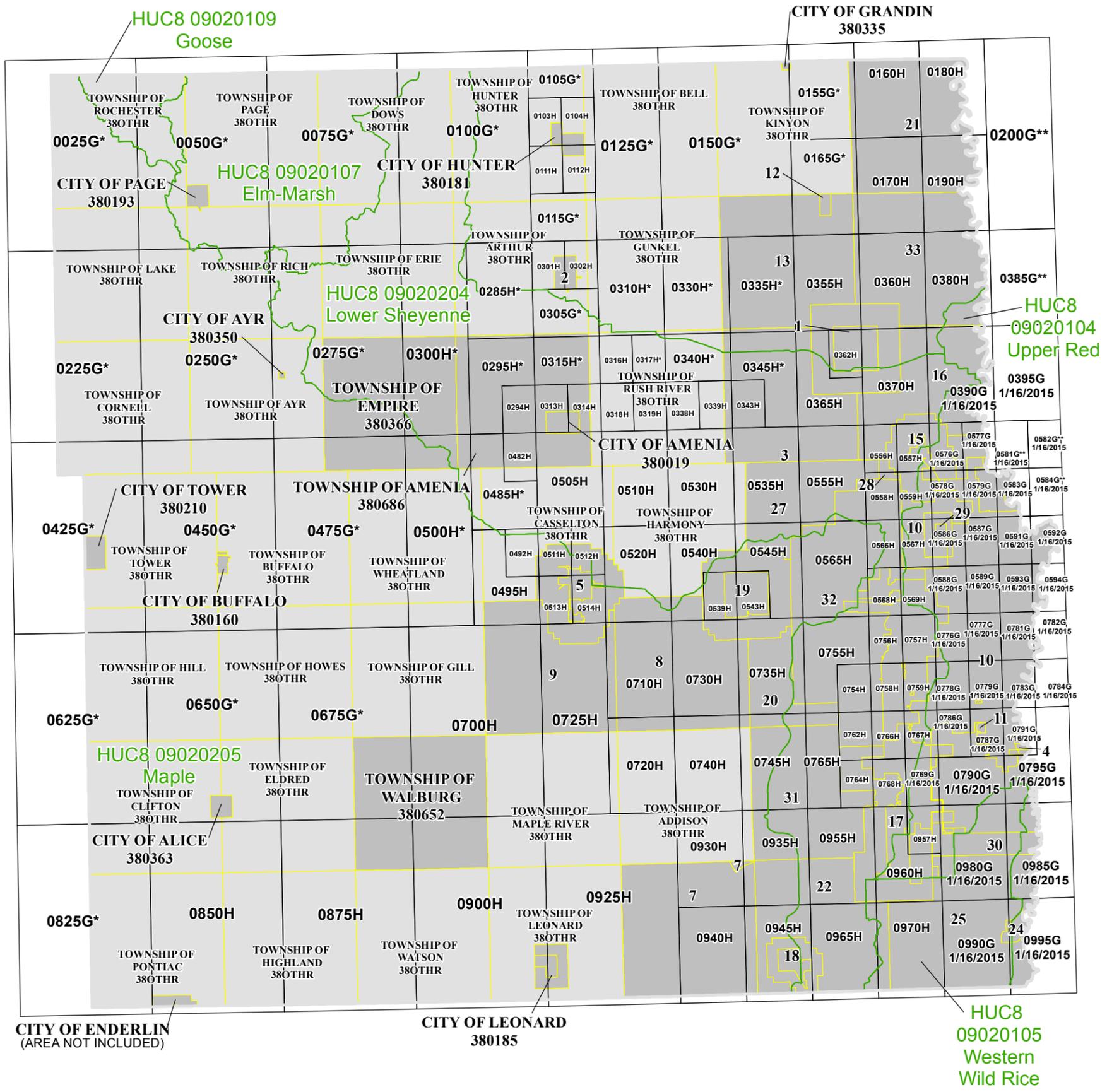
- Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must 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.

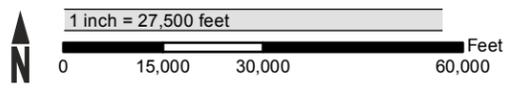
- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM,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

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Cass County, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, flooding sources, watershed boundaries, and United States Geological Survey (USGS) Hydrologic Unit Code – 8 (HUC-8) codes.



ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before 1/16/2015.

KEY NUMBER	COMMUNITY	CID	KEY NUMBER	COMMUNITY	CID
1	CITY OF ARGUSVILLE	380639	18	CITY OF KINDRED	380182
2	CITY OF ARTHUR	380156	19	CITY OF MAPLETON	380023
3	TOWNSHIP OF BERLIN	380620	20	TOWNSHIP OF MAPLETON	380262
4	CITY OF BRIARWOOD	380651	21	TOWNSHIP OF NOBLE	380268
5	CITY OF CASSELTON	380020	22	TOWNSHIP OF NORMANNA	380264
6	CITY OF DAVENPORT	380717	23	CITY OF NORTH RIVER	380623
7	TOWNSHIP OF DAVENPORT	380690	24	CITY OF OXBOW	380681
8	TOWNSHIP OF DURBIN	380325	25	TOWNSHIP OF PLEASANT	380263
9	TOWNSHIP OF EVEREST	380352	26	CITY OF PRAIRIE ROSE	380655
10	CITY OF FARGO	385364	27	TOWNSHIP OF RAYMOND	380261
11	CITY OF FRONTIER	380347	28	TOWNSHIP OF REED	380257
12	CITY OF GARDNER	385412	29	CITY OF REILES ACRES	380324
13	TOWNSHIP OF GARDNER	380266	30	TOWNSHIP OF STANLEY	380258
14	CITY OF GRANDIN	380335	31	TOWNSHIP OF WARREN	380265
15	CITY OF HARWOOD	380338	32	CITY OF WEST FARGO	380024
16	TOWNSHIP OF HARWOOD	380259	33	TOWNSHIP OF WISER	380267
17	CITY OF HORACE	380022			



Map Projection:
Universal Transverse Mercator Zone 14 North;
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
**PANELS NOT PRINTED - AREA OUTSIDE OF COUNTY BOUNDARY



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP INDEX

CASS COUNTY, NORTH DAKOTA (All Jurisdictions)

PANELS PRINTED:
0103, 0104, 0111, 0112, 0160, 0165, 0170, 0180, 0190, 0294, 0301, 0302, 0313, 0314, 0316, 0318, 0319, 0338, 0339, 0343, 0355, 0360, 0362, 0365, 0370, 0380, 0390, 0395, 0482, 0492, 0495, 0505, 0510, 0511, 0512, 0513, 0514, 0520, 0530, 0535, 0539, 0540, 0543, 0545, 0555, 0556, 0557, 0558, 0559, 0565, 0566, 0567, 0568, 0569, 0576, 0577, 0578, 0579, 0583, 0586, 0587, 0588, 0589, 0591, 0592, 0593, 0594, 0700, 0710, 0720, 0725, 0730, 0735, 0740, 0745, 0754, 0755, 0756, 0757, 0758, 0759, 0762, 0764, 0765, 0766, 0767, 0768, 0769, 0776, 0777, 0778, 0779, 0781, 0782, 0783, 0784, 0786, 0787, 0790, 0791, 0795, 0850, 0875, 0900, 0925, 0930, 0935, 0940, 0945, 0955, 0957, 0960, 0965, 0970, 0980, 0985, 0990, 0995



FEMA

PRELIMINARY

MAP NUMBER
38017CINDOB

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.

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.

Figure 2. FIRM Notes to Users

PROJECTION INFORMATION: The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 14. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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

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

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

BASE MAP INFORMATION: Base map information shown on this FIRM was provided in digital format by the Cass County GIS Department dated January 2009. Corporate Boundaries and Transportation features were updated January 2015 based on Cass County GIS Department data. 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.

Figure 2. FIRM Notes to Users

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Cass County, North Dakota, 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 Cass County, North Dakota, effective TBD.

ACCREDITED LEVEE: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/business/nfip/index.shtm>.

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, either at cross section locations or as static whole-foot elevations that apply throughout the 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

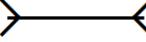
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood. See Notes to Users for important information.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
 (ortho) (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
 <i>Aqueduct Channel Culvert Storm Sewer</i>	Channel, Culvert, Aqueduct, or Storm Sewer
 <i>Dam Jetty Weir</i>	Dam, Jetty, Weir
	Levee, Dike or Floodwall
 <i>Bridge</i>	Bridge

Figure 3: Map Legend for FIRM

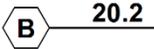
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): <i>CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.</i>	
 CBRS AREA 09/30/2009	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
 OTHERWISE PROTECTED AREA 09/30/2009	Otherwise Protected Area
REFERENCE MARKERS	
	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Coastal Transect
 	<p>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.</p> <p>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.</p>
	Base Flood Elevation Line (shown for flooding sources for which no cross sections or profile are available)
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity

Figure 3: Map Legend for FIRM

BASE MAP FEATURES	
 <i>Missouri Creek</i>	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway
	County Highway
<u>MAPLE LANE</u>	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
4276^{000m}E	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16' 52.5"	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 Cass 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 Cass County, North Dakota, 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

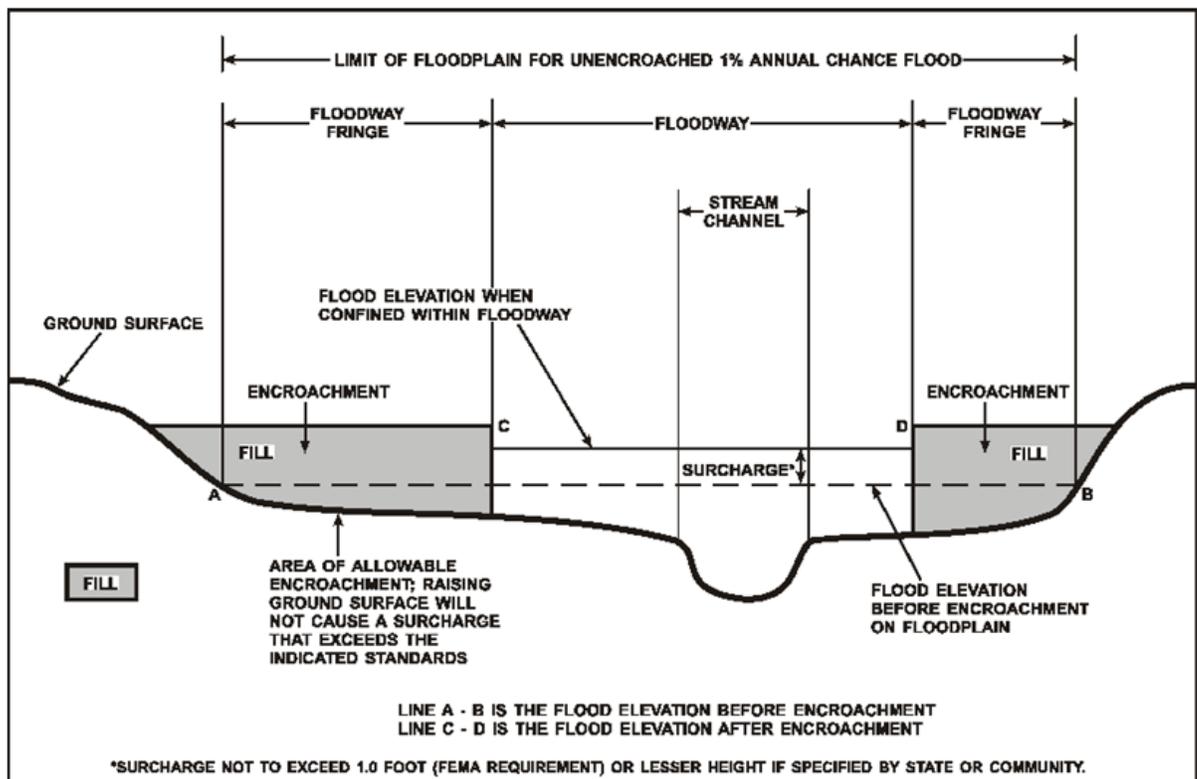
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the

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. In North Dakota, floodplain encroachment on the boundary waters between North Dakota and Minnesota is limited to a 0.75-foot increase in flood heights above pre-flood conditions at any point. The 0.75-foot surcharge was determined from the allowable 0.5-foot floodway on the North Dakota side and the allowable 0.25-foot floodway on the Minnesota side. The 0.75-foot surcharge was rounded to the nearest 0.1 foot, or 0.80 foot. 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."

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.

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 ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
County Drain 10 Breakout	City of Fargo	Confluence with Red River of the North	Just upstream of Cass County Highway 31 N	09020104	3.1		Y	AE	2007
County Drain 45	City of Fargo, City of Harwood, City of Reiles Acres, City of West Fargo	At Drain 40 / 45 split	Approximately 0.5 mile upstream of 19 th Avenue N	09020104	5.3		Y	AE	2007
Drain 14	Township of Addison, Township of Mapleton, City of Mapleton, Township of Warren, City of West Fargo	Confluence with Maple River	Approximately 2.1 miles upstream of 46 th ST SE	09020205	17.7		N	AE	2015
Drain 21	City of West Fargo	Convergence with Sheyenne River	Divergence from Sheyenne River approximately 165 feet downstream of 12 th Avenue NW	09020204	2.2		N	AE	2015
Drain 21C	City of Horace, Township of Warren, City of West Fargo	Confluence with Sheyenne River Diversion Channel	Approximately 2.0 miles upstream of 47 th ST SE	09020204	7.4		N	AE	2015

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 ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Drain 34	Township of Addison, City of Davenport, Township of Davenport, City of Kindred, Township of Normanna, Township of Warren	Confluence with Drain 14	Approximately 1.0 mile upstream of 53 rd ST SE	09020205	7.9		N	AE	2015
Drain 37	Township of Pleasant	Confluence with Wild Rice River	Just downstream of 164 th Avenue SE	09020105	10.3		N	AE	2015
Drain 53 Breakout	City of Fargo	Confluence with Rose Coulee	Approximately 1.1 miles upstream of 88 th Avenue S	09020104	5.2		N	AE	2007

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 ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Lower Branch Rush River	City of Amenia, Township of Amenia, Township of Cassleton, Township of Harmony, City of Harwood, Township of Harwood, Township of Raymond, Township of Reed, Township of Rush River	Confluence with Sheyenne River	Approximately 2.0 miles upstream of 154 th Avenue SE	09020204	26.6		N	A	2015
Maple River	City of Mapleton	Approximately 943 feet downstream of 163 rd Avenue SE	Approximately 2.0 miles upstream of railroad	09020205	5.3		Y	AE	2015

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 ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Maple River	Township of Addison, Township of Durbin, City of Mapleton, Township of Raymond, City of West Fargo	Confluence with Sheyenne River	Approximately 295 feet upstream of 42 nd Street SE	09020205	27.1		N	AE	2015
Red River of the North	City of Briarwood, City of Fargo, Township of Harwood, Township of Noble, City of North River, City of Ox Bow, Township of Pleasant, Township of Stanley, Township of Wisner	At Cass County and Traill County boundary	At Cass County and Richland County boundary	09020104 09020107	97.0		Y	AE	2007

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 ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Rush River	City of Amenia, Township of Amenia, Township of Berlin, Township of Harmony, Harwood, City of Harwood Township of Raymond, Township of Rush River, Township of	Confluence with Sheyenne River	Just downstream of 153 rd Avenue SE	09020204	28.0		N	A	2015
Sheyenne River	City of Fargo, City of Harwood, Township of Harwood, City of Horace, City of Kindred, Township of Normanna, City of West Fargo	Confluence with Red River of the North	Approximately 1.4 miles upstream of 162 nd Avenue SE	09020204	68.0		N	AE	2015
Sheyenne River Diversion Channel	City of Fargo, City of Horace, City of West Fargo	Convergence with Sheyenne River	Divergence from Sheyenne River	09020204	7.3		N	AE	2015

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 ²) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
South Branch Elm River	City of Hunter, Township of Hunter	Approximately 1,660 feet downstream of 155 th Avenue SE	Approximately 962 feet upstream of Dam	09020107	0.9		Y	AE	1978
Swan Creek	City of Casselton, Township of Casselton, Township of Durbin	Confluence with Maple River	Approximately 500 feet upstream of 34 th R ST SE	09020205	11.1		Y	AE	2011
Tributary to Swan Creek	City of Casselton, Township of Casselton	Confluence with Swan Creek	Approximately 1,815 feet upstream of Unnamed Road	09020205	2.0		Y	AE	2011
Wild Rice River	City of Fargo, Township of Pleasant, Township of Stanley	Confluence with Red River of the North	Approximately 1,637 feet upstream of 54 th ST SE	09020105	21.0		Y	AE	2007
Zone A streams			All other Zone A flooding sources within Cass County		96.0		N	A	2015

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 incorporated areas of Cass County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Addison, Township of	A, AE, X
Amenia, City of	A, X
Amenia, Township of	A, X
Argusville, City of	AE, X
Arthur, City of	A, X
Arthur, Township of	A, X
Berlin, Township of	A, AE, X
Briarwood, City of	AE, X
Casselton, City of	AE, X
Casselton, Township of	A, AE, X
Davenport, City of	AE, X
Davenport, Township of	AE, X
Durbin, Township of	A, AE, X
Everest, Township of	A, X
Fargo, City of	AE, X
Frontier, City of	AE, X
Gardner, Township of	X
Harmony, Township of	A, X, AE
Harwood, City of	A, AE, X
Harwood, Township of	A, AE, X
Highland, Township of	A, X
Horace, City of	AE, X
Hunter, City of	A, AE, X
Hunter, Township of	A, AE, X

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Kindred, City of	AE, X
Kinyon, Township of	X
Maple River, Township of	A
Mapleton, City of	AE, X
Mapleton, Township of	AE, X
Noble, Township of	AE, X
Normanna, Township of	AE, X
North River, City of	AE, X
Oxbow, City of	AE, X
Pleasant, Township of	AE, X
Prairie Rose, City of	AE, X
Raymond, Township of	A, AE, X
Reed, Township of	A, AE, X
Reiles Acres, City of	AE, X
Rush River, Township of	A, X
Stanley, Township of	AE, X
Walburg, Township of	A, X
Warren, Township of	AE, X
Watson, Township of	A
West Fargo, City of	A, AE, X
Wiser, Township of	AE, X

3.2 Coastal Barrier Resources System

This section is not applicable to this Flood Risk Project.

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)
Elm-Marsh	09020107	Elm River	Mostly agricultural land, the watershed includes majority of City of Argusville and portion of Township of Harwood.	510
Goose	09020109	Goose River	Headwaters of this basin cover small portion of northwest corner of Cass County.	1,270
Lower Sheyenne	09020204	Sheyenne River	Flows in Cass County near the northern portion of the City of Kindred and joins the Red River north of Fargo.	5,070
Maple	09020205	Maple River	The Maple basin covers approximately 1/3 of Cass County in the southwest portion of the county. Maple River flows northeasterly to confluence with Sheyenne River. The Cities of Casselton, Mapleton, and West Fargo, along with multiple townships, are affected.	1,600
Upper Red	09020104	Red River	The Red River makes up the eastern boundary of Cass County, encompasses City of Harwood, City of Fargo, Township of Harwood and Township of Pleasant.	17,000
Western Wild Rice	09020105	Wild Rice River	Lower portion of Cass County, includes southeastern portion of City of Frontier and City of Fargo.	2,021

4.2 Principal Flood Problems

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

Table 6: Principal Flood Problems

Flooding Source	Description of Flood Problems
All sources	<p>Floods in Cass County occur mainly in the spring and are attributed to spring snowmelt and runoff from high-intensity rainfall. Flooding associated with ice jams usually occurs only with lower frequency floods. In many cases, the ice jams break up before peak flow occurs. Therefore, they are considered to have a negligible effect on major flooding events. Damages include flooding of agricultural and residential buildings, damage to roads, disruption of utilities service, and damage to agricultural land.</p>
Maple River	<p>Flat topography and the large contributing western drainage area are factors that contribute to flooding in the Maple River. The Maple River meanders approximately 2 miles for each valley mile, which results in relatively low velocities and causes extended durations of flooding. Ice jams and debris accumulation at structures can raise flood levels in the area. The most recent significant flood occurred late March through early April 2006. Several homes near the confluence of the Maple and Sheyenne Rivers were completely surrounded by water. Flooding also occurred in June 2005, when the Maple River crested around 908.8 feet mean sea level. The river was reported to be one-quarter to one mile wide in some areas. A major flood occurred on April 1997, with a discharge of 7,150 cubic feet per second (cfs), and an estimated return frequency of 95 years at Mapleton, just upstream of the Raymond township limit. The April 1969 flood had a discharge of 7,000 cfs, with an estimated return frequency of 90 years at Mapleton. During the April 1969 flood, approximately 92 percent of the area within the corporate limits of Mapleton was inundated. In the July 1975 flood, approximately 95 percent of the area within Mapleton was inundated. The maximum flood of record occurred in July 1975, with a discharge of 11,600 cubic feet per second (cfs), and an estimated return frequency of 100 years, 3 miles south of Mapleton. The April 1969 flood had a discharge of 7000 cfs, with an estimated return frequency of 25 years at Mapleton and a discharge of 8000 cfs, with an estimated return frequency of 50 years, 3 miles south of Mapleton. In April 1993, a major flood occurred because of heavy persistent rainfall. However, the USGS gage had been removed so no discharge was recorded. The 1993 flood was generally about 0.5 foot lower than the 1975 flood according to observed high water marks. Water-surface elevations for the April 1969, July 1975, April 1979, and April 1997 floods were 905.0 feet, 906.8 feet, 906.78 feet, and 905.4 feet respectively, as recorded at the gaging station between the Burlington Northern Railroad and Main Street in the City of Mapleton.</p>

Table 6: Principal Flood Problems

Flooding Source	Description of Flood Problems
Red River of the North	<p>The Red River of the North basin exhibits a number of unusual characteristics which make it particularly susceptible to flooding. Because the basin is so flat, it allows water to spread out and inundate vast areas adjacent to the river. The northward direction of flow is a unique and important element in the overall flood pattern of the river. The melting season begins in the southern sections and progresses slowly northward, tending to synchronize the flood peak on the Red River of the North with peaks of its tributaries, progressively increasing flood stages. Also, as the spring runoff moves northward, it often encounters sections on the river which are locked by ice, causing minor localized increases in flood stages. Numerous large floods have occurred in the Red River of the North basin since the inception of flood data collection, the largest of these being the floods of 1882, 1897, 1950, 1965, 1966, and 1969. The maximum recorded flood occurred on April 7, 1897. The highest summer crest of 33.26 feet occurred on July 4, 1975. The most recent major flood occurred through late March and April 2006, causing more than \$20 million in damages and one fatality. The crest was estimated at 37.18 feet on April 5, 2006. Over 40 roads throughout the county were closed due to high water as well as one lane of southbound Interstate 29 south of Horace. A temporary clay dike was built along 2nd Street North to protect a portion of the downtown area, including city hall. Temporary clay dikes were also built to protect the Rose Creek clubhouse and a nearby church. Flooding also occurred in June 2005, when the Red River crested around 28.19 feet in the Fargo/Moorhead area. This was the second highest summer crest on record. Estimated frequencies have not been determined for any of these floods, however, it has been determined that both the 1950 and 1969 floods were less than 1-percent-annual-chance.</p>
Sheyenne River	<p>Flooding on the Sheyenne River is mainly caused by downstream backwater effects from the Red, Rush, and Maple Rivers. Low channel capacity combined with several flow-constraining railroad and roadway embankments causes the flooding to resemble a lake. During larger floods, a significant portion of the flow is in the overbank areas. Additional flooding occurs because of breakout, or diversion, flows between Horace and West Fargo. Overland or breakout flows have occurred during high water due to the perched condition of the Sheyenne River; that is, the riverbanks are higher than the surrounding countryside. The effects of breakout flow are further compounded by the construction of temporary agricultural levees along the Sheyenne River. These breakout flows have occurred at different locations depending on the strength of agricultural levees along the riverbanks. Further flooding occurs because of backwater caused by flow-constraining roadway and railroad embankments. The most recent significant flood occurred late March through early April 2006. Several homes near the confluence of the Maple and Sheyenne Rivers were completely surrounded by water. Major spring flooding occurred on the Sheyenne River in 1882, 1897, 1916, 1947, 1948, 1950, 1952, 1965, 1966, 1969, 1972, 1978, 1979, 1995, 1996, and 1997; major summer flooding occurred in 1897, 1901, 1916, 1918, 1953, 1962, 1975, and 1993.</p>

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

Table 7: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Red River of the North	Gage 05054000 Red River of the North at Fargo, ND	40.8	2009	N/A	USGS gage
Red River of the North	Gage 05054000 Red River of the North at Fargo, ND	39.6	1997	N/A	USGS gage
Red River of the North	Gage 05054000 Red River of the North at Fargo, ND	39.1	1897	N/A	USGS gage
Red River of the North	Gage 05054000 Red River of the North at Fargo, ND	38.8	2011	N/A	USGS gage
Red River of the North	Gage 05054000 Red River of the North at Fargo, ND	37.3	1969	N/A	USGS gage
Sheyenne River	Gage 05059500 Sheyenne River at West Fargo, ND	22.68	1997	N/A	USGS gage
Sheyenne River	Gage 05059500 Sheyenne River at West Fargo, ND	22.66	2011	N/A	USGS gage
Sheyenne River	Gage 05059500 Sheyenne River at West Fargo, ND	22.54	2009	N/A	USGS gage
Wild Rice River	Gage 05053000 Wild Rice River near Abercrombie, ND	27.78	2009	N/A	USGS gage

4.3 Non-Levee Flood Protection Measures

Table 8 contains information about non-levee flood protection measures within Cass 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
Bois de Sioux River (generally considered source of Red River of the North)	White Rock Dam (Mud Lake)	Dam	White Rock Dam, which forms Mud Lake controls water flowing north on the Bois de Sioux River. 45°51'41.9"N,96°34'23.2"W	Earthfill dam for water supply, fish/wildlife pond, and flood control.
Otter Tail River (tributary to Red River of the North at Wahpeton-Breckenrige)	Orwell Dam (Orwell Reservoir)	Dam	Approximately 6 miles southwest of Fergus Falls, MN in Otter Tail County. 46°13'05.9"N,96°10'36.2"W	Earthfill dam for water supply, recreation, fish/wildlife pond, and flood control.
Sheyenne River	Baldhill Dam (Lake Ashtabula Reservoir)	Dam	Approximately 10 miles north-northwest of Valley City, ND in Barnes County. 47°02'03.9"N,98°04'40.4"W	Earthfill and concrete dam for water supply, recreation, and flood control.

4.4 Levees

For purposes of the NFIP, FEMA only recognizes levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with comprehensive floodplain management criteria. The Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10) describes the information needed for FEMA to determine if a levee system reduces the risk from the 1% annual chance flood. This information must be supplied to FEMA by the community or other party when a flood risk study or restudy is conducted, when FIRMs are revised, or upon FEMA request. FEMA reviews the information for the purpose of establishing the appropriate FIRM flood zone.

Levee systems that are determined to reduce the risk from the 1% annual chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with Section 65.10. These levee systems are referred to as Provisionally Accredited Levees, or PALs. Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee's certification status. Accredited levee systems and PALs are shown on the FIRM using the symbology shown in Figure 3 and in Table 9. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system no longer meets Section 65.10, FEMA will de-accredit the levee system and issue an effective FIRM showing the levee-impacted area as a SFHA.

FEMA coordinates its programs with USACE, who may inspect, maintain, and repair levee systems. The USACE has authority under Public Law 84-99 to supplement local efforts to repair flood control projects that are damaged by floods. Like FEMA, the USACE provides a program to allow public sponsors or operators to address levee system maintenance deficiencies. Failure to

do so within the required timeframe results in the levee system being placed in an inactive status in the USACE Rehabilitation and Inspection Program. Levee systems in an inactive status are ineligible for rehabilitation assistance under Public Law 84-99.

FEMA coordinated with the USACE, the local communities, and other organizations to compile a list of levees that exist within Cass County. Table 9, "Levees," lists all accredited levees, PALs, and de-accredited levees shown on the FIRM for this FIS Report. Other categories of levees may also be included in the table. The Levee ID shown in this table may not match numbers based on other identification systems that were listed in previous FIS Reports.

Please note that the information presented in Table 9 is subject to change at any time. For that reason, the latest information regarding any USACE structure presented in the table should be obtained by contacting USACE and accessing the USACE national levee database. For levees owned and/or operated by someone other than the USACE, contact the local community shown in Table 31.

Table 9: Levees

Community	Flooding Source	Levee Location	Levee Owner	USACE Levee	Levee ID	Covered Under PL84-99 Program?	FIRM Panel(s)
City of Argusville	Red River of the North	Left Bank	City of Argusville	Yes	1801000573	No	38017C0362H 38017C0370H
City of Mapleton	Maple River	Left Bank	City of Mapleton	Yes	1801000595	No	38017C0539H 38017C0543H
City of Mapleton	Maple River	Left Bank	City of Mapleton	Yes	1801000566	No	38017C0543H
City of West Fargo	Sheyenne River	Right Bank	SE Cass Water Resource District	Yes	1801000593	No	38017C0756H 38017C0758H
City of West Fargo	Sheyenne River	Left Bank	SE Cass Water Resource District	No	1801000594	No	38017C0565H 38017C0568H 38017C0755H 38017C0756H 38017C0758H 38017C0766H 38017C0768H
City of West Fargo	Sheyenne River	Left Bank	SE Cass Water Resource District	Yes	1801001362	No	38017C0766H 38017C0768H 38017C0960H
City of Horace	Sheyenne River	Left Bank	SE Cass Water Resource District	No	1801001363	No	38017C0756H 38017C0758H 38017C0766H 38017C0768H
City of Fargo	Sheyenne River	Right Bank	SE Cass Water Resource District	Yes	1801000591	Yes	38017C0565H 38017C0568H 38017C0569H 38017C0588G 38017C0755H 38017C0756H 38017C0757H 38017C0759H
City of West Fargo	Sheyenne River	Left Bank	SE Cass Water District	Unknown	1801000592	Unknown	38017C0568H

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.

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 Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
County Drain 10 Breakout	Convergence with Red River of the North	*	*	*	307	1,492	*	11,404
County Drain 45	Just downstream of 52nd Avenue	*	450	*	3,350	6,100	*	13,700
County Drain 45	Just upstream of Breakout Floodway Corridor B	*	450	*	1,800	3,600	*	8,500
County Drain 45	Just upstream of Breakout Floodway Corridor C	*	155	*	530	600	*	1,000
County Drain 45	Just upstream of Breakout Floodway Corridor D	*	155	*	255	300	*	410
Drain 14	Upstream of confluence with Maple River	90.6	1,340	1,519	1,700	2,130	*	2,674
Drain 14	Approximately 110 feet downstream of 38th Street SE	74.6	1,125	1,651	1,944	2,050	*	2,369
Drain 14	Downstream of confluence with Drain 34	16.3	259	395	374	406	*	492
Drain 14	Upstream of confluence with Drain 34	11.6	58	71	88	67	*	163
Drain 14	Immediately downstream of 162nd Avenue SE	9.1	50	50	173	167	*	194
Drain 21	Upstream of confluence with Sheyenne River	1.3	1,618	1,970	2,332	3,020	*	3,876

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Drain 21C	Just upstream of 81st Street S	22.7	508	571	586	544	*	461
Drain 21C	Approximately 79 feet downstream of 43rd Street SE	11.3	141	276	415	488	*	616
Drain 21C	Approximately 670 feet upstream of 43rd Street SE	6.3	137	276	413	485	*	611
Drain 34	Upstream of confluence with Drain 14	18.8	208	342	337	350	*	342
Drain 34	Just upstream of 47 th Street SE	18.6	199	336	343	346	*	392
Drain 34	Approximately 88 feet upstream of Railroad	8.8	186	325	333	337	*	476
Drain 34	Approximately 1,074 feet upstream of 51st Street SE	6.5	146	269	272	273	*	273
Drain 37	Confluence with Wild Rice River	56.7	302	628	866	1,290	*	3,478
Drain 37	Approximately 330 feet upstream 53rd R Street E	54.6	283	609	847	1,270	*	3,459
Drain 37	Approximately 1,170 feet downstream of 54th Street SE	50.4	259	585	823	1,247	*	3,435
Drain 37	Just upstream of 55th Street SE	42.1	174	392	613	1,010	*	2,929

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Drain 37	Approximately 151 feet upstream of 168th Avenue SE	7.7	116	214	214	370	*	482
Drain 37	Approximately 107 feet upstream of 167th Avenue SE	7.6	89	218	281	322	*	392
Drain 37	Approximately 117 feet upstream of 166th Avenue SE	5.4	63	278	657	970	*	1,469
Drain 37	Just upstream of 56th Street SE	4.3	52	263	654	1,048	*	1,861
Drain 37	Approximately 250 feet upstream of Railroad	2.7	50	513	1,715	529	*	916
Drain 53 Breakout	Confluence with Red River of the North	*	*	*	165	2,199	*	9,027
Maple River	Confluence with Sheyenne River	1,547.8	6,178	8,273	9,284	10,352	*	11,580
Maple River	Upstream of confluence with Drain 14	1,456.5	4,022	4,840	5,108	5,227	*	5,515
Maple River	Approximately 437 feet upstream of 165th Avenue SE	1,453.2	4,936	5,775	5,827	5,848	*	5,887
Maple River	Approximately 0.7 mile downstream of 163rd Avenue SE	1,449.8	5,177	7,045	7,683	8,398	*	9,366
Maple River	USGS Gage 05060100 Maple River below Mapleton, ND	1,450.8	5,235	7,064	7,720	8,470	*	9,494

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Maple River	Approximately 0.9 mile downstream of Railroad	1449.4	5,433	7,110	7,738	8,483	*	9,520
Maple River	Approximately 624 feet downstream of I-94 W	1444.7	5,552	7,253	7,851	8,533	*	9,694
Maple River	Approximately 2.0 miles downstream of 160 ½ Avenue SE	1,443.5	5,780	7,967	9,105	10,388	*	12,541
Maple River	USGS Gage 05060000 Maple River near Mapleton, ND	1,443.3	5,825	8,260	9,875	12,068	*	16,736
Maple River	Approximately 1,582 feet downstream of 38th Street SE	1,302.3	3,823	4,916	5,536	6,502	*	8,251
Maple River	Approximately 63 feet upstream 38th Street SE	1,302.2	2,817	3,208	3,339	3,583	*	3,871
Maple River	Upstream of confluence with Buffalo Creek	1,102.0	2,993	4,367	5,142	5,367	*	5,498
Maple River	Approximately 19 feet upstream of Railroad	1,098.0	3,064	5,082	7,405	10,596	*	14,630
Red River of the North	Upstream of confluence with Elm River	13,085	24,100	*	45,290	56,080	*	85,390
Red River of the North	Upstream of confluence with Drain 13	*	23,900	*	44,891	56,080	*	84,025

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Red River of the North	Downstream of confluence with Buffalo River	12,735	22,473	*	42,875	53,690	*	81,098
Red River of the North	Upstream of confluence with Buffalo River	11,545	15,383	*	32,851	41,830	*	66,538
Red River of the North	Downstream of confluence with Sheyenne River	13,940	16,000	*	31,000	38,300	*	60,000
Red River of the North	Downstream of confluence with Drain 40	6,800	10,150	*	22,150	29,000	*	50,000
Red River of the North	Approximately 15 miles downstream of Cass County Highway 16	4,625	10,300	*	22,300	29,300	*	50,500
Red River of the North	Approximately 2.9 miles downstream of Cass County Highway 16	4,485	10,125	*	21,468	25,137	*	33,764
Red River of the North	Approximately 2.3 miles upstream of Cass County Highway 16	2,845	7,850	*	13,967	17,606	*	27,466
Red River of the North	Approximately 3.6 miles upstream of Cass County Highway 18	2,715	7,648	*	12,307	14,173	*	21,818
Sheyenne River	Confluence with Red River of the North	10,861.5	8,457	12,912	15,539	18,092	*	20,863

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Sheyenne River	Approximately 1.1 miles upstream of 173rd Avenue SE	10,855.7	8,232	10,385	11,466	12,530	*	13,419
Sheyenne River	Approximately 3.4 miles upstream of 173rd Avenue SE	10,853.4	7,379	7,492	7,513	7,526	*	7,544
Sheyenne River	Approximately 0.7 mile downstream of Cass County 81	10,850.4	7,958	8,218	8,283	8,331	*	8,593
Sheyenne River	Upstream of confluence with Rush River	10,694.7	8,068	8,742	8,999	9,555	*	10,262
Sheyenne River	Upstream of confluence with Lower Rush River	10,632.3	7,031	6,969	6,986	7,029	*	7,301
Sheyenne River	Near USGS 05060400 Sheyenne River at Harwood, ND	10,632.2	7,088	7,034	7,036	7,092	*	7,384
Sheyenne River	Approximately 1,115 feet upstream of 52nd Avenue N	10,627.5	8,850	9,752	10,158	10,561	*	10,984
Sheyenne River	Upstream of confluence with Maple River	9,078.7	3,513	3,770	3,876	3,888	*	4,038
Sheyenne River	Upstream of confluence with Drain 21	9,077.2	2,491	2,654	2,747	2,614	*	2,663
Sheyenne River	Upstream of the Horace to West Fargo Diversion Channel just upstream of diversion control structure	9,020.7	2,054	2,085	2,093	2,105	*	2,399

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Sheyenne River	Near USGS 05059400 Sheyenne River near Horace, ND	9,018.6	2,055	2,086	2,093	2,098	*	2,461
Sheyenne River	Near USGS 05059300 Sheyenne River above Sheyenne River Diversion near Horace, ND	9,018.0	2,056	2,087	2,092	2,096	*	2,399
Sheyenne River	Approximately 1,583 feet upstream of 46th Street SE	9,015.5	3,694	3,796	3,815	3,833	*	3,844
Sheyenne River	Approximately 1.0 mile upstream of 168th R Avenue SE	9,002.8	3,758	3,877	3,917	3,958	*	3,986
Sheyenne River	Approximately 1.7 miles upstream of 52nd R Street SE	8,997.3	3,863	4,060	4,126	4,149	*	4,172
Sheyenne River	USGS Gage 05059000 Sheyenne River near Kindred, ND	8,995.9	4,046	4,675	4,946	5,118	*	5,323
Sheyenne River	Upstream face of railroad	8,995.8	4,046	4,675	4,947	5,122	*	5,332
Sheyenne River	USGS 05058980 Sheyenne River on Gol Road near Kindred, ND	8,992.6	4,187	5,880	7,134	8,494	*	11,795
Sheyenne River	Approximately 2,355 feet upstream of Gol Road	8,990.6	4,188	5,881	7,136	8,496	*	11,796

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Sheyenne River (West Fargo Diversion Channel)	Upstream of confluence with Sheyenne River	48.9	2,588	2,693	2,812	4,034	*	6,334
Sheyenne River (West Fargo Diversion Channel)	USGS 05059480 Sheyenne River Diversion at West Fargo, ND	48.7	4,085	4,276	4,413	5,991	*	8,963
Sheyenne River (West Fargo Diversion Channel)	Approximately 640 feet upstream of Interstate 90	43.9	4,073	4,241	4,388	4,459	*	5,352
Sheyenne River (West Fargo Diversion Channel)	Approximately 0.8 mile upstream of Interstate 90	42.7	4,070	4,234	4,383	4,445	*	5,007
Sheyenne River (West Fargo Diversion Channel)	Approximately 1.8 miles upstream of Interstate 90	41.2	4,066	4,222	4,373	4,423	*	4,740
Sheyenne River Diversion Channel	Upstream of confluence with Sheyenne River West Fargo Diversion Channel	41.1	2,010	2,134	2,274	2,318	*	2,547
Sheyenne River Diversion Channel	Approximately 1,014 feet upstream of 21st Avenue West	30.9	2,010	2,134	2,239	2,308	*	2,371
Sheyenne River Diversion Channel	Just upstream of 40th Avenue West	27.9	2,011	2,134	2,238	2,305	*	2,345
Sheyenne River Diversion Channel	Upstream of confluence with Drain 21C	3.5	1,917	2,016	2,062	2,123	*	2,272
Sheyenne River Diversion Channel	Downstream of Sheyenne Diversion Channel Control Structure	*	1,588	1,666	1,681	1,703	*	1,736

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Sheyenne River Diversion Channel	Upstream of Sheyenne Diversion Canal Control Structure	*	1,588	1,666	1,681	1,703	*	1,736
South Branch Elm River	City of Hunter, North Dakota	20.9	510	*	750	910	*	1,170
Swan Creek	Confluence with Maple River	124.6	907	*	2,181	2,875	*	4,798
Swan Creek	Approximately 871 feet downstream of 37th R Street SE	109.4	832	*	1,999	2,635	*	4,394
Swan Creek	Above 158th R Avenue SE	85.9	717	*	1,718	2,262	*	3,765
Swan Creek	Upstream of confluence with Tributary to Swan Creek	83	712	*	1,699	2,236	*	3,717
Swan Creek	Approximately 305 feet downstream of Burlington Northern Santa Fe Railroad	75	676	*	1,609	2,115	*	3,510
Swan Creek	Approximately 500 feet upstream of 34th R Street SE	60.6	586	*	1,393	1,832	*	3,037
Tributary to Swan Creek	Confluence with Swan Creek	3.8	78	*	187	247	*	3,037
Tributary to Swan Creek	Approximately 624 feet upstream of 35th R Street SE	3.3	62	*	153	203	*	412

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
Tributary to Swan Creek	Approximately 1,400 feet downstream of 155th R Avenue SE	1.8	51	*	120	159	*	341
Wild Rice River	At mouth	1640	5,222	*	11,016	13,963	*	21,610
Wild Rice River	Approximately 200 feet upstream of Southbound I-29	*	5,222	*	11,016	13,300	*	15,878
Wild Rice River	Approximately 2,180 feet downstream of 25th Street S	*	5,222	*	8,662	9,574	*	10,259
Wild Rice River	Downstream of 76th Avenue	*	5,222	*	8,543	9,249	*	9,801

* Not calculated for this Flood Risk Project

Figure 7: Frequency Discharge-Drainage Area Curves

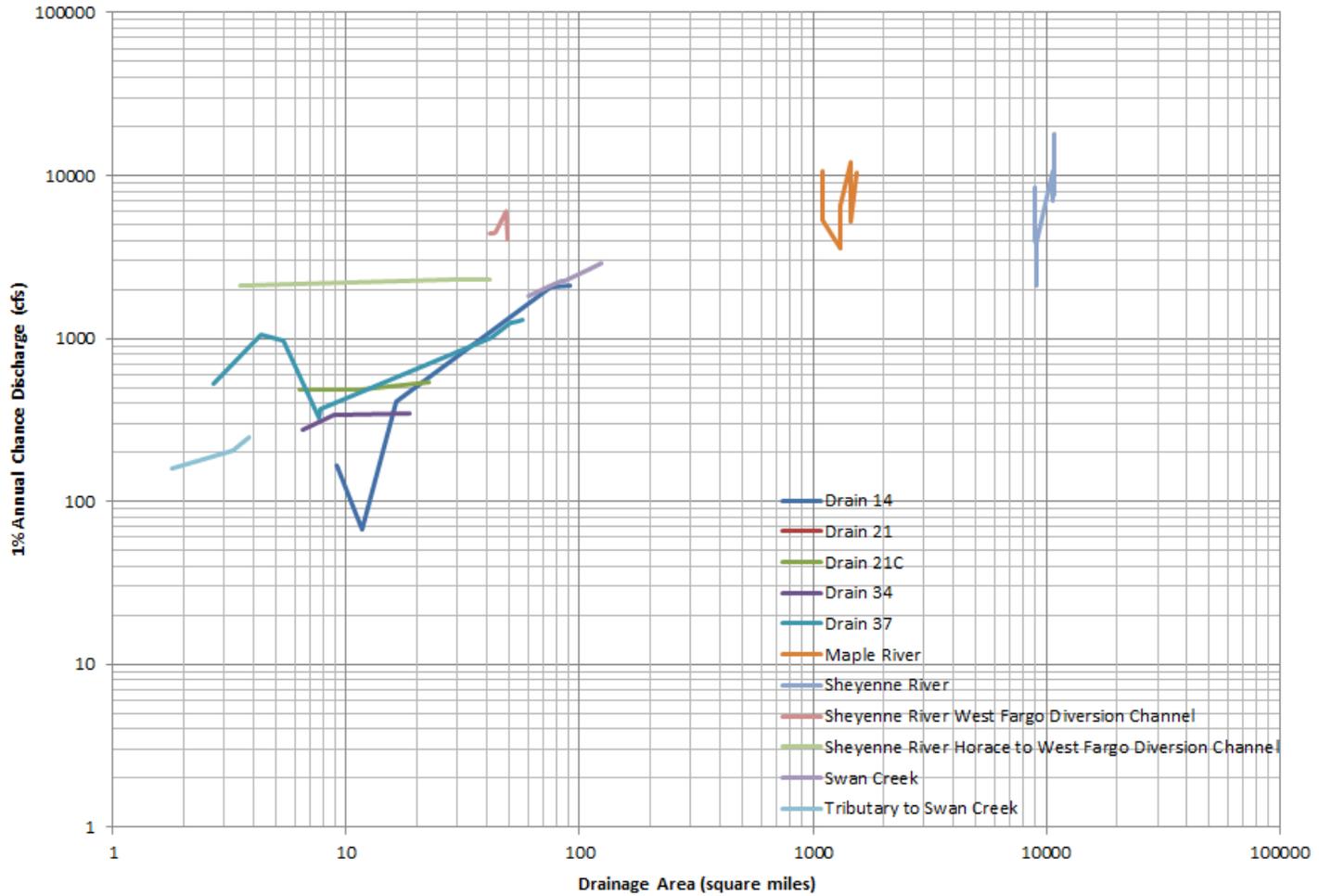


Table 11: Summary of Non-Coastal Stillwater Elevations

[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
Maple River	05060000	USGS	MAPLE RIVER NR MAPLETON, ND	1,380	06/12/1959	03/25/2009
Maple River	05060100	USGS	MAPLE RIVER BL MAPLETON, ND	1,410	04/8/1944	03/26/2009
Red River of the North	05051522	USGS	RED RIVER OF THE NORTH AT HICKSON, ND	4,300	03/3/1976	04/12/2001
Red River of the North	05054000	USGS	RED RIVER OF THE NORTH AT FARGO, ND	6,800	05/23/1902	04/14/2001
Rush River	05060500	USGS	RUSH RIVER AT AMENIA, ND	116	04/14/1947	03/24/2009
Sheyenne River	05059000	USGS	SHEYENNE RIVER NEAR KINDRED, ND	3,020	1947	04/14/2009
Sheyenne River	05059300	USGS	SHEYENNE R AB SHEYENNE R DIVERSION NR HORACE, ND	8,840	08/11/1993	04/14/2009
Sheyenne River	05059400	USGS	SHEYENNE RIVER NR HORACE, ND	8,850 3,070*	04/7/1980	03/17/1992
Sheyenne River	05059500	USGS	SHEYENNE RIVER AT WEST FARGO, ND	3,090	04/11/1903	04/12/2009
Sheyenne River	05060400	USGS	SHEYENNE RIVER AT HARWOOD, ND	**	03/30/1995	03/29/2009
Sheyenne River Diversion Channel	05059480	USGS	SHEYENNE RIVER DIVERSION AT WEST FARGO, ND	**	08/11/1993	04/12/2009

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
Wild Rice River	0505300	USGS	WILD RICE RIVER NR ABERCROMBIE, ND	2,080	03/13/1933	06/2/2004

*Contributing Area

**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
County Drain 10 Breakout	Confluence with Red River of the North	Just upstream of Cass County Highway 31 N	Breakout flows from Red River of the North via HEC-RAS	HEC-RAS 3.1.3	10/01/2007	AE w/ Floodway	
County Drain 45	At Drain 40 / 45 split	Approximately 0.5 mile upstream of 19 th Avenue N	Breakout flows from Sheyenne River via HEC-RAS	HEC-RAS 3.1.3	10/01/2007	AE w/ Floodway	
Drain 14	Confluence with Maple River	Approximately 2.1 miles upstream of 46 th ST SE	Breakout flows from the Maple and Sheyenne Rivers routed via unsteady HEC-RAS	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	
Drain 21	Convergence with Sheyenne River	Divergence from Sheyenne River approximately 165 feet downstream of 12 th Avenue NW	Breakout flows from the Sheyenne River routed via unsteady HEC-RAS	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	
Drain 21C	Confluence with Sheyenne River Diversion Canal	Approximately 2.0 miles upstream of 47 th ST SE	Breakout flows from the Sheyenne River routed via unsteady HEC-RAS	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	

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
Drain 34	Confluence with Drain 14	Approximately 1.0 mile upstream of 53 rd ST SE	Breakout flows from the Maple and Sheyenne Rivers routed via unsteady HEC-RAS	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	
Drain 37	Confluence with Wild Rice River	Just downstream of 164 th Avenue SE	Breakout flows from the Sheyenne River routed via unsteady HEC-RAS	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	
Drain 53 Breakout	Confluence with Rose Coulee	Approximately 1.1 miles upstream of 88 th Avenue S	Breakout flows from Wild Rice River via HEC-RAS	HEC-RAS 3.1.3	10/01/2007	AE	
Lower Branch Rush River	Confluence with Sheyenne River	Approximately 2.0 miles upstream of 154 th Avenue SE	HEC-HMS 3.4 Synthetic balanced hydrographs derived from a discharge frequency analysis	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	A	

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
Maple River	Approximately 943 feet downstream of 163 rd Avenue SE	Approximately 2.0 miles upstream of railroad	HEC-HMS 3.4 Synthetic balanced hydrographs derived from a discharge frequency analysis	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE w/ Floodway	
Maple River	Confluence with Sheyenne River	Approximately 295 feet upstream of 42 nd Street SE	HEC-HMS 3.4 Synthetic balanced hydrographs derived from a discharge frequency analysis	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	
Red River of the North	At Cass County and Traill County boundary	At Cass County and Richland County boundary	Bulletin 17B discharge-frequency relationships based on USGS gage records through 2001	HEC-RAS 3.1.3	10/01/2007	AE w/ Floodway	
Rush River	Confluence with Sheyenne River	Just downstream of 153 rd Avenue SE	HEC-HMS 3.4 Synthetic balanced hydrographs derived from a discharge frequency analysis	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	A	

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
Sheyenne River	Confluence with Red River of the North	Approximately 1.4 miles upstream of 162 nd Avenue SE	HEC-HMS 3.4 Synthetic balanced hydrographs derived from a discharge frequency analysis	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	
Sheyenne River Diversion Channel	Convergence with Sheyenne River	Divergence from Sheyenne River	HEC-HMS 3.4 Synthetic balanced hydrographs derived from a discharge frequency analysis	Unsteady HEC-RAS BETA 5.0 [AUG 2015]	09/01/2015	AE	
South Branch Elm River	Approximately 1,660 feet downstream of 155 th Avenue SE	Approximately 962 feet upstream of Dam	TR-20	HEC-2	07/01/1978	AE w/ Floodway	
Swan Creek	Confluence with Maple River	Approximately 500 feet upstream of 34 th ST SE	USGS Regression WRIR 92-4040	HEC-RAS 4.1.0	05/13/2011	AE w/ Floodway	
Tributary to Swan Creek	Confluence with Swan Creek	Approximately 1,815 feet upstream of Unnamed Road	USGS Regression WRIR 92-4040	HEC-RAS 4.1.0	05/13/2011	AE w/ Floodway	

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
Wild Rice River	Confluence with Red River of the North	Approximately 1,637 feet upstream of 54 th ST SE	HEC-FFA performed Log-Pearson type III analysis	HEC-RAS 3.1.3	10/01/2007	AE w/ Floodway	
Zone A streams			USGS Regression WRIR 92-4040	HEC-RAS 4.1.0	07/23/2014	A	

Table 14: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
County Drain 10 Breakout	0.045	0.045
County Drain 45	0.045	0.060
Drain 14	0.035-0.036	0.035-0.04
Drain 21	0.030-0.030	0.030-0.030
Drain 21C	0.035-0.035	0.035-0.035
Drain 34	0.035-0.035	0.035-0.040
Drain 37	0.040-0.040	0.040-0.040
Drain 53 Breakout	0.045	0.045-0.060
Lower Branch Rush River	0.035-0.040	0.060-0.060
Maple River	0.045-0.100	0.045-0.100
Red River of the North	0.030-0.150	0.030-0.180
Rush River	0.035-0.040	0.060-0.060
Sheyenne River (upper)	0.050-0.050	0.050-0.150
Sheyenne River (middle)	0.030-0.050	0.035-0.140
Sheyenne River (lower)	0.050-0.050	0.100-0.140
Sheyenne River Diversion Channel	0.027-0.040	0.027-0.040
South Branch Elm River	0.400	0.045
Swan Creek	0.030	0.030-0.035
Tributary to Swan Creek	0.035	0.050-0.100
Wild Rice River	0.035-0.120	0.060-0.120

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, 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.

The datum conversion locations and values that were calculated for Cass County are provided in Table 20.

Table 20: Countywide Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

Some of the data used in this revision were taken from the prior effective FIS reports and FIRMs and adjusted to NAVD. The datum conversion factor from NGVD to NAVD in Cass County is 1.06 feet.

Table 21: Stream-Based Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

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*, 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 Vector Data	Cass County GIS Department	2009	*	<ul style="list-style-type: none"> - Municipal and county boundaries - PLSS data - Transportation data including Railroads - Stream data
Digital Vector Data	Cass County GIS Department	2010 (Updated)	*	<ul style="list-style-type: none"> - Municipal and county boundaries - PLSS data - Transportation data including Railroads - Stream data
Digital Vector Data	Cass County GIS Department	2015 (Updated)	*	<ul style="list-style-type: none"> - Municipal and county boundaries - PLSS data - Transportation data including Railroads - Stream data

*Not available for this Flood Risk Project

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.

For Zone AE riverine flooding sources listed in Table 13 that were studied in 2015 the current model geometry defines the effective flow limits between the river overbanks and the storage areas. Storage areas within the hydraulic model are represented as polygons and are regions in which water can be diverted into or from. The storage areas can be connected to one another via a storage area connections. The connections can represent natural ground or roadway with or without culverts. Floodplain boundaries shown on the FIRM with static elevations have been delineated using the flood elevations determined at each storage area. The boundaries were created 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.”

Table 23: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data					
		Description	Scale	Contour Interval	RMSE _z	Accuracy _z	Citation
Cass County	All studied reaches	LiDAR	N/A	N/A	15.0 cm	29.4 cm	International Water Institute 2008; Red River Basin Mapping

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 ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	838	3,140	10,880	0.1	891.7	891.7	892.1	0.5
B	2,194	3,445	16,240	0.1	891.7	891.7	892.1	0.5
C	3,570	2,275	11,520	0.1	891.7	891.7	892.1	0.5
D	5,202	620	3,124	0.4	891.7	891.7	892.2	0.5
E	7,002	540	3,011	0.4	891.7	891.7	892.2	0.4
F	9,641	770	2,143	0.6	891.7	891.7	892.4	0.7
G	10,912	790	2,412	0.5	893.0	893.0	893.2	0.2
H	14,165	775	937	1.4	893.0	893.0	893.4	0.4
I	15,779	610	3,563	0.4	893.0	893.0	893.5	0.5

¹Feet above confluence with Red River of the North

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
 ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: COUNTY DRAIN 10 BREAKOUT

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,530	1,800	12,064	0.5	893.5	893.5	894.5	1.0
B	3,380	1,700	10,781	0.6	893.5	893.5	894.5	1.0
C	5,220	1,300	8,735	0.7	893.5	893.5	894.5	1.0
D	5,700	1,050	7,720	0.8	893.5	893.5	894.5	1.0
E	7,120	750	7,428	0.8	893.7	893.7	894.7	1.0
F	11,363	800	7,059	0.5	893.8	893.8	894.8	1.0
G	12,792	508	4,226	0.9	893.9	893.9	894.9	1.0
H	13,913	390	3,484	1.0	893.9	893.9	894.9	1.0
I	15,400	680	5,895	0.1	894.6	894.6	895.4	0.8
J	17,028	550	3,749	0.2	894.6	894.6	895.4	0.8
K	18,152	479	3,336	0.2	894.6	894.6	895.4	0.8
L	19,563	500	2,804	0.2	894.6	894.6	895.4	0.8
M	23,089	100	888	0.3	894.7	894.7	895.7	1.0
N	26,485	100	690	0.4	895.1	895.1	895.7	0.6

¹Feet above Interstate 29-southbound lane

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
 ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: COUNTY DRAIN 45

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	57,346	2,769 / 821 ²	13,063	0.6	906.3	906.3	907.2	0.9
B	63,494	2,525	13,663	0.6	907.3	907.3	908.3	1.0
C	67,701	4,091 / 3469 ²	16,460	0.5	907.6	907.6	908.6	1.0
D	73,494	1,224	8,112	0.9	908.6	908.6	909.6	1.0
E	77,755	1,606	8,520	0.9	908.9	908.9	909.9	1.0
F	80,941	740	4,895	1.5	909.2	909.2	910.2	1.0

¹Feet above confluence with Sheyenne River

²Total floodway width / width within jurisdiction

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: MAPLE RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	243.17	10,050 / 7,127 ²	55,417	1.0	874.8	874.8	875.6	0.8
B	245.23	8,900 / 6,711 ²	52,764	1.1	875.4	875.4	876.2	0.8
C	247.72	7,700 / 5,313 ²	53,053	1.1	876.1	876.1	876.8	0.7
D	250.16	7,350 / 5,305 ²	61,478	0.9	876.6	876.6	877.3	0.7
E	251.94	8,300 / 8,565 ²	57,001	1.0	876.9	876.9	877.6	0.7
F	254.33	8,600 / 8102 ²	71,004	0.8	877.4	877.4	878.0	0.6
G	254.47	8,650 / 8,201 ²	67,896	0.8	877.8	877.8	878.5	0.7
H	255.79	9,400 / 8,499 ²	58,892	1.0	878.0	878.0	878.7	0.7
I	257.32	7,950 / 6,950 ²	55,288	1.0	878.5	878.5	879.2	0.7
J	261.02	7,190 / 4,467 ²	59,634	0.9	879.4	879.4	880.0	0.6

¹Stream distance in miles above International Border

²Total floodway width / width within jurisdiction

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY CASS COUNTY, ND ALL JURISDICTIONS	FLOODWAY DATA FLOODING SOURCE: RED RIVER OF THE NORTH
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LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
K	264.04	7,700 / 5,628 ³	42,152	1.3	880.6	880.6	881.1	0.5
L	265.79	7,350 / 4,775 ³	43,298	1.2	881.6	881.6	882.3	0.7
M	266.20	5,250 / 3,676 ³	55,001	1.0	881.7	881.7	882.4	0.7
N	266.66	5,600 / 3,736 ³	24,377	2.2	881.9	881.9	882.6	0.7
O	266.75	6,883 / 5,500 ³	30,270	1.8	882.2	882.2	882.8	0.6
P	267.92	5,500 / 5,468 ³	37,366	1.4	883.0	883.0	883.6	0.6
Q	269.00	7,740 / 4,695 ³	46,128	0.9	883.4	883.4	884.1	0.7
R	270.74	6,320 / 3,316 ³	31,522	1.5	884.0	884.0	884.7	0.7
S	271.14	7,275 / 3,847 ³	36,396	1.3	884.3	884.3	885.0	0.7
T	272.75 / 295.61 ²	2,370	23,729	1.6	884.7	884.7	885.5	0.8

¹Stream distance in miles above International Border

²Inaccurate stream distance in miles above International Border

³Total floodway width / width within jurisdiction

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY CASS COUNTY, ND ALL JURISDICTIONS	FLOODWAY DATA FLOODING SOURCE: RED RIVER OF THE NORTH

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
U	296.38	1,480	12,285	3.1	885.2	885.2	886.0	0.8
V	297.78	2,080	14,552	2.6	887.0	887.0	887.8	0.8
W	299.14	1,890	22,310	1.7	888.2	888.2	888.9	0.7
X	300.91	5,030	40,604	0.9	889.2	889.2	889.9	0.7
Y	301.67	3,840	23,004	1.3	889.4	889.4	890.0	0.6
Z	301.91	4,420	30,837	0.9	889.4	889.4	890.0	0.6
AA	302.35	3,860	23,489	1.1	889.5	889.5	890.2	0.7
AB	303.77	2,190	17,270	1.6	889.8	889.8	890.5	0.7
AC	304.94	2,350	20,410	1.3	890.3	890.3	891.0	0.7
AD	305.67 ²	850	13,414	2.0	891.1	891.1	891.6	0.5
AE	306.93 ²	639	13,056	2.0	891.8	891.8	892.3	0.5
AF	307.4 ²	1,150	20,017	1.3	892.0	892.0	892.5	0.5
AG	308.18 ²	1,408	18,900	1.4	892.2	892.2	892.7	0.4
AH	309.92 ²	665	12,882	2.0	892.0	893.0	893.4	0.4
AI	310.63 ²	3,030	18,053	1.5	893.4	893.4	893.8	0.4
AJ	311.52 ²	1,050	15,097	1.7	893.9	893.9	894.3	0.4
AK	312.35 ²	550	10,978	2.4	894.4	894.4	894.8	0.4
AL	313.04 ²	950	14,659	1.8	894.9	894.9	895.3	0.4
AM	313.23 ²	566	11,588	2.2	895.0	895.0	895.4	0.4
AN	313.88 ²	990	16,247	1.6	895.3	895.3	895.7	0.4
AO	314.11 ²	1,400	22,676	1.1	895.5	895.5	895.8	0.4

¹Inaccurate stream distance in miles above International Border

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY CASS COUNTY, ND ALL JURISDICTIONS	FLOODWAY DATA
		FLOODING SOURCE: RED RIVER OF THE NORTH

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AP	315.09	1,310	19,797	1.3	895.7	895.7	896.0	0.4
AQ	315.70	2,420	40,624	0.6	895.8	895.8	896.2	0.4
AR	316.18	3,043	29,770	1.0	896.0	896.0	896.3	0.4
AS	316.94	1,622	19,189	1.5	896.3	896.3	896.6	0.3
AT	317.24	3,157	33,397	0.9	896.5	896.5	896.8	0.3
AU	318.43	802	12,477	2.4	896.7	896.7	897.0	0.3
AV	318.60	1,711	28,750	1.0	896.9	896.9	897.2	0.3
AW	319.33	2,257	31,490	0.9	897.0	897.0	897.3	0.3
AX	319.95	792	14,821	2.0	897.3	897.3	897.5	0.3
AY	320.29	1,389	20,324	1.4	897.5	897.5	897.8	0.3
AZ	320.66	716	13,965	2.1	897.7	897.7	897.9	0.2
BA	321.03	1,085	18,420	1.6	897.9	897.9	898.1	0.2
BB	321.62	1,002	14,082	2.1	898.3	898.3	898.6	0.2
BC	322.14	1,205	16,497	1.8	898.6	898.6	899.0	0.4
BD	322.37	711	12,802	2.3	898.9	898.9	899.3	0.4
BE	322.88	1,499	20,274	1.5	899.3	899.3	899.6	0.4
BF	323.25	1,104	15,577	1.9	899.5	899.5	899.9	0.4
BG	323.45	1,857	25,645	1.1	899.7	899.7	900.0	0.4
BH	324.12	996	17,151	1.7	900.0	900.0	900.3	0.3
BI	324.45	616	11,252	2.6	900.3	900.3	900.6	0.3
BJ	324.83	771	14,965	2.0	900.9	900.9	901.3	0.4
BK	325.11	505	9,383	3.1	901.2	901.2	901.6	0.4

¹Inaccurate stream distance in miles above International Border

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY CASS COUNTY, ND ALL JURISDICTIONS	FLOODWAY DATA
		FLOODING SOURCE: RED RIVER OF THE NORTH

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BL	325.51	554	11,239	2.6	901.6	901.6	902.0	0.5
BM	325.50	972	17,281	1.7	902.0	902.0	902.5	0.5
BN	326.42	724	14,604	2.0	902.3	902.3	902.8	0.4
BO	327.27	2,705	26,207	1.1	902.7	902.7	903.1	0.4
BP	328.01	2,115	25,939	1.1	903.1	903.1	903.5	0.4
BQ	328.42	1,126	19,738	1.5	903.3	903.3	903.7	0.3
BR	328.77	584	12,495	2.3	903.5	903.5	903.8	0.3
BS	329.17	2,231	28,297	1.0	903.7	903.7	904.1	0.3
BT	329.91	1,445	20,303	1.4	904.0	904.0	904.3	0.3
BU	330.34	1,449	22,318	1.3	904.2	904.2	904.5	0.3
BV	330.52	1,046	16,360	1.8	904.2	904.2	904.6	0.4
BW	331.04	1,267	20,062	1.5	904.5	904.5	904.9	0.4
BX	331.56	710	11,928	2.5	904.7	904.7	905.1	0.4
BY	331.99	2,394	32,031	0.9	905.0	905.0	905.4	0.4
BZ	333.50	699	13,324	2.2	905.6	905.6	906.1	0.5
CA	333.92	1,128	16,183	1.6	906.0	906.0	906.5	0.5
CB	334.50	855	15,887	1.6	906.3	906.3	906.9	0.5
CC	335.24	1,070	18,754	1.3	906.8	906.8	907.4	0.6
CD	335.39	902	15,951	1.6	906.8	906.8	907.5	0.7
CE	335.96	1,523	20,808	1.2	907.1	907.1	907.8	0.7
CF	336.99	1,045	16,205	1.5	907.6	907.6	908.3	0.6
CG	337.56	1,096	17,436	1.4	908.0	908.0	908.6	0.6

¹Inaccurate stream distance in miles above International Border

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY CASS COUNTY, ND ALL JURISDICTIONS	FLOODWAY DATA
		FLOODING SOURCE: RED RIVER OF THE NORTH

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CH	337.94	1,460	16,172	1.6	908.2	908.2	908.9	0.7
CI	338.48	3,080	28,075	0.9	908.5	908.5	909.2	0.7
CJ	339.26	1,571	20,015	1.3	908.8	908.8	909.5	0.7
CK	339.95	1,625	18,293	1.4	909.1	909.1	909.8	0.7
CL	340.88	2,570	29,052	0.9	909.5	909.5	910.2	0.7
CM	341.61	2,599	34,989	0.7	909.7	909.7	910.4	0.7
CN	342.35	3,261	38,459	0.7	909.9	909.9	910.6	0.7
CO	343.27	3,280	29,505	0.9	910.1	910.1	910.8	0.7
CP	343.68	4,641	32,596	0.8	910.2	910.2	910.9	0.7
CQ	344.21	4,715	29,978	0.5	910.3	910.3	911.0	0.7
CR	344.98	3,800	25,239	0.6	910.4	910.4	911.1	0.7
CS	345.82	1,662	24,108	0.6	910.5	910.5	911.2	0.7
CT	345.87	1,593	18,466	0.8	910.5	910.5	911.2	0.7
CU	346.62	1,275	14,814	1.0	910.7	910.7	911.4	0.7
CV	347.48	1,522	18,243	1.0	911.0	911.0	911.7	0.7
CW	347.83	654	11,606	1.5	911.1	911.1	911.8	0.7
CX	347.87	686	10,593	1.7	911.2	911.2	911.9	0.7
CY	348.34	1,781	17,916	1.0	911.4	911.4	912.1	0.7
CZ	349.08	968	10,883	1.6	911.7	911.7	912.4	0.7
DA	349.47	2,327	21,501	0.8	911.9	911.9	912.6	0.7
DB	350.19	2,959	21,400	0.8	912.1	912.1	912.8	0.7

¹Inaccurate stream distance in miles above International Border

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
 ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: RED RIVER OF THE NORTH

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
DC	350.85	1,220	12,084	1.2	912.3	912.3	913.0	0.7
DD	351.42	1,327	17,575	0.8	912.5	912.5	913.3	0.7
DE	351.90	1,364	14,747	1.0	912.8	912.8	913.6	0.8
DF	352.69	1,035	14,372	1.0	913.1	913.1	913.9	0.7
DG	353.05	702	12,790	1.1	913.2	913.2	914.0	0.7
DH	353.58	1,950	17,917	0.8	913.4	913.4	914.2	0.8
DI	354.43	1,509	18,229	0.8	913.7	913.7	914.4	0.7
DJ	355.72	1,707	15,338	0.9	914.1	914.1	914.7	0.7
DK	356.34	1,132	14,365	1.0	914.3	914.3	914.9	0.6
DL	357.15	1,050	9,326	1.5	915.1	915.1	915.8	0.7
DM	357.98	1,902	22,702	0.6	915.7	915.7	916.4	0.6
DN	359.20	1,465	25,569	0.6	915.9	915.9	916.6	0.7
DO	359.25	1,589	24,520	0.6	915.9	915.9	916.6	0.7
DP	359.68	785	12,540	1.1	916.0	916.0	916.7	0.7
DQ	360.05	613	10,318	1.4	916.1	916.1	916.8	0.7
DR	360.45	420	9,400	1.5	916.4	916.4	917.0	0.7
DS	361.11	740	13,023	1.1	916.9	916.9	917.5	0.6
DT	361.65	642	9,386	1.5	917.3	917.3	918.0	0.6

¹Inaccurate stream distance in miles above International Border

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: RED RIVER OF THE NORTH

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	4,875	95	395	2.3	968.4	968.4	968.9	0.5
B	8,160	70	300	3.1	972.6	972.6	973.6	1.0

¹Feet above City of Hunter Corporate Limits

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
 ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: SOUTH BRANCH ELM RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	530	184	540	5.3	912.5	907.2 ²	908.0	0.8
B	2,371	302	1,108	2.6	912.8	909.4 ²	909.8	0.4
C	4,653	327	1,200	2.2	912.8	910.8 ²	911.3	0.5
D	6,668	139	617	4.3	912.8	911.7 ²	912.0	0.3
E	9,391	259	1,263	2.1	913.0	913.0	913.7	0.7
F	12,354	172	657	4.0	913.9	913.9	914.3	0.4
G	12,852	96	602	3.8	914.0	914.0	914.8	0.8
H	13,626	176	930	2.4	915.7	915.7	915.8	0.1
I	16,450	134	817	2.8	916.2	916.2	916.5	0.3
J	19,545	123	649	3.5	917.3	917.3	917.5	0.2
K	22,139	116	691	3.3	918.6	918.6	918.7	0.1
L	24,489	114	626	3.6	919.7	919.7	919.8	0.1
M	25,925	108	601	3.7	920.7	920.7	920.8	0.1
N	28,061	101	578	3.9	921.8	921.8	921.9	0.1
O	30,545	106	631	3.6	923.2	923.2	923.2	0.0
P	32,747	115	683	3.3	925.3	925.3	925.3	0.0
Q	34,221	163	749	3.0	926.0	926.0	926.0	0.0
R	37,063	58	506	4.2	928.2	928.2	928.2	0.0
S	39,862	203	1,242	1.7	930.7	930.7	930.8	0.1
T	41,795	187	736	2.9	930.9	930.9	930.9	0.0
U	43,841	190	627	3.4	934.2	934.2	934.2	0.0

¹Feet above confluence with Maple River

²Elevations without consideration of backwater effects from Maple River and off-channel storage area

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: SWAN CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	45,735	79	495	3.7	938.1	938.1	938.1	0.0
W	47,913	106	544	3.4	939.1	939.1	939.1	0.0
X	50,457	183	661	2.8	940.0	940.0	940.1	0.1
Y	51,712	74	392	4.7	940.5	940.5	941.1	0.6
Z	52,887	474	1,195	1.5	942.2	942.2	943.0	0.8
AA	54,918	276	315	5.8	943.7	943.7	944.2	0.5
AB	55,748	196	510	3.6	944.9	944.9	945.9	1.0
AC	58,170	70	330	5.6	948.5	948.5	948.7	0.2
AD	58,755	80	309	5.9	949.9	949.9	950.0	0.1

¹Feet above confluence with Maple River

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
 ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: SWAN CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	467	140	84	3.0	927.7	923.7 ²	923.7	0.0
B	2,034	127	139	1.5	927.7	926.3 ²	926.3	0.0
C	3,156	87	116	1.8	927.7	927.1 ²	927.1	0.0
D	4,499	70	78	2.6	930.9	930.9	930.9	0.0
E	5,484	65	123	1.7	932.1	932.1	932.1	0.0
F	6,436	34	75	2.1	933.0	933.0	933.4	0.4
G	7,956	53	120	1.3	933.7	933.7	934.1	0.4
H	9,867	27	88	1.8	936.4	936.4	937.3	0.9

¹Feet above confluence with Swan Creek

²Elevations without consideration of backwater effects from Swan Creek

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
 ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: TRIBUTARY TO SWAN CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	4,770	365	6,987	1.4	910.2	908.4 ²	909.2 ²	0.8
B	10,599	2,756	20,387	0.5	910.2	908.6 ²	909.5 ²	0.9
C	15,722	830	9,404	1.0	910.2	908.7 ²	909.6 ²	0.9
D	18,163	1,040	9,924	1.0	910.2	908.8 ²	909.7 ²	0.9
E	21,325	1,340	11,186	0.9	910.2	908.9 ²	909.8 ²	0.9
F	24,064	800	7,806	1.2	910.2	909.1 ²	910.0 ²	0.9
G	26,261	468	6,408	1.5	910.2	909.3 ²	910.1 ²	0.8
H	26,444	613	8,144	1.2	910.2	909.3 ²	910.2 ²	0.9
I	27,495	480	5,772	1.7	910.2	909.3 ²	910.2 ²	0.9
J	28,355	700	8,819	1.1	910.2	909.4 ²	910.3 ²	0.9
K	28,992	520	6,359	1.6	910.2	909.5 ²	910.4 ²	0.9
L	35,505	1,420	8,672	1.1	910.2	910.0 ²	911.0 ²	1.0
M	36,562	1,450	9,815	1.0	910.2	910.1 ²	911.1 ²	1.0
N	38,734	2,800	10,449	1.0	910.2	910.2	911.2	1.0
O	42,654	2,300	11,792	0.8	910.6	910.6	911.6	1.0
P	42,921	1,439	6,530	1.5	910.7	910.7	911.6	0.9
Q	44,565	2,088	10,433	1.0	910.8	910.8	911.8	1.0
R	46,725	1,026	7,657	1.3	911.0	911.0	912.0	1.0
S	53,139	700	7,322	1.3	911.7	911.7	912.6	0.9
T	54,539	797	10,289	0.9	911.8	911.8	912.7	0.9
U	54,979	743	8,087	1.2	911.9	911.9	912.8	0.9

¹Feet above confluence with Red River of the North

²Elevations without consideration of backwater effects from Red River of the North

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY CASS COUNTY, ND ALL JURISDICTIONS	FLOODWAY DATA
		FLOODING SOURCE: WILD RICE RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
V	57,608	642	4,931	2.0	912.2	912.2	913.1	0.9
W	59,558	327	3,983	3.4	912.9	912.9	913.7	0.8
X	60,058	634	7,113	1.9	913.7	913.7	914.5	0.8
Y	61,599	1,468	8,110	1.7	914.1	914.1	914.8	0.7
Z	65,099	1,381	8,577	1.6	915.0	915.0	915.9	0.9
AA	65,178	1,091	4,723	3.0	915.0	915.0	915.9	0.9
AB	65,465	987	7,248	1.9	915.5	915.5	916.2	0.7
AC	66,377	725	5,934	1.8	915.6	915.6	916.4	0.8
AD	66,597	754	6,355	1.7	916.0	916.0	916.6	0.6
AE	68,027	700	7,177	1.5	916.1	916.1	916.9	0.8
AF	70,106	2,373	13,817	0.8	916.2	916.2	917.1	0.9
AG	74,928	3,611	18,758	0.7	916.4	916.4	917.4	1.0
AH	76,399	4,100	19,526	0.7	916.5	916.5	917.5	1.0
AI	76,851	4,800	24,021	0.6	916.5	916.5	917.5	1.0
AJ	77,463	5,600	26,454	0.5	916.5	916.5	917.5	1.0
AK	78,921	5,600	22,757	0.6	916.6	916.6	917.6	1.0
AL	80,332	2,386	10,503	1.2	916.7	916.7	917.7	1.0
AM	81,261	1,344	8,342	1.5	916.9	916.9	917.8	0.9
AN	82,346	554	5,865	2.1	917.2	917.2	918.1	0.9
AO	82,799	1,051	7,557	1.6	917.8	917.8	918.6	0.8
AP	83,558	1,420	9,598	1.3	917.9	917.9	918.8	0.9

¹Feet above confluence with Red River of the North

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: WILD RICE RIVER

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AQ	85,030	445	5,957	2.0	918.1	918.1	919.0	0.9
AR	87,283	420	5,484	2.2	918.5	918.5	919.4	0.9
AS	89,038	451	6,209	2.0	918.9	918.9	919.8	0.9
AT	90,127	1,100	8,827	1.4	919.2	919.2	920.1	0.9
AU	92,874	1,750	11,415	1.1	919.5	919.5	920.4	0.9
AV	95,932	1,127	7,989	1.5	920.1	920.1	920.9	0.8
AW	97,302	415	6,133	2.3	920.3	920.3	921.1	0.8
AX	98,461	796	7,820	1.8	920.5	920.5	921.3	0.8
AY	99,351	855	9,847	1.4	920.8	920.8	921.6	0.8
AZ	103,867	1,230	9,734	1.4	921.8	921.8	922.8	1.0
BA	105,119	724	8,150	1.7	922.2	922.2	923.1	0.9
BB	106,616	895	9,399	1.5	922.5	922.5	923.5	1.0
BC	108,792	778	9,029	1.6	922.9	922.9	923.8	0.9

¹Feet above confluence with Red River of the North

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

FLOODWAY DATA

FLOODING SOURCE: WILD RICE 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.

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.

6.5.4 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.

Previously issued mappable LOMCs (including LOMRs) that have been incorporated into the Flood County FIRM are listed in Table 27. Please note that this table 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]

6.5.3 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.

6.5.4 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 to learn more about the CNMS or contact the FEMA Regional Office listed in Section 8 of this FIS Report.

6.5.5 Community Map History

The current FIRM presents flooding information for the entire geographic area of Cass 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 Table 28, "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 Cass County FIRMs in countywide format was 01/16/2015.

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)
Alice, City of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Amenia, City of	N/A	N/A	N/A	N/A	N/A
Amenia, Township of	N/A	N/A	N/A	N/A	N/A
Argusville, City of	09/30/1980	N/A	N/A	02/19/1986	N/A
Arthur, City of	02/14/1975	N/A	N/A	08/05/1986	09/30/1993
Ayr, City of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Berlin, Township of	12/15/1981	N/A	N/A	04/01/1986	01/16/2015
Briarwood, City of	09/27/1985	N/A	N/A	05/01/1971	N/A
Buffalo, City of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Casselton, City of	05/24/1974	N/A	02/27/1976	05/05/1981	08/03/1989 07/17/1986
Davenport, City of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Davenport, Township of	N/A	N/A	N/A	N/A	N/A
Durbin, Township of	03/18/1987	N/A	N/A	03/18/1987	01/04/2002
Empire, Township of ¹	N/A	N/A	N/A	N/A	N/A
Fargo, City of	04/10/1970	N/A	N/A	05/01/1971	01/16/2015 09/04/2002 11/02/1995 02/02/1995 08/15/1989 02/19/1987 01/19/1982 12/01/1978 04/23/1976 07/01/1974
Frontier, City of	N/A	N/A	N/A	N/A	N/A
Gardner, City of ¹	N/A	N/A	N/A	N/A	N/A
Gardner, Township of ¹	01/17/1975	N/A	N/A	N/A	N/A
Harwood, City of	09/30/1980	N/A	N/A	08/30/1980	01/16/2015 09/04/2002 08/19/1991

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)
Harwood, Township of	10/15/1980	N/A	N/A	10/15/1980	01/16/2015 12/18/1985 04/17/1984
Horace, City of	11/29/1974	N/A	N/A	07/02/1981	01/16/2015 09/27/1985
Hunter, City of	02/21/1975	N/A	N/A	12/04/1979	N/A
Kindred, City of	02/21/1975	N/A	N/A	N/A	N/A
Leonard, City of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Mapleton, City of	11/01/1974	N/A	01/16/1976	07/02/1981	02/02/2002
Mapleton, Township of	12/08/1981	N/A	N/A	10/01/1986	01/16/2015
Noble, Township	07/16/1980	N/A	N/A	07/16/1980	N/A
Normanna, Township of	11/12/1980	N/A	N/A	09/30/1987	N/A
North River, City of	9/27/1985	N/A	N/A	9/27/1985	01/16/2015
Oxbox, City of	N/A	N/A	N/A	N/A	01/16/2015
Page, City of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Pleasant, Township of	02/03/1982	N/A	N/A	02/03/1982	01/16/2015
Prairie Rose, City of	N/A	N/A	N/A	N/A	01/16/2015
Raymond, Township of	12/08/1981	N/A	N/A	10/01/1986	01/16/2015 01/04/2002
Reed, Township of	02/02/1982	N/A	N/A	10/15/1980	01/16/2015 09/04/2002 12/18/1985 05/01/1984
Reiles Acres, City of	02/02/1982	N/A	N/A	9/30/1987	01/16/2015 09/04/2002
Rich, Township of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Riverside, City of ²	01/05/1978	N/A	N/A	01/05/1978	01/16/2015 09/27/1985 06/22/1982
Stanley, Township of	07/05/1982	N/A	N/A	07/05/1982	01/16/2015 02/02/1995 09/27/1985

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)
Tower City, City of ^{1,2}	N/A	N/A	N/A	N/A	N/A
Walburg, Township of	05/04/1987	N/A	N/A	05/04/1987	N/A
Warren, Township of	11/24/1981	N/A	N/A	05/01/1986	01/16/2015
West Fargo, City of	06/07/1974	N/A	08/29/1975	04/17/1978	01/16/2015 09/04/2002 02/02/1995 09/27/1985 05/18/1982
Wiser, Township of	07/16/1980	N/A	N/A	07/16/1980	12/18/1984

¹ No Special Flood Hazard Areas Identified

² Non-participating Community

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

Table 29 provides a summary of the contracted studies, by flooding source, which is 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
County Drain 10 Breakout	01/16/2015	Houston Engineering, Inc.	N/A	10/01/2007	City of Fargo
County Drain 45	01/16/2015	Houston Engineering, Inc.	N/A	10/01/2007	City of Fargo, City of Harwood, City of Reiles Acres, City of West Fargo
Drain 14	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	Township of Addison, City of Mapleton Township of Mapleton, Township of Warren, City of West Fargo

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

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Drain 21	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	City of West Fargo
Drain 21C	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	City of Horace, Township of Warren, City of West Fargo
Drain 34	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	Township of Addison, City of Davenport, Township of Davenport, City of Kindred, Township of Normanna, Township of Warren
Drain 37	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	Township of Pleasant
Drain 53 Breakout	01/16/2015	Houston Engineering, Inc.	N/A	10/1/2007	City of Fargo
Lower Branch Rush River	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	City of Amenia, Township of Amenia, Township of Cassleton, Township of Harmony, City of Harwood, Township of Harwood, Township of Raymond, Township of Reed, Township of Rush River
Maple River	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	Township of Addison, Township of Durbin, City of Mapleton, Township of Raymond, City of West Fargo

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

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Red River of the North	01/16/2015	Houston Engineering, Inc.	N/A	10/01/2007	City of Briarwood, City of Fargo, Township of Harwood, Township of Noble, City of North River, City of Oxbow, Township of Pleasant, Township of Stanley, Township of Wisler
Rush River	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	City of Amenia, Township of Amenia, Berlin, Township of, Harmony, Township of, Harwood, City of Harwood, Township of Rush River, Township of Raymond, Township of
Sheyenne River	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	City of Fargo, City of Harwood, Township of Harwood, City of Horace, City of Kindred, Township of Normanna, City of West Fargo
Sheyenne River Diversion Channel	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	09/01/2015	City of Fargo, City of Horace, City of West Fargo
South Branch Elm River	06/01/1979	Barr Engineering Company	N/A	07/01/1978	City of Hunter, Township of Hunter
Swan Creek	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	05/13/2011	City of Casselton, Township of Casselton, Township of Durbin
Tributary to Swan Creek	TBD	BakerAECOM	HSFEHQ-09-D-0386; multiple task orders	05/13/2011	City of Casselton, Township of Casselton

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

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Wild Rice River	01/16/2015	Houston Engineering, Inc.	N/A	10/1/2007	City of Fargo, Township of Pleasant, Township of Stanley

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
Briarwood, City of	9/27/1985	10/20/1983	Initial CCO	City representatives, FEMA, the North Dakota State Water Commission and study contractor
		*	Final CCO	*
Casselton, City of	8/3/1989	6/22/1977	Initial CCO	City representatives, FEMA, the North Dakota State Water Commission and North Dakota State Highway Department
		4/12/1979	Final CCO	City representatives, FEMA, NDSWC and the study contractor
Durbin, Township of	1/4/2002	*	Initial CCO	*
		*	Final CCO	*
Fargo, City of	01/16/2015	6/14/1983	Initial CCO	Representatives of the Cities of Fargo and Moorhead, Minnesota; FEMA; the States of Minnesota and North Dakota; and the COE
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Harwood, City of	01/16/2015	*	Initial CCO	*
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Harwood, Township of (Red River of the North in Cass County Incorporated Areas)	12/18/1985	*	Initial CCO	*
		8/7/1979	Final CCO	Representatives of FEMA, NDSWC, the study contractor and the township
Harwood, Township of (Red River of the North)	12/18/1985	*	Initial CCO	*
		3/22/1983	Final CCO	Representatives of FEMA, NDSWC, the study contractor and the township

Table 30: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Harwood, Township of (Sheyenne River)	12/18/1985	6/30/1981	Initial CCO	Representatives of FEMA, NDSWC, the study contractor and the township
		6/14/1983 ¹	Final CCO	Representatives of FEMA, NDSWC, the study contractor and the township
Horace, City of	01/16/2015	8/13/1984	Initial CCO	Representatives of FEMA, NDSWC, the study contractor and the city
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Hunter, City of	6/1/1979	6/22/1977	Initial CCO	Representatives of the Federal Insurance Administration, the study contractor, NDSWC, and the city
		10/30/1978	Final CCO	Representatives of the Federal Insurance Administration, the study contractor, NDSWC, and the city
Mapleton, City of	7/2/1981	6/21/1977	Initial CCO	Representatives of the Federal Insurance Administration, the study contractor, NDSWC, and the city
		8/8/1979	Final CCO	Representatives of the Federal Insurance Administration, the study contractor, NDSWC, and the city
Mapleton, City of (revision)	2/2/2002	*	Initial CCO	*
		8/12/1980	Final CCO	Representatives of the Federal Insurance Administration, the study contractor, NDSWC, and the city
Noble, Township of (Red River of the North in Cass County Incorporated Areas)	1/1/1980	*	Initial CCO	*
		8/7/1979	Final CCO	Representatives of the Federal Insurance Administration, the study contractor, NDSWC, and the Townships of Harwood, Noble, Reed, and Wiser.
Normanna, Township of	9/30/1987	7/28/1983	Initial CCO	Representatives of the township, NDSWC, and the COE

Table 30: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
		7/15/1986	Final CCO	Representatives of FEMA, the township, the study contractor and the community
North River, City of	9/27/1985	*	Initial CCO	*
		*	Final CCO	*
Pleasant, Township of (Cass County Incorporated Areas)	01/16/2015	*	Initial CCO	*
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Raymond, Township of	01/16/2015	*	Initial CCO	*
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Reed, Township of (Red River of the North)	01/16/2015	*	Initial CCO	*
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Reiles Acres, City of	9/4/2002	*	Initial CCO	*
		8/17/1999	Final CCO	Representatives of FEMA and the city
Riverside, City of	01/16/2015	7/3/1981	Initial CCO	Representatives of FEMA, NDSWC, the study contractor and the city
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Stanley, Township of	01/16/2015	*	Initial CCO	*
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.

Table 30: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
West Fargo, City of	01/16/2015	7/3/1981	Initial CCO	Representatives of FEMA, NDSWC, the study contractor and the city
		9/10/2012 9/11/2012 9/12/2012	Final CCO	BakerAECOM, FEMA Region VIII, numerous communities.
Wiser, Township of	6/18/1984	*	Initial CCO	*
		1/23/1984	Final CCO	Representatives of FEMA, NDSWC, the study contractor and the township

¹Interim coordination meeting

*Data not available

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 Cass County (FEMA 2015).

Users may need to pay particular attention to the data represented in Table 24: Floodway Data and the Flood Profiles shown in Exhibits section of Volume 2 of this Flood Insurance Study Report for Red River of the North. The stream distance values shown in both products are not consistent between the data from the January 16, 2015 Effective FIS Report and this current revision. The stream distance values from the effective study and this revision are both shown in miles above the International Border with one exception. Cross-section letters A-S reflect the correct distance while T-DT inaccurately use the cross-section number upstream of the international border. For example, the data originally notated cross-section letter A as “station” 270 in the model. This is in fact, the 270th cross-section upstream of the international border. This section converts to 243.17 miles using the conversion key provide by the USACE – St. Paul District.

Table 31 is a list of the locations where FIRMs for Cass 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
ADDISON, TOWNSHIP OF	Township Chairman’s Office 4582 157 th Avenue Southeast	Davenport	ND	58021
ALICE, CITY OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
AMENIA, CITY OF	City Auditor’s Office 510 Reed Street West	Amenia	ND	58004
AMENIA, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
ARGUSVILLE, CITY OF	City Auditor’s Office 602 Lynn Dawn Drive	Argusville	ND	58005
ARTHUR, CITY OF	Arthur Community Hall 340 Main Street	Arthur	ND	58006
ARTHUR, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
AYR, CITY OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
BERLIN, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
BRIARWOOD, CITY OF	7 Briarwood Place	Fargo	ND	58104

Table 31: Map Repositories

Community	Address	City	State	Zip Code
BUFFALO, CITY OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
CASSELTON, CITY OF	Casselton City Hall 702 1 st Street North	Casselton	ND	58012
CASSELTON, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
DAVENPORT, CITY OF	Davenport City Hall (Old School) 1154 th Avenue	Davenport	ND	58021
DAVENPORT, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
DURBIN, TOWNSHIP OF	Township Clerk / Treasurer's Office 4175 161 st Avenue Southeast	Mapleton	ND	58059
EMPIRE, TOWNSHIP OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
EVEREST, TOWNSHIP OF	Township Clerk / Treasurer's Office 15449 37 th Street Southeast	Casselton	ND	58012
FARGO, CITY OF	FargoCity Hall 200 3rd Street North	Fargo	ND	58102
FRONTIER, CITY OF	5202 32nd Street South	Fargo	ND	58104
GARDNER, CITY OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
GARDNER, TOWNSHIP OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
HARMONY, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
HARWOOD, CITY OF	Harwood City Hall 108 Main Street	Harwood	ND	58042
HARWOOD, TOWNSHIP OF	Clerk, Zoning & Administrator's Office 126 Brooktree Park	Harwood	ND	58042
HIGHLAND, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
HORACE, CITY OF	Maintenance Shop 600 Nelson Drive	Horace	ND	58047
HUNTER, CITY OF	Hunter City Hall 122 Second Avenue West	Hunter	ND	58048
HUNTER, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
KINDRED, CITY OF	Kindred City Hall 31 5 th Avenue North PO Box 158	Kindred	ND	58051
LEONARD, CITY OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
MAPLE RIVER, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
MAPLETON, CITY OF	Mapleton City Office 651 Second Street	Mapleton	ND	58059

Table 31: Map Repositories

Community	Address	City	State	Zip Code
MAPLETON, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
NOBLE, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
NORMANNA, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
NORTH RIVER, CITY OF	1409 Reed Drive	North River	ND	58102
OXBOW, CITY OF	610 Evergreen Circle	Oxbow	ND	58047
PAGE, CITY OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
PLEASANT, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
PONTIAC, TOWNSHIP OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
PRAIRIE ROSE, CITY OF	3514 41st Avenue South	Fargo	ND	58104
RAYMOND, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
REED, TOWNSHIP OF	Reed Township Hall 617 19th Avenue Northwest	West Fargo	ND	58078
REILES ACRES, CITY OF	Reiles Acres City Hall 4635 35th Avenue North	Reiles Acres	ND	58102
RICH, TOWNSHIP OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
RUSH RIVER, TOWNSHIP OF	Township Chairman's Office 15879 26 th Street Southeast	Amenia	ND	58004
STANLEY, TOWNSHIP OF	Horace Training Center 419 Main Street	Horace	ND	58047
TOWER CITY, CITY OF ¹	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
WALBURG, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
WARREN, TOWNSHIP OF	Township Chairman's Office 4308 165th Avenue Southeast	Davenport	ND	58021
WATSON, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078
WEST FARGO, CITY OF	West Fargo City Hall 800 4th Avenue East	West Fargo	ND	58078
WISER, TOWNSHIP OF	Cass County Planning Office 1201 Main Avenue West	West Fargo	ND	58078

¹No Special Flood Hazard Areas Identified

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.

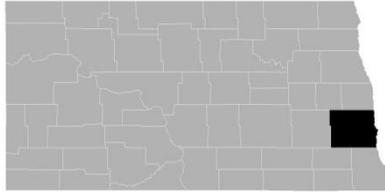
Table 32: Additional Information

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	http://www.fema.gov
NFIP website	http://www.fema.gov/business/nfip
NFHL Dataset	http://msc.fema.gov
FEMA Region VIII	Denver Federal Center, Building 710, Denver, CO 80225 303-235-4800
Other Federal Agencies	
USGS website	http://www.usgs.gov
Hydraulic Engineering Center website	http://www.hec.usace.army.mil
State Agencies and Organizations	
State NFIP Coordinator	Dionne Haynes, CFM North Dakota State Water Commission 900 East Boulevard Avenue Bismarck, ND 58505 701.328.4961 dfhaynes@nd.gov
State GIS Coordinator	Bob Nutsch Information Technology Department 600 East Boulevard, Department 112 Bismarck, ND 58505 701.328.3212 bnutsch@nd.us
State Mapping Coordinator	Laura Horner North Dakota State Water Commission 900 East Boulevard Avenue Bismarck, ND 58505 701.328.2759 lmhorner@nd.gov

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 2 OF 3



CASS COUNTY, NORTH DAKOTA

ALL JURISDICTIONS

COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER
Addison, Township of	380THR	Fargo, City of	385364	North River, City of	380623
Alice, City of*	380363	Frontier, City of	380347	Oxbow, City of	380681
Amenia, City of	380019	Gardner, City of*	385412	Page, City of*	380193
Amenia, Township of	380686	Gardner, Township of*	380266	Page, Township of*	380THR
Argusville, City of	380639	Gill, Township of*	380THR	Pleasant, Township of	380263
Arthur, City of	380156	Grandin, City of*	380335	Pontiac, Township of*	380THR
Arthur, Township of	380THR	Gunkel, Township of*	380THR	Prairie Rose, City of*	380655
Ayr, City of*	380350	Harmony, Township of	380THR	Raymond, Township of	380261
Ayr, Township of*	380THR	Harwood, City of	380338	Reed, Township of	380257
Bell, Township of*	380THR	Harwood, Township of	380259	Reiles Acres, City of	380324
Berlin, Township of	380620	Highland, Township of	380THR	Rich, Township of*	380THR
Briarwood, City of	380651	Hill, Township of*	380THR	Rochester, Township of*	380THR
Buffalo, City of*	380160	Horace, City of	380022	Rush River, Township of	380THR
Buffalo, Township of*	380THR	Howes, Township of*	380THR	Stanley, Township of	380258
Casselton, City of	380020	Hunter, City of	380181	Tower City, City of*	380210
Casselton, Township of	380THR	Hunter, Township of	380THR	Tower, Township of*	380THR
Clifton, Township of*	380THR	Kindred, City of	380182	Walburg, Township of	380652
Cornell, Township of*	380THR	Kinyon, Township of*	380THR	Warren, Township of	380265
Davenport, City of	380717	Lake, Township of*	380THR	Watson, Township of	380THR
Davenport, Township of	380690	Leonard, City of*	380185	West Fargo, City of	380024
Dows, Township of*	380THR	Leonard, Township of*	380THR	Wheatland, Township of*	380THR
Durbin, Township of	380325	Maple River, Township of	380THR	Wiser, Township of	380267
Eldred, Township of*	380THR	Mapleton, City of	380023		
Empire, Township of*	380366	Mapleton, Township of	380262		
Erie, Township of*	380THR	Noble, Township of	380268		
Everest, Township of	380352	Normanna, Township of	380264		

*No Special Flood Hazards Identified

REVISED:

PRELIMINARY
1/29/2016

FLOOD INSURANCE STUDY NUMBER
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FEMA

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County Drain 45	04-05 P
Drain 14	06-09 P
Drain 21	10 P
Drain 21C	11-12 P
Drain 34	13-14 P
Drain 37	15 P
Drain 53 Breakout	16-20 P
Maple River	21-34 P
Red River of the North	35-43 P
Sheyenne River	44-57 P
Sheyenne River Diversion Channel	58-59 P
South Branch Elm River	60 P
Swan Creek	61-70 P
Tributary to Swan Creek	71-72 P

Volume 3
Exhibits

Flood Profiles	
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Published Separately

Flood Insurance Rate Map (FIRM)

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
Aero-Metric Engineering 1981	Aero-Metric Engineering	<i>Aerial Photography, Sheyenne River, Fargo, North Dakota, Scale 1:9,600</i>		Fargo, ND	Apr-81	http://www.aerometric.com/
Cass Co. 2010	Cass County	Cass County, North Dakota. Shapefile Data		Cass County, ND	May-10	http://www.casscountynd.gov/county/depts/GIS/Pages/GISHome.aspx
FEMA 1979	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Hunter</i>		Washington, D.C.	Jun-79	FEMA Map Service Center http://msc.fema.gov
FEMA 1981.08	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Pleasant</i>		Washington, D.C.	Aug-81	FEMA Map Service Center http://msc.fema.gov
FEMA 1981.09	Federal Emergency Management Agency	<i>Flood Insurance Study, Norman County, Minnesota (Unincorporated Areas)</i>		Washington, D.C.	Sep-81	FEMA Map Service Center http://msc.fema.gov
FEMA 1982	Federal Emergency Management Agency	<i>Flood Insurance Study, Clay County, Minnesota (Draft Report)</i>		Washington, D.C.	Jan-82	FEMA Map Service Center http://msc.fema.gov
FEMA 1984	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, North Dakota, Township of Harwood</i>		Washington, D.C.	1984	FEMA Map Service Center http://msc.fema.gov
FEMA 1984.04	Federal Emergency Management Agency	<i>Flood Insurance Study, Clay County, Minnesota, Unincorporated Areas</i>		Washington, D.C.	Apr-84	FEMA Map Service Center http://msc.fema.gov

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
FEMA 1984.06	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Wisner</i>		Washington, D.C.	Jun-84	FEMA Map Service Center http://msc.fema.gov
FEMA 1985	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, North Dakota, City of West Fargo</i>		Washington, D.C.	1985	FEMA Map Service Center http://msc.fema.gov
FEMA 1985.09	Federal Emergency Management Agency	<i>Flood Insurance Study, Ransom County, North Dakota, Unincorporated Areas</i>		Washington, D.C.	Sep-85	FEMA Map Service Center http://msc.fema.gov
FEMA 1985.09a	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND</i>		Washington, D.C.	Sep-85	FEMA Map Service Center http://msc.fema.gov
FEMA 1985.09b	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Briarwood</i>		Washington, D.C.	Sep-85	FEMA Map Service Center http://msc.fema.gov
FEMA 1985.09c	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Horace</i>		Washington, D.C.	Sep-85	FEMA Map Service Center http://msc.fema.gov
FEMA 1985.09d	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of North River</i>		Washington, D.C.	Sep-85	FEMA Map Service Center http://msc.fema.gov
FEMA 1985.12	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Harwood</i>		Washington, D.C.	Dec-85	FEMA Map Service Center http://msc.fema.gov

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
FEMA 1985.12a	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Harwood</i>		Washington, D.C.	Dec-85	FEMA Map Service Center http://msc.fema.gov
FEMA 1987	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Red River of the North</i>		Washington, D.C.	1987	FEMA Map Service Center http://msc.fema.gov
FEMA 1987.09	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Normanna</i>		Washington, D.C.	Sep-87	FEMA Map Service Center http://msc.fema.gov
FEMA 1989	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Casselton</i>		Washington, D.C.	Aug-89	FEMA Map Service Center http://msc.fema.gov
FEMA 1992	Federal Emergency Management Agency	<i>Converting the National Flood Insurance Program to the North American Vertical Datum of 1988 - Guidelines for Community Officials, Engineers, and Surveyors. 3-0170</i>		Washington, D.C.	Jun-92	FEMA Map Service Center http://msc.fema.gov
FEMA 1994	Federal Emergency Management Agency	<i>Flood Insurance Study, Norman County, Minnesota, and Incorporated Areas</i>		Washington, D.C.	Jul-94	FEMA Map Service Center http://msc.fema.gov
FEMA 1995	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Stanley</i>		Washington, D.C.	Feb-95	FEMA Map Service Center http://msc.fema.gov

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
FEMA 2002.01	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Durbin</i>		Washington, D.C.	Jan-02	FEMA Map Service Center http://msc.fema.gov
FEMA 2002.01	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Raymond</i>		Washington, D.C.	Jan-02	FEMA Map Service Center http://msc.fema.gov
FEMA 2002.02	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Mapleton</i>		Washington, D.C.	Feb-02	FEMA Map Service Center http://msc.fema.gov
FEMA 2002.09	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Fargo</i>		Washington, D.C.	Sep-02	FEMA Map Service Center http://msc.fema.gov
FEMA 2002.09a	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, Township of Reed</i>		Washington, D.C.	Sep-02	FEMA Map Service Center http://msc.fema.gov
FEMA 2002.09b	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of Reile's Acres</i>		Washington, D.C.	Sep-02	FEMA Map Service Center http://msc.fema.gov
FEMA 2002.09c	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, ND, City of West Fargo</i>		Washington, D.C.	Sep-02	FEMA Map Service Center http://msc.fema.gov
FEMA 2008	Federal Emergency Management Agency	<i>Flood Insurance Study, Barnes County, North Dakota, and Incorporated Areas</i>		Washington, D.C.	Feb-08	FEMA Map Service Center http://msc.fema.gov

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
FEMA 2009.04	Federal Emergency Management Agency	<i>Flood Insurance Study, Traill County, North Dakota, and Incorporated Areas</i>		Washington, D.C.	9-Apr	FEMA Map Service Center http://msc.fema.gov
FEMA 2009.12	Federal Emergency Management Agency	<i>Flood Insurance Study, Richland County, North Dakota, Unincorporated Areas</i>		Washington, D.C.	Dec-09	FEMA Map Service Center http://msc.fema.gov
FEMA unpub1	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, North Dakota (Unincorporated Areas)</i>		unpublished	unpublished	FEMA Map Service Center http://msc.fema.gov
FEMA unpub2	Federal Emergency Management Agency	<i>Flood Insurance Study, Cass County, North Dakota, Township of Reed</i>		Washington, D.C.	unpublished	FEMA Map Service Center http://msc.fema.gov
FHWA 1973	U.S. Department of Transportation, Federal Highway Administration	<i>Hydraulic Design Series No. 1: Hydraulics of Bridge Waterways</i>		Washington, D.C.	Sep-73	http://www.fhwa.dot.gov/
HEC 1972	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>Computer Program 723-X6-L7350, Regional Frequency Computations</i>		Davis, CA	Jul-72	http://www.usace.army.mil/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
HEC 1976	U.S. Department of the Army, Hydrologic Engineering Center	<i>Computer Program 723-X6-L7550, Flood Flow Frequency Analysis</i>		Davis, CA	Jun-76	http://www.usace.army.mil/
HMI	Haested Methods, Inc.	<i>Pond-2, Detention Pond Design and Analysis, Version 5.12</i>		Waterbury, CT		http://www.bentley.com/en-US/
Houston Eng	Houston Engineering, Inc.	<i>Technical Support Data Notebook for City of Fargo, North Dakota Flood Insurance Study</i>			2007	
KBM	KBM, Inc.	<i>Historic Flood Photographs, April 17, 1969, and May 12, 1979</i>		Minneapolis, MN		http://www.kbm-corp.com/
KBM 1984	KBM, Inc.	<i>Orthophoto Topographic Mapping, Scale 1:2,400, Contour Interval 2 Feet.</i>			Apr-84	http://www.kbm-corp.com/
Martinez Orth-Mapping	Martinez Geospatial	<i>Aerial Photographs, Red River of the North, Cass County, North Dakota, Scale 1:4,800</i>				http://www.mtzgeo.com/
NCDC 2010	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climate Data Center	<i>Storm Events</i>		Washington, D.C.	May-10	http://www.ncdc.noaa.gov
NDSWC	North Dakota State Water Commission	<i>Plans for Dam on South Branch Elm River, West Side of Hunter, North Dakota</i>		Bismarck, ND		www.swc.nd.gov/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
NDSWC 1971	North Dakota State Water Commission and Minnesota Department of Natural Resources, Division of Water, Soils & Minerals	<i>Red River of the North Regional Flood Analysis</i>		Bismarck, ND	Aug-71	http://www.swc.nd.gov/4dlink9/4dcgi/redirect/index.html and http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html
NDSWC 1982	North Dakota State Water Commission	<i>Casselton, North Dakota, Topographic Map, Scale 1:600, Contour Interval 1 Foot</i>		Bismarck, ND	Nov-82	www.swc.nd.gov/
NRCS 1986	U.S. Department of Agriculture, Natural Resources Conservation Service	<i>Technical Release No. 55: Urban Hydrology for Small Watersheds.</i>		Washington, D.C.	Jun-86	http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf
NWS 2002	National Weather Service Eastern North Dakota, Scientific Services Division	<i>Fargo, North Dakota Climate</i>	Vincent Godon and Nancy Godon	Grand Forks, ND	Apr-02	http://www.weather.gov/organization
SCS 1957	U.S. Department of Agriculture, Soil Conservation Service	<i>Lower Swan Channel Improvements, Swan-Buffalo Creek Watershed</i>		Washington, D.C.	1957	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
SCS 1959	U.S. Department of Agriculture, Soil Conservation Service	<i>Detention Dam SB-12, Swan Buffalo Creek Watershed</i>		Washington, D.C.	1959	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
SCS 1965	U.S. Department of Agriculture, Soil Conservation Service,	<i>Technical Release No. 20: Computer Program for Project Formulation, Hydrology</i>	Engineering Division, Central Technical Unit	Washington, D.C.	May-65	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
SCS 1971	U.S. Department of Agriculture, Soil Conservation Service	<i>Type-15 Flood Insurance Study, Cass County, North Dakota</i>		Washington, D.C.	Nov-71	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
SCS 1972	U.S. Department of Agriculture, Soil Conservation Service	<i>National Engineering Handbook, Section 4 - Hydrology</i>		Washington, D.C.	Aug-72	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
SCS 1973	U.S. Department of Agriculture, Soil Conservation Service	<i>Mapleton Flood Hazard Analyses</i>		Washington, D.C.	Jul-73	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
SCS 1973	U.S. Department of Agriculture, Soil Conservation Service	<i>General Soil Map, Lake Agassiz Multi-County, North Dakota</i>		Cass County, ND	Aug-73	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
SCS 1983	U.S. Department of Agriculture, Soil Conservation Service	<i>General Soil Map, Cass County, North Dakota</i>		Cass County, ND	1983	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
Ulteig Engineering Inc. 1999	Ulteig Engineering, Inc.	<i>Revised Hydrology Report for the City of Mapleton, Fargo, North Dakota</i>		Fargo, ND	1999	http://www.ulteig.com/
USACE	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>HEC-1 Flood Hydrograph Package</i>		Davis, CA		http://www.usace.army.mil/
USACE 1940	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>Sheyenne River Survey, Field Books Nos. F2-T7 through F2-T10</i>		St. Paul, MN	1940	http://www.mvp.usace.army.mil/
USACE 1969	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>HEC-2 Input for Sheyenne River, Kindred to Horace, 1969 Flood</i>		St. Paul, MN	Feb-69	http://www.mvp.usace.army.mil/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USACE 1970	U.S. Department of the Army, Corps of Engineers, St. Paul District, Reservoir Regulating Section	<i>Red River of the North, Water-Surface Profiles</i>		St. Paul, MN	Jul-70	http://www.mvp.usace.army.mil/
USACE 1972	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>Flood Plain Information, Red River of the North, Fargo, North Dakota, and Moorhead, Minnesota</i>		St. Paul, MN	Sep-72	http://www.mvp.usace.army.mil/
USACE 1973	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>Generalized Computer Program, HEC-2 Water Surface Profiles</i>		Davis, CA	Nov-73	http://www.hec.usace.army.mil/
USACE 1976	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>Computer Program 732-X6-1202A, HEC-2 Water-Surface Profiles</i>		Davis, CA	Nov-76	http://www.hec.usace.army.mil/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USACE 1978	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>Red River of the North, Post Flood Report</i>		St. Paul, MN	1978	http://www.mvp.usace.army.mil/
USACE 1979	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>Letter Regarding Red River Hydrology and Coordinated Discharges</i>		St. Paul, MN	May-79	http://www.mvp.usace.army.mil/
USACE 1981	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>HEC-2 Step-Backwater Model for the Sheyenne River</i>		St. Paul, MN	Nov-81	http://www.mvp.usace.army.mil/
USACE 1982	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>General Reevaluation (GR) and Environmental Impact Statement for Flood Control and Related Purposes, Sheyenne River, North Dakota</i>		St. Paul, MN	Aug-82	http://www.mvp.usace.army.mil/
USACE 1982	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>General Design Memorandum Phase I and Environmental Impact Statement for Flood Control and Related Purposes, Sheyenne River, North Dakota</i>		St. Paul, MN	Jan-82	http://www.mvp.usace.army.mil/

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Citation in this FIS	Publisher/ Issuer	<i>Publication Title, "Article,"</i> Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USACE 1985	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>Fargo-Moorhead Urban Study</i>		Washington, D.C.	May-85	http://www.mvp.usace.army.mil/
USACE 1991	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>HEC-2 Water-Surface Profiles, Generalized Computer Program</i>		Davis, CA	May-91	http://www.hec.usace.army.mil/
USACE 1998	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>HEC-RAS River Analysis System, Version 2.2</i>		Davis, CA	Sep-98	http://www.hec.usace.army.mil/software/hecras/
USACE 2005	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>HEC-RAS River Analysis System, Version 3.1.3</i>		Davis, CA	May-15	http://www.hec.usace.army.mil/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USACE 2009	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>HEC-HMS Hydrologic Modeling System Version 3.4</i>		Davis, CA	Aug-09	http://www.hec.usace.army.mil/
USACE 2010	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>HEC-RAS River Analysis System, Version 4.1</i>		Davis, CA	Jan-15	http://www.hec.usace.army.mil/
USACE 2014	U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center	<i>HEC-RAS River Analysis System, Version 5.0 [BETA]</i>		Davis, CA	Oct-15	http://www.hec.usace.army.mil/
USDC 1961	U.S. Department of Commerce, Weather Bureau	<i>Technical Paper No. 40: Rainfall Frequency Atlas of the United States</i>		Washington, D.C.	1961	http://www.commerce.gov/
USDC 2010	U.S. Department of Commerce, Bureau of the Census	<i>State & County Quickfacts, North Dakota Quicklinks</i>		Washington, D.C.	May-10	http://www.census.gov/census2000/states/nd.html

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USDOT 1965	U.S. Department of Transportation, Bureau of Public Roads, Hydraulic Branch	<i>Hydraulic Engineering Circular No. 5: Hydraulic Charts for the Selection of Highway Culverts</i>		Washington, D.C.	Dec-65	http://www.fhwa.dot.gov/engineering/hydraulics/pubs/hec/hec05.pdf
USGS 1955-1967, 1969-1973	U.S. Department of the Interior, Geological Survey, Surface Water Records	<i>Water Resources Data for North Dakota, Part 1, 1955-1967 and 1969-1973</i>		Washington, D.C.	various	http://www.usgs.gov/
USGS 1965	U.S. Department of the Interior, Geological Survey	<i>Water Resources Data for North Dakota and South Dakota, 1944-1965</i>		Washington, D.C.	1965	http://www.usgs.gov/
USGS 1967	U.S. Department of the Interior, Geological Survey	<i>7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet</i>		Hunter, ND	1967	http://www.usgs.gov/
USGS 1971	U.S. Department of the Interior, Geological Survey	<i>7.5-Minutes Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet</i>		Mapleton, ND	1961 (revised 1971)	http://www.usgs.gov/

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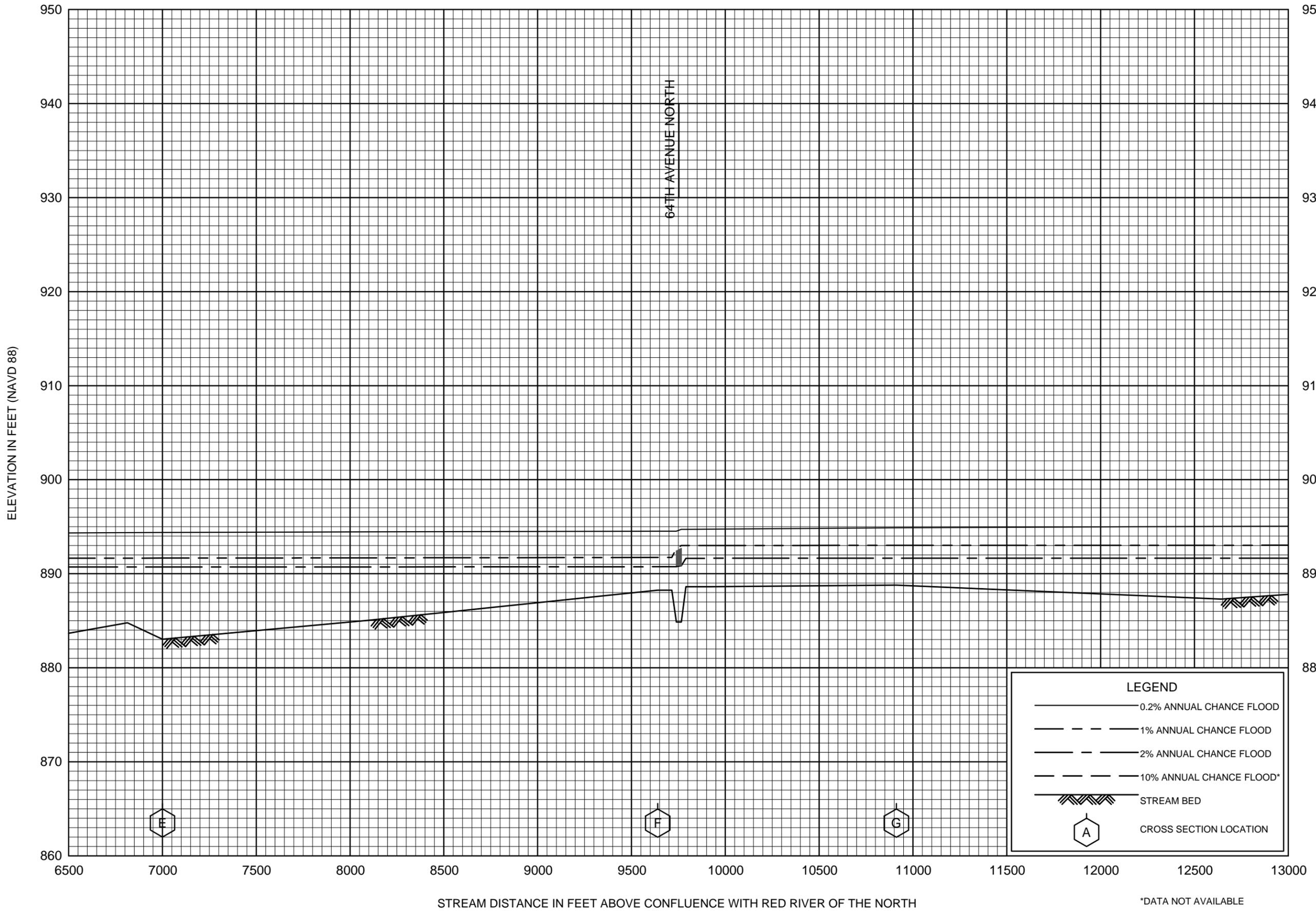
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USGS 1971	U.S. Department of the Interior, Geological Survey	<i>7.5-Minutes Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet, Barries, ND (1960); Kindred, ND (1969); Norman, ND (1959); SW Fargo, ND (1971); W Fargo N, ND (1959); Walcott, ND (1959)</i>		Washington, D.C.	various	http://www.usgs.gov/
USGS 1974	U.S. Department of the Interior, Geological Survey	<i>Flood-Prone Area Map, 7.5-Minutes Series Topographic Maps, Scale 1:24,000</i>		Casselton, ND	1974	http://www.usgs.gov/
USGS 1975	U.S. Department of the Interior, Geological Survey	<i>Water Resources Investigations 1975: Magnitude and Frequency of Floods in Small Drainage Basins in North Dakota</i>		Washington, D.C.	May-75	http://www.usgs.gov/
USGS 1976	U.S. Department of the Interior, Geological Survey	<i>7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 Feet, Argusville, ND (1976); Casselton SE, ND (1976); Fargo N, ND (1976); Fargo S, ND (1976); Georgetown, ND (1959); Hickson, ND (1971); Kindred, ND (1959); Mapleton, ND (1971); Normanna, ND (1959); SW Fargo, ND (1971); W Fargo N, ND (1976).</i>		Washington, D.C.	various	http://www.usgs.gov/

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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USGS 1977	U.S. Department of the Interior, Geological Survey	<i>Water Resources Investigations 77-31: Techniques for Estimating Magnitude and Frequency of Floods in Minnesota</i>		Washington, D.C.	May-77	http://www.usgs.gov/
USGS 1979	U.S. Department of the Interior, Geological Survey, Water Resources Division	<i>Water Resources Data for Minnesota, Part 1: Surface Water Resources and Part 2: Water Quality Records, 1902-1979</i>		St. Paul, MN	1979	http://www.usgs.gov/
USGS 1979	U.S. Department of the Interior, Geological Survey	<i>Letter Regarding Red River Hydrology and Coordinated Discharges (open files)</i>		St. Paul, MN	Apr-79	http://www.usgs.gov/
USGS 1992	U.S. Department of the Interior, Geological Survey	<i>WRIR 92-4020: Techniques for Estimating Peak-Flow Frequency Relations for North Dakota Streams</i>	Tara Williams Sether	Bismarck, ND	1994	http://www.usgs.gov/
USGS 1994	U.S. Department of the Interior, Geological Survey	<i>Water Resources Data for North Dakota and South Dakota, 1966-1994</i>		Washington, D.C.	1994	http://www.usgs.gov/
USWRC 1967	U.S. Water Resources Council	<i>Bulletin 15: A Uniform Technique for Determining Flood Flow Frequencies</i>		Washington, D.C.	Dec-67	http://water.usgs.gov/waterce/nsus/
USWRC 1976	U.S. Water Resources Council	<i>Bulletin 17: Guidelines for Determining Flood Flow Frequency</i>		Washington, D.C.	Mar-76	http://water.usgs.gov/waterce/nsus/

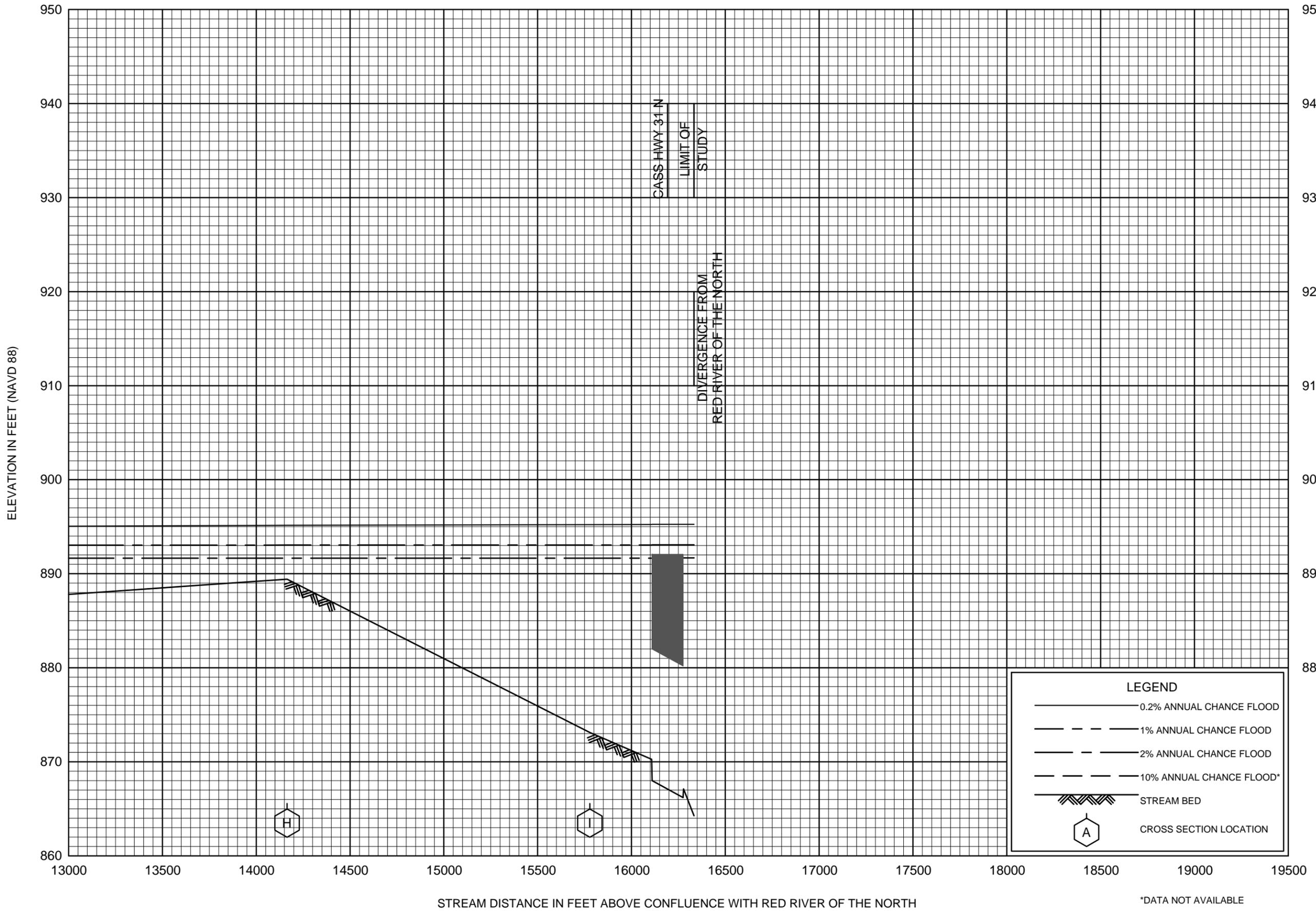
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Citation in this FIS	Publisher/ Issuer	Publication Title, "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USWRC 1977	U.S. Water Resources Council	<i>Bulletin 17A: Guidelines for Determining Flood Flow Frequencies</i>		Washington, D.C.	1977	http://water.usgs.gov/waterce/nsus/
USWRC 1981	U.S. Water Resources Council	<i>Bulletin 17B: Guidelines for Determining Flood Flow Frequency</i>		Washington, D.C.	Sep-81	http://water.usgs.gov/waterce/nsus/
WSC 2008	Watershed Concepts, a Division of Hayes, Seay, Mattern & Mattern	<i>Watershed Information System (WISE) Computer Software, v.4.1.0</i>			2008	http://www.aecom.com/
USDA 1966	U.S. Department of Agriculture, North Dakota Agricultural Experiment Station	<i>Soil Survey Tri-County Area, [Cass, Ransom, and Richland Counties], North Dakota</i>	Hollis W. Omodt, Fred W. Schroer, and C.R. Redmond	Washington, D.C.	1966	http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
USACE 1979	U.S. Department of the Army, Corps of Engineers, St. Paul District	<i>Red River of the North and Souris River, Post Flood Report</i>		St. Paul, MN	1979	http://www.mvp.usace.army.mil/



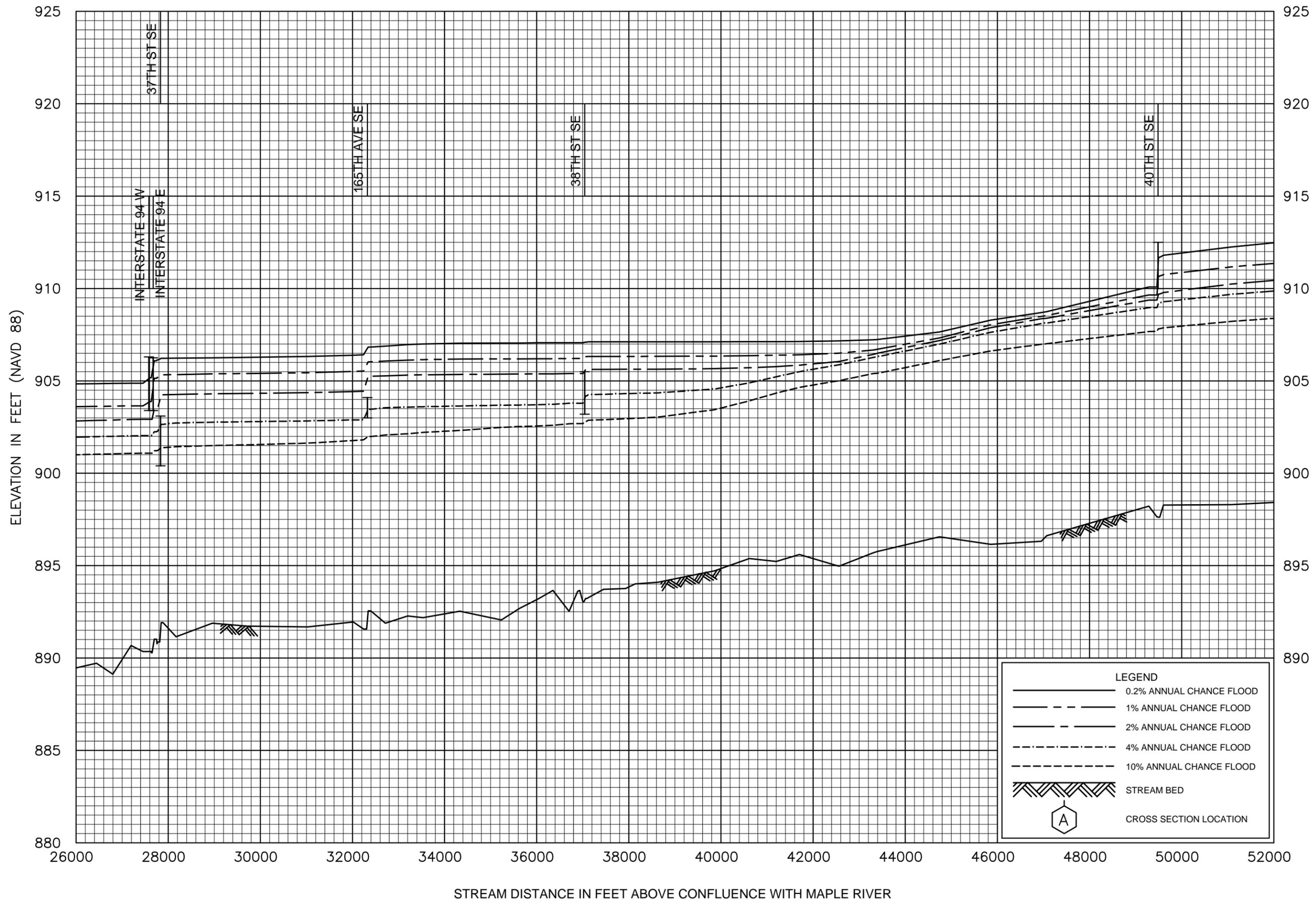
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COUNTY DRAIN 10 BREAKOUT

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS



FLOOD PROFILES
 COUNTY DRAIN 10 BREAKOUT

FEDERAL EMERGENCY MANAGEMENT AGENCY
 CASS COUNTY, ND
 ALL JURISDICTIONS



FLOOD PROFILES

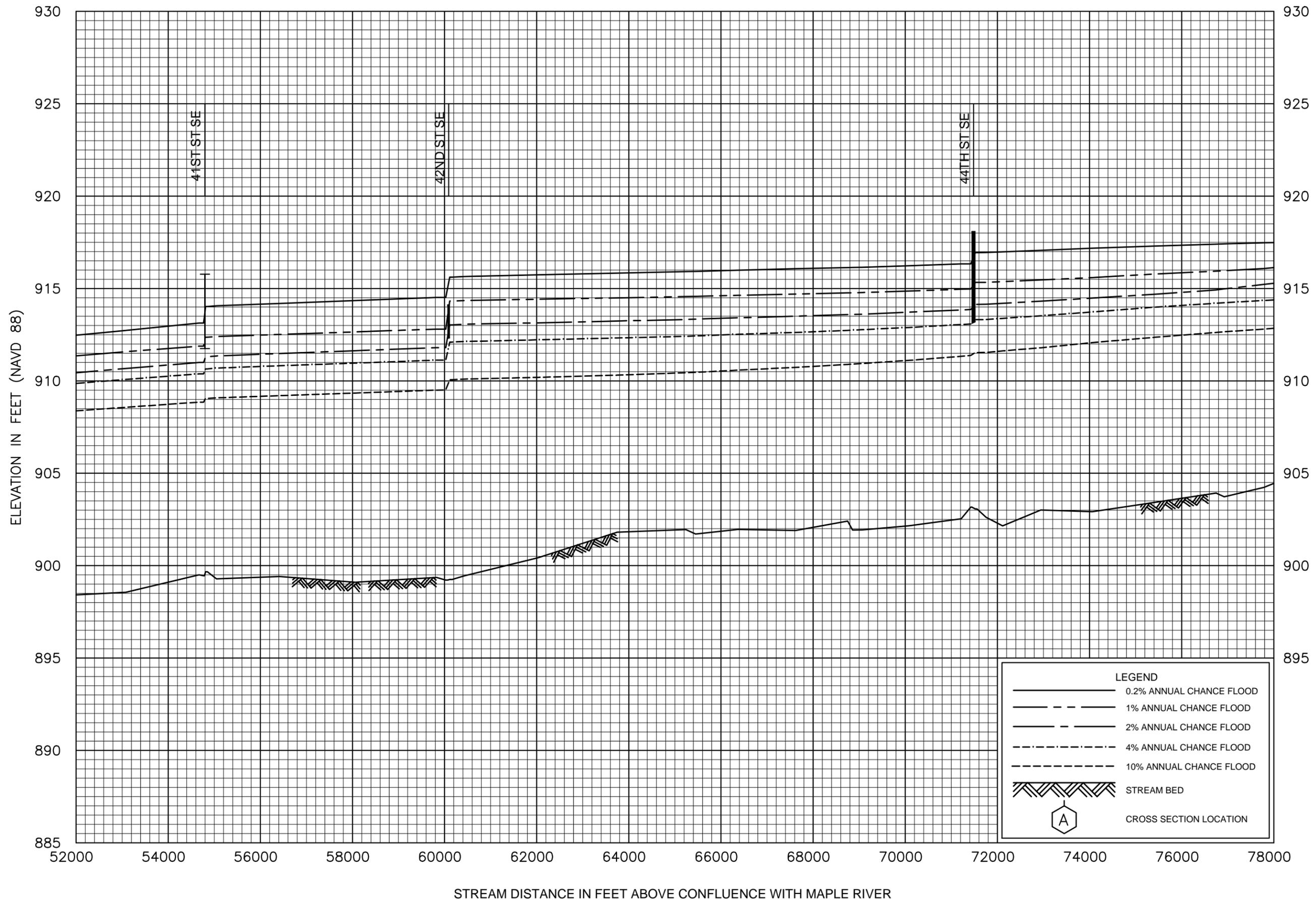
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CASS COUNTY, ND

ALL JURISDICTIONS

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FLOOD PROFILES

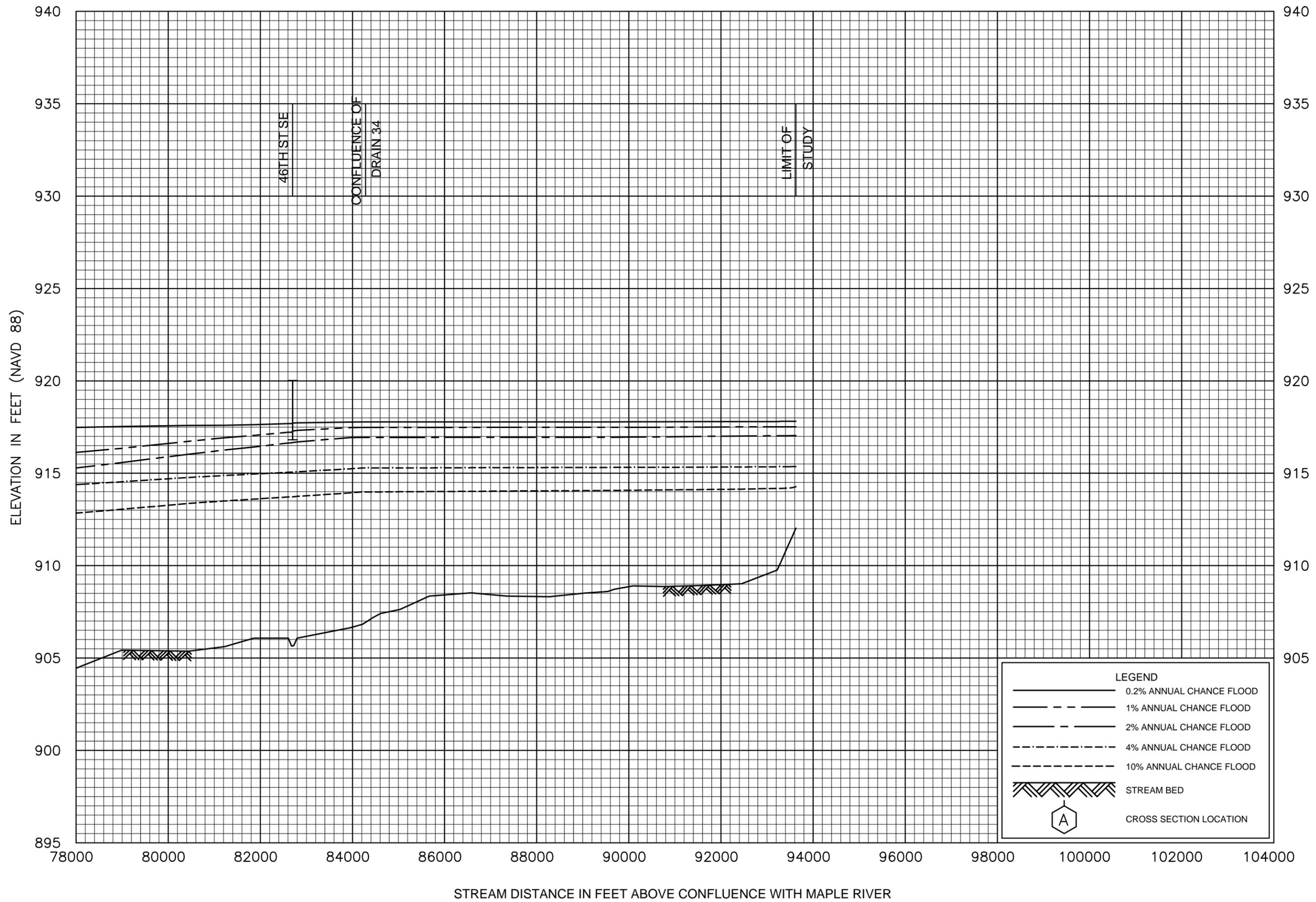
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FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

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FLOOD PROFILES

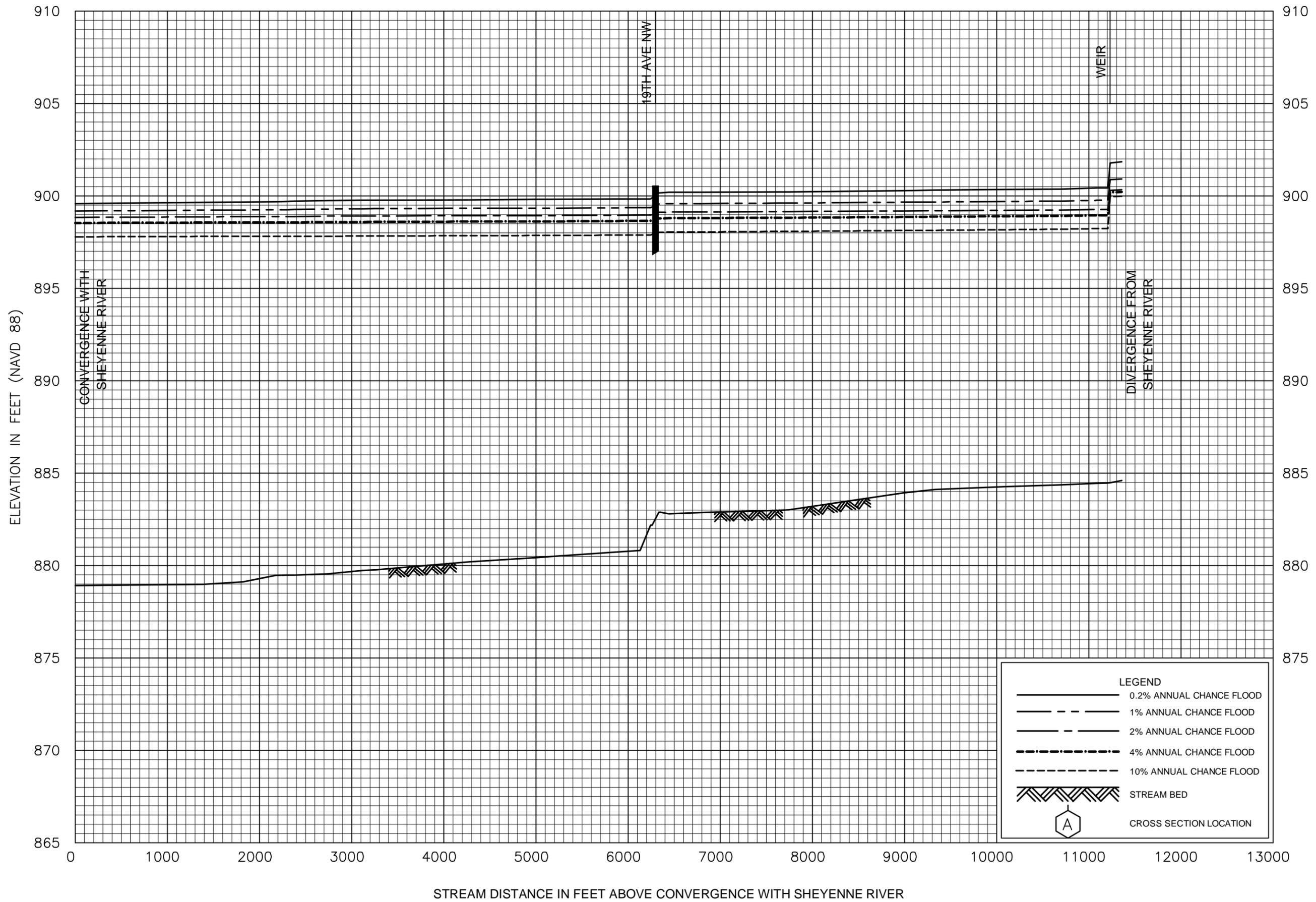
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FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

09P



FLOOD PROFILES

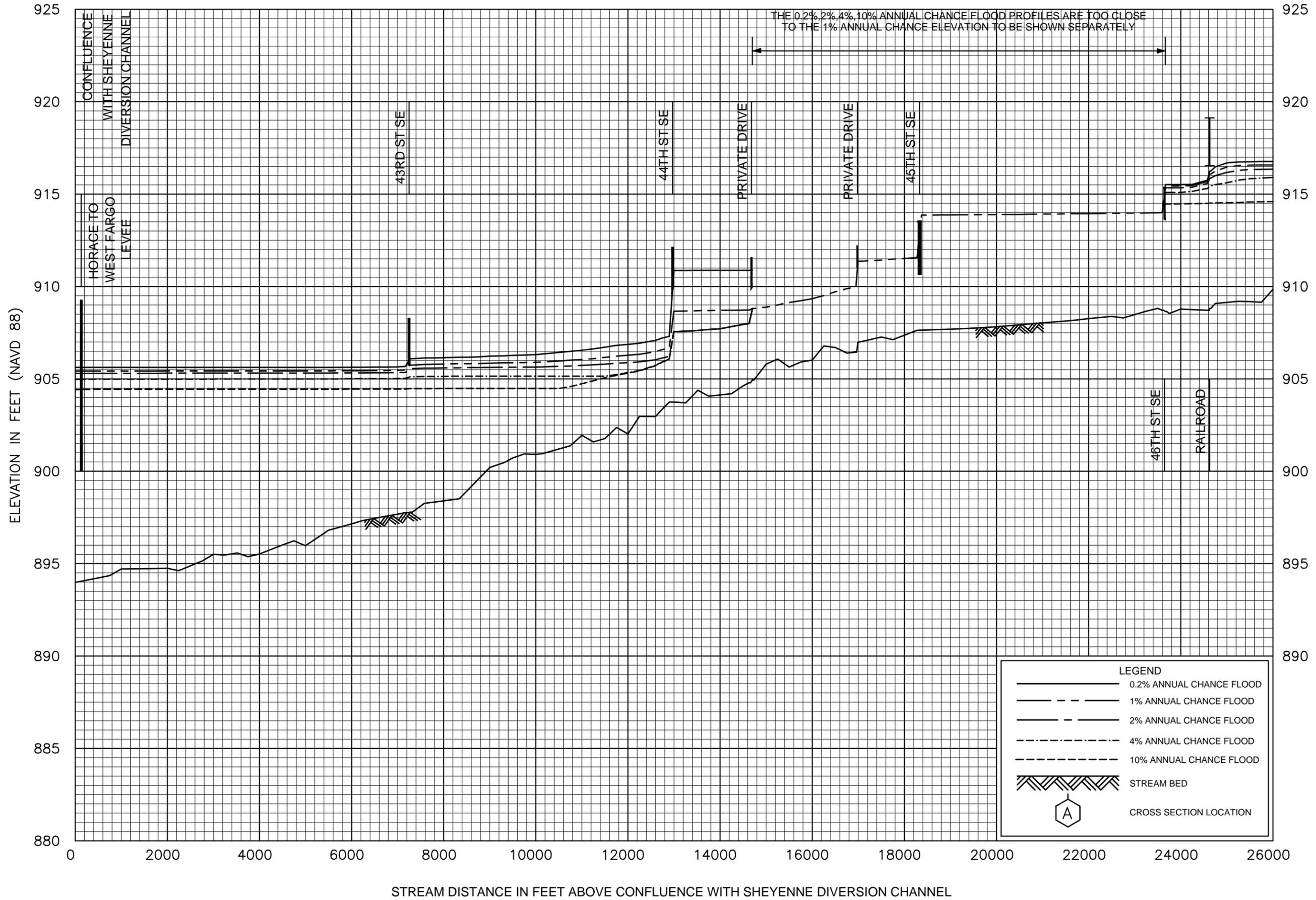
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FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

10P



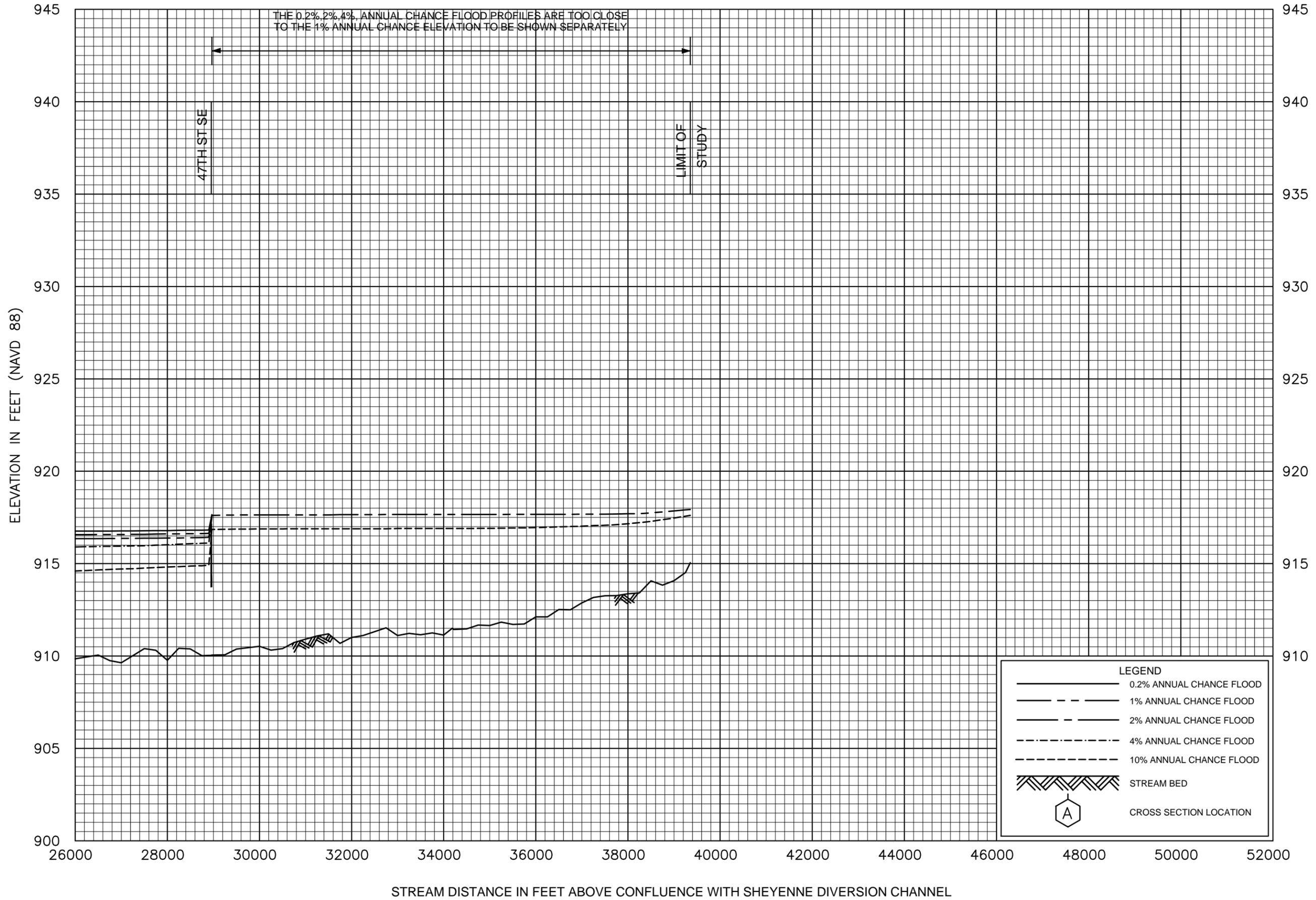
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CASS COUNTY, ND

ALL JURISDICTIONS



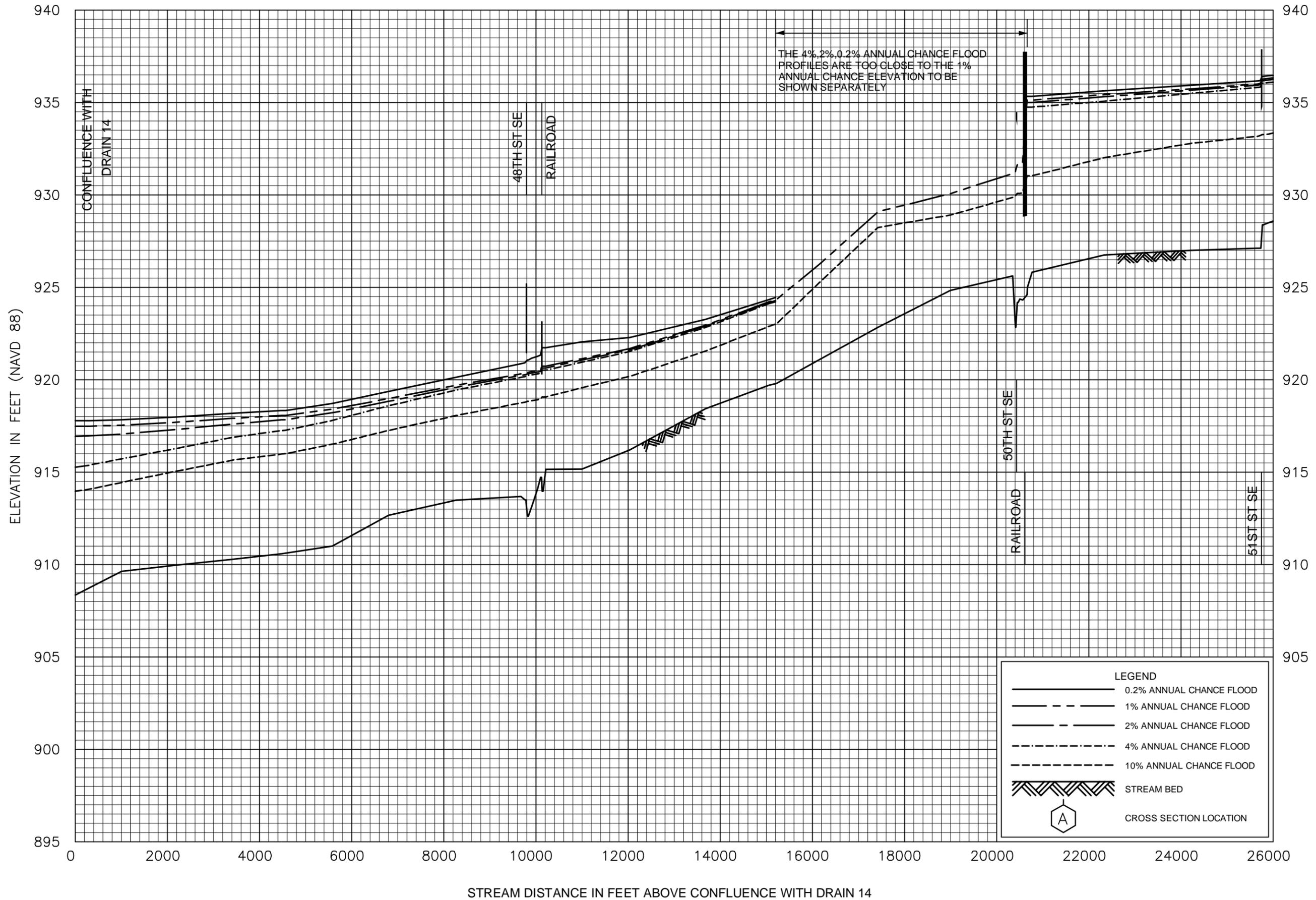
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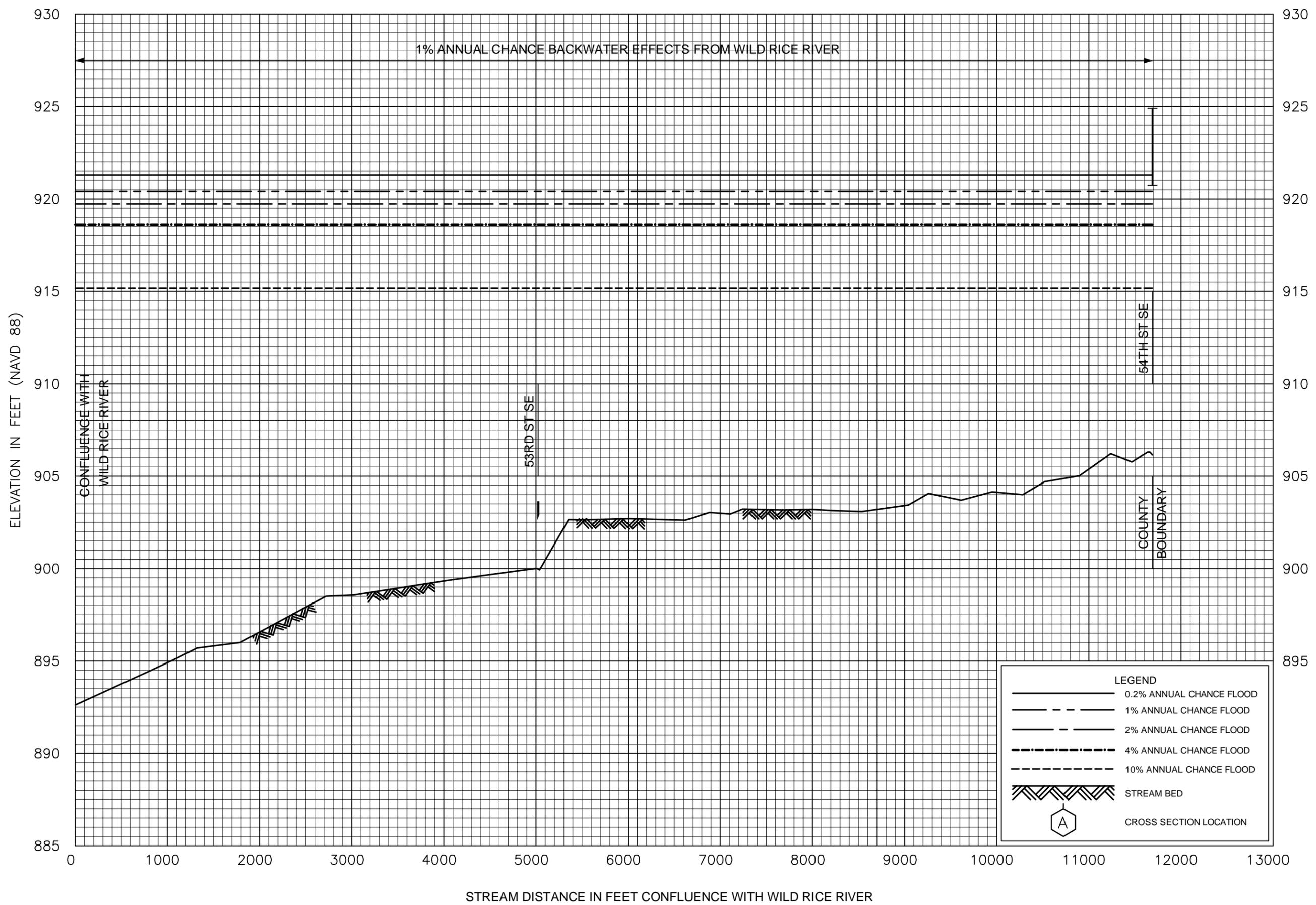
CASS COUNTY, ND

ALL JURISDICTIONS



FLOOD PROFILES
DRAIN 34

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS



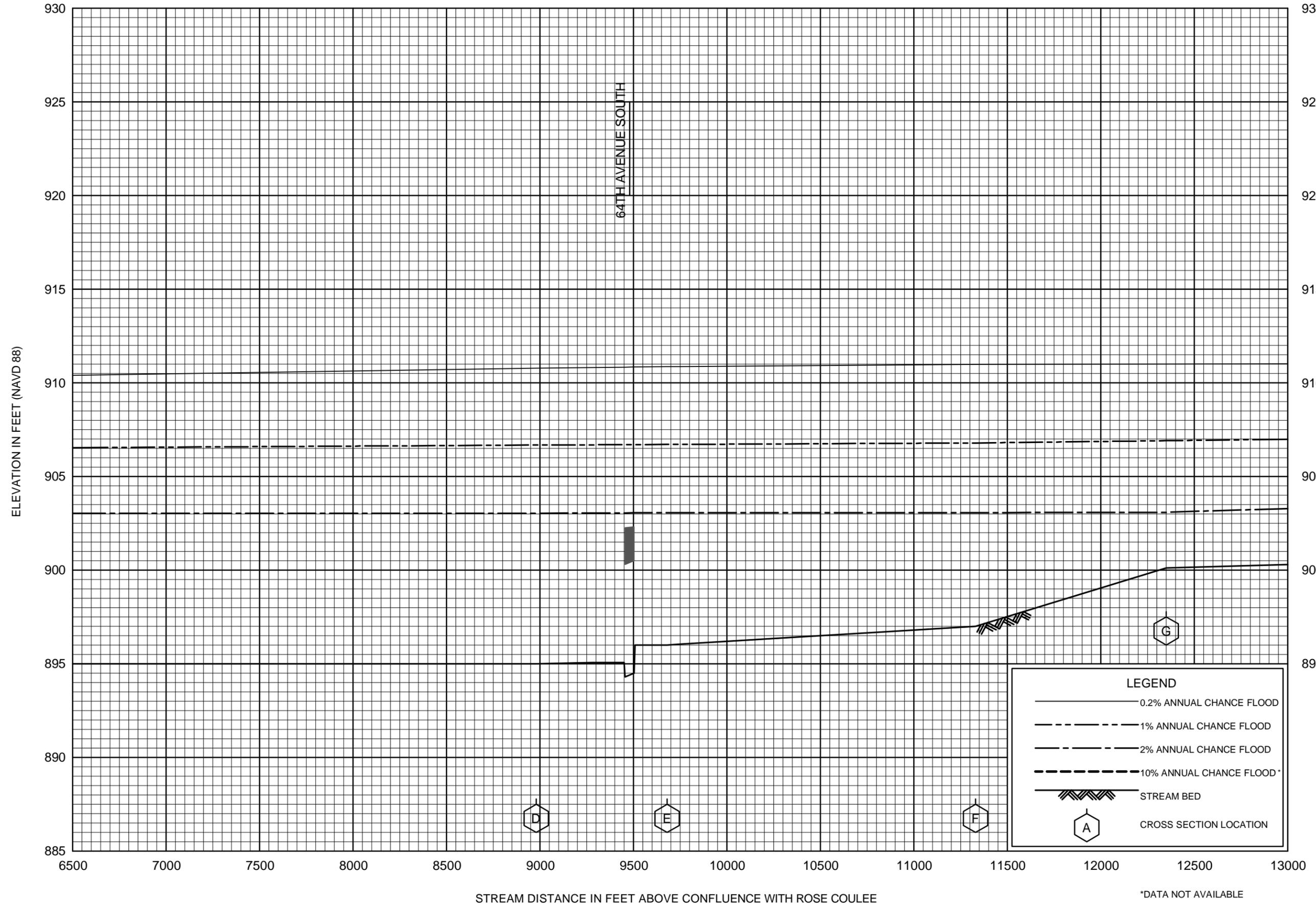
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DRAIN 37

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS



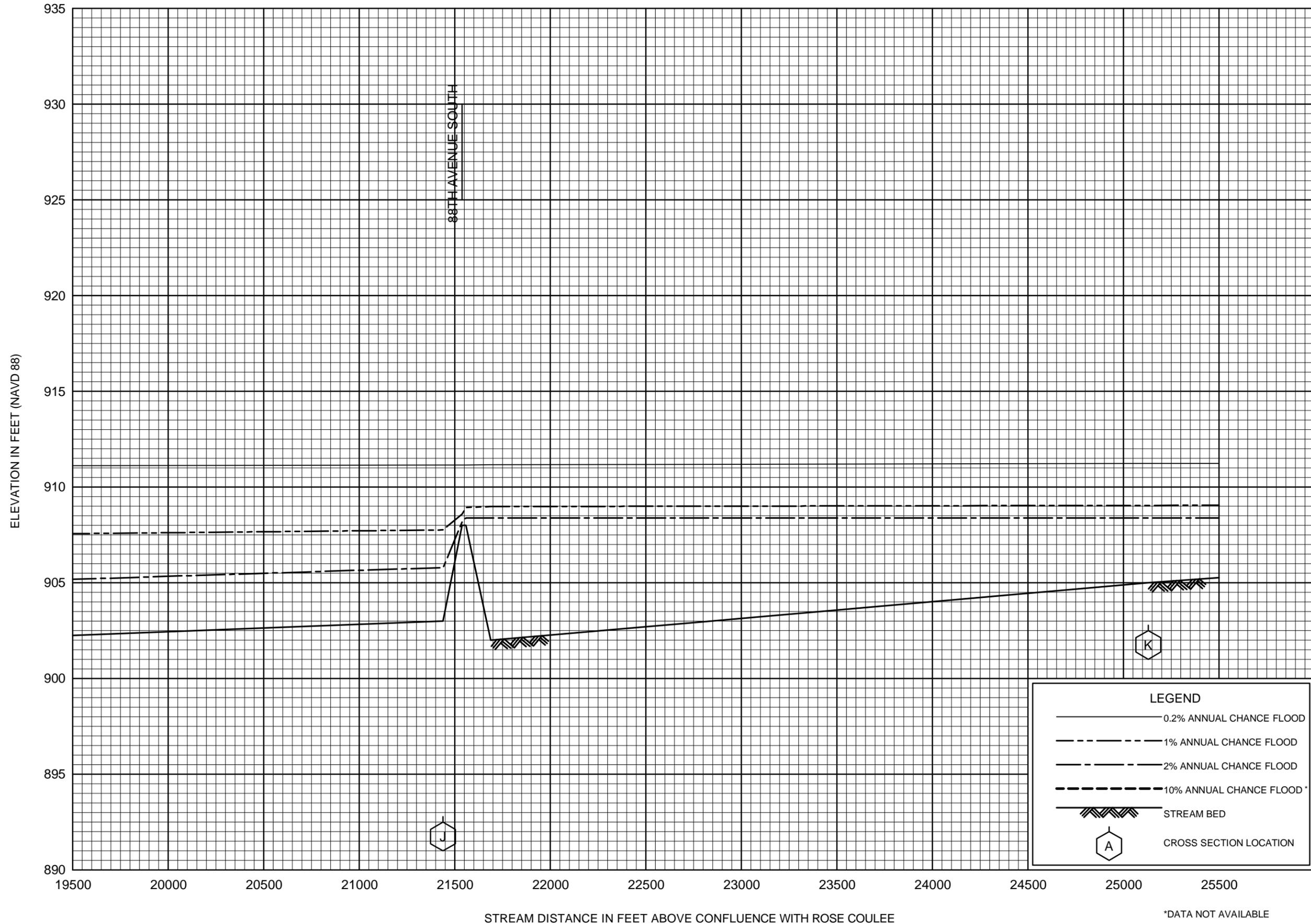
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DRAIN 53 BREAKOUT

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS



ELEVATION IN FEET (NAVD 88)

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ROSE COULEE

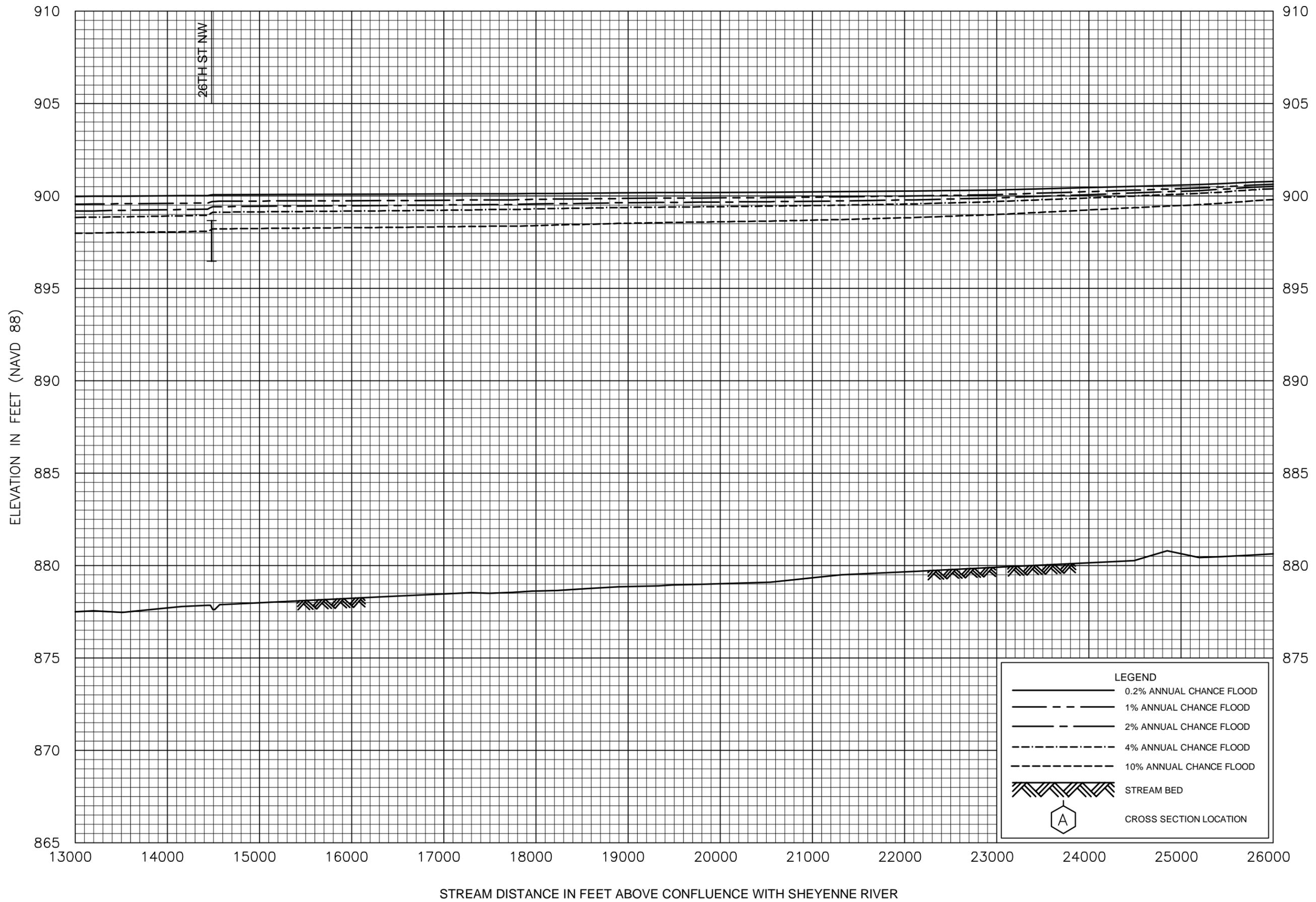
LEGEND

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

*DATA NOT AVAILABLE

FLOOD PROFILES
DRAIN 53 BREAKOUT

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS



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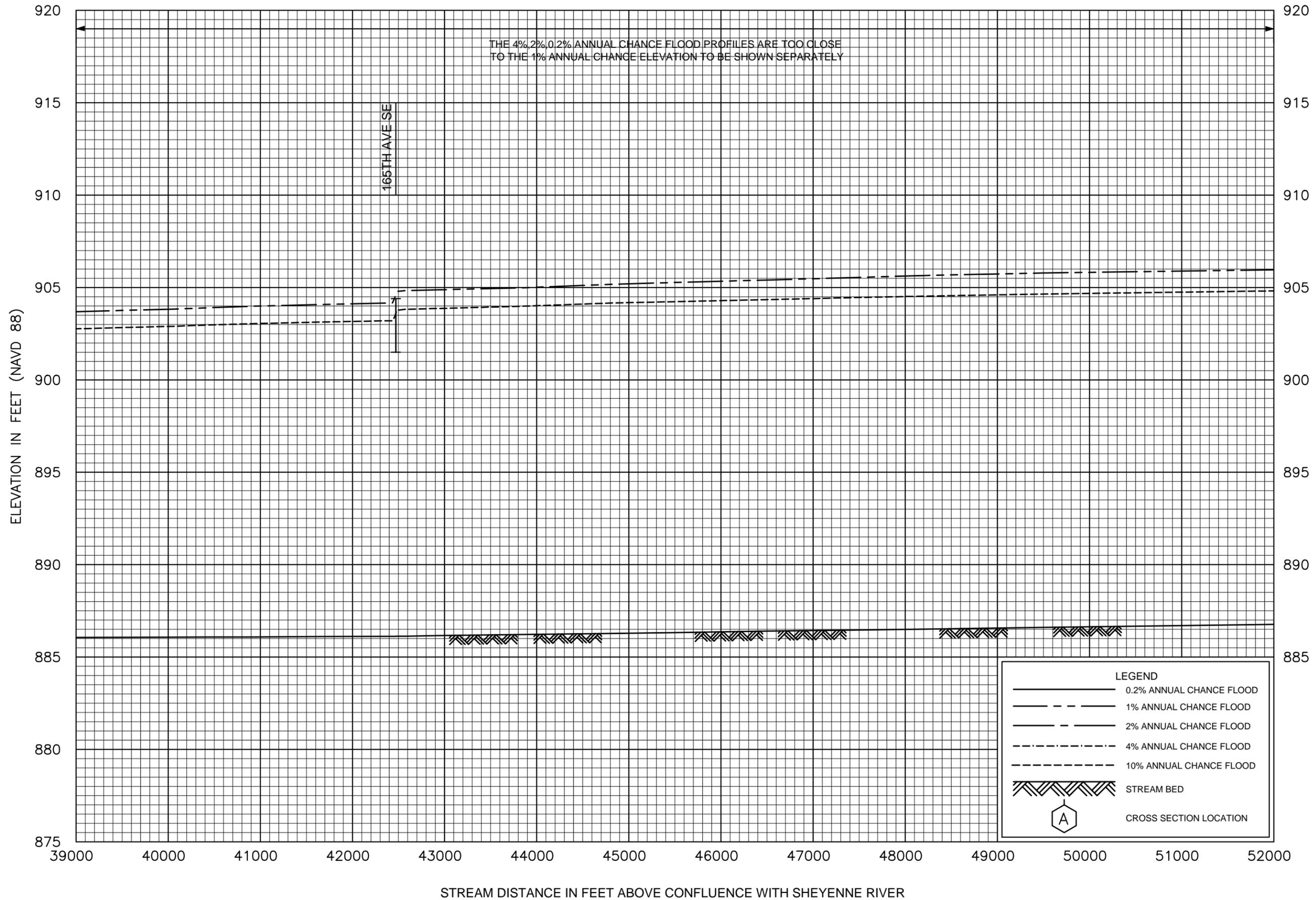
MAPLE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

22P



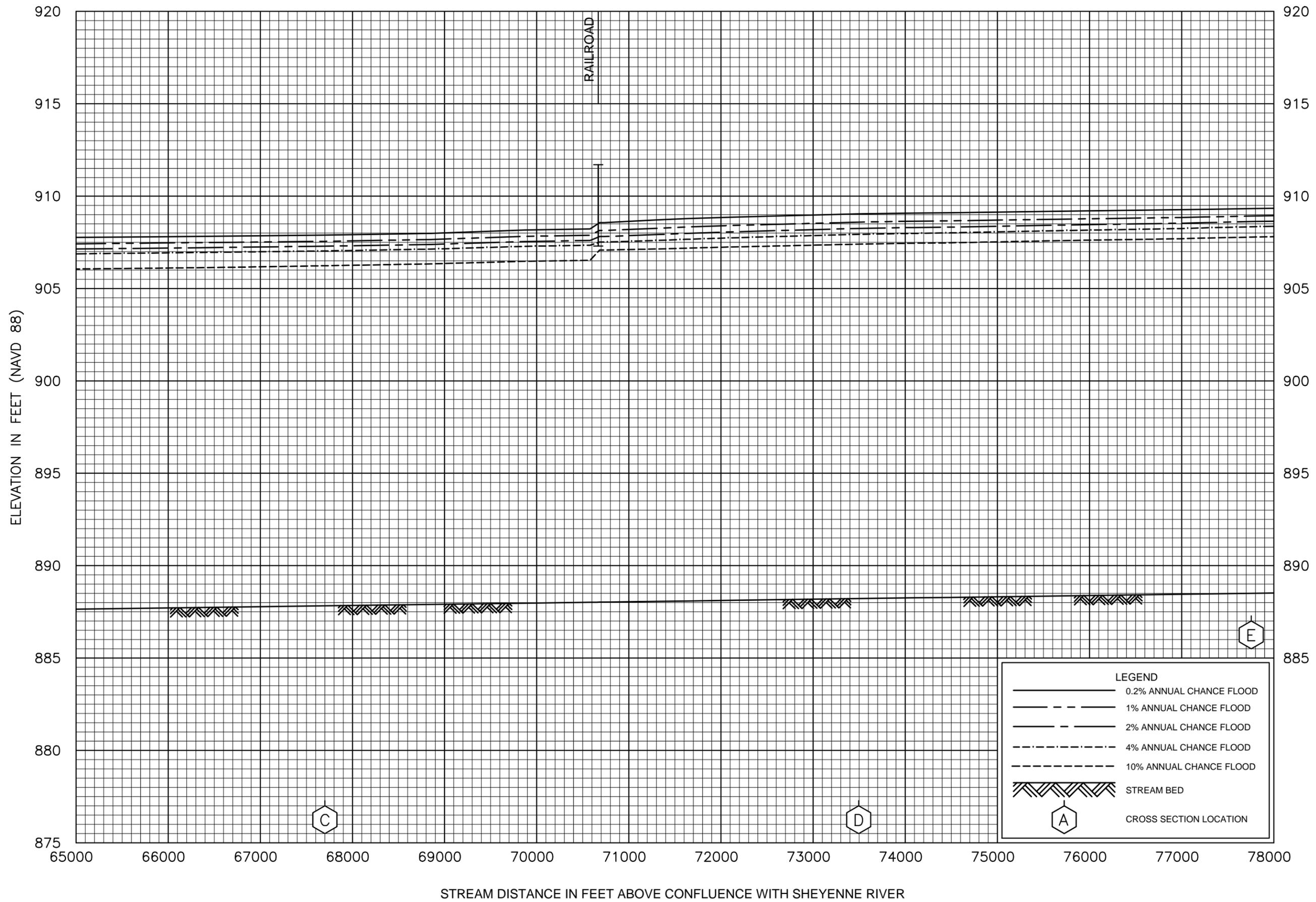
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MAPLE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

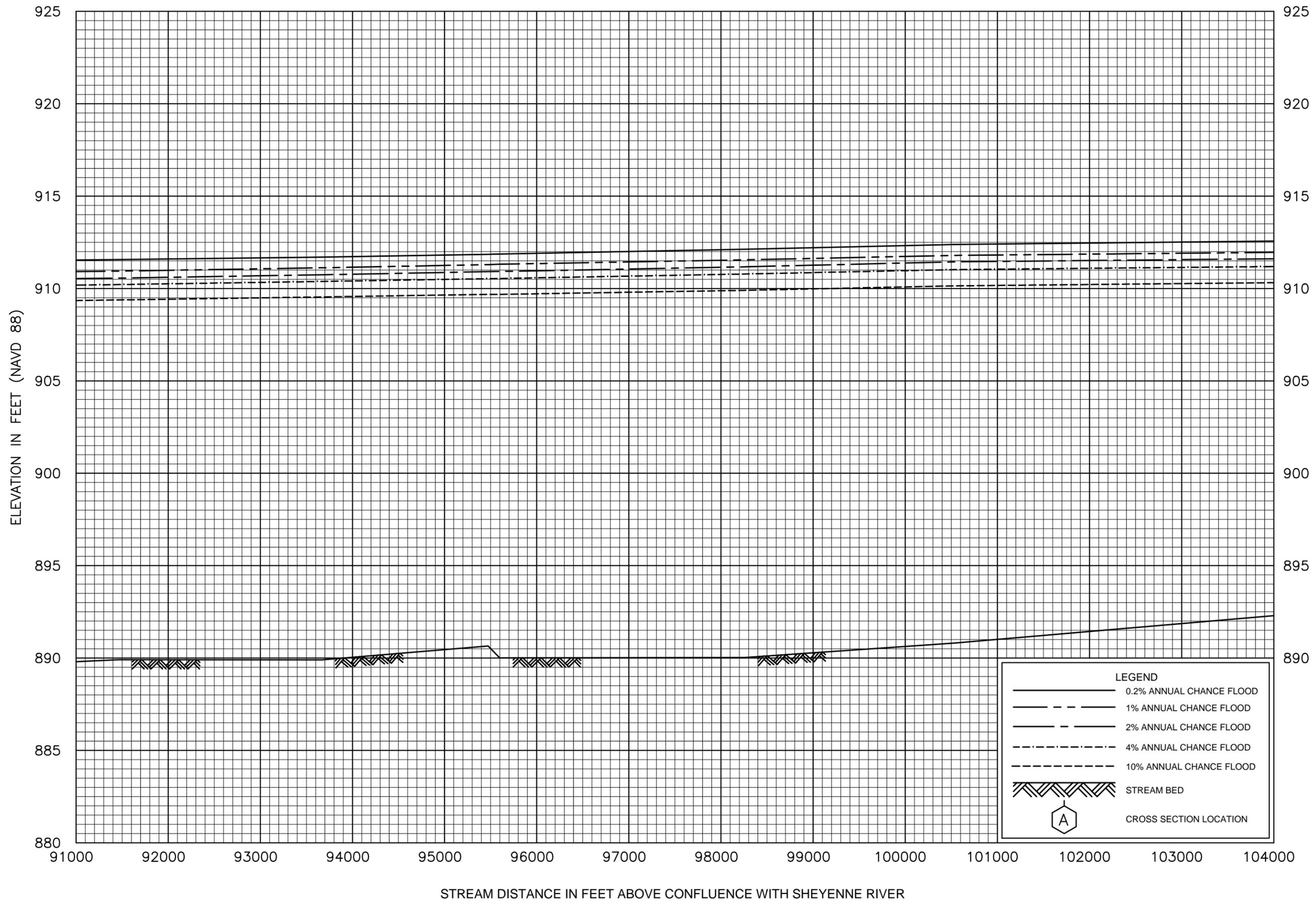
CASS COUNTY, ND

ALL JURISDICTIONS



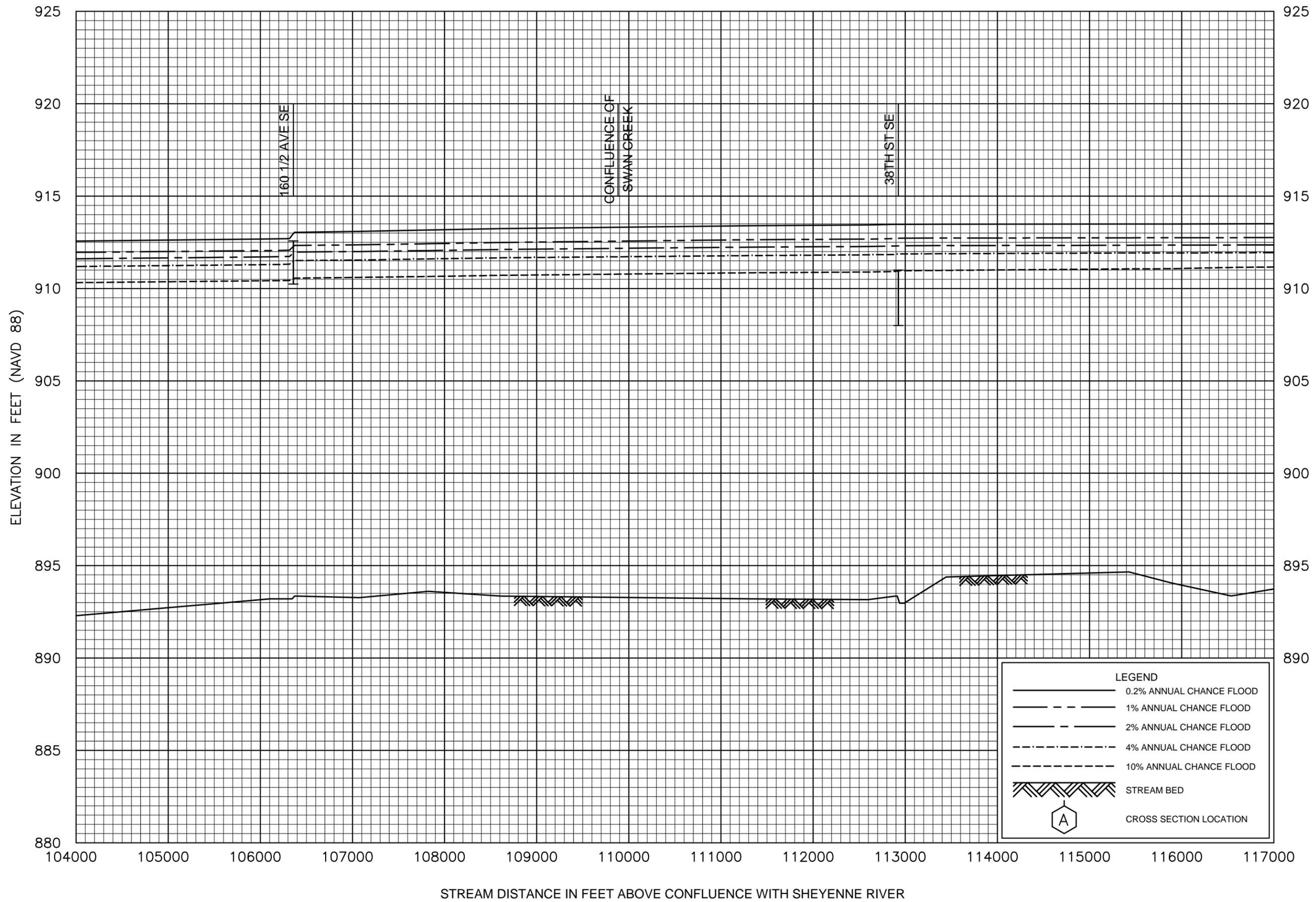
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CASS COUNTY, ND
 ALL JURISDICTIONS



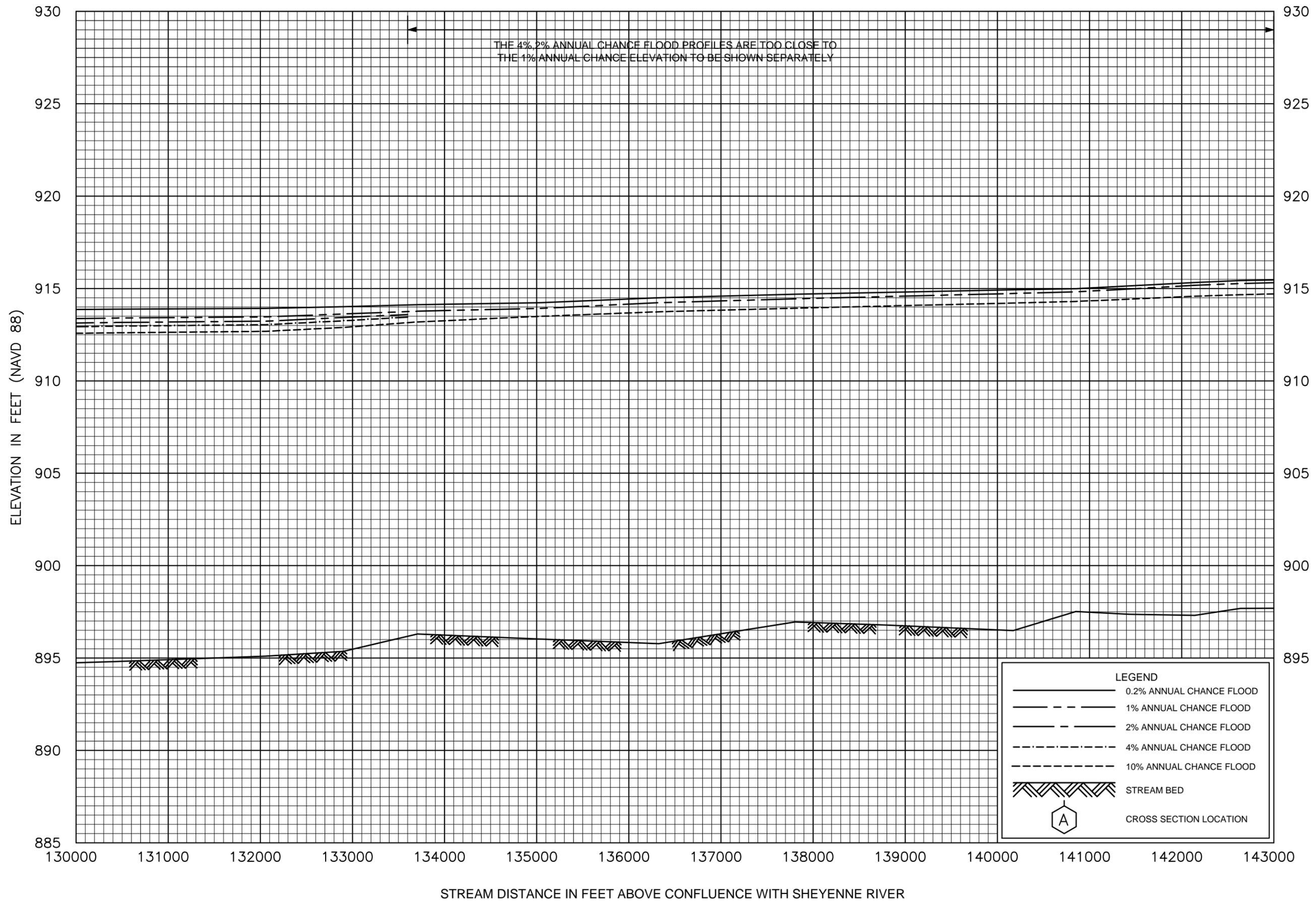
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 CASS COUNTY, ND
 ALL JURISDICTIONS



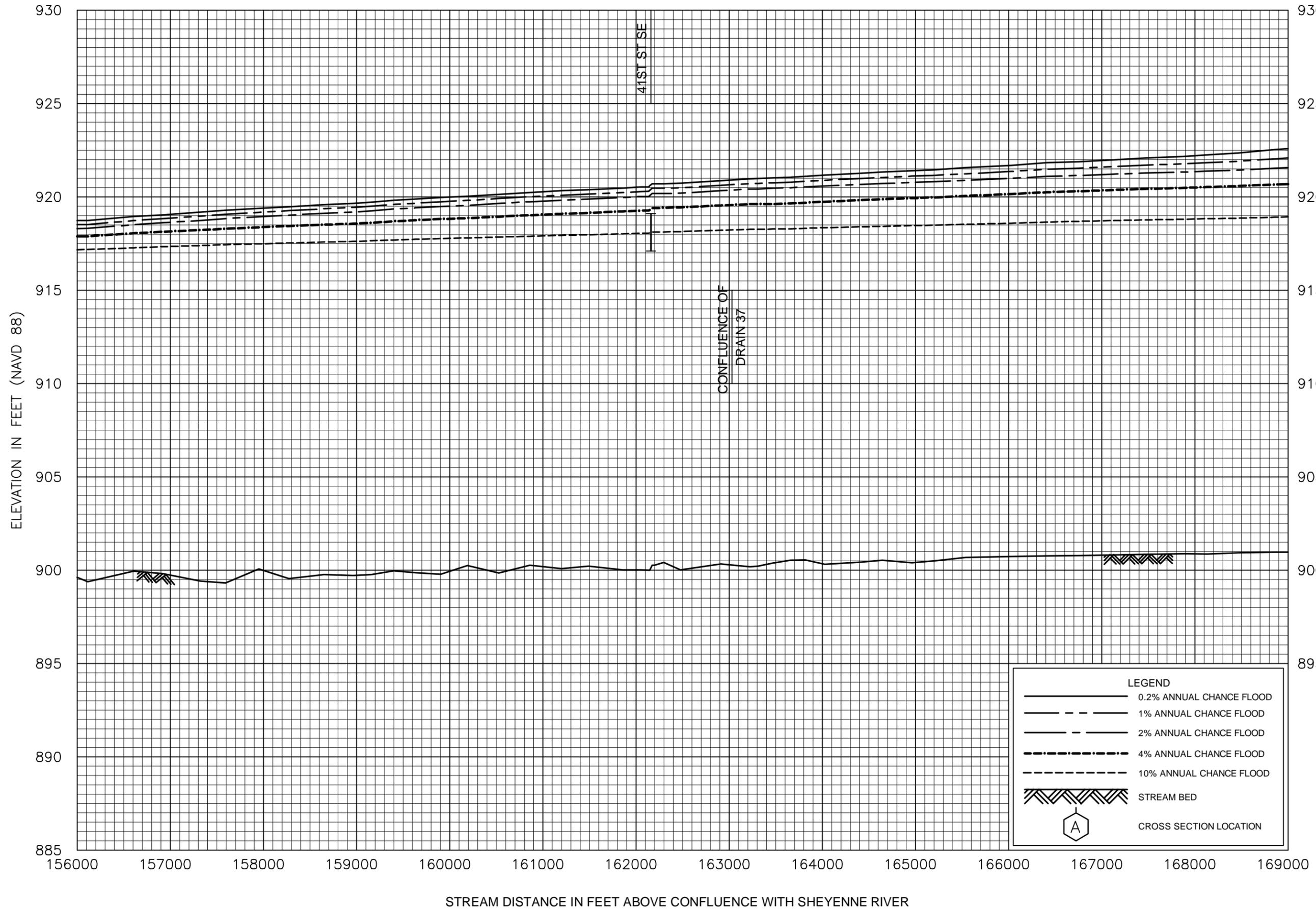
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 MAPLE RIVER

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 CASS COUNTY, ND
 ALL JURISDICTIONS



FLOOD PROFILES
 MAPLE RIVER

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 CASS COUNTY, ND
 ALL JURISDICTIONS



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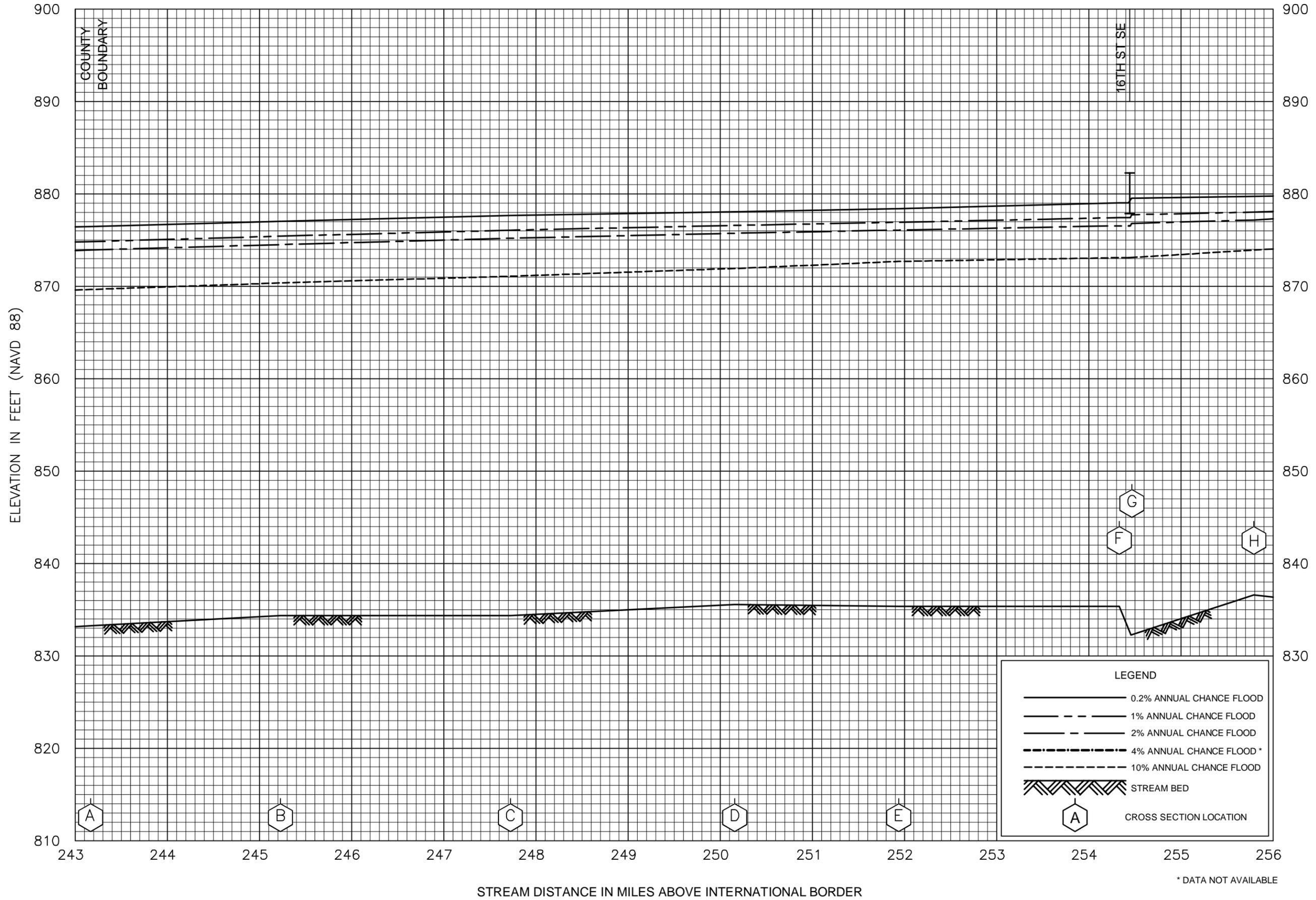
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CASS COUNTY, ND

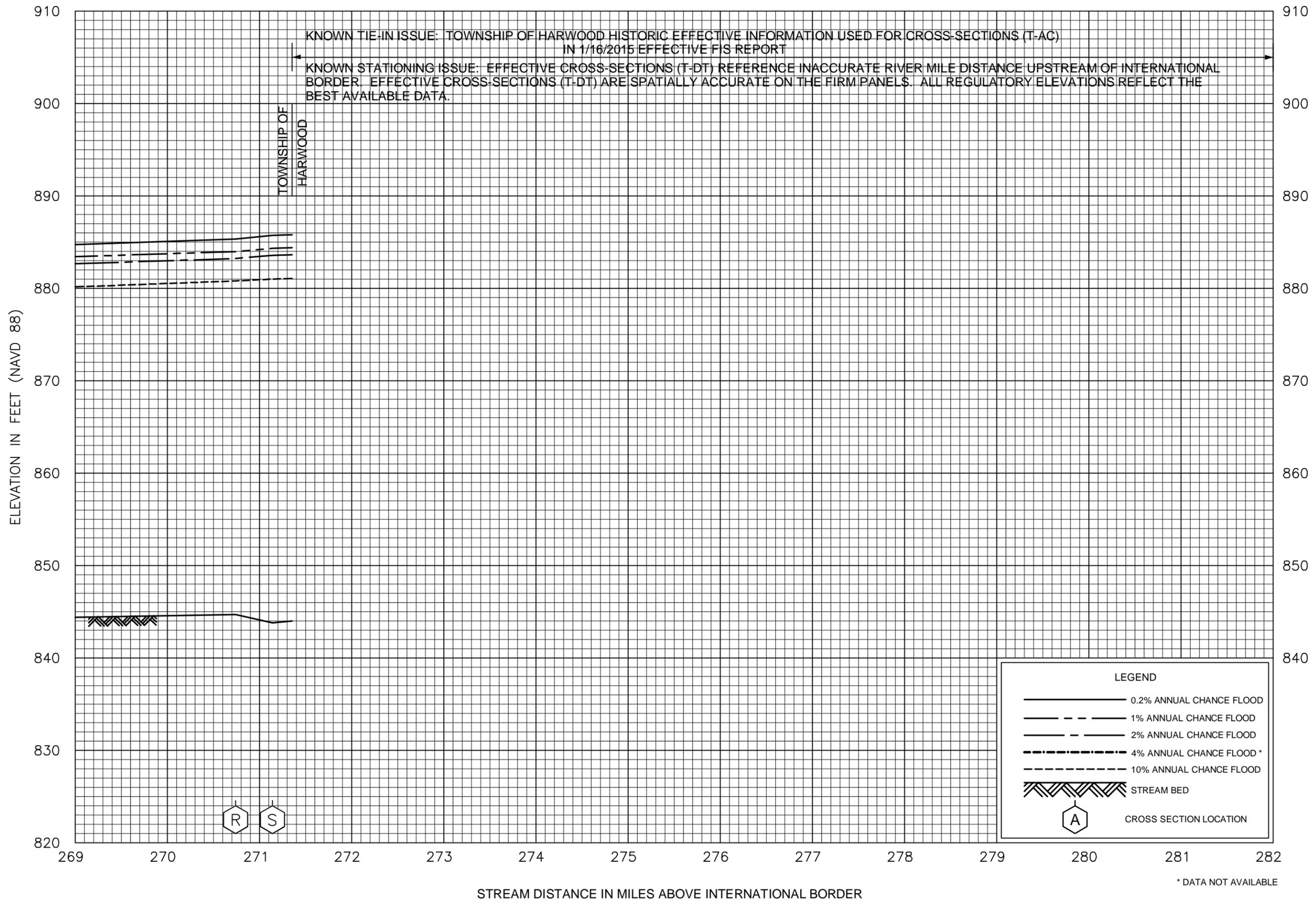
ALL JURISDICTIONS

33P



* DATA NOT AVAILABLE

FLOOD PROFILES
RED RIVER OF THE NORTH
FEDERAL EMERGENCY MANAGEMENT AGENCY CASS COUNTY, ND ALL JURISDICTIONS
35P



FLOOD PROFILES

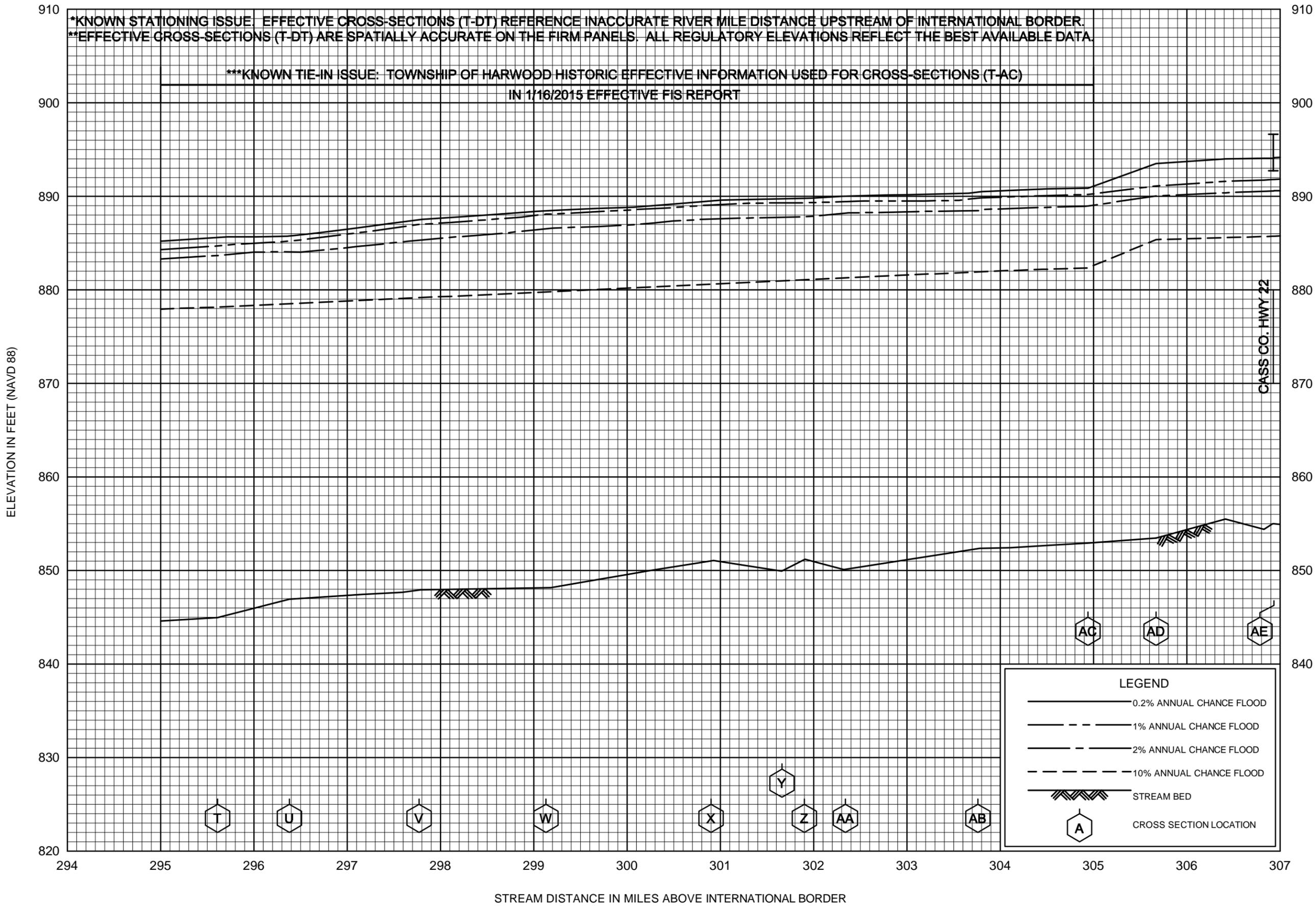
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CASS COUNTY, ND

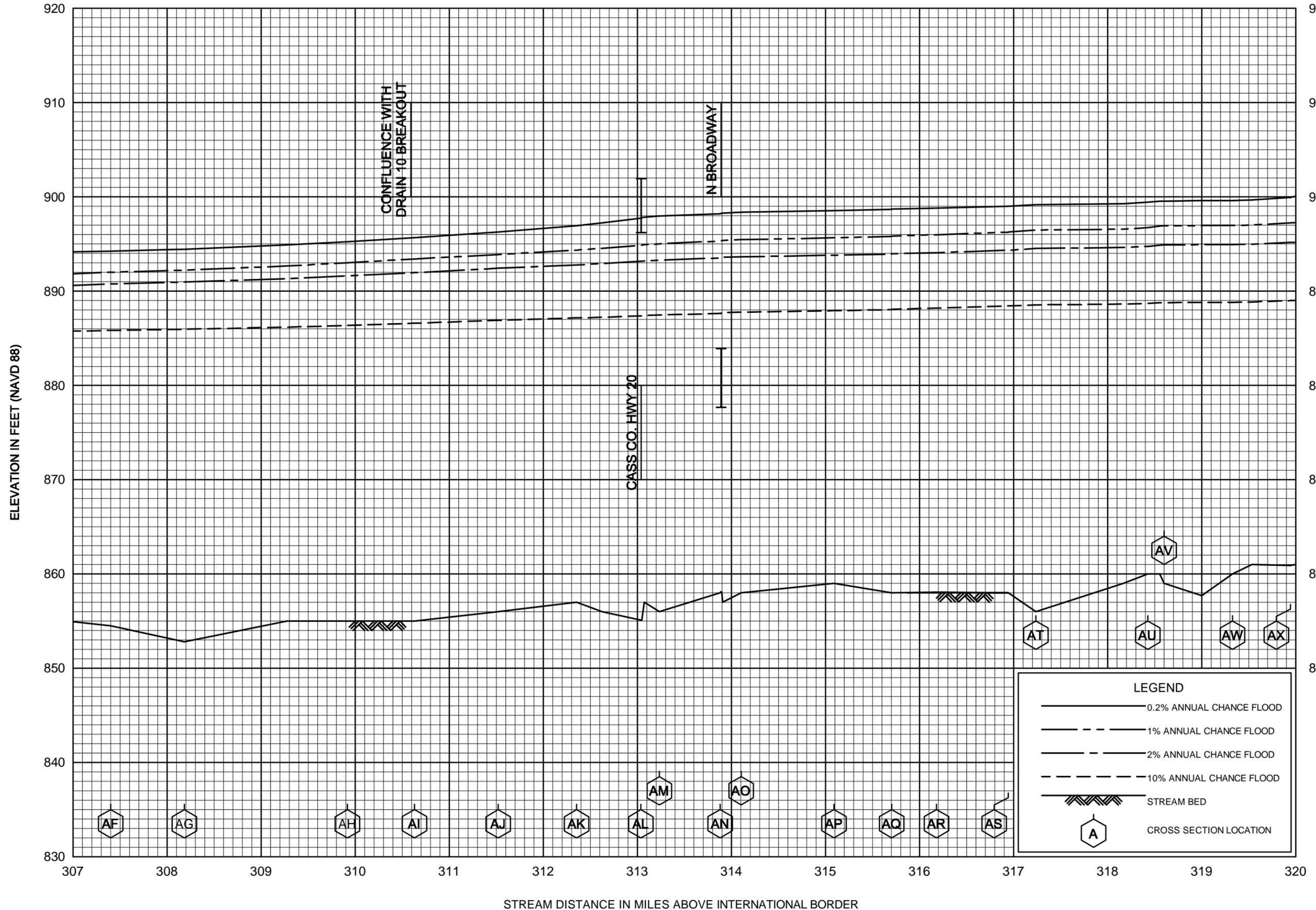
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37P



FLOOD PROFILES
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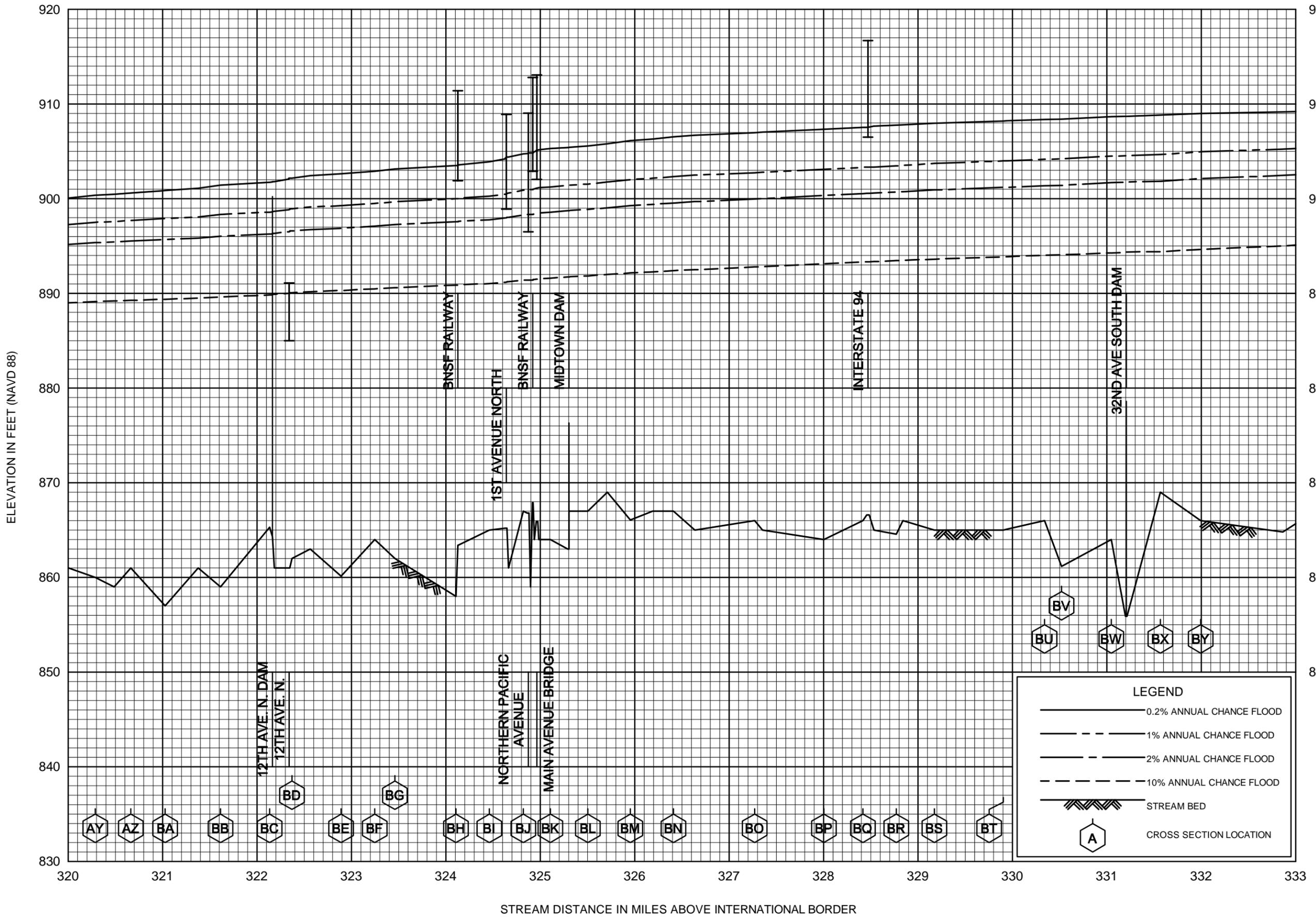
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RED RIVER OF THE NORTH

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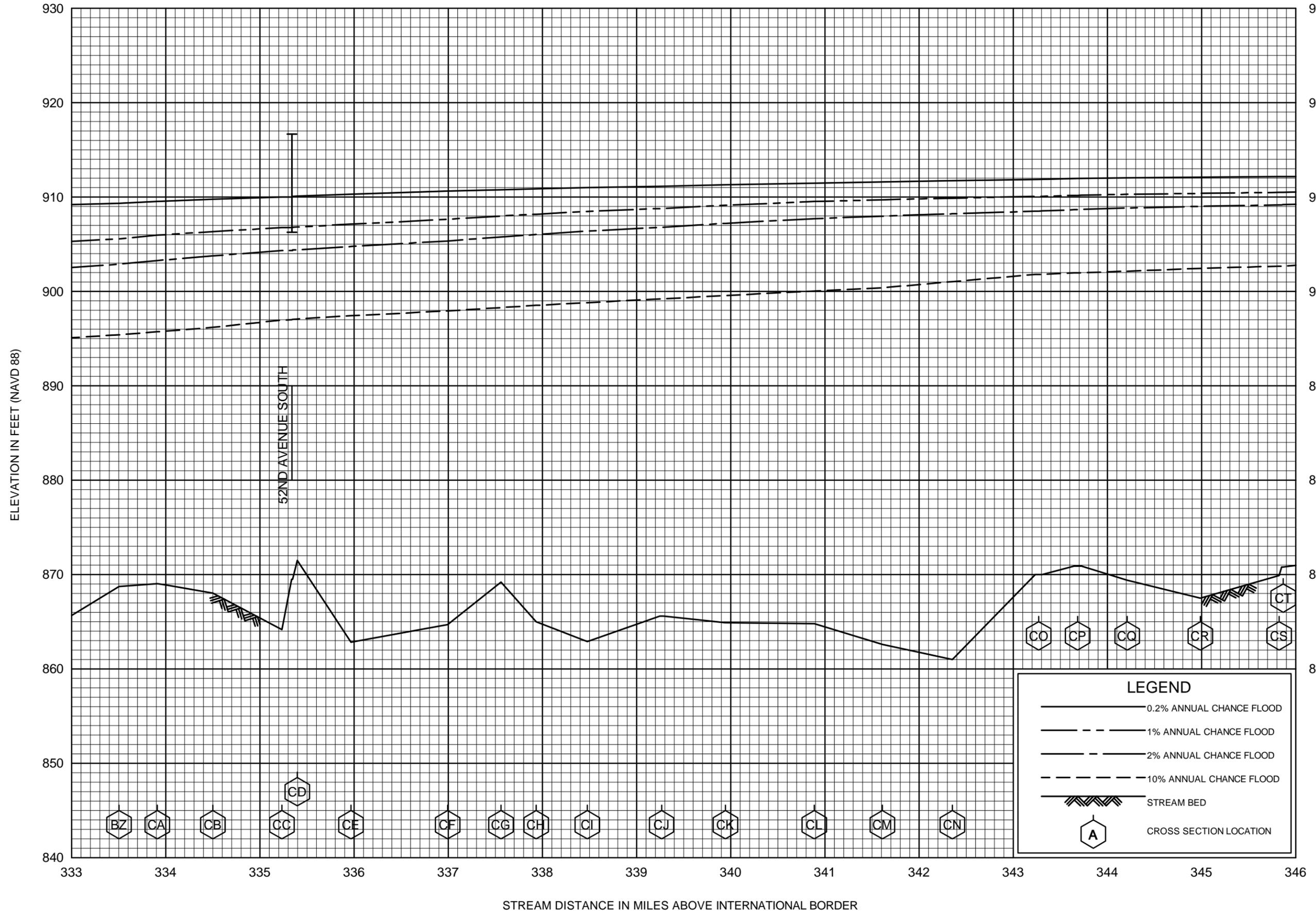
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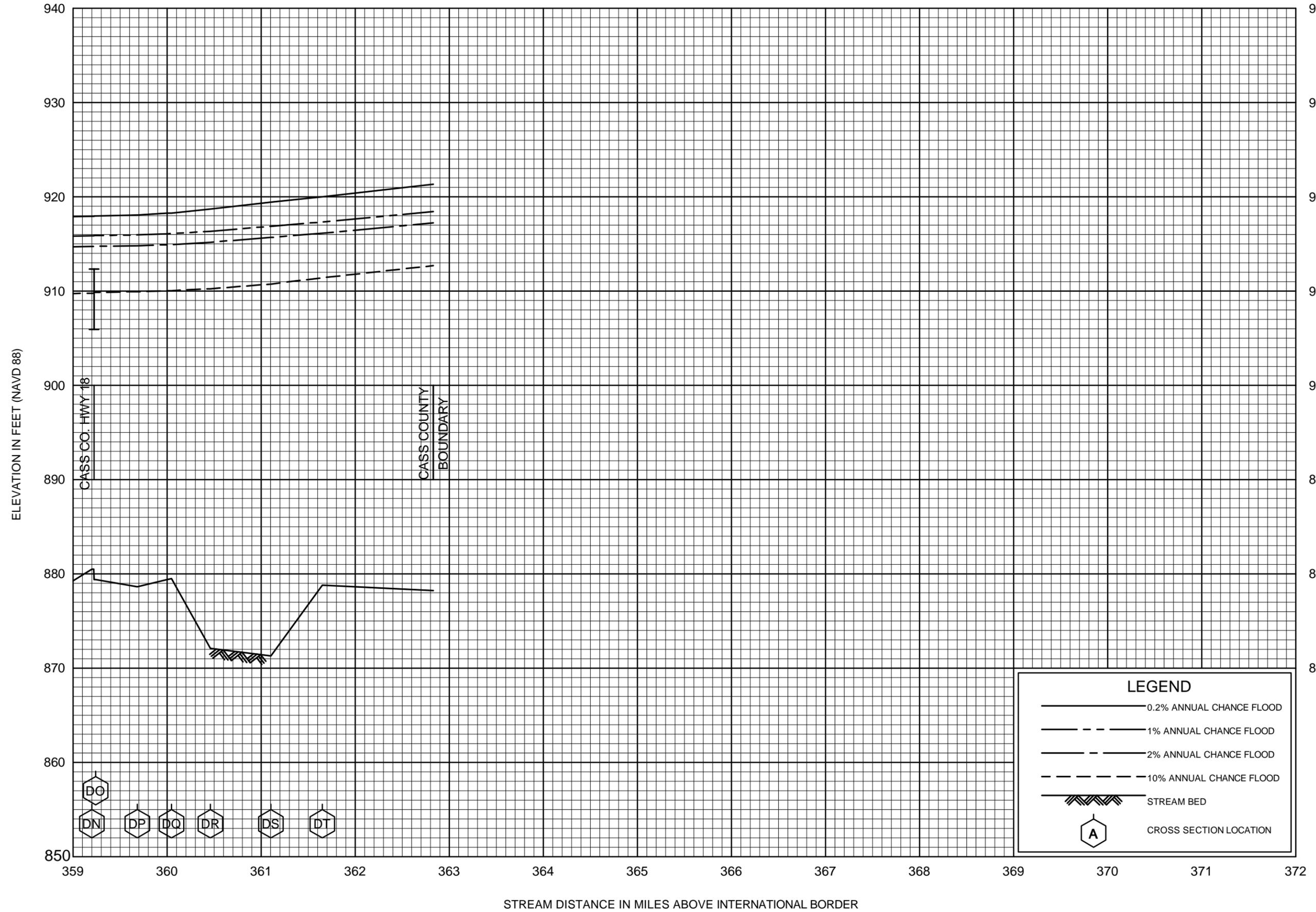
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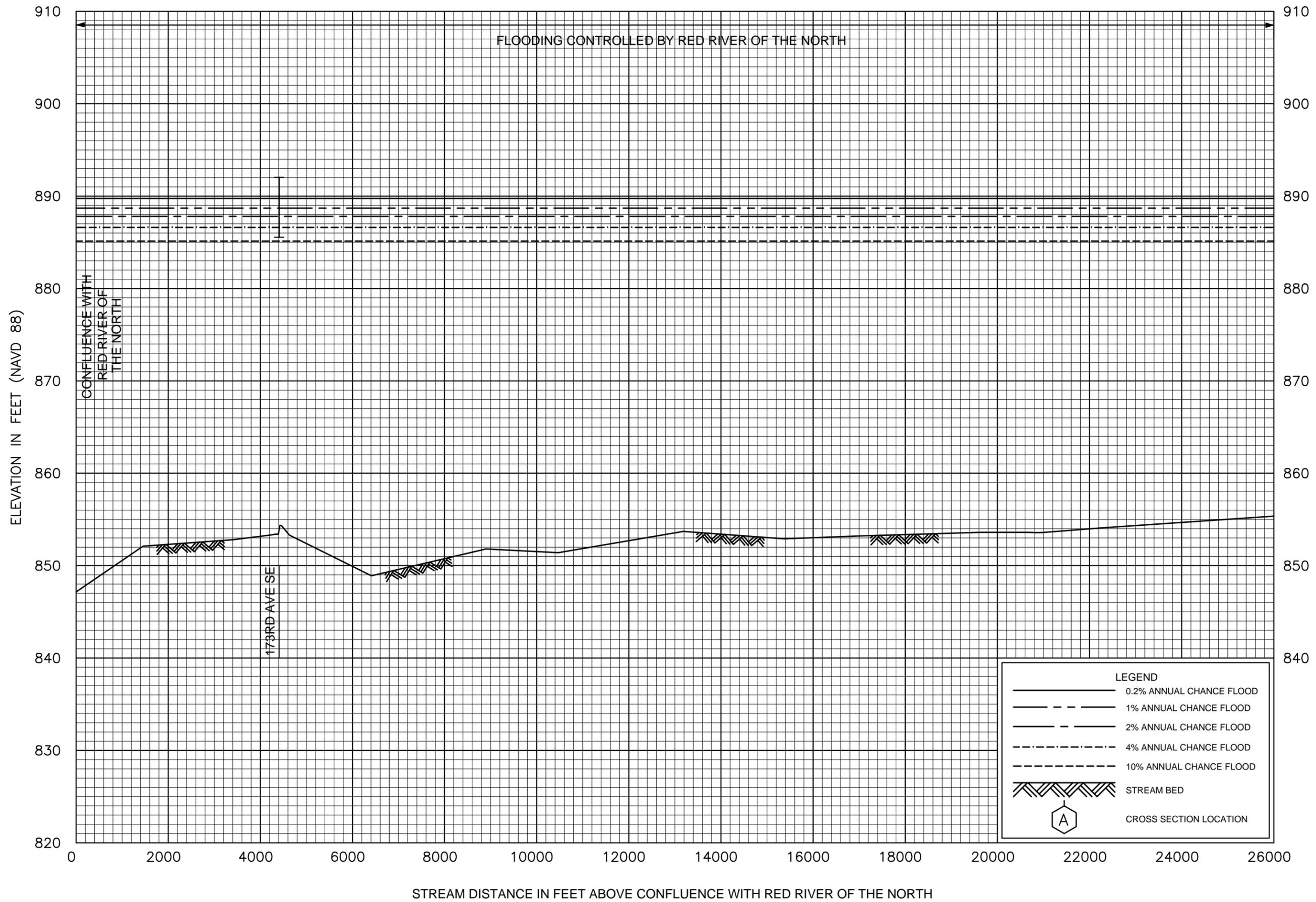
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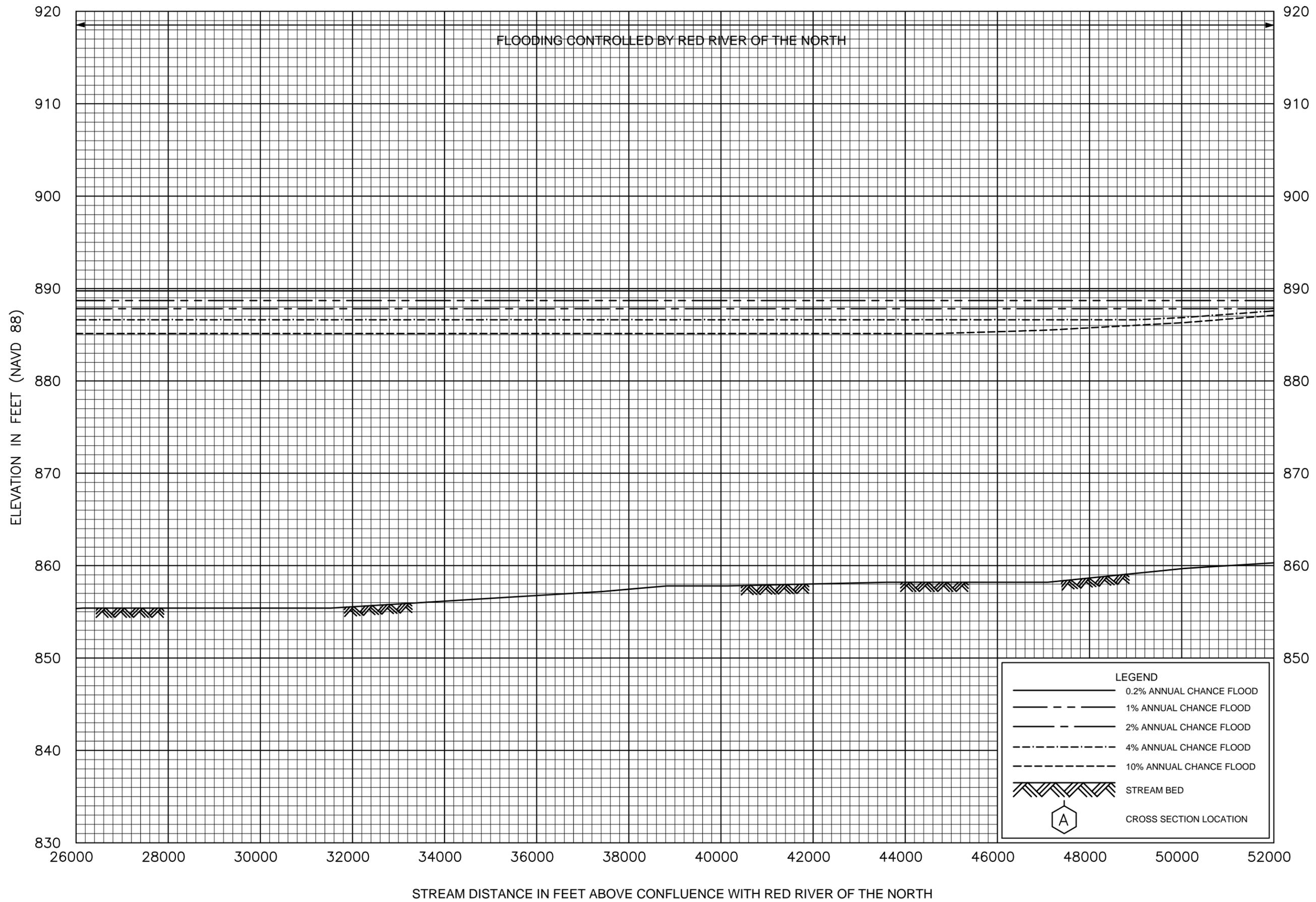
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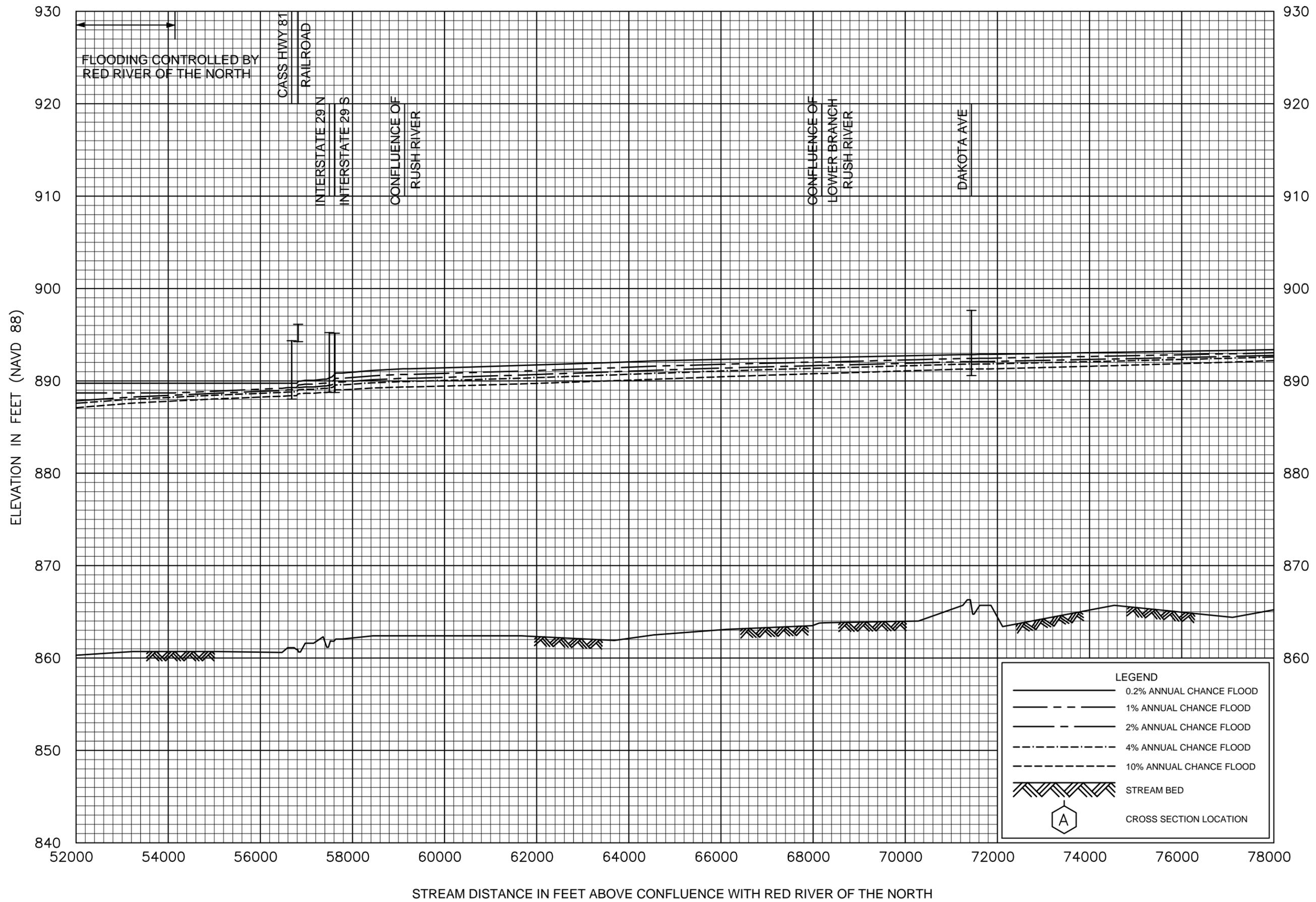
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SHEYENNE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS



FLOOD PROFILES
SHEYENNE RIVER

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ALL JURISDICTIONS



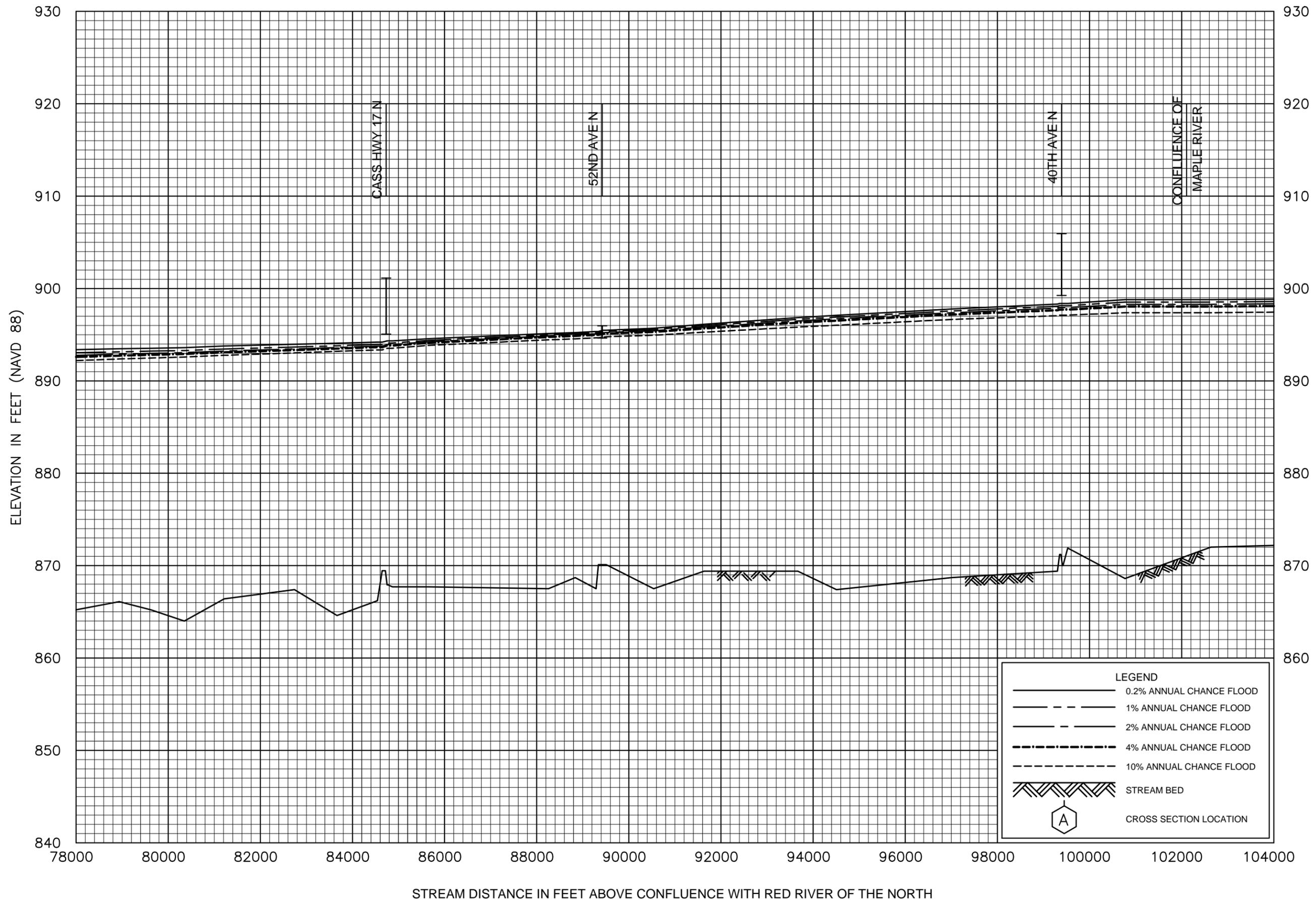
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SHEYENNE RIVER

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CASS COUNTY, ND

ALL JURISDICTIONS



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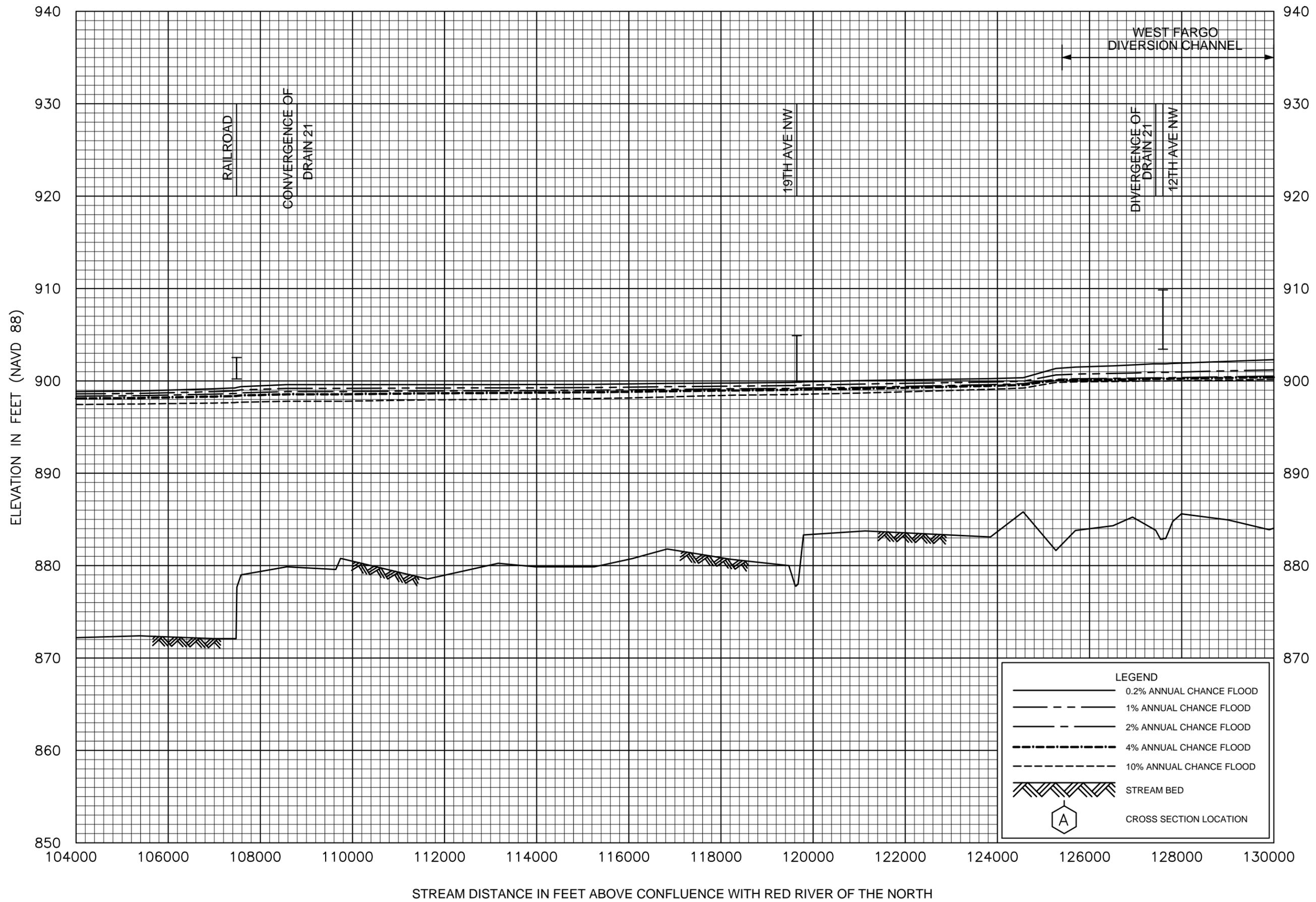
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CASS COUNTY, ND

ALL JURISDICTIONS

47P



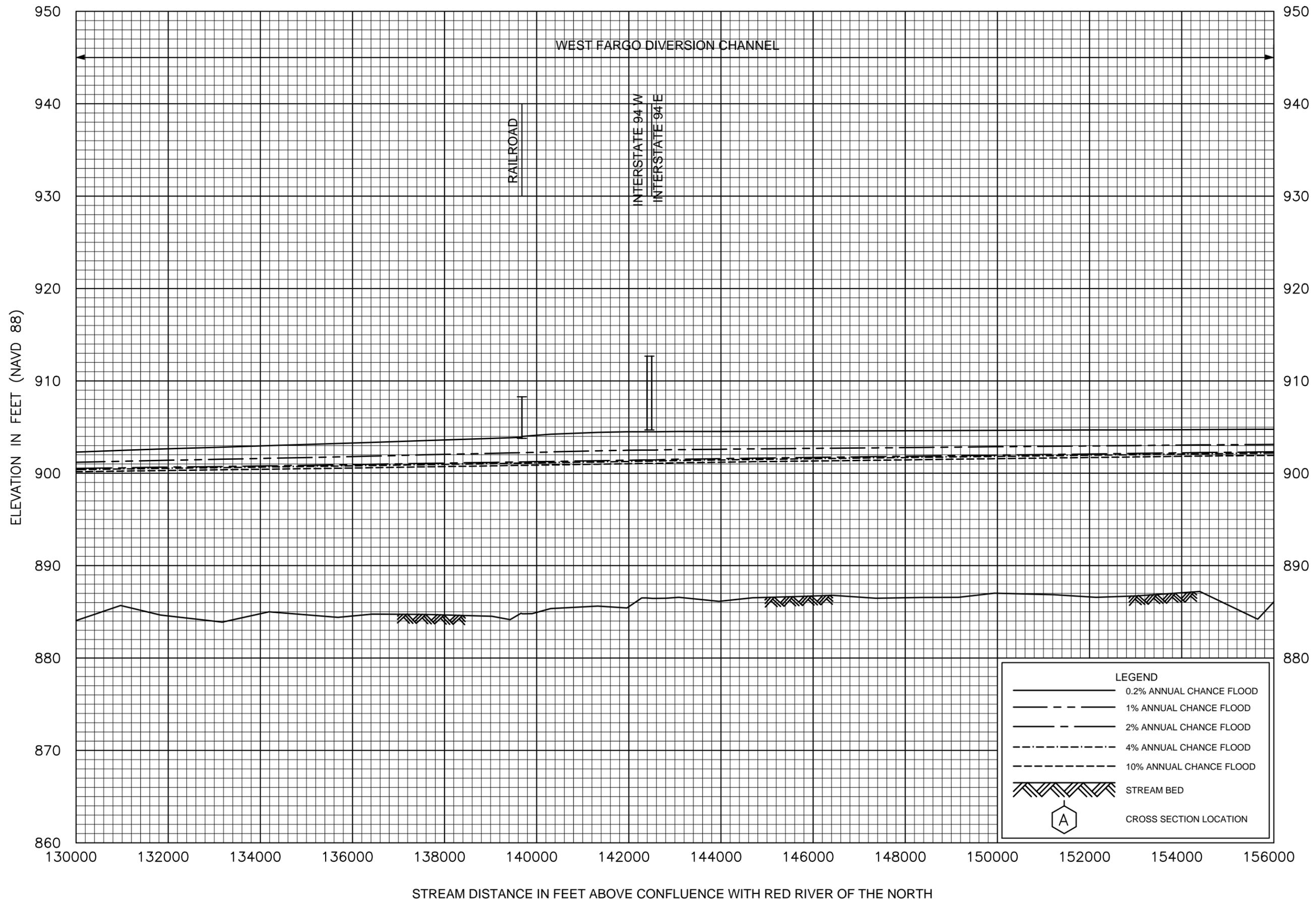
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SHEYENNE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

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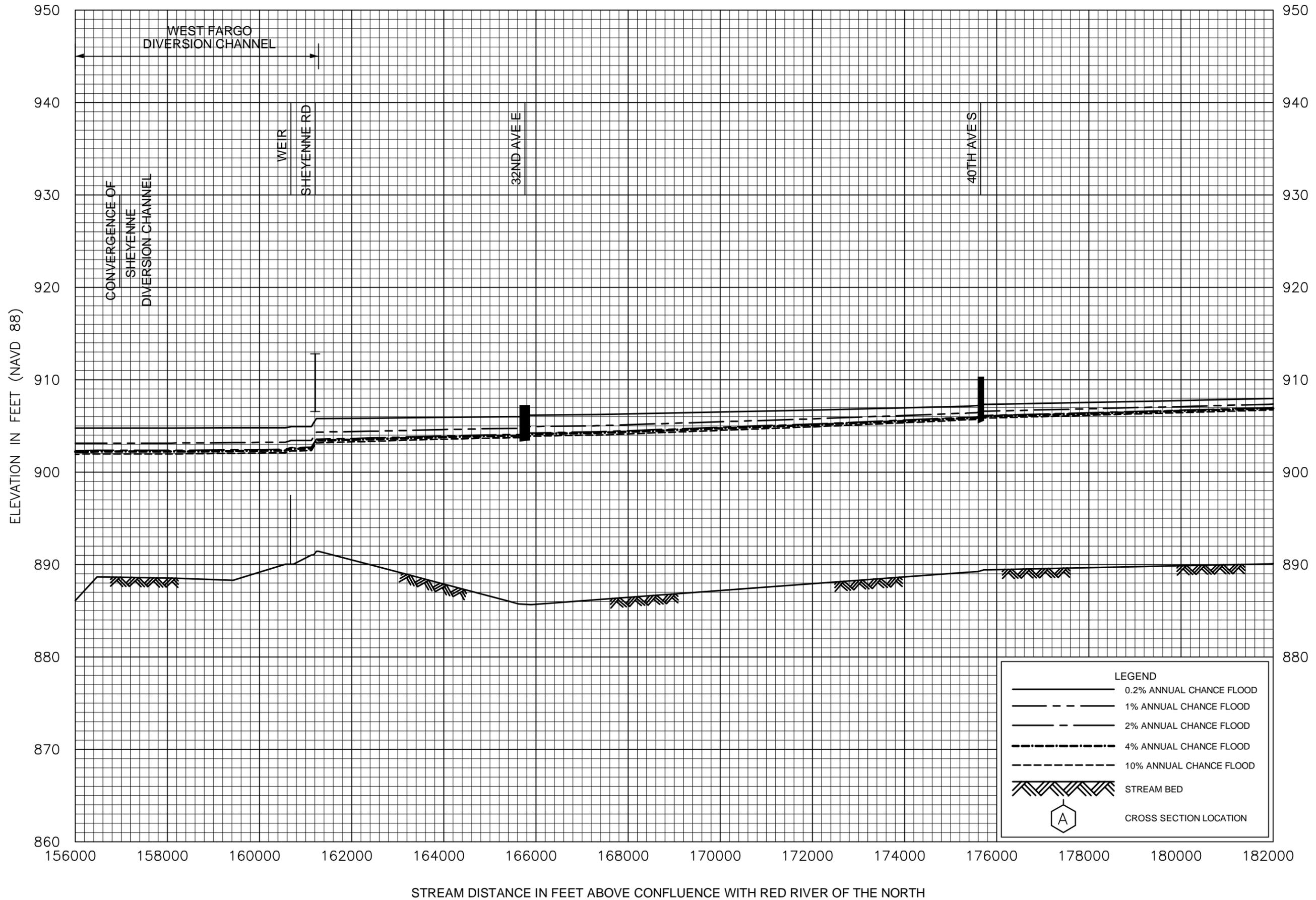
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FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

49P



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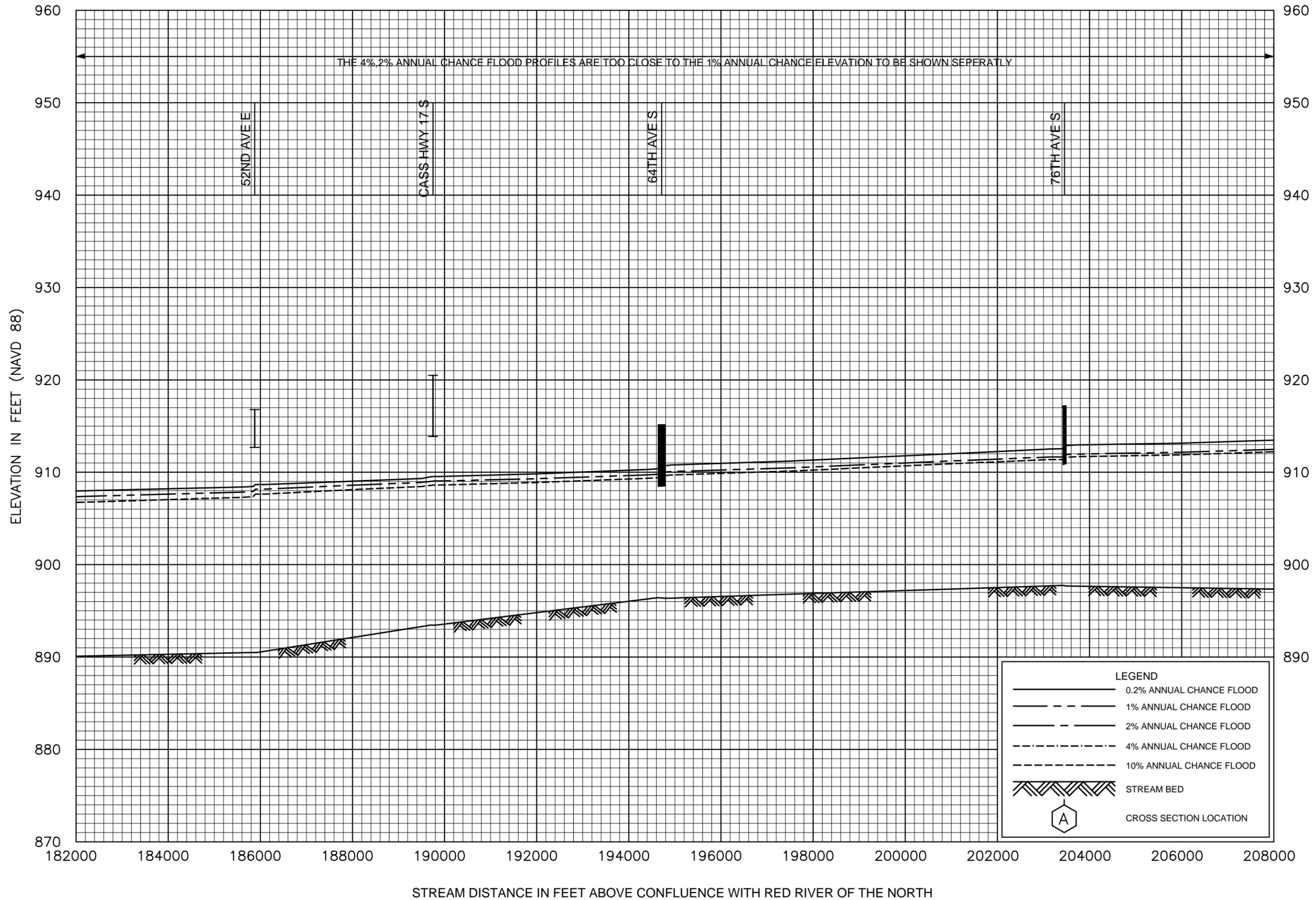
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CASS COUNTY, ND

ALL JURISDICTIONS

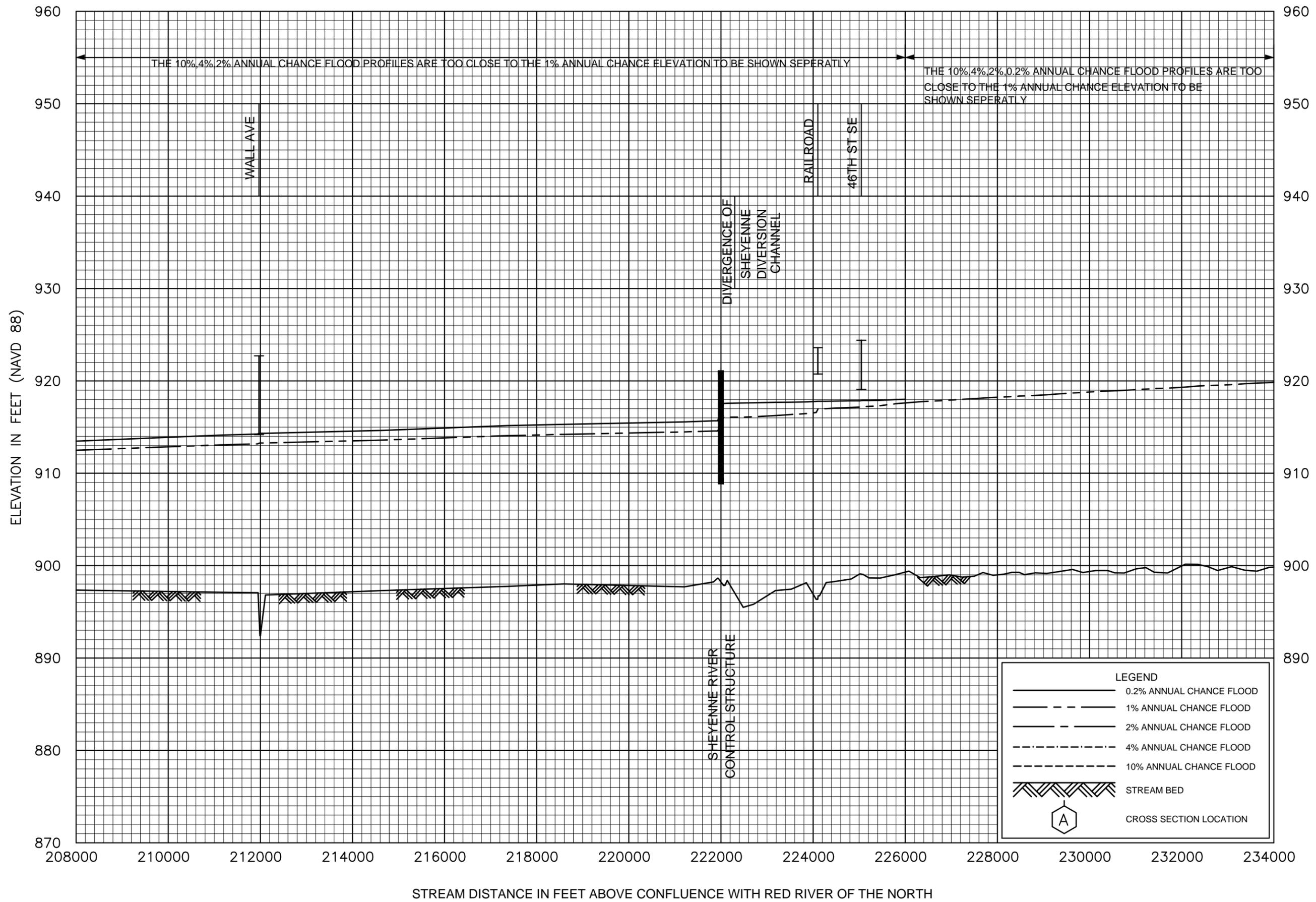
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FLOOD PROFILES
SHEYENNE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS

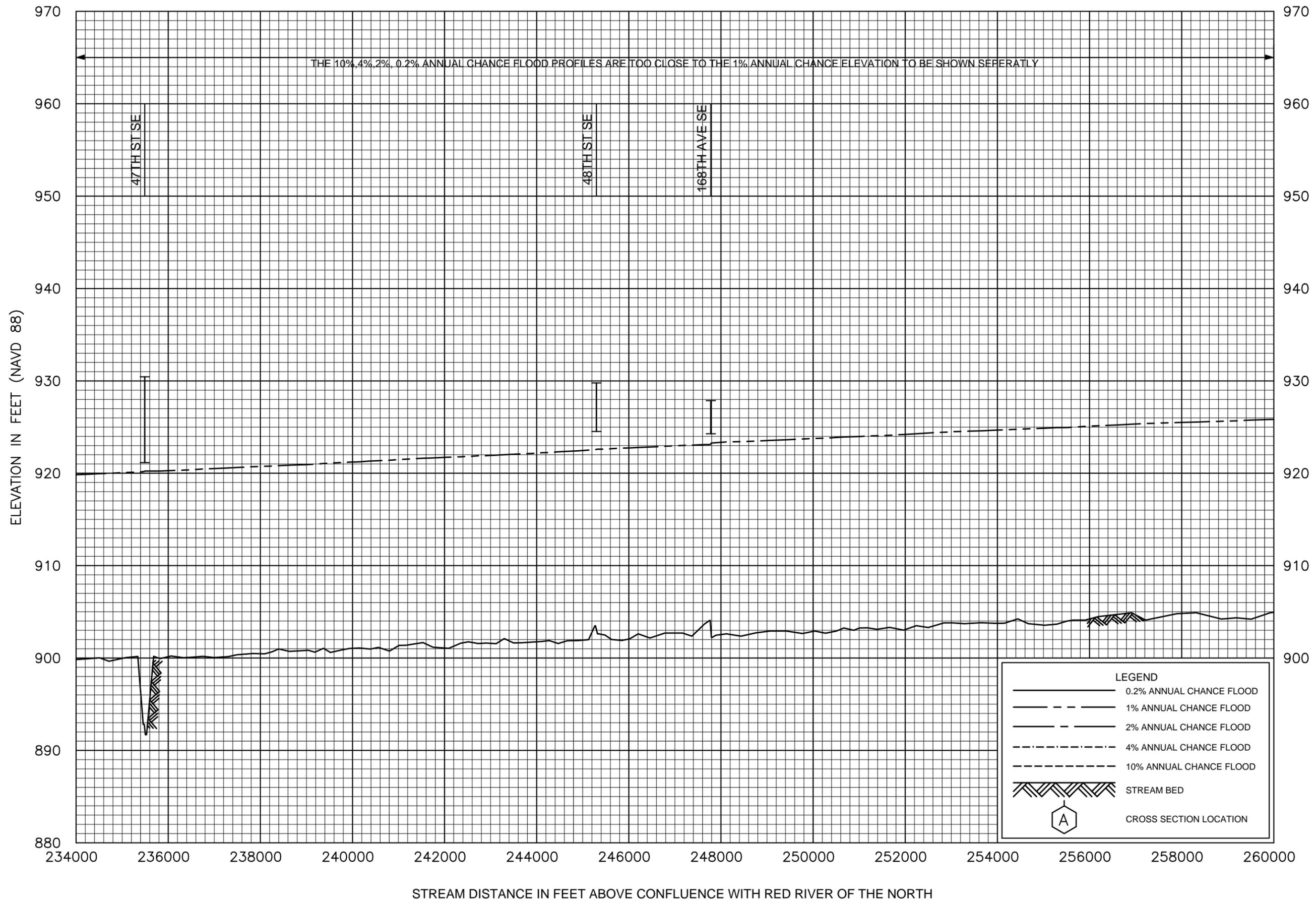
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FLOOD PROFILES
SHEYENNE RIVER

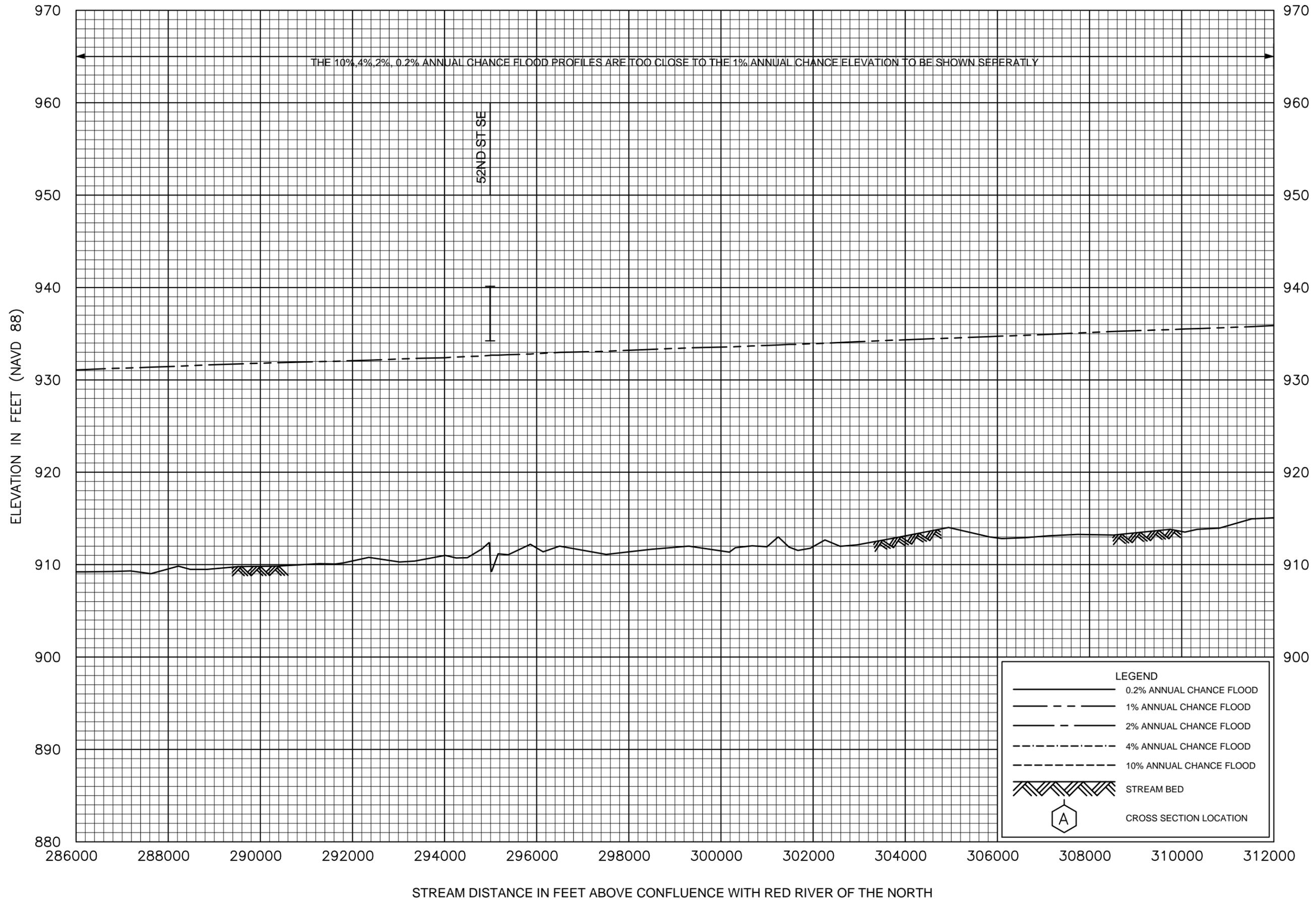
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CASS COUNTY, ND
ALL JURISDICTIONS

52P



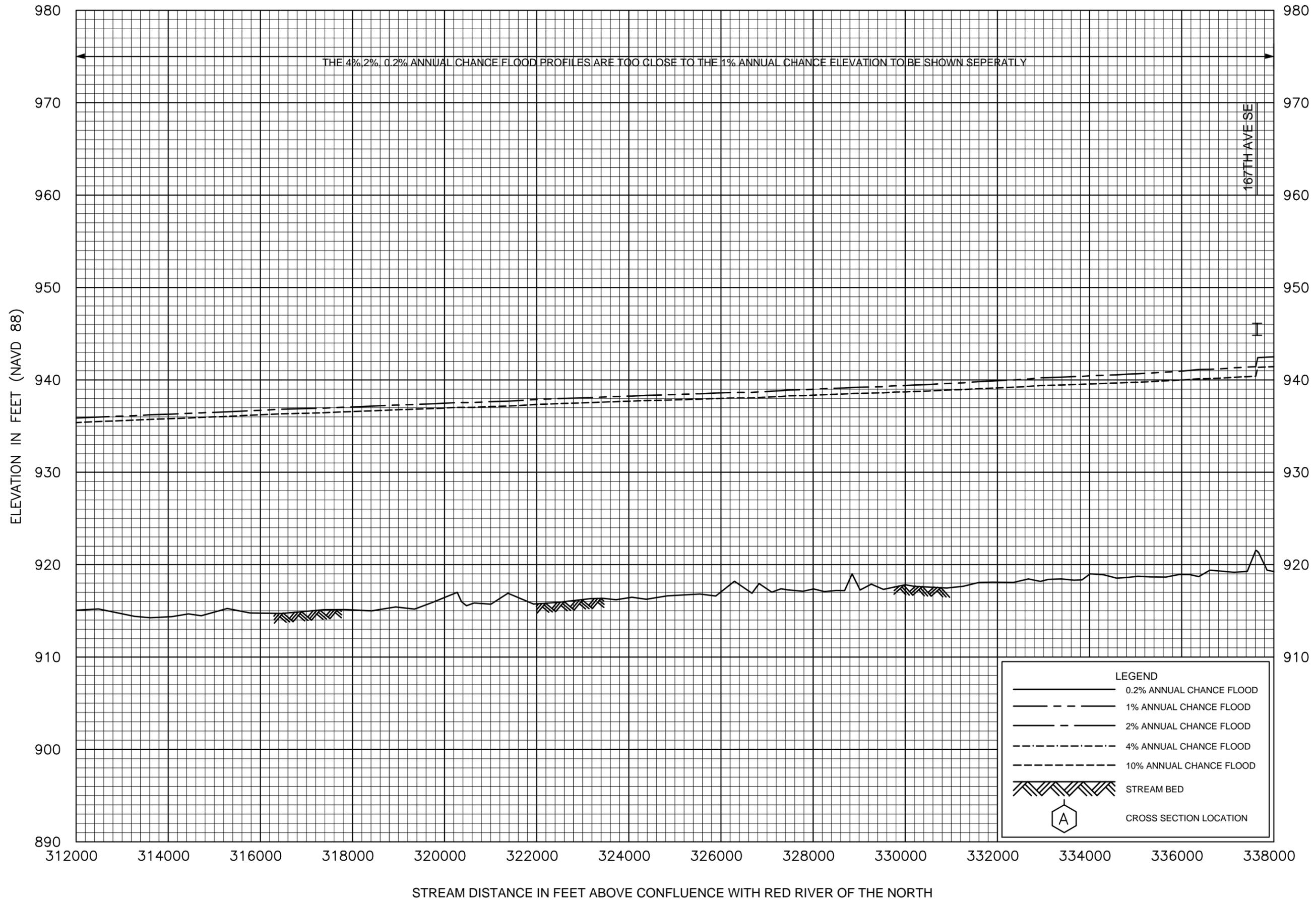
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SHEYENNE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS



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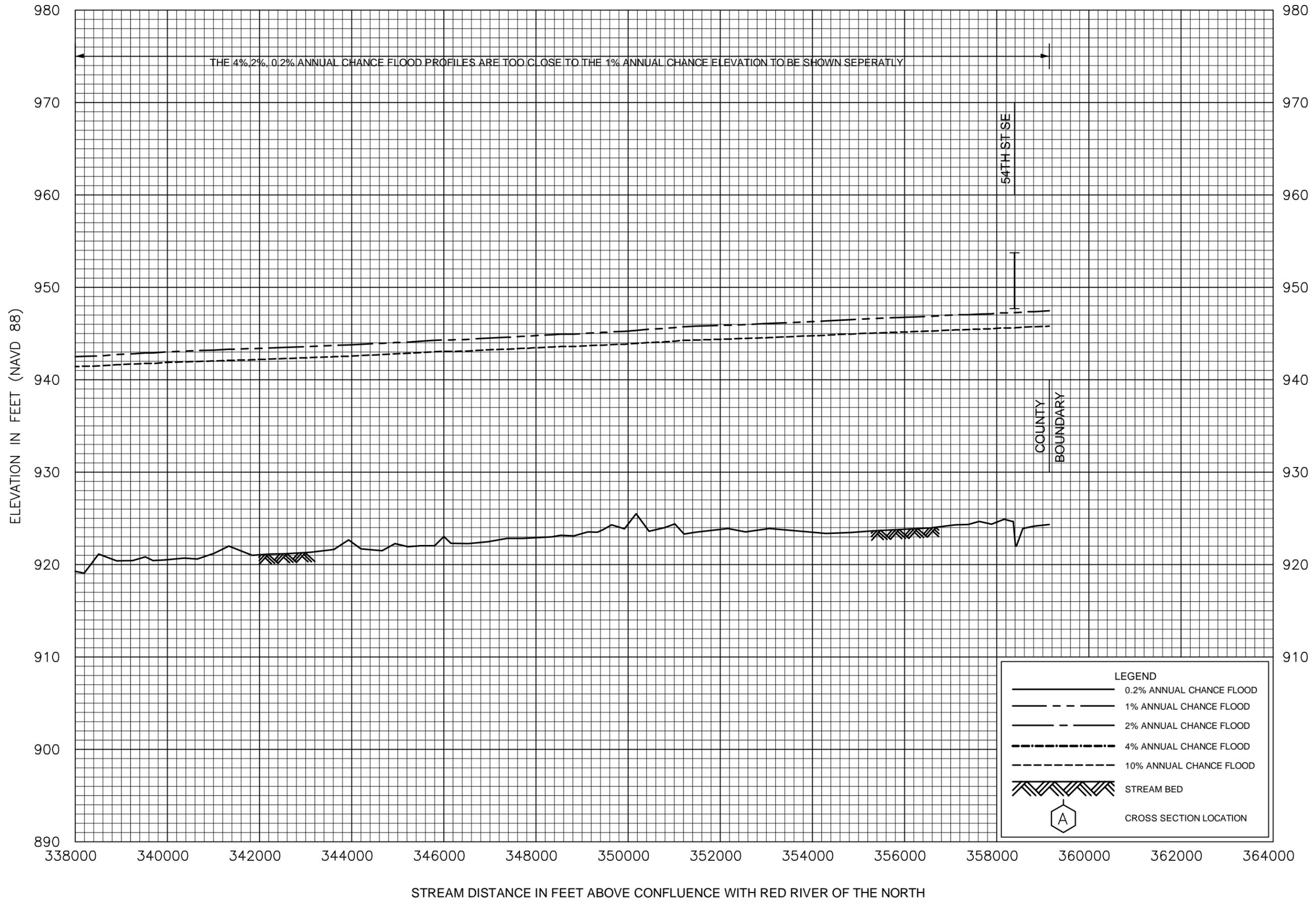
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CASS COUNTY, ND
ALL JURISDICTIONS



FLOOD PROFILES
SHEYENNE RIVER

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CASS COUNTY, ND
ALL JURISDICTIONS

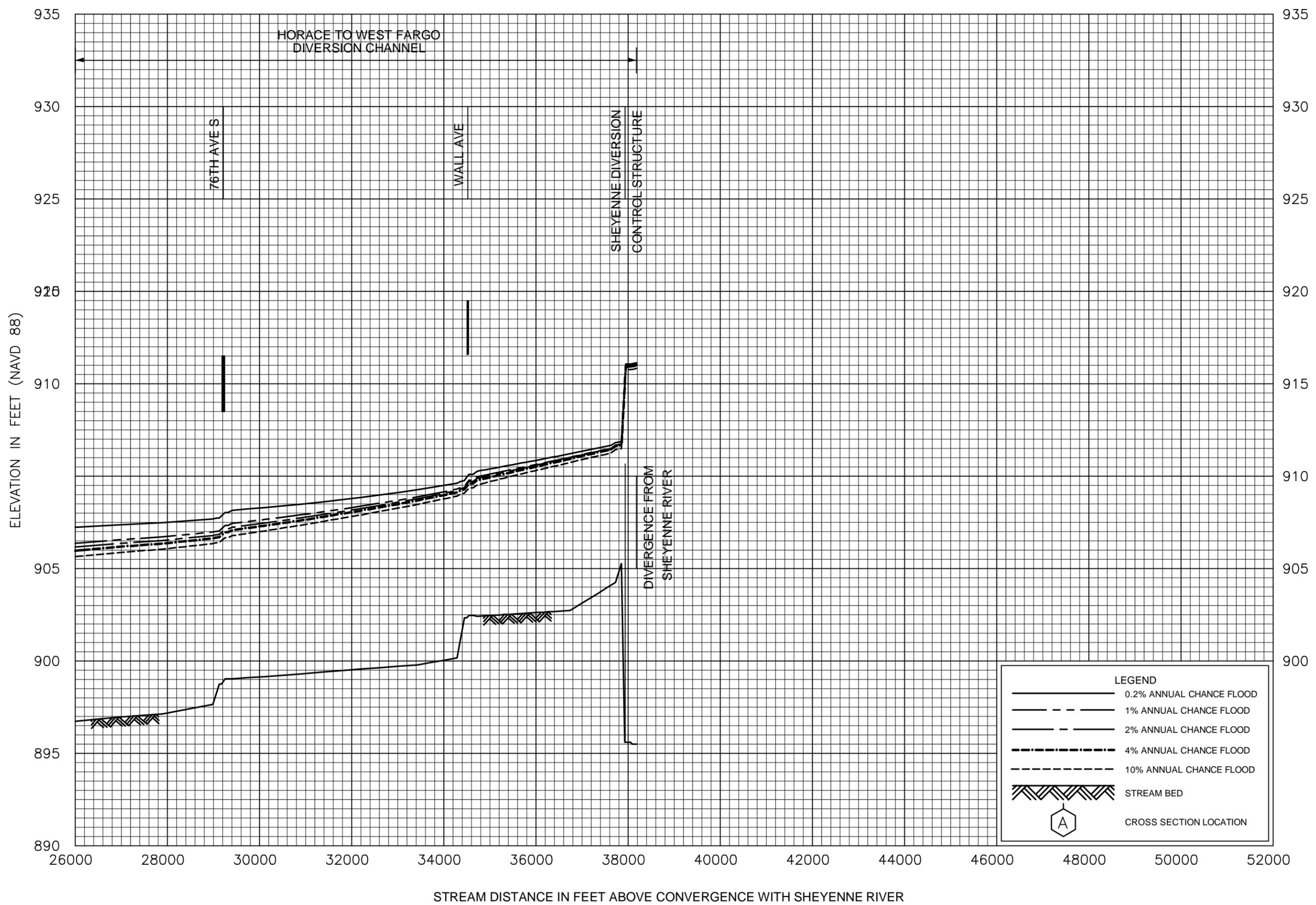
56P



FLOOD PROFILES
SHEYENNE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS

57P



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

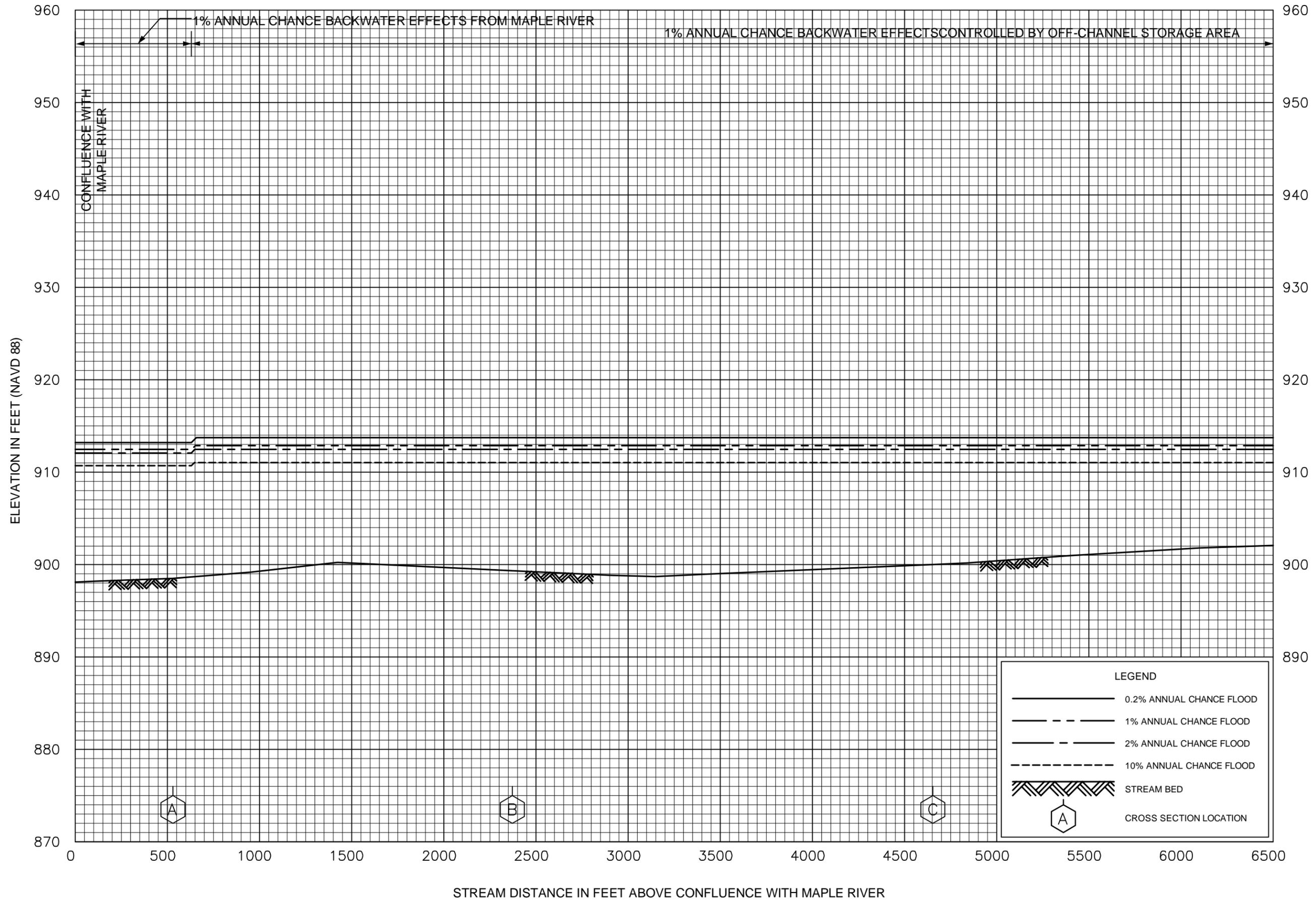
SHEYENNE RIVER DIVERSION CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND

ALL JURISDICTIONS

59P



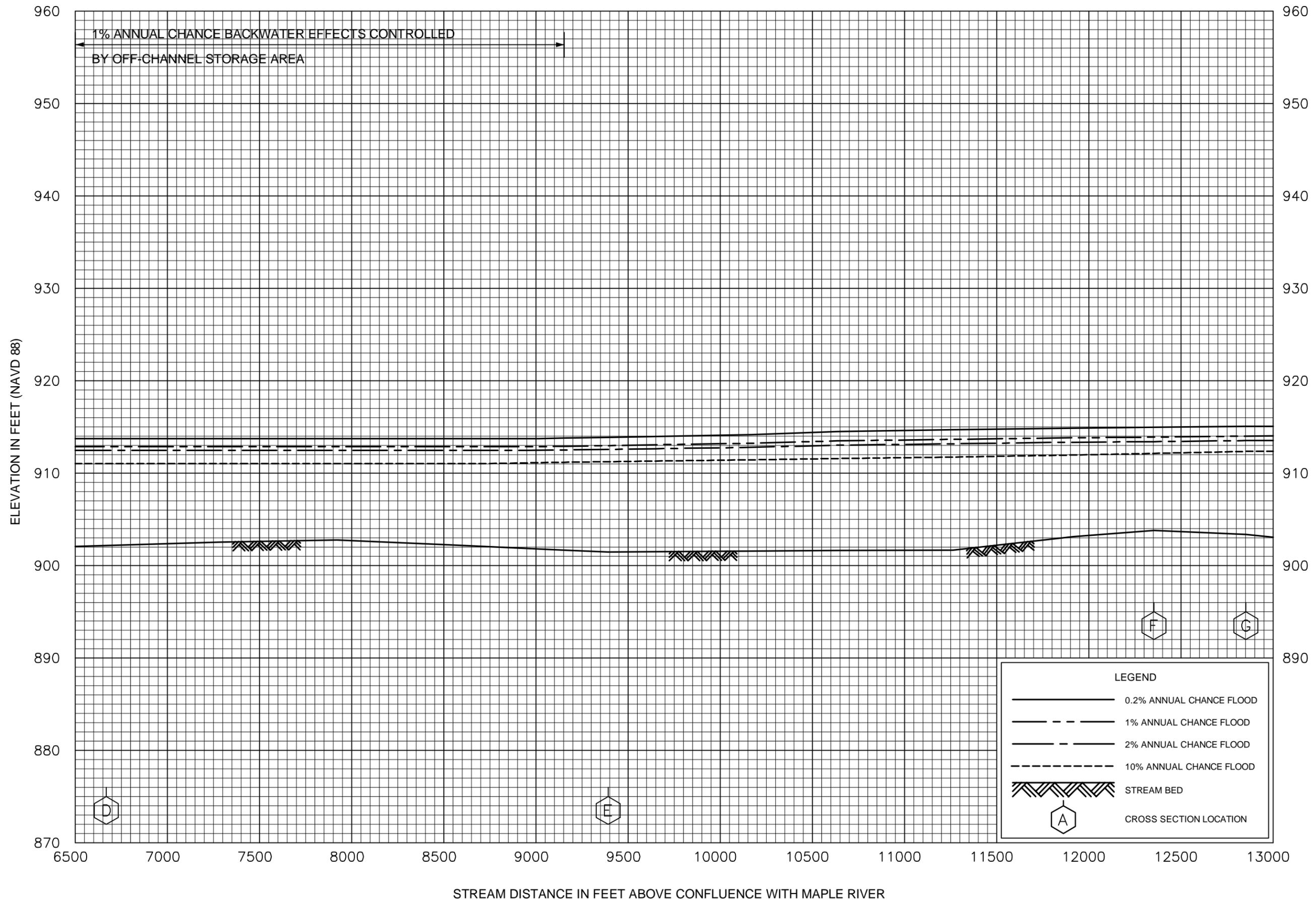
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SWAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

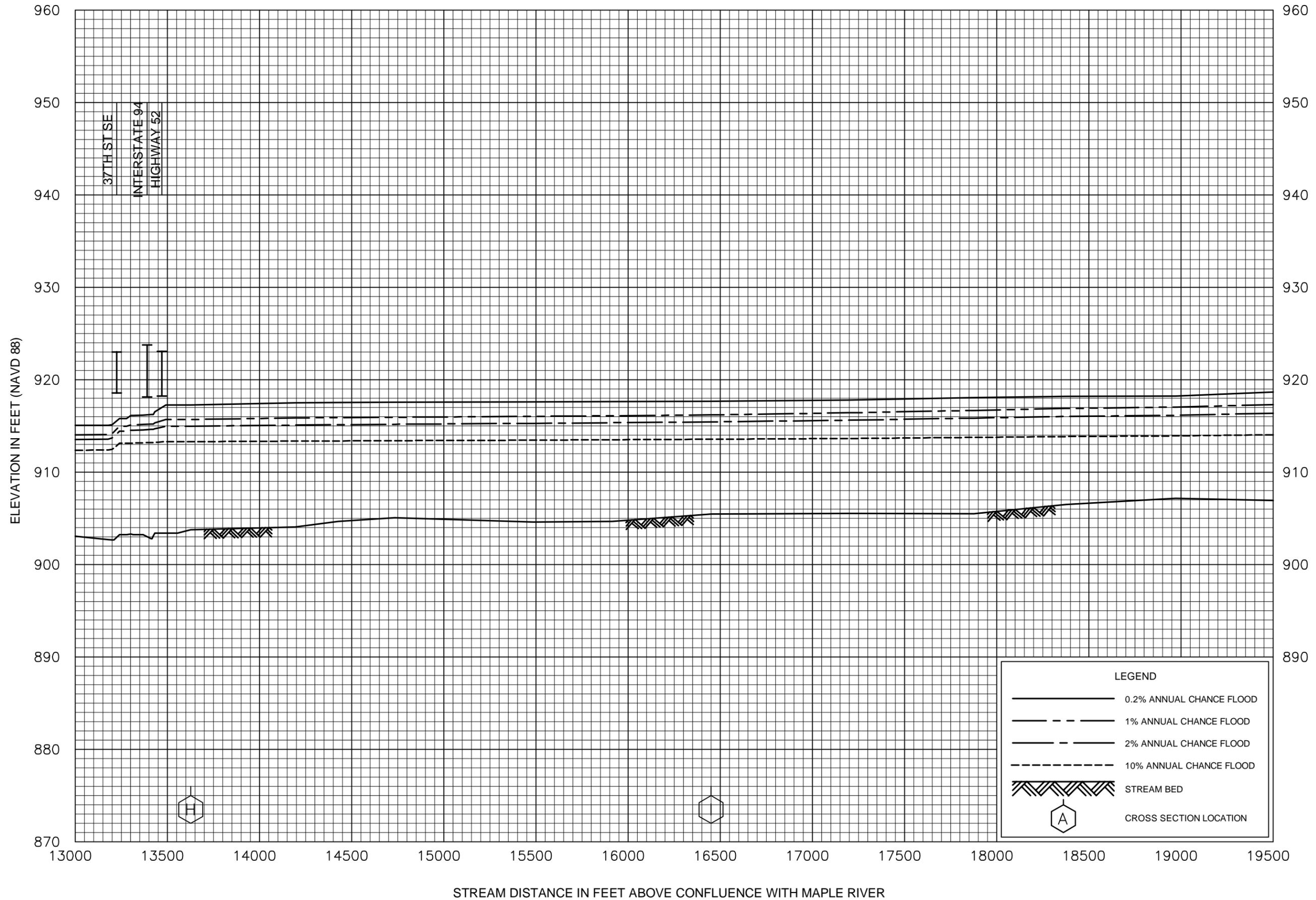
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61P



FLOOD PROFILES
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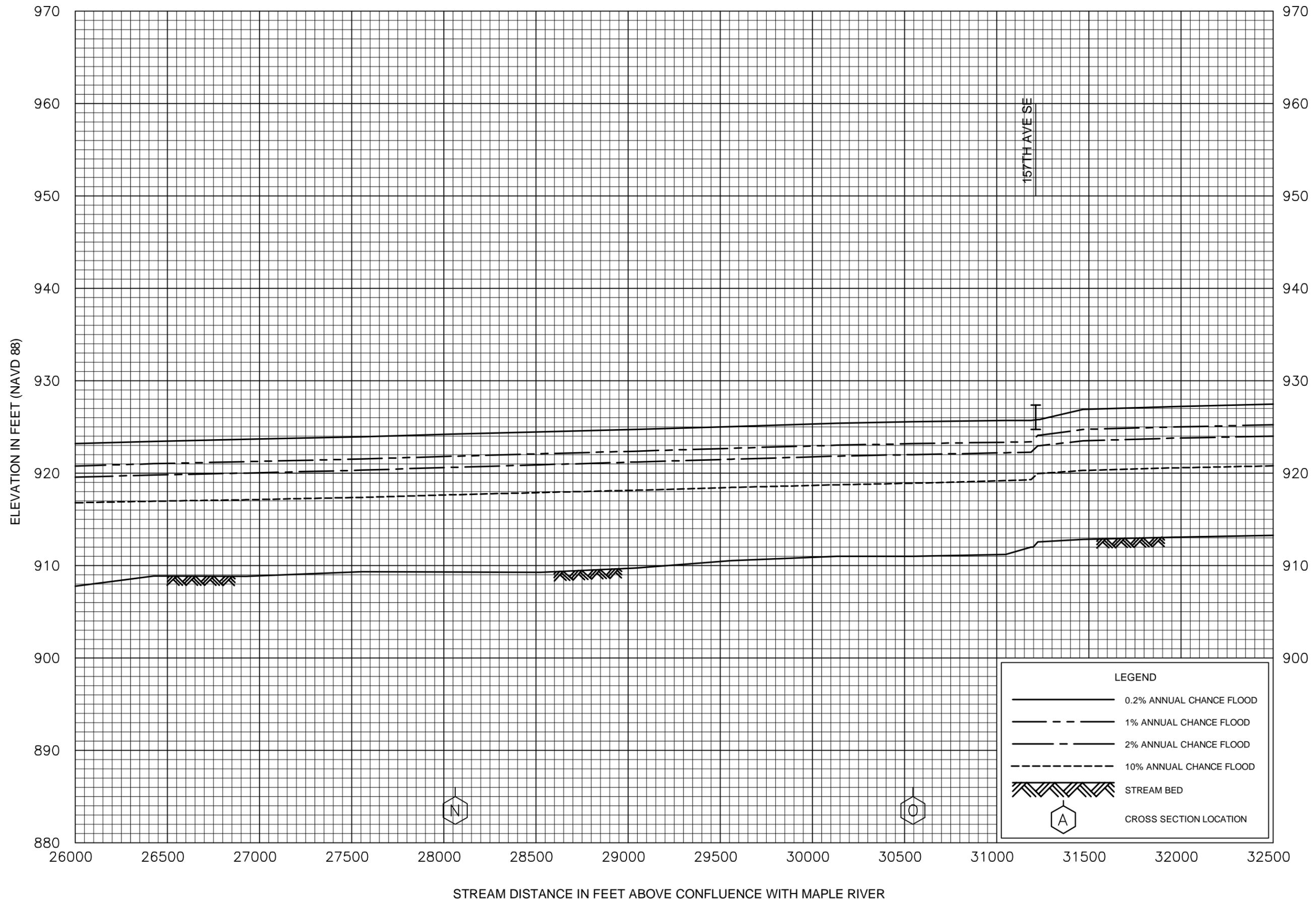
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CASS COUNTY, ND
ALL JURISDICTIONS



FLOOD PROFILES
SWAN CREEK

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CASS COUNTY, ND
ALL JURISDICTIONS

63P



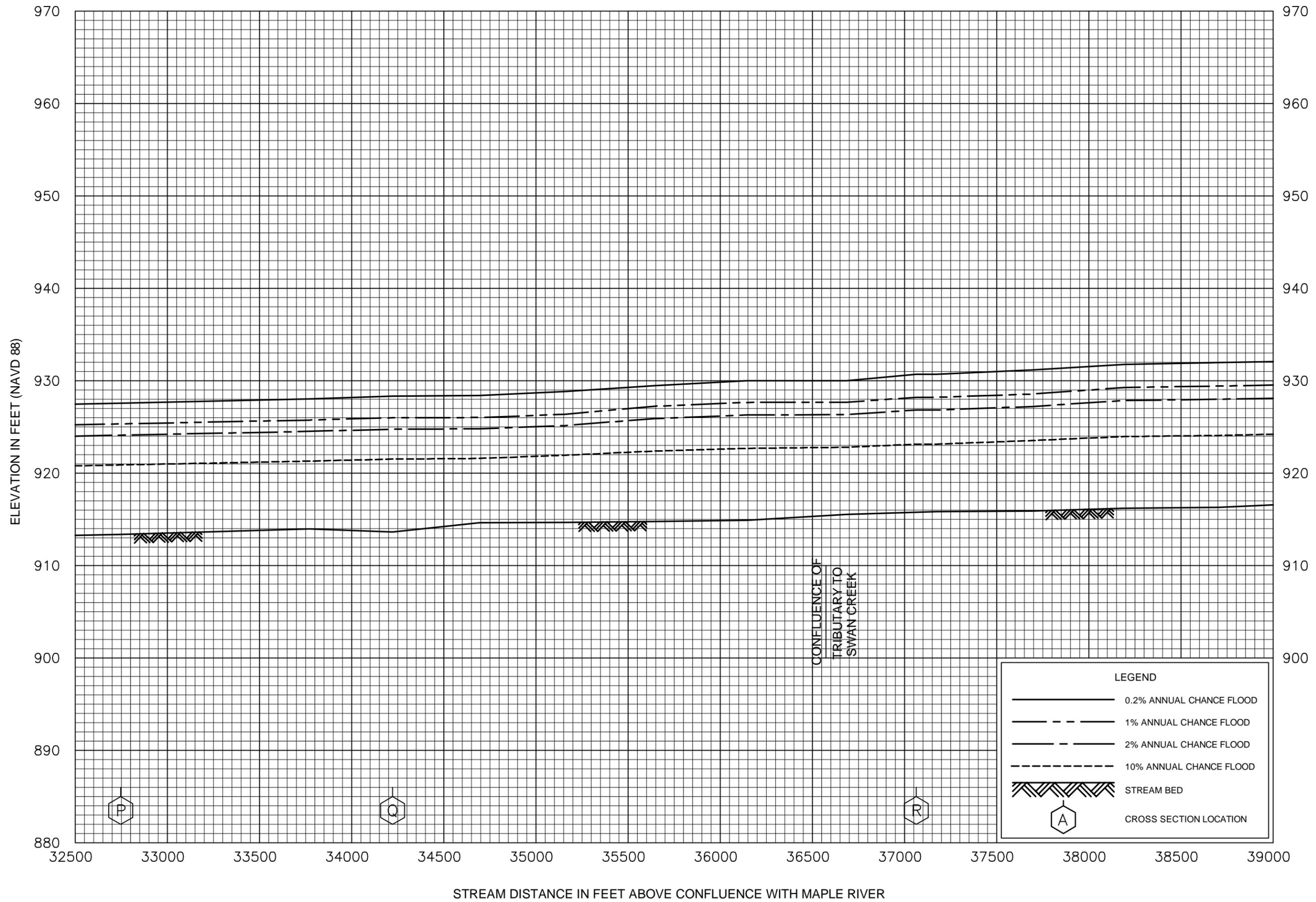
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SWAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND
ALL JURISDICTIONS

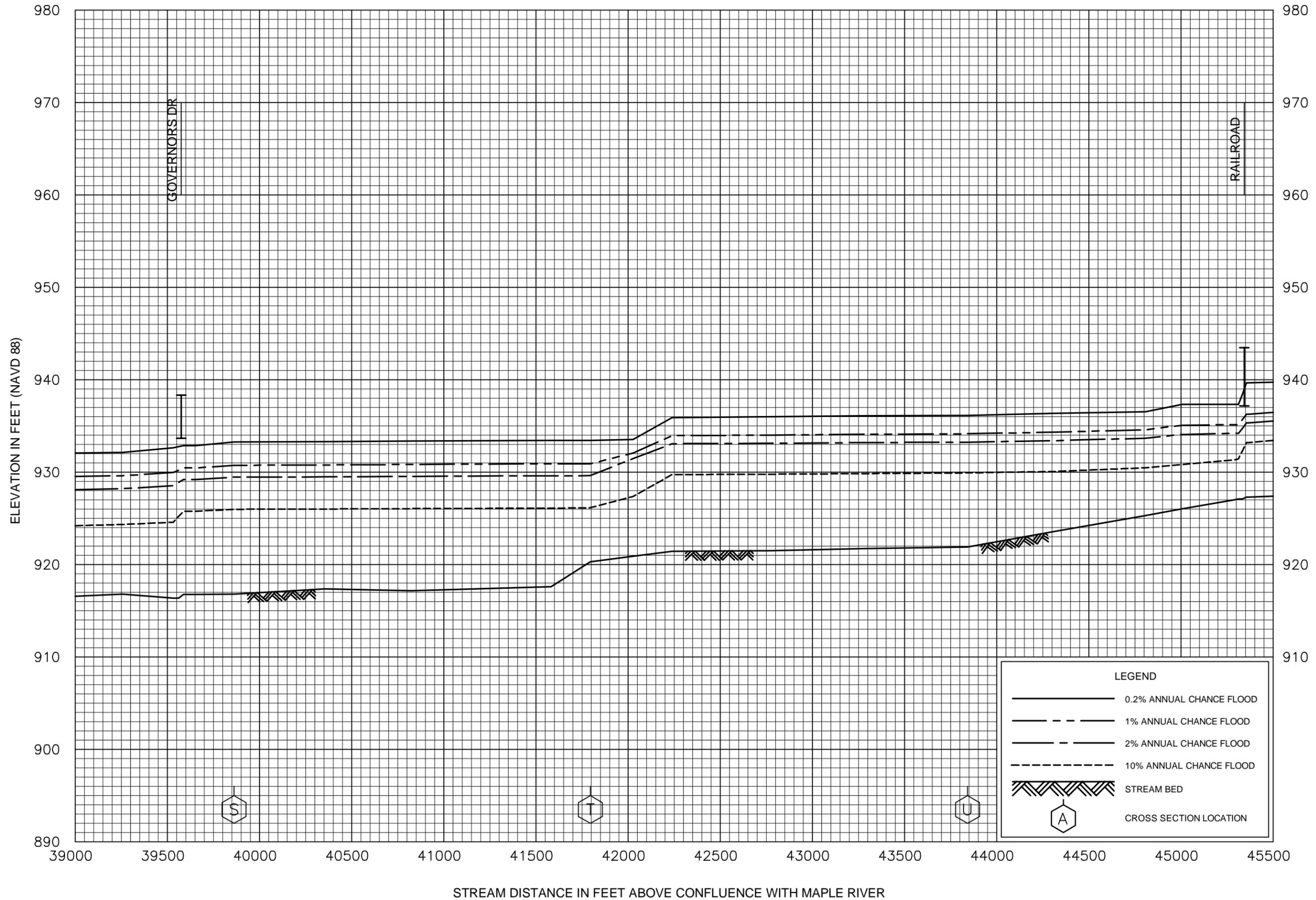
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FLOOD PROFILES
SWAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS

66P

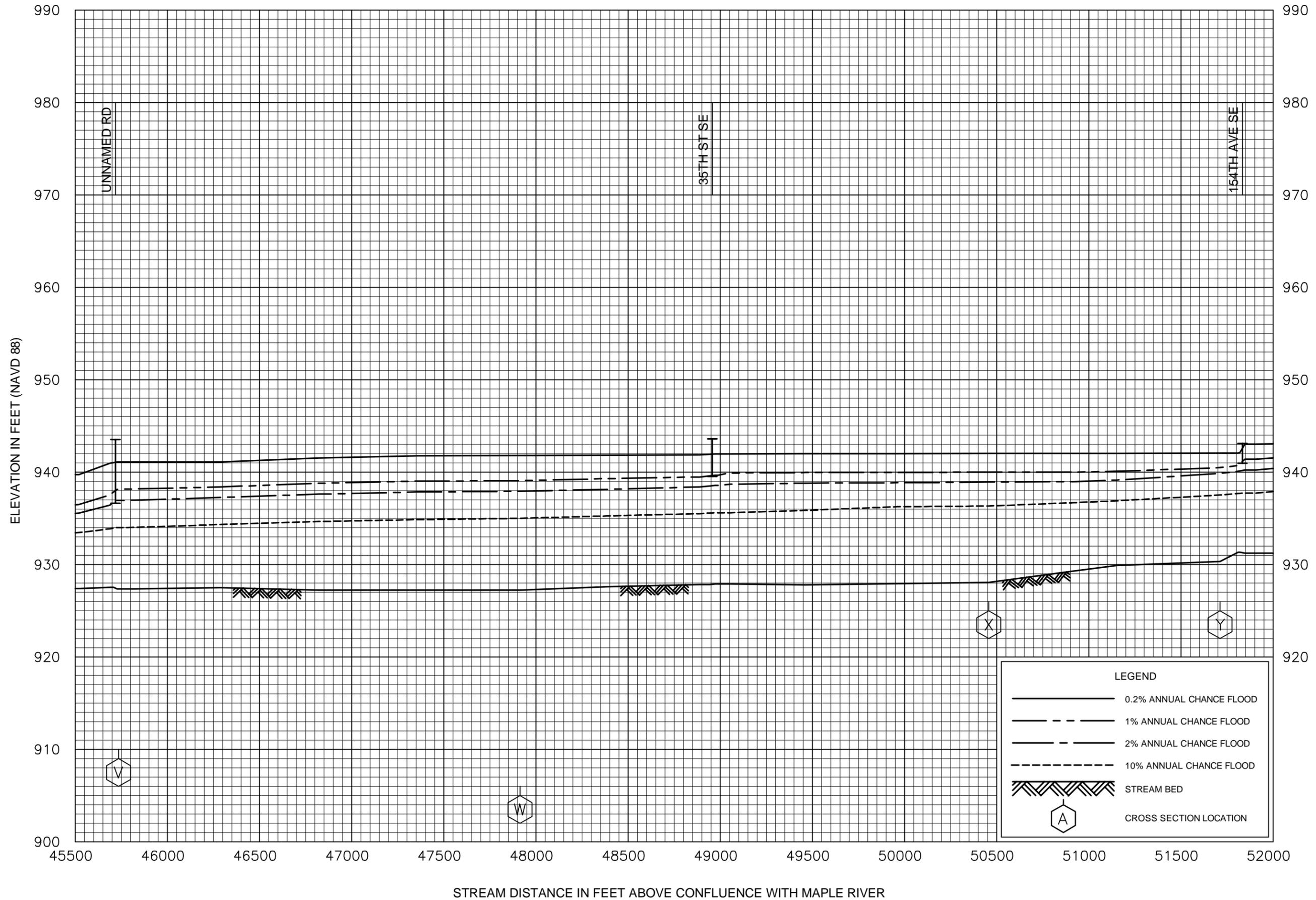


FLOOD PROFILES

SWAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND
ALL JURISDICTIONS

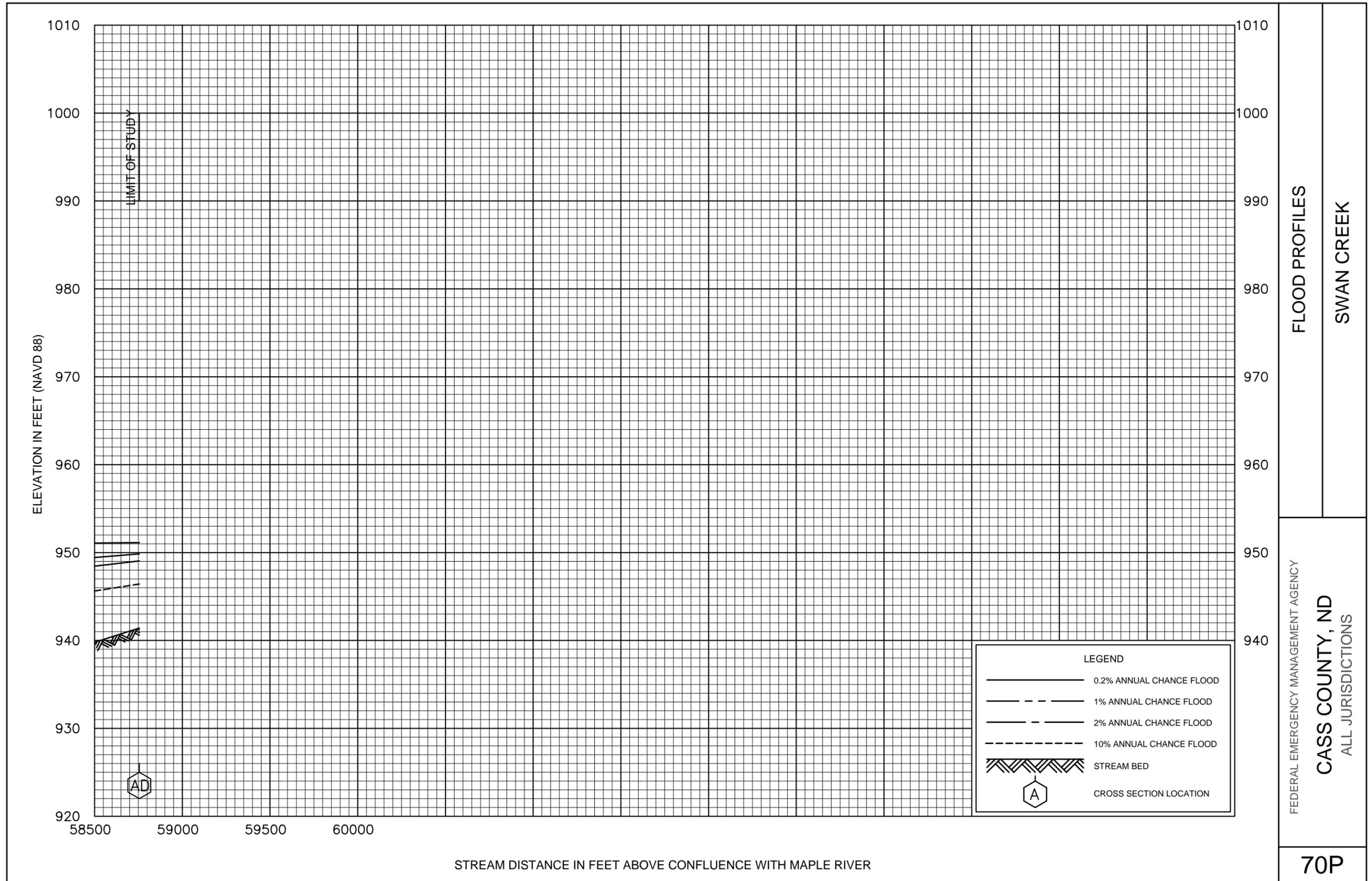


FLOOD PROFILES

SWAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CASS COUNTY, ND
ALL JURISDICTIONS



FLOOD PROFILES

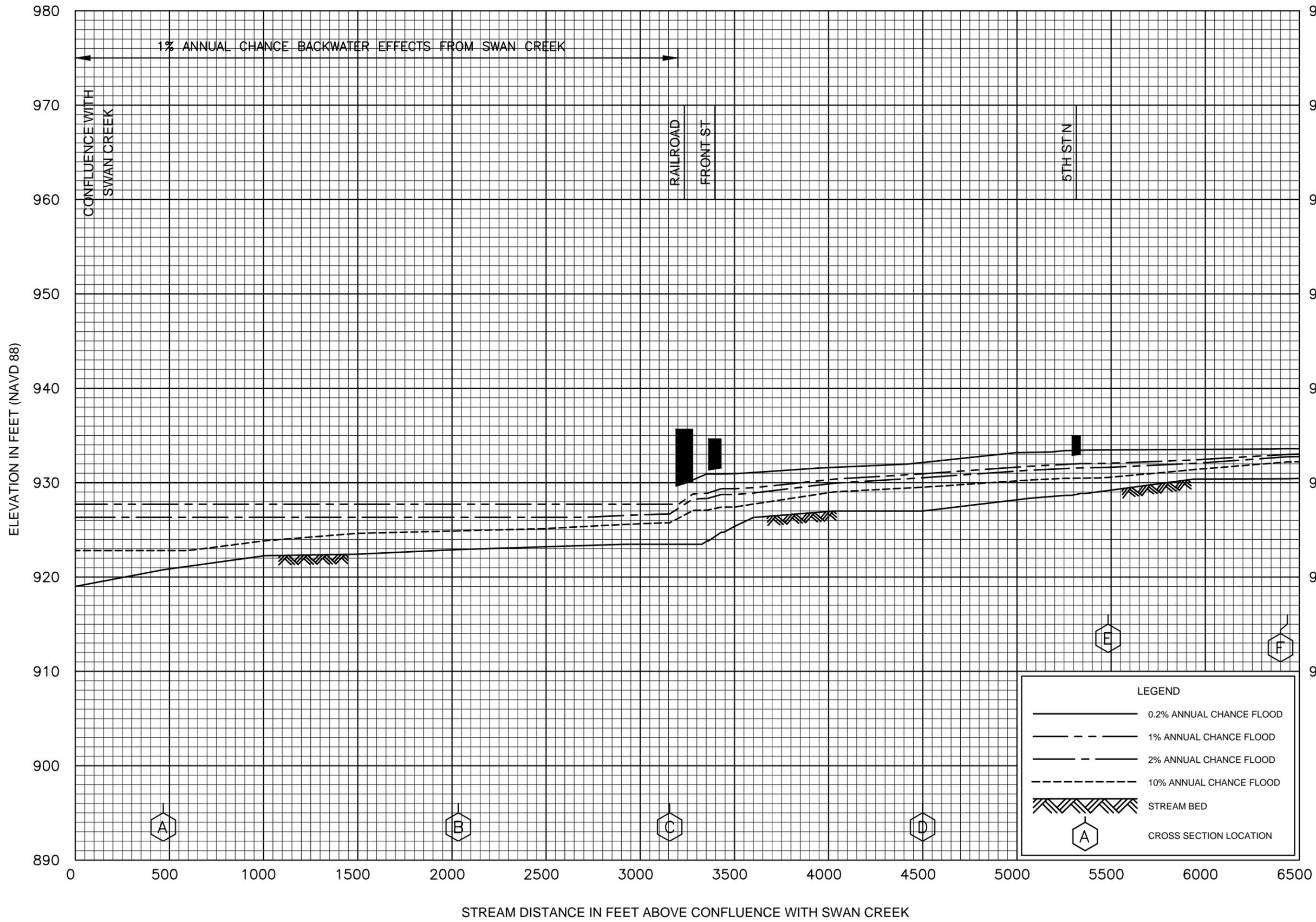
SWAN CREEK

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CASS COUNTY, ND

ALL JURISDICTIONS

70P

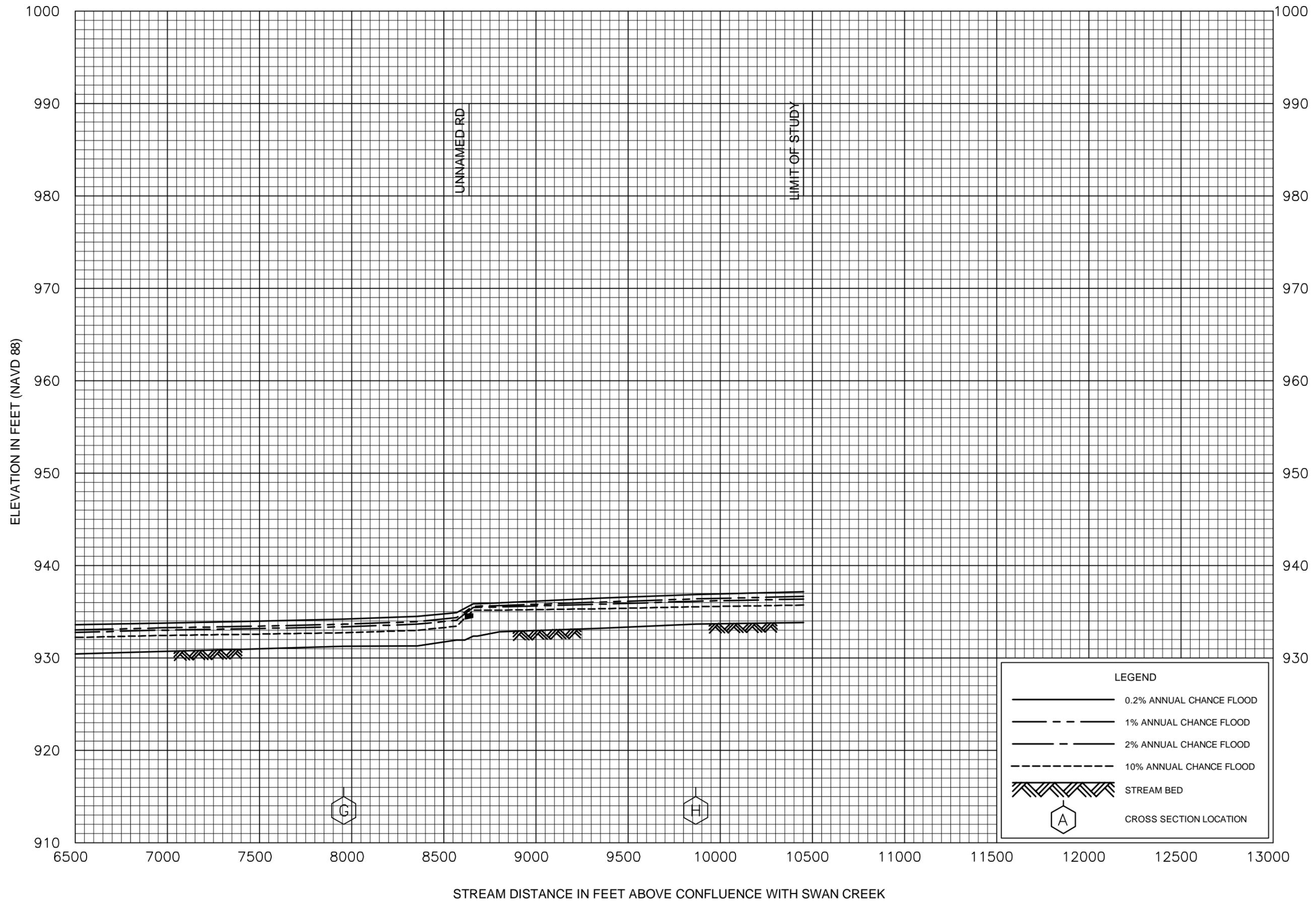


LEGEND	
	0.2% ANNUAL CHANCE FLOOD
	1% ANNUAL CHANCE FLOOD
	2% ANNUAL CHANCE FLOOD
	10% ANNUAL CHANCE FLOOD
	STREAM BED
	CROSS SECTION LOCATION

FLOOD PROFILES
TRIBUTARY TO SWAN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
CASS COUNTY, ND
ALL JURISDICTIONS

71P



FLOOD PROFILES

TRIBUTARY TO SWAN CREEK

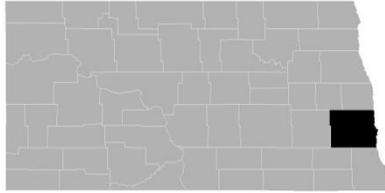
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CASS COUNTY, ND
ALL JURISDICTIONS

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 3 OF 3



CASS COUNTY, NORTH DAKOTA ALL JURISDICTIONS

COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER
Addison, Township of	380THR	Fargo, City of	385364	North River, City of	380623
Alice, City of*	380363	Frontier, City of	380347	Oxbow, City of	380681
Amenia, City of	380019	Gardner, City of*	385412	Page, City of*	380193
Amenia, Township of	380686	Gardner, Township of*	380266	Page, Township of*	380THR
Argusville, City of	380639	Gill, Township of*	380THR	Pleasant, Township of	380263
Arthur, City of	380156	Grandin, City of*	380335	Pontiac, Township of*	380THR
Arthur, Township of	380THR	Gunkel, Township of*	380THR	Prairie Rose, City of*	380655
Ayr, City of*	380350	Harmony, Township of	380THR	Raymond, Township of	380261
Ayr, Township of*	380THR	Harwood, City of	380338	Reed, Township of	380257
Bell, Township of*	380THR	Harwood, Township of	380259	Reiles Acres, City of	380324
Berlin, Township of	380620	Highland, Township of	380THR	Rich, Township of*	380THR
Briarwood, City of	380651	Hill, Township of*	380THR	Rochester, Township of*	380THR
Buffalo, City of*	380160	Horace, City of	380022	Rush River, Township of	380THR
Buffalo, Township of*	380THR	Howes, Township of*	380THR	Stanley, Township of	380258
Casselton, City of	380020	Hunter, City of	380181	Tower City, City of*	380210
Casselton, Township of	380THR	Hunter, Township of	380THR	Tower, Township of*	380THR
Clifton, Township of*	380THR	Kindred, City of	380182	Walburg, Township of	380652
Cornell, Township of*	380THR	Kinyon, Township of*	380THR	Warren, Township of	380265
Davenport, City of	380717	Lake, Township of*	380THR	Watson, Township of	380THR
Davenport, Township of	380690	Leonard, City of*	380185	West Fargo, City of	380024
Dows, Township of*	380THR	Leonard, Township of*	380THR	Wheatland, Township of*	380THR
Durbin, Township of	380325	Maple River, Township of	380THR	Wiser, Township of	380267
Eldred, Township of*	380THR	Mapleton, City of	380023		
Empire, Township of*	380366	Mapleton, Township of	380262		
Erie, Township of*	380THR	Noble, Township of	380268		
Everest, Township of	380352	Normanna, Township of	380264		

*No Special Flood Hazards Identified

REVISED:

PRELIMINARY
1/29/2016

FLOOD INSURANCE STUDY NUMBER

38017CV003B

Version Number 2.3.3.2



FEMA

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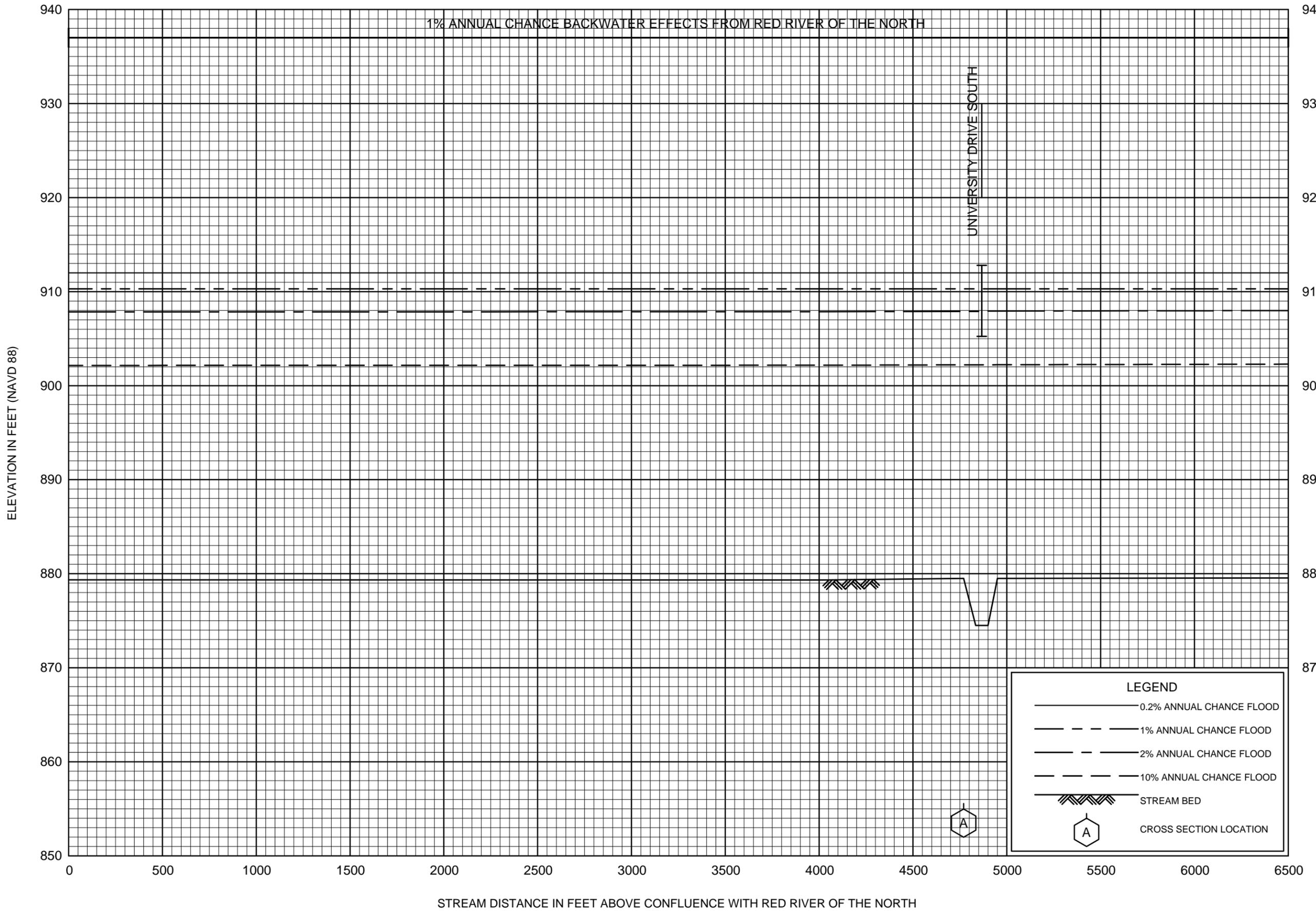
	<u>Panel</u>
Flood Profiles	
County Drain 10 Breakout	01-03 P
County Drain 45	04-05 P
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Flood Profiles	
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Published Separately

Flood Insurance Rate Map (FIRM)



FLOOD PROFILES

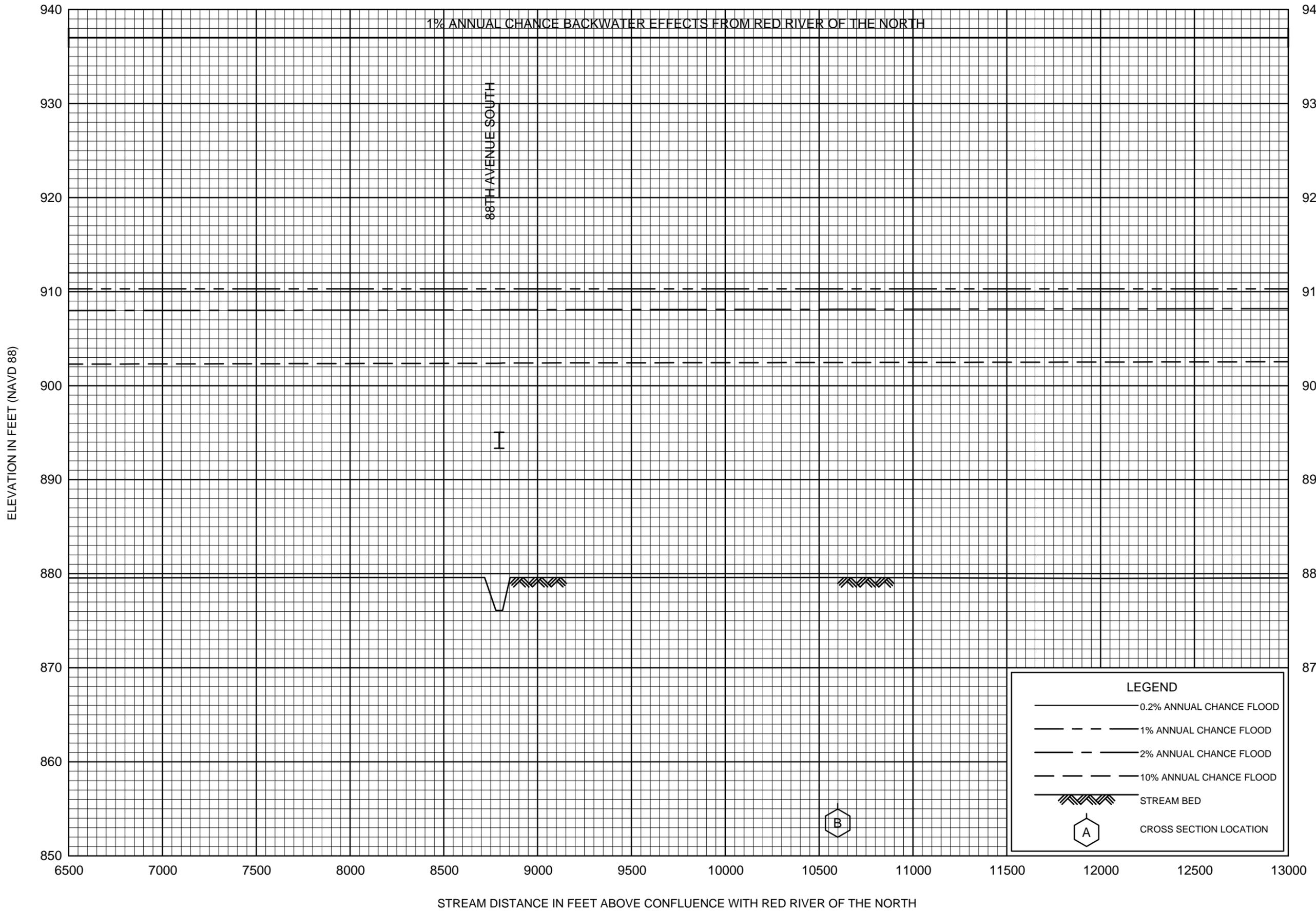
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CASS COUNTY, ND

ALL JURISDICTIONS

73P



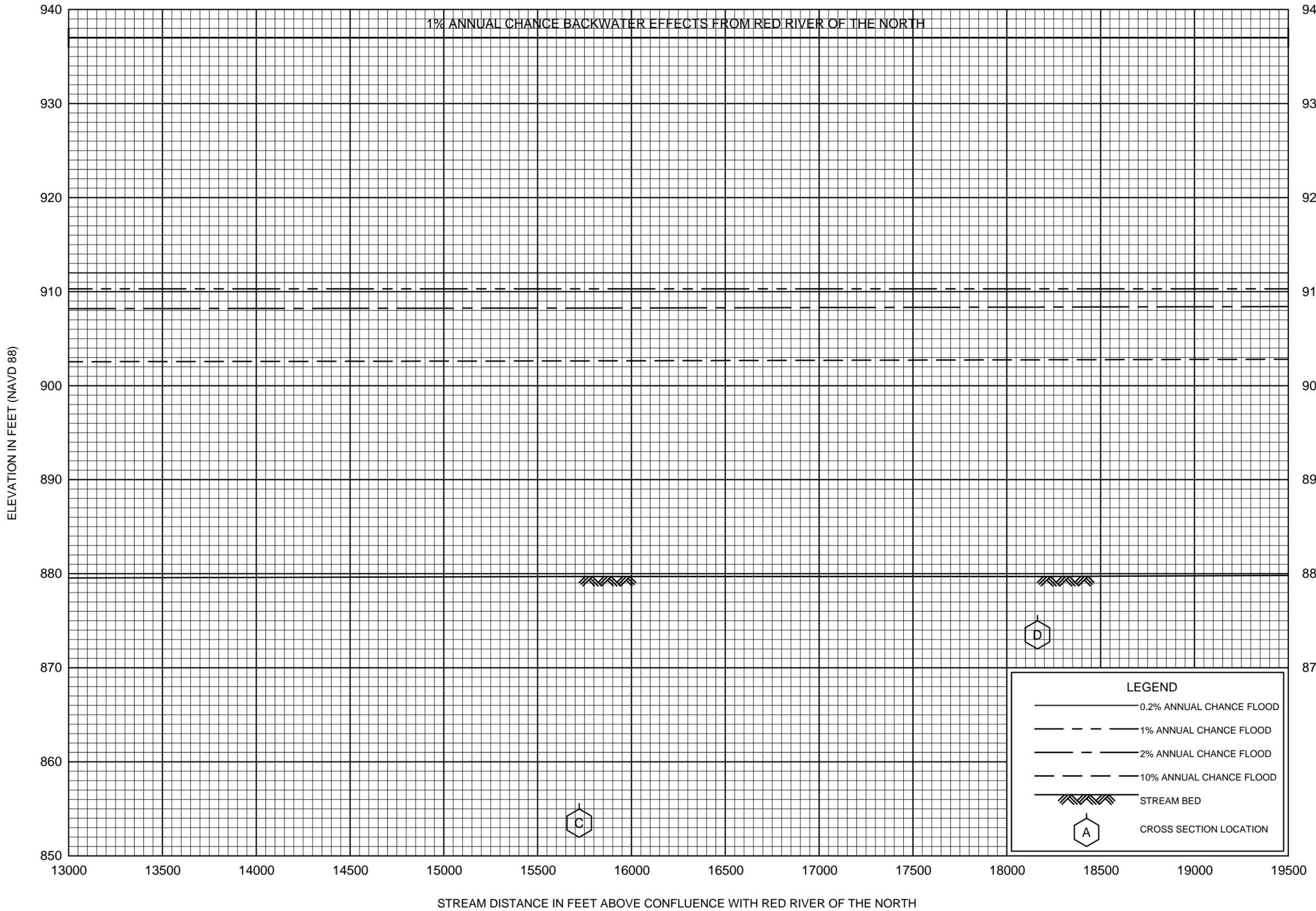
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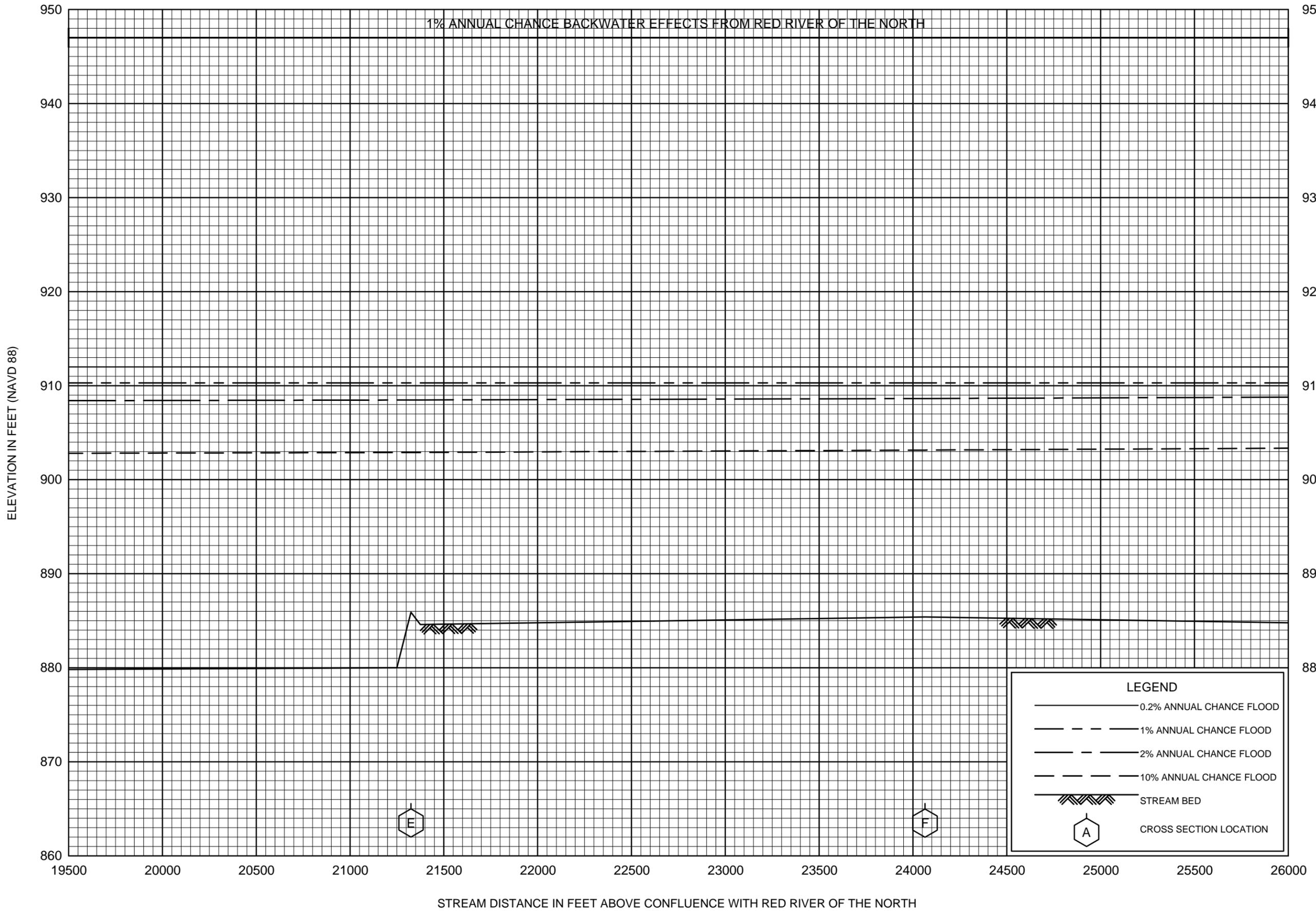
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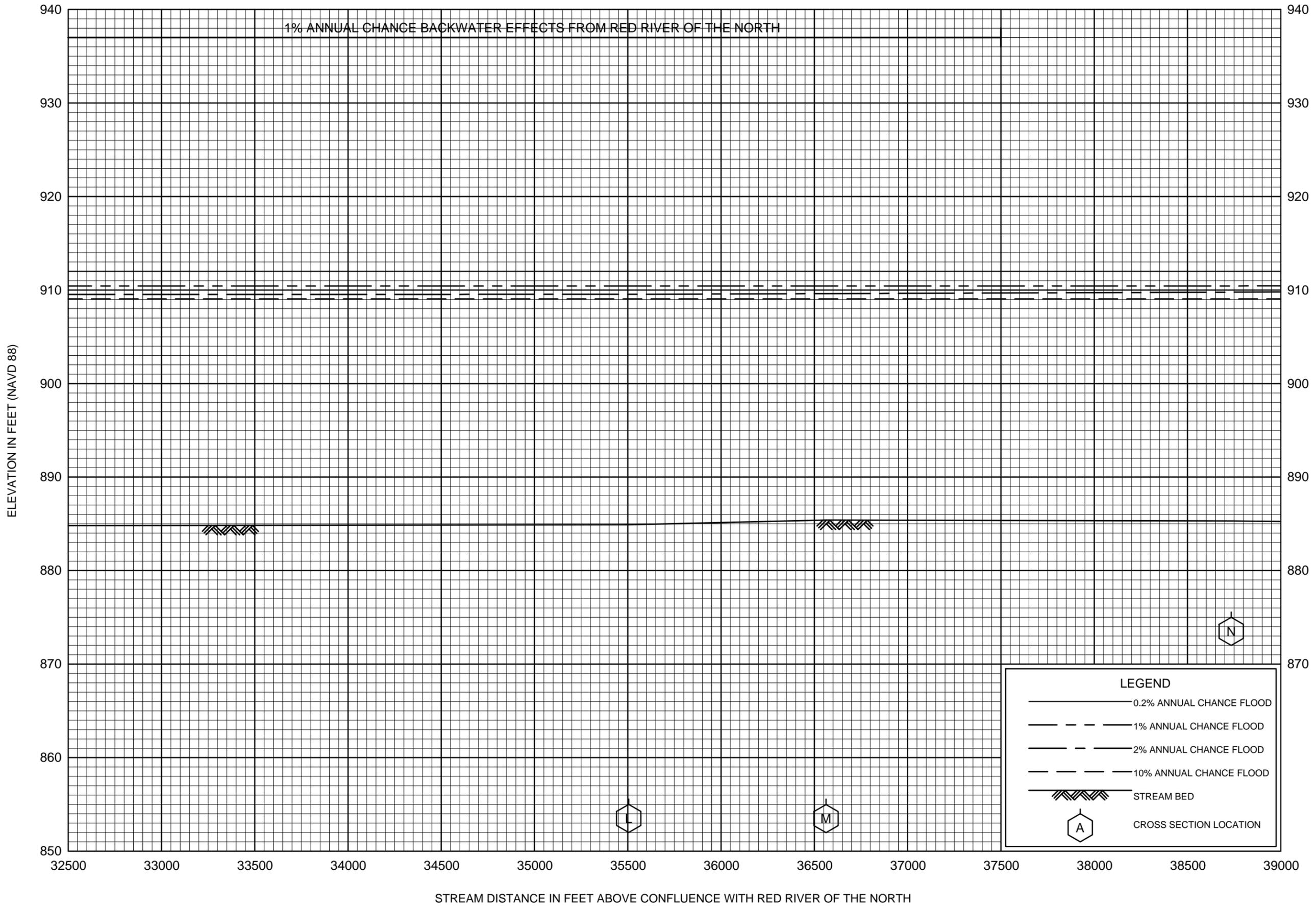
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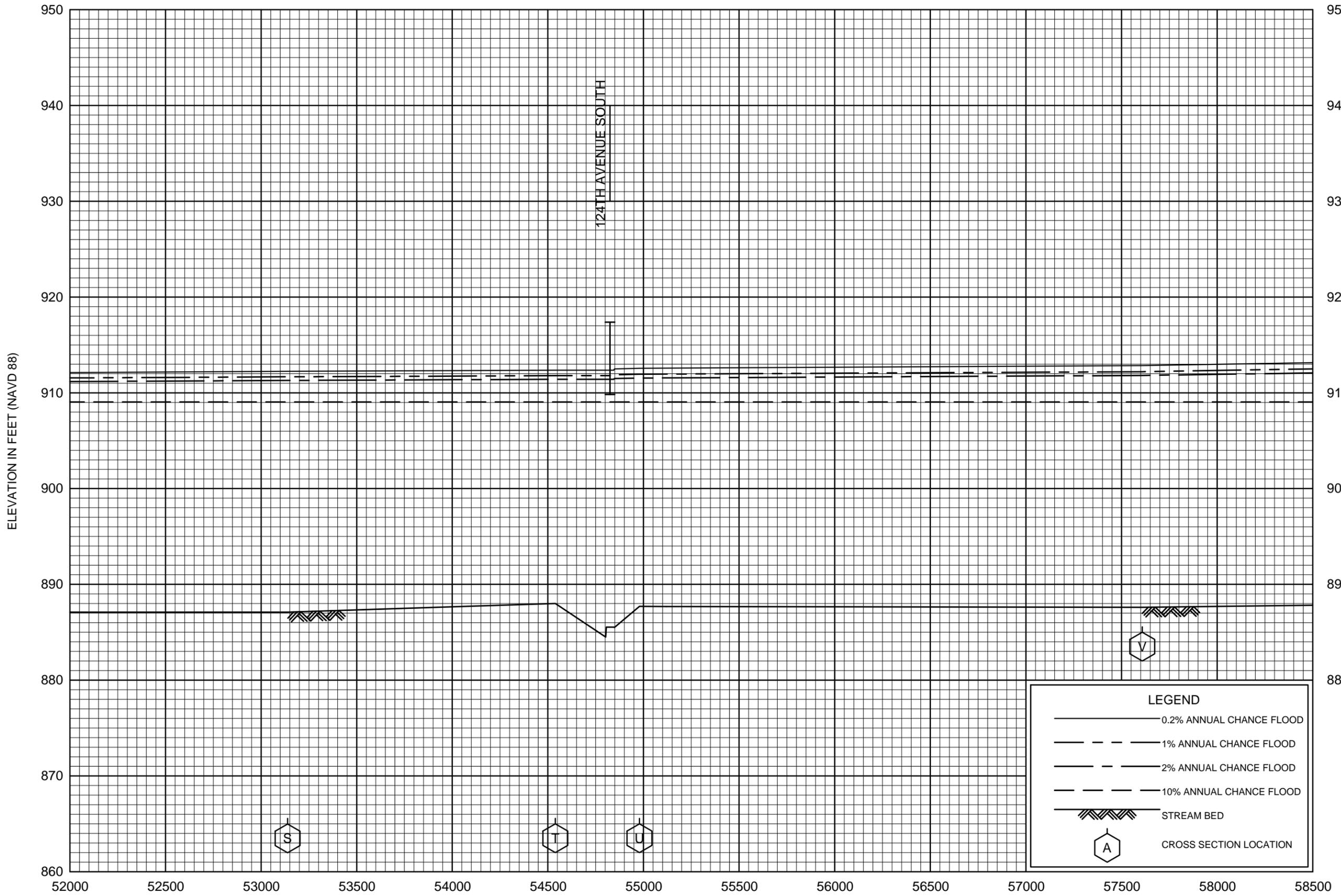
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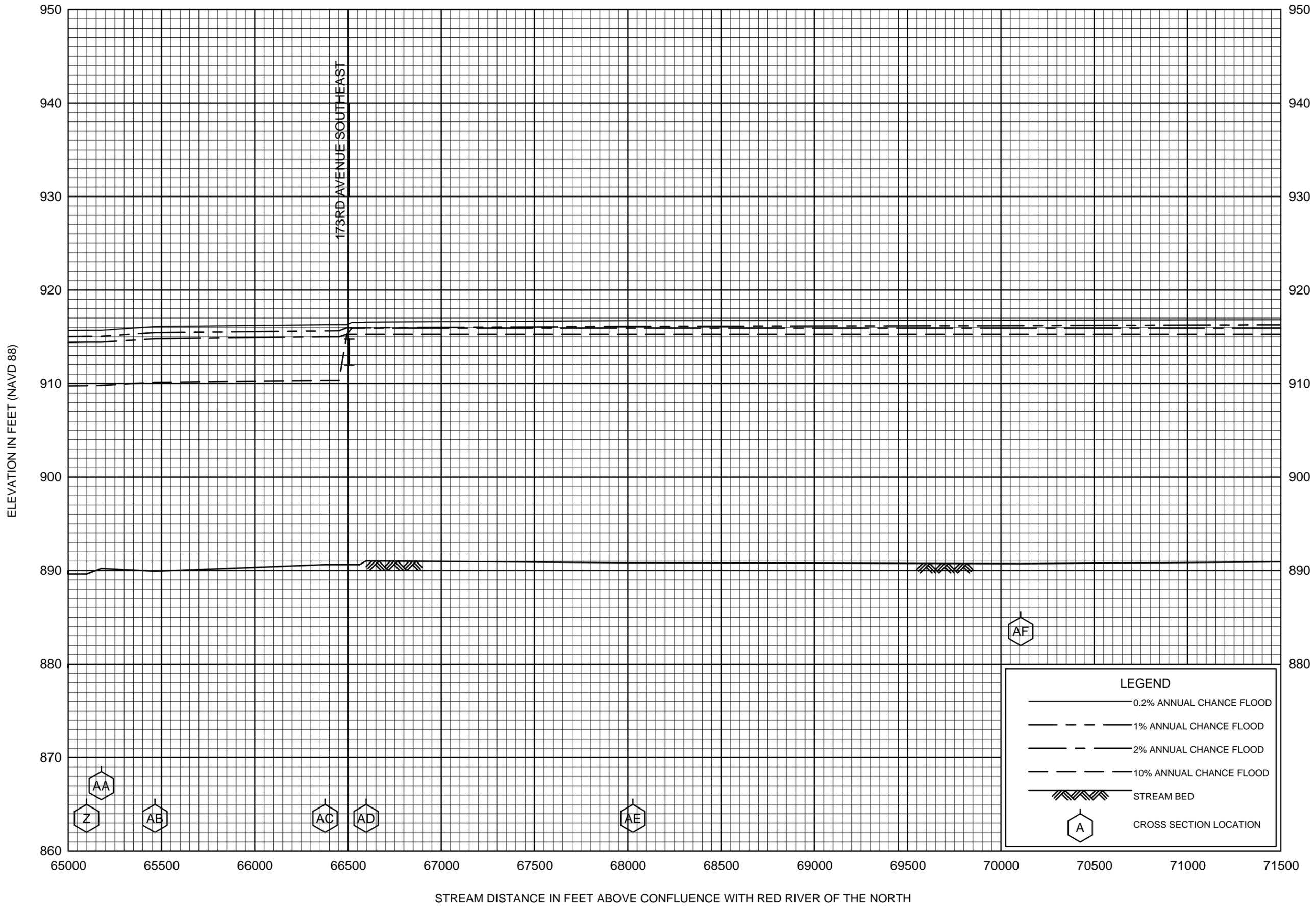
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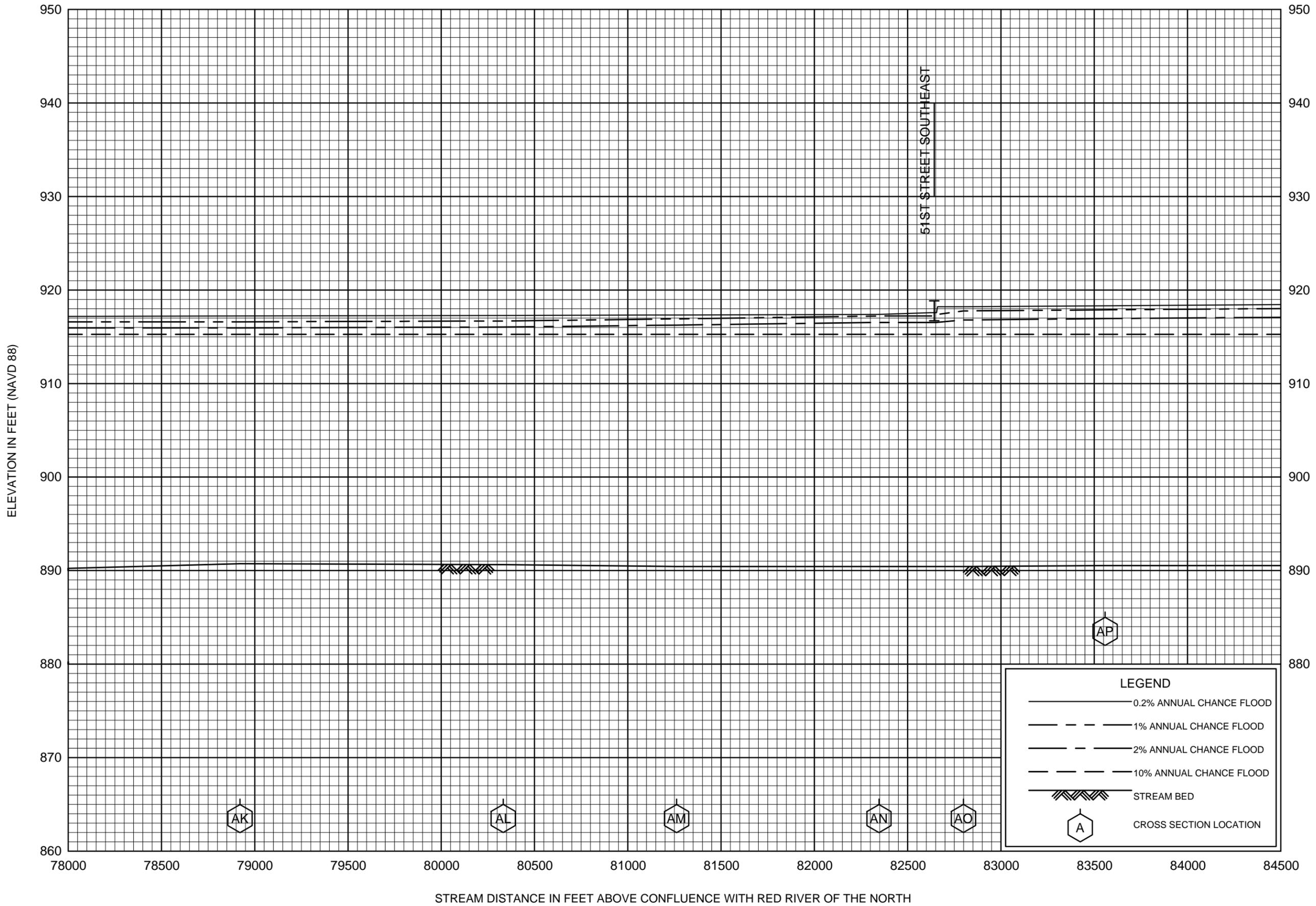
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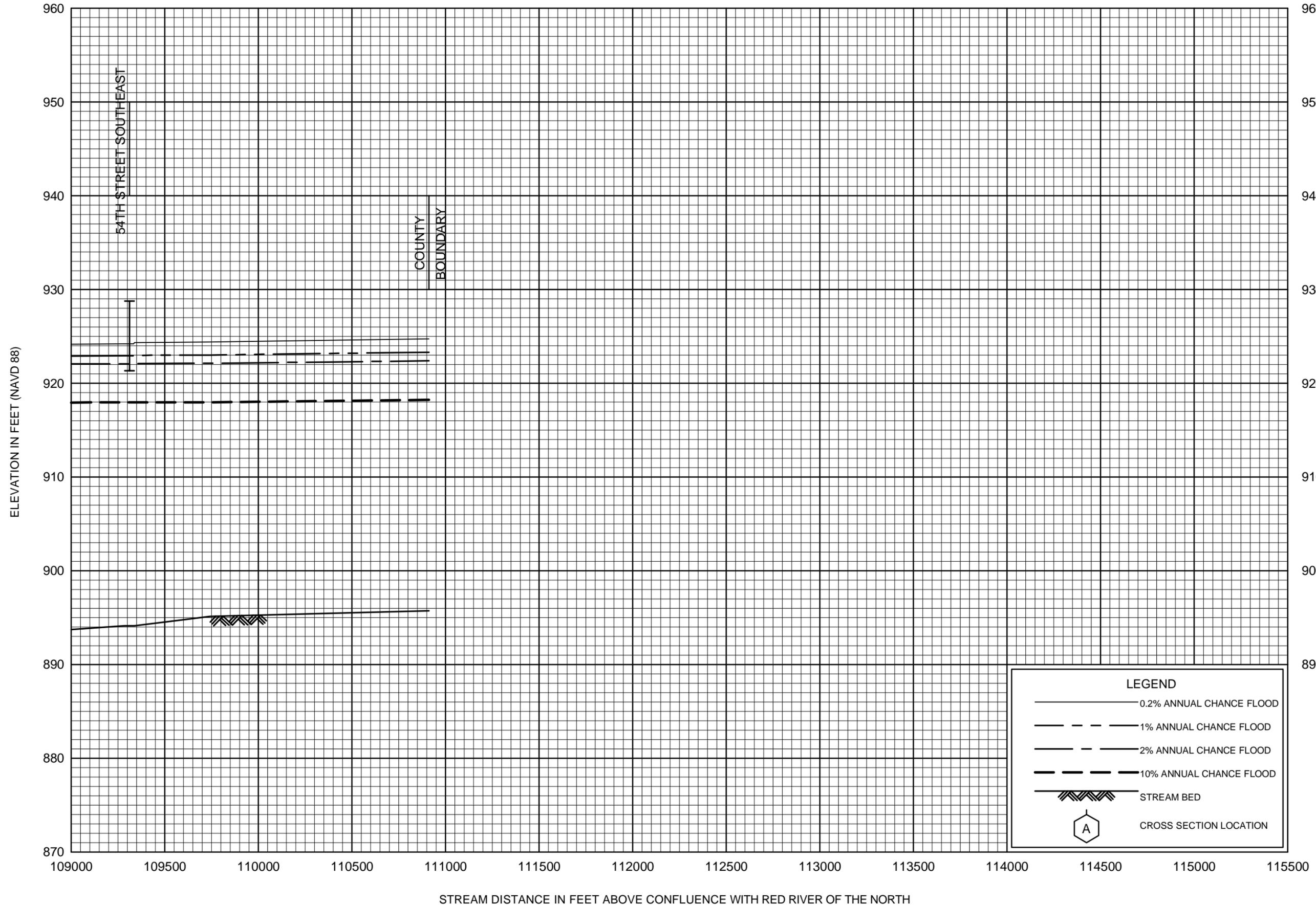
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