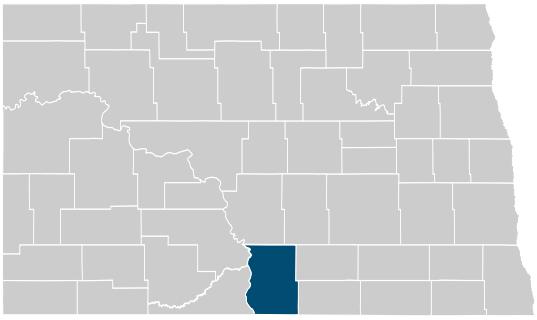
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 1



EMMONS COUNTY, NORTH DAKOTA

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BRADDOCK, CITY OF *	380260
EMMONS COUNTY, UNINCORPORATED AREAS	380327
HAGUE, CITY OF *	380380
HAZELTON, CITY OF *	380232
LINTON, CITY OF	380032
STRASBURG, CITY OF *	380252

*No Special Flood Hazard Areas Identified

PRELIMINARY:
DECEMBER 8, 2021

FEMA

EFFECTIVE:

TO BE DETERMINED

FLOOD INSURANCE STUDY NUMBER
38029CV000A
Version Number 2.6.4.6

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Published Separately

FLOOD INSURANCE STUDY REPORT
EMMONS 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 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, *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 Emmons County, North Dakota.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the United States Geological Survey (USGS) 8-digit Hydrologic Unit Code (HUC-8) sub-basins affecting each, are shown in Table 1. The 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.

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
Braddock, City of [1]	380260	10130103	38029C0325D[2]	
Emmons County, Unincorporated Areas	380327	10130102 10130103 10130104	38029C0025D[2], 38029C0050D[2], 38029C0075D[2], 38029C0100D[2], 38029C0125D[2], 38029C0150D[2], 38029C0175D[2], 38029C0200D[2], 38029C0225D[2], 38029C0250D[2], 38029C0275D[2], 38029C0300D[2], 38029C0325D[2], 38029C0350D[2], 38029C0375D[2], 38029C0400D[2], 38029C0425D[2], 38029C0450D[2], 38029C0475D[2], 38029C0500D[2], 38029C0525D[2], 38029C0550D[2], 38029C0570D, 38029C0575D[2], 38029C0586D, 38029C0587D[2], 38029C0588D, 38029C0589D, 38029C0600D[2], 38029C0625D[2], 38029C0650D[2], 38029C0675D[2], 38029C0700D[2], 38029C0725D[2], 38029C0750D[2], 38029C0751D, 38029C0752D, 38029C0755D[2], 38029C0775D[2], 38029C0800D[2], 38029C0825D[2], 38029C0850D[2], 38029C0875D[2], 38029C0900D[2], 38029C0925D[2], 38029C0950D[2], 38029C0975D[2], 38029C1000D[2], 38029C1025D[2], 38029C1050D[2], 38029C1075D[2], 38029C1100D[2], 38029C1125D[2]	
Hague, City of [1]	380380	10130102	38029C0950D[2], 38029C0975D[2]	
Hazelton, City of [1]	380232	10130103	38029C0425D[2]	
Linton, City of	380032	10130104	38029C0588D	
Strasburg, City of [1]	380252	10130104	38029C0775D[2]	

[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-percent-annual-chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1-percent-annual-chance and 0.2-percent-annual-chance floodplains; and 1-percent-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 30, "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 Emmons County became effective on **To Be Determined**. Refer to Table 27 for information about subsequent revisions to the FIRMs.

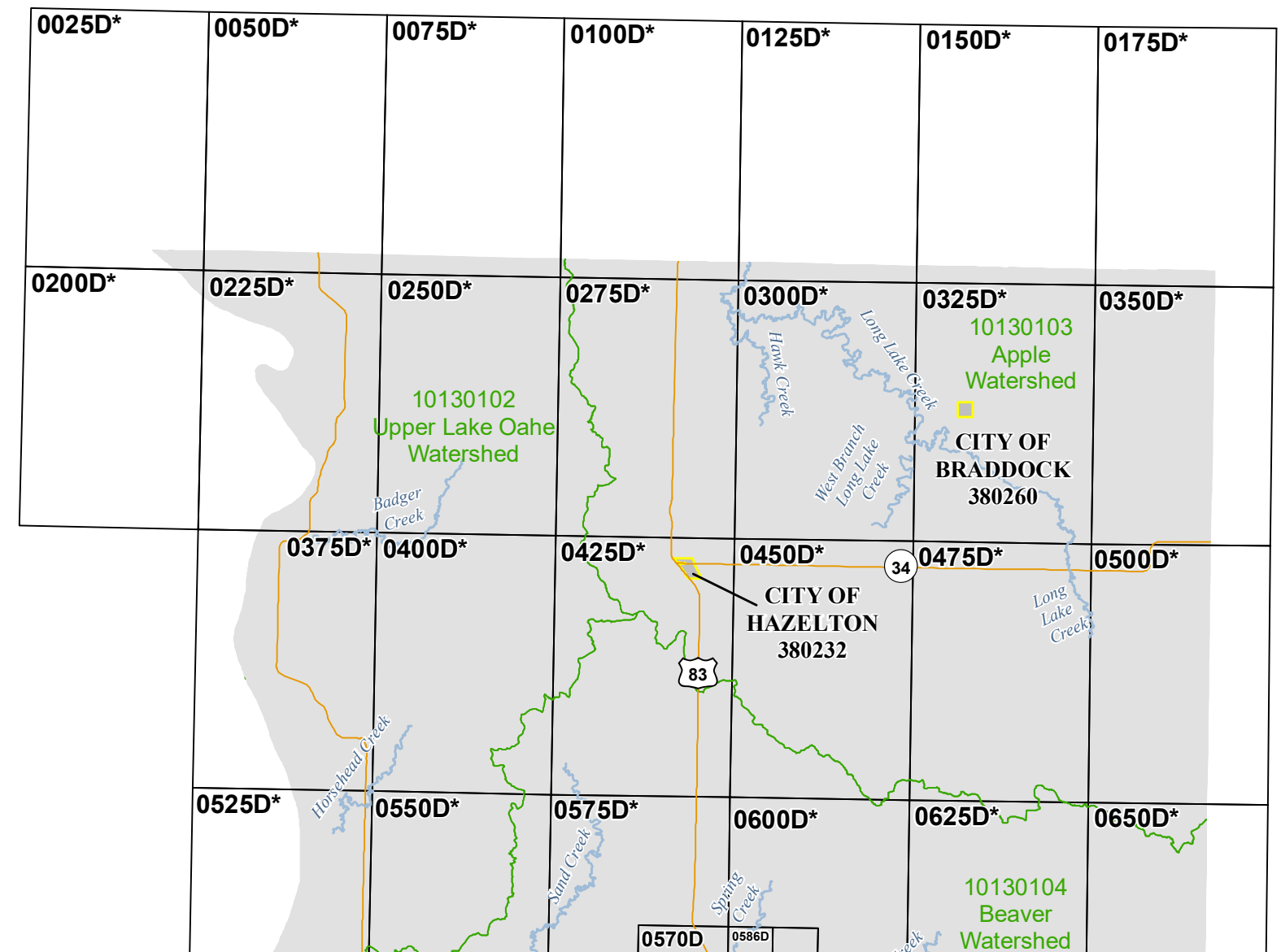
- Selected FIRM panels for the community may contain information (such as floodways and cross sections) that was previously shown separately on the corresponding Flood Boundary and Floodway Map (FBFM) panels. In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
B	X (shaded)
C	X (unshaded)

- 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 www.fema.gov/flood-maps/tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Emmons 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 USGS HUC-8 codes.

Figure 1: FIRM Index



N

1 inch = 5 miles

Miles
0 2.5 5 10

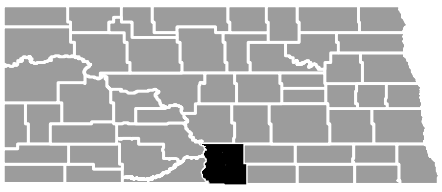
Map Projection:
Universal Transverse Mercator Zone 14 North:
North American Datum 1983

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

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - COMPREHENSIVE FLOOD HAZARD INFORMATION IS AVAILABLE. PLEASE SEE YOUR LOCAL FLOODPLAIN ADMINISTRATOR OR STATE NFIP COORDINATORFOR FLOOD HAZARD INFORMATION IN THIS AREA.



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

EMMONS COUNTY, ND AND INCORPORATED AREAS

PANELS PRINTED:

0570, 0586, 0588, 0589, 0751, 0752

FEMA

PRELIMINARY
12/8/2021

MAP NUMBER
38029CIND0A

EFFECTIVE DATE

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), 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 Mapping and Insurance eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at 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 Flood Map Service Center website or by calling the FEMA Mapping and Insurance 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 Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 27 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 Non-Coastal 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.

Figure 2. FIRM Notes to Users *(continued)*

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 have reduced flood hazards due to flood control structures. Refer to Section 4.3 "Dams and Other Flood Hazard Reduction Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was Universal Transverse Mercator (UTM) Zone 14N. The horizontal datum was the North American Datum of 1983 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 www.ngs.noaa.gov.

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 30 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided in digital format by the United States Department of Agriculture (USDA). This information was derived from digital orthophotography at a 2-foot resolution from photography dated 2020. For information about base maps, refer to Section 6.2 “Base Map” in this FIS Report.

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

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Emmons 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 27 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.

Figure 2. FIRM Notes to Users *(continued)*

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Emmons County, North Dakota, effective **To Be Determined**.

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

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Emmons County.

Figure 3: Map Legend for FIRM

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

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

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

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.

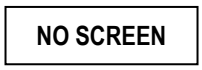
Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.

Area with Reduced Flood Hazard due to Accredited or Provisionally Accredited Levee System: Area is shown as reduced flood hazard from the 1-percent-annual-chance or greater flood by a levee system. Overtopping or failure of any levee system is possible.

Area with Undetermined Flood Hazard due to Non-Accredited Levee System: Analysis and mapping procedures for non-accredited levee systems were applied resulting in a flood insurance rate zone where flood hazards are undetermined, but possible.

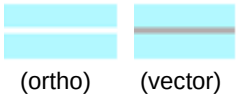
OTHER AREAS

Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.



Unshaded Zone X: Areas of minimal flood hazard.

FLOOD HAZARD AND OTHER BOUNDARY LINES



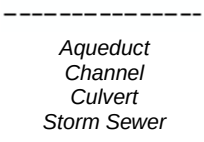
Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)

Limit of Study

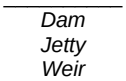
Jurisdiction Boundary

Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet

GENERAL STRUCTURES



Channel, Culvert, Aqueduct, or Storm Sewer



Dam, Jetty, Weir

Levee, Dike, or Floodwall

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

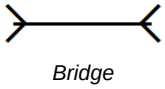
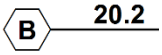
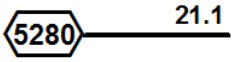
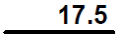
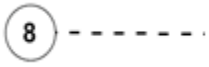
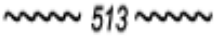
	Bridge
REFERENCE MARKERS	
	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Coastal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

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

MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}E$	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-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 Emmons 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-percent-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 22), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1-percent and 0.2-percent-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-percent-annual-chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-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 Emmons County, 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 12. 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-percent-annual-chance floodplain corresponds to the SFHAs. The 0.2-percent-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.

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
Beaver Creek	Emmons County, Unincorporated Areas; Linton, City of	Approximately 0.2 miles downstream of 6th Avenue SE	Approximately 3.1 miles upstream of US Hwy 83 / Broadway St N	10130104	5.8		Y	AE	2020
Horner's Ravine	Emmons County, Unincorporated Areas; Linton, City of	Confluence with Beaver Creek	Approximately 0.9 miles upstream of East Sampson Ave	10130104	1.6		N	AE	2020
Sheep Shed Coulee	Emmons County, Unincorporated Areas	Confluence with Unnamed Tributary 1	Approximately 0.6 miles upstream of Laurel Avenue	10130104	0.8		N	A	2020
	Emmons County, Unincorporated Areas; Linton, City of	Confluence with Spring Creek Overflow	Confluence with Unnamed Tributary 1	10130104	1.0		N	AE	2020
Spring Creek	Emmons County, Unincorporated Areas; Linton, City of	Confluence with Beaver Creek	Approximately 0.1 miles upstream of 78th Street SE	10130104	2.3		Y	AE	2020
Spring Creek Overflow	Emmons County, Unincorporated Areas; Linton, City of	Convergence with Spring Creek	Divergence from Spring Creek	10130104	1.1		Y	AE	2020
Unnamed Tributary 1	Emmons County, Unincorporated Areas	Confluence with Sheep Shed Coulee	Approximately 0.6 miles upstream from the confluence with Sheep Shed Coulee	10130104	0.6		N	A	2020
Unnamed Tributary 2	Emmons County, Unincorporated Areas	Confluence with Sheep Shed Coulee	Approximately 0.8 miles upstream from the confluence with Sheep Shed Coulee	10130104	0.8		N	A	2020

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

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Unnamed Tributary 3	Emmons County, Unincorporated Areas	Confluence with Sheep Shed Coulee	Approximately 0.4 miles upstream from the confluence with Sheep Shed Coulee	10130104	0.4		N	A	2020

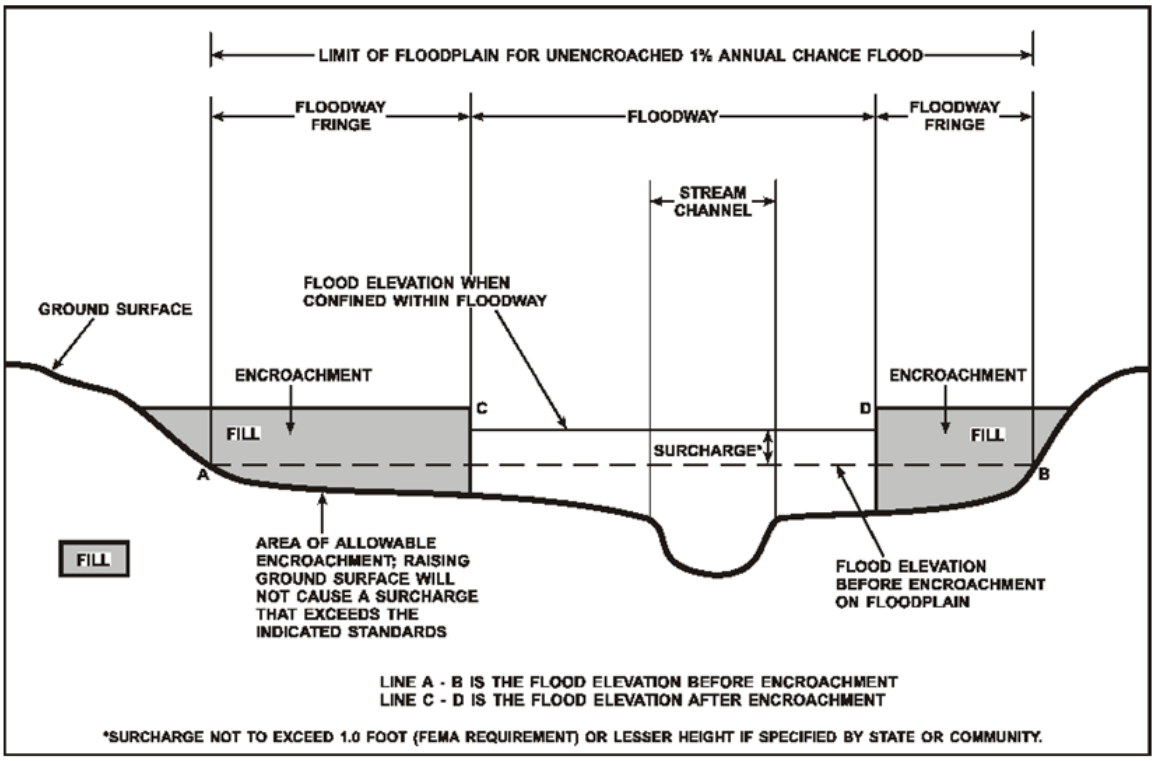
2.2 Floodways

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-percent-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-percent-annual-chance flood. The floodway fringe is the area between the floodway and the 1-percent-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-percent-annual-chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

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

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 23, "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-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The BFE is the elevation of the 1-percent-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.

BFEs are primarily intended for flood insurance rating purposes. 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. 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. For example, the user may use the FIRM to determine the stream station of a location of interest and then use the profile to determine the 1-percent annual chance elevation at that location. Because only selected cross sections may be shown on the FIRM for riverine areas, the profile should be used to obtain the flood elevation between mapped cross sections. Additionally, for riverine areas, whole-foot elevations shown on the FIRM may not exactly reflect the elevations derived from the hydraulic analyses; therefore, elevations obtained from the profile may more accurately reflect the results of the hydraulic analysis.

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-percent-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-percent-annual-chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in Emmons County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Braddock, City of	X
Emmons County, Unincorporated Areas	X, A, AE
Hague, City of	X
Hazelton, City of	X
Linton, City of	X, AE
Strasburg, City of	X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 4 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 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Apple Creek	10130103	Apple Creek	The Apple Creek watershed encompasses the northeast portion of Emmons County, ND. The sub-basin is part of the Missouri Region – Missouri-Oahe Sub-Region. All drainage patterns flow towards Hay Creek, downstream to its confluence with Apple Creek before making its way into the Missouri River.	3,707
Beaver	10130104	Beaver Creek	The Beaver Creek watershed is located within south central North Dakota. The meandering creek flows west from Beaver Lake to the Missouri River. The northern and eastern portions of the watershed are characterized by steep, rolling hills and hummocky areas with nonintegrated drainage existing near the southern and eastern edges of the basin.	1,036
Upper Lake Oahe	10130102	Lake Oahe	Dominating the eastern and southern portions of Emmons County, ND, the Upper Lake Oahe watershed contains one of the six main stem reservoirs (Lake Oahe) on the Upper Missouri River. The relief of the watershed varies from flat, gently rolling plains in the glaciated regions to steep and dissected rolling plains to the west and drains into the Missouri River basin.	3771

4.2 Principal Flood Problems

Table 5 contains a description of the principal flood problems that have been noted for Emmons County by flooding source.

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
Beaver Creek	The City of Linton, located within Emmons County, has experienced numerous floods from Beaver Creek and local tributaries. Most peak flows are caused by rain in conjunction with snowmelt events. The largest on record took place in March 2009 with a peak discharge of 14,000 cfs.
	The largest rainfall event took place in June of 1953 and caused extensive flooding in the City of Linton. A total of 29 homes in the Old Town area were flooded.
Horner's Ravine	Horner's Ravine is intercepted by a storm drain system in the developed area of Linton at 1st Street SE. However, the storm drain system cannot carry the entire 100-year flow resulting in overland flows.
Spring Creek and Spring Creek Overflow	Spring Creek splits into Spring Creek and Spring Creek Overflow upstream of Laurel Avenue. The main channel flow is routed beneath US Hwy 83. During higher flow events, the flows from both flooding sources intermix and cause substantial flooding across US Hwy 83.

Table 6 contains information about historic flood elevations in the communities within Emmons County.

Table 6: Historic Flooding Elevations

[Not Applicable to this Flood Risk Project]

4.3 Dams and Other Flood Hazard Reduction Measures

Table 7 contains information about non-levee flood hazard reduction measures within Emmons County such as dams or jetties. Levee systems are addressed in Section 4.4 of this FIS Report.

Table 7: Dams and Other Flood Hazard Reduction Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Horner's Ravine	Horner's Ravine Dam	Dam	Approximately 0.6 miles upstream of East Sampson Ave	Dam

4.4 Levee Systems

This section is not applicable to this Flood Risk Project.

Table 8: Levee Systems

[Not Applicable to this Flood Risk Project]

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources in the community, standard hydrologic and hydraulic study

methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance, respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 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.

In addition to these flood events, the “1-percent-plus”, or “1%+”, annual chance flood elevation has been modeled and included on the flood profile for certain flooding sources in this FIS Report. While not used for regulatory or insurance purposes, this flood event has been calculated to help illustrate the variability range that exists between the regulatory 1-percent-annual-chance flood elevation and a 1-percent-annual-chance elevation that has taken into account an additional amount of uncertainty in the flood discharges (thus, the 1% “plus”). For flooding sources whose discharges were estimated using regression equations, the 1%+ flood elevations are derived by taking the 1-percent-annual-chance flood discharges and increasing the modeled discharges by a percentage equal to the average predictive error for the regression equation. For flooding sources with gage- or rainfall-runoff-based discharge estimates, the upper 84-percent confidence limit of the discharges is used to compute the 1%+ flood elevations.

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 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 9. Stream gage information is provided in Table 11.

Table 9: 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	1% Plus Annual Chance	0.2% Annual Chance
Beaver Creek	At USGS gage 06354580. Just upstream of 6th Ave SE	765.0	4,846	8,534	12,180	16,660	25,680	30,830
Horner's Ravine	At the double box culverts under US Hwy 83	0.7	134	210	271	335	548	488
	Approximately 130 feet west of the intersection of 2nd Street SE and South Milwaukee Ave	0.4	114	178	229	282	461	409
	Just downstream of 2nd Street SE	0.4	111	175	227	280	458	409
	Approximately 455 feet upstream of East Sampson Avenue	0.4	106	167	217	269	439	393
	Just downstream of the Horner's Ravine Dam	0.3	87	138	180	223	365	329
Sheep Shed Coulee	Just upstream of 1st Street NW	2.0	273	433	562	698	1,141	1,025
Spring Creek	At the convergence of Spring Creek and Spring Creek Overflow	35.6	1,954	3,820	5,604	7,672	18,053	13,310
	Near divergence of Spring Creek Overflow from Spring Creek	32.8	1,860	3,636	5,339	7,308	17,198	12,678

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

[Not Applicable to this Flood Risk Project]

Table 11: 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
Beaver Creek	06354500	U.S. Geological Survey	Beaver Creek at Linton, ND	717	09/01/1949	09/29/1989
Beaver Creek	06354580	U.S. Geological Survey	Beaver Creek below Linton, ND	765	10/01/1989	09/30/2017
Spring Creek	06354700	U.S. Geological Survey	Spring Creek near Linton, ND	23	10/01/1954	09/30/1973

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 in Table 23, “Floodway Data.”

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 12. Roughness coefficients are provided in Table 13. 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 12: 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
Beaver Creek	Approximately 0.2 miles downstream of 6th Avenue SE	Approximately 3.1 miles upstream of US Hwy 83 / Broadway St N	PeakFQ 7.2 (Bulletin 17C method)	HEC-RAS 5.0.6	01/31/2020	AE w/ Floodway	Gage Nos. 06354500 and 0635480 were used in hydrologic analysis. Hydraulic models incorporated field measured bridge and culvert data.
Horner's Ravine	Confluence with Beaver Creek	Approximately 0.9 miles upstream of East Sampson Ave	2015 North Dakota Regression Equations	HEC-RAS 5.0.6 (1D) and HEC-RAS 5.0.7 (2D)	01/31/2020	AE	A portion of Horner's Ravine was modeled using the 2-dimensional flow routines in HEC-RAS (version 5.0.7)
Sheep Shed Coulee	Confluence with Unnamed Tributary 1	Approximately 0.6 miles upstream of Laurel Avenue	2015 North Dakota Regression Equations	HEC-RAS 5.0.6	01/31/2020	A	
	Confluence with Spring Creek Overflow	Confluence with Unnamed Tributary 1				AE	
Spring Creek	Confluence with Beaver Creek	Approximately 0.1 miles upstream of 78th Street SE	PeakFQ 7.2 (Bulletin 17C method)	HEC-RAS 5.0.6 (1D) and HEC-RAS 5.0.7 (2D)	01/31/2020	AE w/ Floodway	Gage No. 06354700 was used in hydrologic analysis. Hydraulic models incorporated field measured bridge and culvert data. Also, a 2-dimensional HEC-RAS model was created to characterize the flow split between Spring Creek and Spring Creek Overflow.
Spring Creek Overflow	Convergence with Spring Creek	Divergence from Spring Creek	HEC-RAS 5.0.6	HEC-RAS 5.0.6 (1D) and HEC-RAS 5.0.7 (2D)	01/31/2020	AE w/ Floodway	Flow Rate determined from Hydraulic Model Breakout Flow. Also, a 2-dimensional HEC-RAS model was created to characterize the flow split between Spring Creek and Spring Creek Overflow.
Unnamed Tributary 1	Confluence with Sheep Shed Coulee	Approximately 0.6 miles upstream from the confluence with Sheep Shed Coulee	2015 North Dakota Regression Equations	HEC-RAS 5.0.6	01/31/2020	A	
Unnamed Tributary 2	Confluence with Sheep Shed Coulee	Approximately 0.8 miles upstream from the confluence with Sheep Shed Coulee	2015 North Dakota Regression Equations	HEC-RAS 5.0.6	01/31/2020	A	

Table 12: Summary of Hydrologic and Hydraulic Analyses *(continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Tributary 3	Confluence with Sheep Shed Coulee	Approximately 0.4 miles upstream from the confluence with Sheep Shed Coulee	2015 North Dakota Regression Equation	HEC-RAS 5.0.6	01/31/2020	A	

Table 13: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
Beaver Creek	0.035-0.040	0.050-0.100
Horner’s Ravine	0.035	0.050-0.100
Sheep Shed Coulee	0.032-0.045	0.045-0.050
Spring Creek	0.035	0.040-0.070
Spring Creek Overflow	0.035	0.045
Approximate streams	0.035	0.050

5.3 Coastal Analyses

This section is not applicable to this Flood Risk Project.

Table 14: 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 15: 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 16: 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 17: Summary of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

Table 18: 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.

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 visit the NGS website at www.ngs.noaa.gov.

The datum conversion locations and values that were calculated for Emmons County are provided in Table 19.

Table 19: Countywide Vertical Datum Conversion

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Appert Lake	SE	46.375	-100.125	1.414
Braddock	SE	46.500	-100.000	1.371
Braddock NE	SE	46.625	-100.000	1.385

Table 19: Countywide Vertical Datum Conversion *(continued)*

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Braddock NW	SE	46.625	-100.125	1.388
Cannon Ball	SE	46.375	-100.500	1.329
Cannon Ball SE	SE	46.250	-100.500	1.276
Dana	SE	46.500	-100.125	1.391
Fort Rice	SE	46.500	-100.500	1.381
Fort Yates NE	SE	46.125	-100.500	1.276
Fort Yates NW	SE	46.125	-100.625	1.263
Fort Yates SE	SE	46.000	-100.500	1.240
Grassna	SE	46.000	-100.250	1.348
Grassna NE	SE	46.125	-100.250	1.362
Grassna NW	SE	46.125	-100.375	1.322
Hague	SE	46.000	-99.875	1.355
Hazelton	SE	46.375	-100.250	1.394
Hazelton NW	SE	46.375	-100.375	1.378
Hazelton SW	SE	46.250	-100.375	1.280
Huff	SE	46.500	-100.625	1.362
Huff NE	SE	46.625	-100.500	1.388
Kiefer Buttes	SE	46.000	-100.375	1.306
Kintyre	SE	46.500	-99.875	1.394
Linton	SE	46.250	-100.125	1.368
Linton NE	SE	46.375	-100.000	1.440
Moffit	SE	46.625	-100.250	1.342
Moffit NW	SE	46.625	-100.375	1.378
Moffit SE	SE	46.500	-100.250	1.411
Moffit SW	SE	46.500	-100.375	1.417
Pursian Lake	SE	46.625	-99.875	1.401
Rohrich Dam	SE	46.250	-100.000	1.394
Schell Buttes NW	SE	46.375	-99.875	1.430
Schell Buttes SW	SE	46.250	-99.875	1.417
Senger Lake North	SE	46.125	-100.000	1.394
Senger Lake South	SE	46.000	-100.000	1.335
Strasburg	SE	46.125	-100.125	1.362
Sugarloaf Butte	SE	46.625	-100.625	1.348
Temvik	SE	46.250	-100.250	1.299
Weisser Dam West	SE	46.125	-99.875	1.414

Table 19: Countywide Vertical Datum Conversion *(continued)*

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Westfield	SE	46.000	-100.125	1.339
Average Conversion from NGVD29 to NAVD88 = 1.361 feet				

Table 20: 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/flood-maps/guidance-partners/guidelines-standards.

Base map information shown on the FIRM was derived from the sources described in Table 21.

Table 21: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
City Boundaries	North Dakota Department of Transportation	2017	1:24,000	Location and attributes for the city limits shown on the FIRM
County Boundaries	North Dakota State Water Commission	2013	1:24,000	Location and attributes for the county boundaries shown on the FIRM
Digital Orthophoto	USDA FSA APFO (Aerial Photography Field Office)	2020	1:12,000	Base Imagery
FIRM Panel Layout	Federal Emergency Management Agency	2009	1:24,000	County-wide FIRM panel scheme and number attribution
HUC-8 Subbasins	United States Geological Survey	2015	1:12,000	Watersheds used in the hydrologic analysis

Table 21: Base Map Sources *(continued)*

Data Type	Data Provider	Data Date	Data Scale	Data Description
Public Land Survey System (PLSS)	North Dakota State Water Commission	2013	1:24,000	Location and attributes of sections, townships, and ranges on the FIRM.
Transportation Features	U.S. Census Bureau, Geography Division	2017	1:24,000	Location and attributes for roads and other transportation features shown on the FIRM
Water Lines	North Dakota State Water Commission	2008	1:100,000	Location and attributes for streams, rivers, and lakes

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 22.

In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

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 23, “Floodway Data.”

Table 22: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Vertical Accuracy	Horizontal Accuracy	Citation
Emmons County	All Flooding Sources	James River Basin Phase 5 Light Detection and Ranging (LiDAR) data	15cm $RMSE_z$	0.6m $RMSE_h$	USACE 2010

BFEs shown at cross sections on the FIRM represent the 1-percent-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 23: 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	1,042	402	3,710	4.6	1,699.5	1,699.5	1,700.1	0.6
B	1,825	904	5,958	2.8	1,702.4	1,702.4	1,702.6	0.2
C	4,607	820	5,865	2.8	1,705.7	1,705.7	1,706.1	0.4
D	7,714	1,091	6,719	2.5	1,707.0	1,707.0	1,707.7	0.7
E	9,586	1,004	6,936	2.4	1,708.1	1,708.1	1,709.1	1.0
F	10,775	776	4,636	3.6	1,709.3	1,709.3	1,710.1	0.8
G	14,321	1,652	9,913	2.4	1,711.3	1,711.3	1,712.1	0.8
H	15,055	1,398	7,503	2.2	1,712.8	1,712.8	1,713.5	0.7
I	18,287	1,165	5,897	2.8	1,714.4	1,714.4	1,715.1	0.7
J	19,818	1,044	7,127	2.3	1,716.2	1,716.2	1,716.7	0.5
K	22,214	1,251	6,003	2.8	1,717.5	1,717.5	1,718.1	0.6
L	24,819	1,123	7,974	2.1	1,719.3	1,719.3	1,719.8	0.5
M	29,657	490	4,553	3.7	1,722.5	1,722.5	1,722.8	0.3

[1] Feet above Limit of Detailed Study (Limit of Detailed Study is approximately 1,100 feet downstream of 6th Avenue SE Bridge)

Table 23: Floodway Data *(continued)*

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	1,444	696[3]	1,456	5.3	1,704.7	1,701.9[2]	1,702.8	0.9
B	2,814	874[3]	3,442	4.3	1,706.1	1,706.1	1,707.1	1.0
C	5,073	78	583	11.2	1,713.5	1,713.5	1,714.5	1.0
D	5,290	173	1,432	2.5	1,719.4	1,719.4	1,719.7	0.3
E	6,731	57	363	9.3	1,720.6	1,720.6	1,721.2	0.6
F	7,616	41	255	13.2	1,724.2	1,724.2	1,724.6	0.4
G	8,055	43	487	6.9	1,728.1	1,728.1	1,728.2	0.1
H	8,509	78	586	5.7	1,729.5	1,729.5	1,729.6	0.1
I	8,782	735	1,727	4.4	1,730.2	1,730.2	1,730.2	0.0
J	10,299	340	993	7.4	1,733.4	1,733.4	1,733.4	0.0
K	11,470	490	1,825	4.0	1,738.6	1,738.6	1,739.0	0.4
L	11,671	488	3,286	4.2	1,741.3	1,741.3	1,742.2	0.9

[1] Feet above confluence with Beaver Creek
[2] Elevation does not include backwater effects from Beaver Creek
[3] Floodway width influenced by Beaver Creek

Table 23: Floodway Data *(continued)*

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	1,328	693	3,800	1.1	1,719.4	1,719.4	1,720.3	0.9
B	2,844	485	1,865	2.3	1,720.2	1,720.2	1,720.8	0.6
C	3,213	405	1,013	4.3	1,721.3	1,721.3	1,722.1	0.8
D	3,485	619	4,058	3.3	1,725.0	1,725.0	1,725.0	0.0
E	5,143	247	558	7.7	1,726.4	1,726.4	1,726.8	0.4
F	5,526	185	575	7.5	1,729.4	1,729.4	1,730.4	1.0

[1] Feet above convergence with Spring Creek

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: SPRING CREEK OVERFLOW

Table 24: 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 25: 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 30, “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.

To obtain an application for a LOMA, visit www.fema.gov/flood-maps/change-your-flood-zone 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 www.fema.gov/flood-maps/tutorials.

For more information about how to apply for a LOMA, call the FEMA Mapping and Insurance 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 www.fema.gov/flood-maps/change-your-flood-zone 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 Mapping and Insurance 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 www.fema.gov/flood-maps/tutorials.

6.5.3 Letters of Map Revision

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

To obtain an application for a LOMR, visit www.fema.gov/media-library/assets/documents/1343 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 Mapping and Insurance 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 Emmons County FIRM are listed in Table 26.

Table 26: Incorporated Letters of Map Change

[Not Applicable to this Flood Risk Project]

6.5.4 Physical Map Revisions

A Physical Map Revisions (PMR) is 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 www.fema.gov and visit the Floods & Maps "Change Your Flood Zone Designation" section.

6.5.5 Contracted Restudies

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

6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of Emmons County. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBMs) and/or Flood Boundary and Floodway Maps (FBFMs) 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 27, "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 27 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 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.

- *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 PMRs 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 Emmons County FIRMs in countywide format was **To Be Determined.**

Table 27: Community Map History

Community Name	Initial Identification Date	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Braddock, City of[1,2]	**TBD**	N/A	N/A	**TBD**	N/A
Emmons County, Unincorporated Areas	02/04/1987	N/A	N/A	02/04/1987	**TBD**
Hague, City of[1,2]	**TBD**	N/A	N/A	**TBD**	N/A
Hazelton, City of[1,2]	**TBD**	N/A	N/A	**TBD**	N/A
Linton, City of	06/28/1974	06/28/1974	12/19/1975	11/19/1980	**TBD** 09/30/1992
Strasburg, City of[1,2]	**TBD**	N/A	N/A	**TBD**	N/A

[1] No Special Flood Hazard Areas Identified
[2] This community did not have a FIRM prior to the first countywide FIRM for Emmons County

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

Table 28 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

Table 28: Summary of Contracted Studies Included in this FIS Report

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
All Flooding Sources	**TBD**	Atkins	EMW-2018-CA-APP-00029	January 2020	Emmons County, Unincorporated Areas; Linton, City of

7.2 Community Meetings

The dates of the community meetings held for this Flood Risk Project and previous Flood Risk Projects are shown in Table 29. 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 29: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Emmons County, Unincorporated Areas	**TBD**	**TBD**	CCO Meeting	**TBD**
		02/16/2021	Flood Risk Review Meeting	FEMA Region VIII, Apex Engineering, North Dakota State Water Commission, Atkins, and community officials
Linton, City of	**TBD**	**TBD**	CCO Meeting	**TBD**
		02/16/2021	Flood Risk Review Meeting	FEMA Region VIII, Apex Engineering, North Dakota State Water Commission, Atkins, and community officials

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 www.fema.gov.

The additional data that was used for this project includes the FIS Report and FIRM that were previously prepared for the City of Linton, (FEMA 1992).

Table 30 is a list of the locations where FIRMs for Emmons 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 30: Map Repositories

Community	Address	City	State	Zip Code
Braddock, City of [1]	Braddock Community Hall 107 Mitchell Street North	Braddock	ND	58524
Emmons County, Unincorporated Areas	Emmons County Courthouse 100 4th Street Northwest	Linton	ND	58552
Hague, City of [1]	City Clerk's Office 10050 18th Ave Southeast	Hague	ND	58542
Hazelton, City of [1]	City Hall 342 Main Street	Hazelton	ND	58544
Linton, City of	City Hall 101 Northeast 1st Street	Linton	ND	58552
Strasburg, City of [1]	City Hall 713 Main Street	Strasburg	ND	58573

[1] No 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 31.

Table 31 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 31: Additional Information

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	www.fema.gov/flood-maps/products-tools/know-your-risk/engineers-surveyors-architects
NFIP website	www.fema.gov/flood-insurance
NFHL Dataset	msc.fema.gov
FEMA Region VIII	Denver Federal Center Building 710, Box 25267 Denver, CO 80225-0267 (303) 235-4800
Other Federal Agencies	
USGS website	www.usgs.gov
Hydraulic Engineering Center website	www.hec.usace.army.mil
State Agencies and Organizations	
State NFIP Coordinator	Dionne Haynes North Dakota State Water Commission 900 East Boulevard Avenue Bismarck, ND 58505-0850 (701) 328-4961 dfhaynes@nd.gov
State GIS Coordinator	Bob Nutsch, GIS Coordinator Information Technology Department 600 East Boulevard, Department 112 Bismarck, ND 58505-0100 (701) 328-3212 bnutsch@nd.us

SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES

Table 32 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 32: 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
FEMA 1992	Federal Emergency Management Agency	*Flood Insurance Study, City of Linton, Emmons County, North Dakota*	FEMA	Linton, ND	September 1992	https://msc.fema.gov/portal/advanceSearch
FEMA 2020	Federal Emergency Management Agency	*All approximate and detailed flooding*	ATKINS	Washington, D.C.	January 2020	https://msc.fema.gov/portal
ND DOT 2017	North Dakota Department of Transportation	*North Dakota City Boundaries*	North Dakota Department of Transportation	Bismarck, ND	January 2017	https://gisdata.nd.gov/
NDSWC 2008	North Dakota State Water Commission	*Water Lines*	North Dakota State Water Commission	Bismarck, ND	January 2008	https://gisdata.nd.gov/
NDSWC 2013	North Dakota State Water Commission	*PLSS Areas*	North Dakota State Water Commission	Bismarck, ND	July 2013	https://gisdata.nd.gov/
NDSWC 2013a	North Dakota State Water Commission	*North Dakota County Boundaries*	North Dakota State Water Commission	Bismarck, ND	May 2013	https://gisdata.nd.gov/
NDSWC 2018	North Dakota State Water Commission	*Discovery Report Emmons County, North Dakota*	Federal Emergency Management Agency Region VIII and North Dakota State Water Commission	Bismarck, ND	May 2018	

Table 32: Bibliography and References *(continued)*

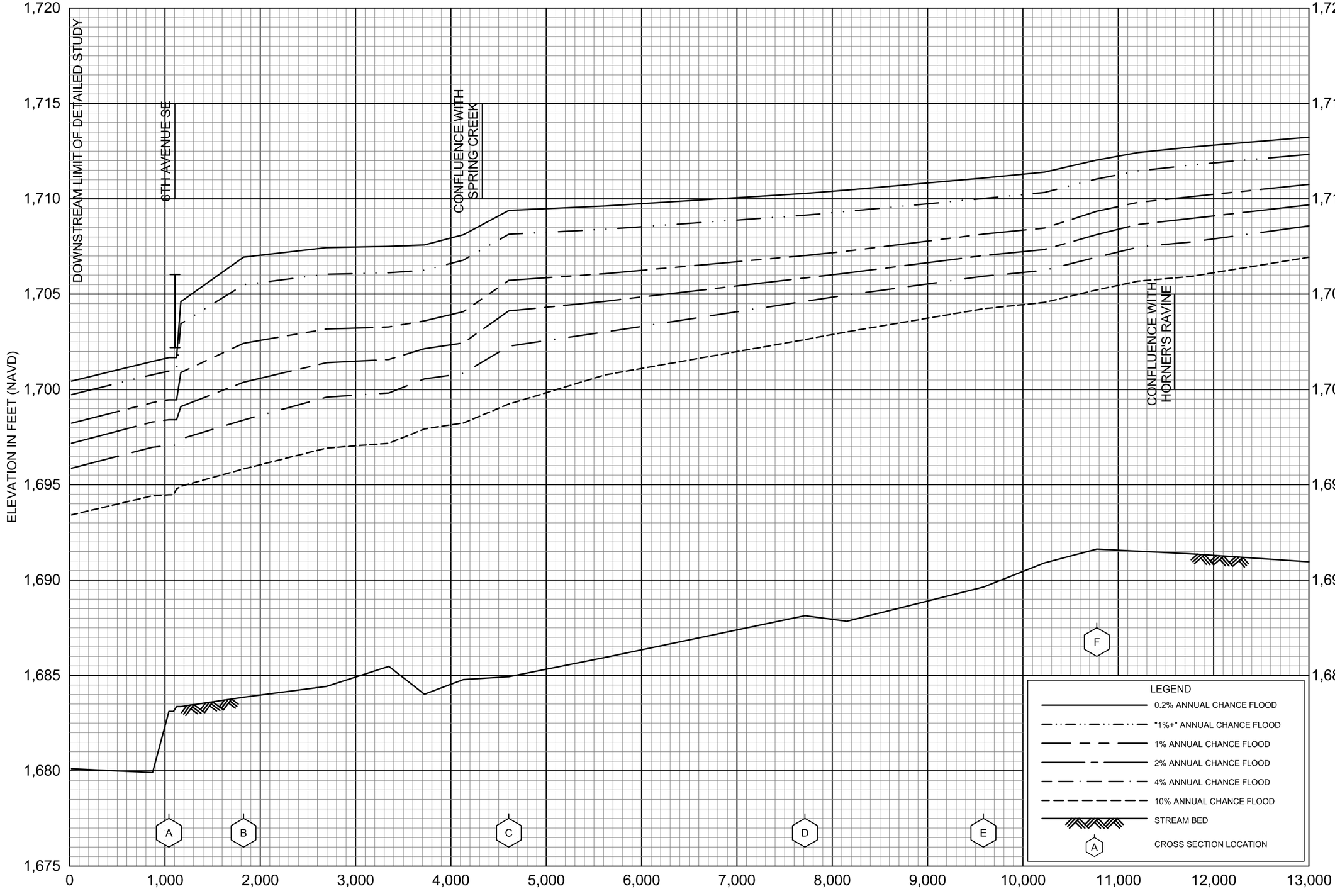
Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
NDSWC 2019	North Dakota State Water Commission	*Hydrologic Report for Beaver Creek, Spring Creek, Sheep Shed Coulee, and Horner's Ravine, Emmons County, North Dakota*	Apex Engineering Group, Inc.	Bismarck, ND	June 2019	
NDSWC 2020	North Dakota State Water Commission	*Emmons County FY18 Risk MAP Hydraulics Report for Beaver Creek, Spring Creek, and Other Streams*	ATKINS	Bismarck, ND	January 2020	
U.S. CENSUS 2017	U.S. Census Bureau, Geography Division	*Emmons County Transportation Features*	U.S. Census Bureau, Geography Division	Washington, D.C.	May 2017	https://gisdata.nd.gov/
USACE 2010	USACE St. Louis District	*2010 James River Watershed LiDAR*	Fugro Horizons Inc.	St. Louis, MO	January 2010	https://lidar.swc.nd.gov/
USACE 2016	U.S. Army Corps of Engineers	*Emmons County Section 22 Beaver Creek Hydrology Report for Emmons, Logan, and McIntosh Counties, North Dakota*	North Dakota State Water Commission	Reston, VA	August 2016	https://www.swc.nd.gov/info_edu/reports_and_publications/prelim_engineering_reports/pdfs/beaver_creek_hydrology_report.pdf
USACE 2018	U.S. Army Corps of Engineers, Hydrologic Engineering Center	*HEC-RAS River Analysis System Version 5.0.6*	U.S. Army Corps of Engineers, Hydrologic Engineering Center	Davis, CA	November 2018	

Table 32: Bibliography and References *(continued)*

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USACE 2019	U.S. Army Corps of Engineers, Hydrologic Engineering Center	*HEC-RAS River Analysis System Version 5.0.7*	U.S. Army Corps of Engineers, Hydrologic Engineering Center	Davis, CA	March 2019	
USDA 2020	USDA_FSA_APFO Aerial Photography Field Office	*Ortho-Imagery for Emmons County, ND*	USDA_FSA_APFO Aerial Photography Field Office	Salt Lake City, Utah	September 2020	https://datagateway.nrcs.usda.gov/
USGS 1982	U.S Department of the Interior Geological Survey, Office of Water Data Coordination	*Guidelines for Determining Flood Flow Frequency: Bulletin No. 17B*	Interagency Advisory Committee on Water Data	Reston, VA	March 1982	https://water.usgs.gov/osw/bulletin17b/dl_flow.pdf
USGS 2009	Federal Emergency Management Agency	*FIRM Panel Layout*	Atkins	Washington, D.C.	January 2009	https://msc.fema.gov/portal
USGS 2015a	United States Geological Survey	*HUC 8 watersheds for Emmons County, ND*	United States Geological Survey	Washington, DC	December 2015	https://www.usgs.gov
USGS 2015b	U.S. Geological Survey	*Regional Regression Equations to Estimate Peak Flow Frequency at Sites in North Dakota Using Data through 2009 U.S. Geological Survey Scientific Investigations Report 2015 5096*	U.S. Geological Survey	Reston, VA	January 2015	http://dx.doi.org/10.3133/sir20155096.

Table 32: Bibliography and References *(continued)*

Citation in this FIS	Publisher/ Issuer	*Publication Title,* "Article," Volume, Number, etc.	Author/Editor	Place of Publication	Publication Date/ Date of Issuance	Link
USGS 2018a	U.S. Geological Survey	*Guidelines for Determining Flood Flow Frequency Bulletin 17C: U.S. Geological Survey Techniques and Method*	U.S. Geological Survey	Reston, VA	January 2018	https://pubs.er.usgs.gov/publication/tm4B5
USGS 2018b	U.S. Geological Survey	*PeakFQ Version 7.2*	U.S. Geological Survey	Reston, VA	January 2018	
USGS 2019a	U.S. Geological Survey	*USGS Water Date: Surface Water*	U.S. Geological Survey	Reston, VA	January 2019	https://waterdata.usgs.gov/nwis
USGS 2019b	U.S. Geological Survey	*StreamStats Version 4.1.6. Retrieved September 20, 2017*	United States Geological Survey	Reston, VA	January 2019	



FLOOD PROFILES

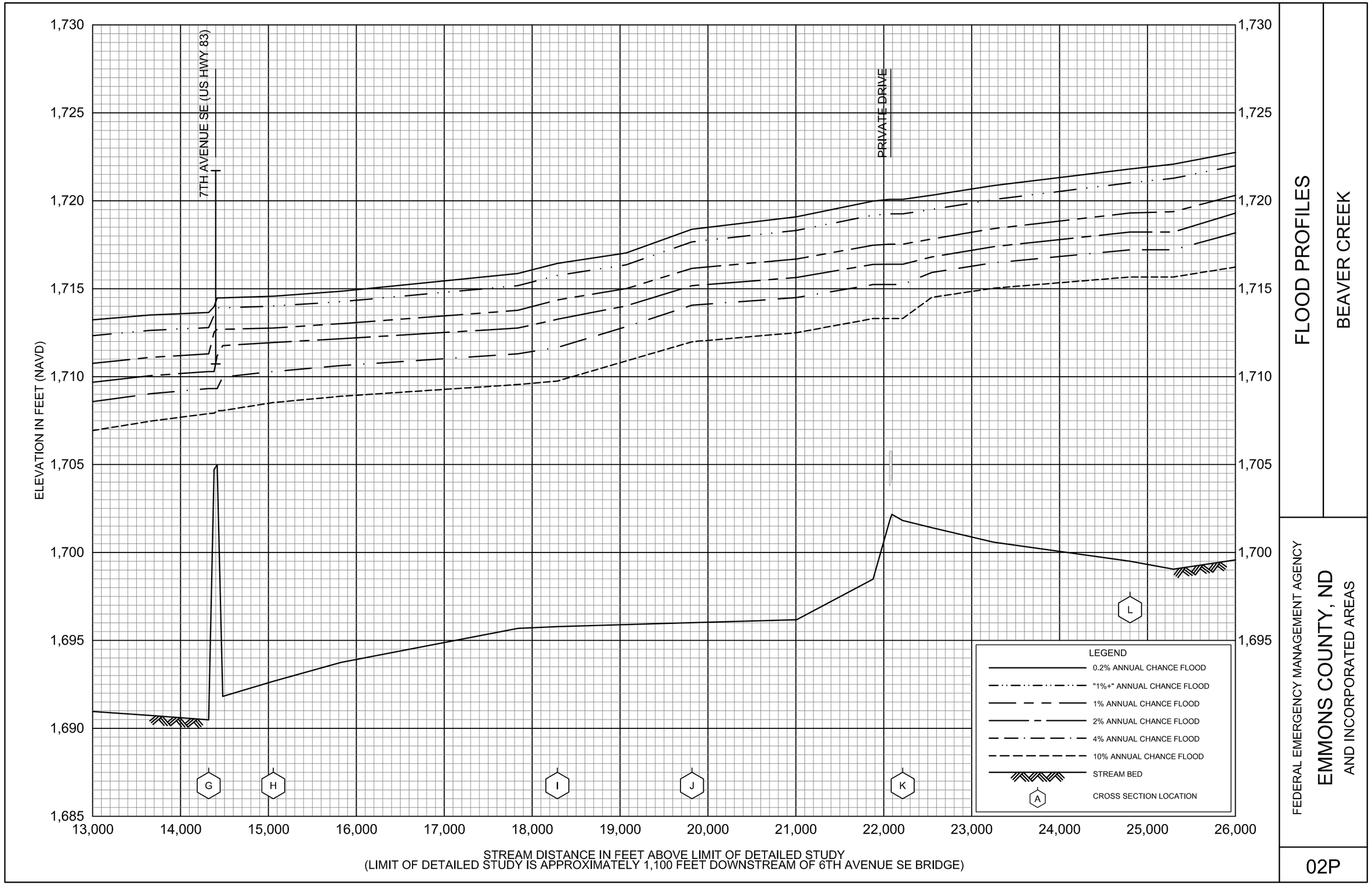
BEAVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

01P



FLOOD PROFILES

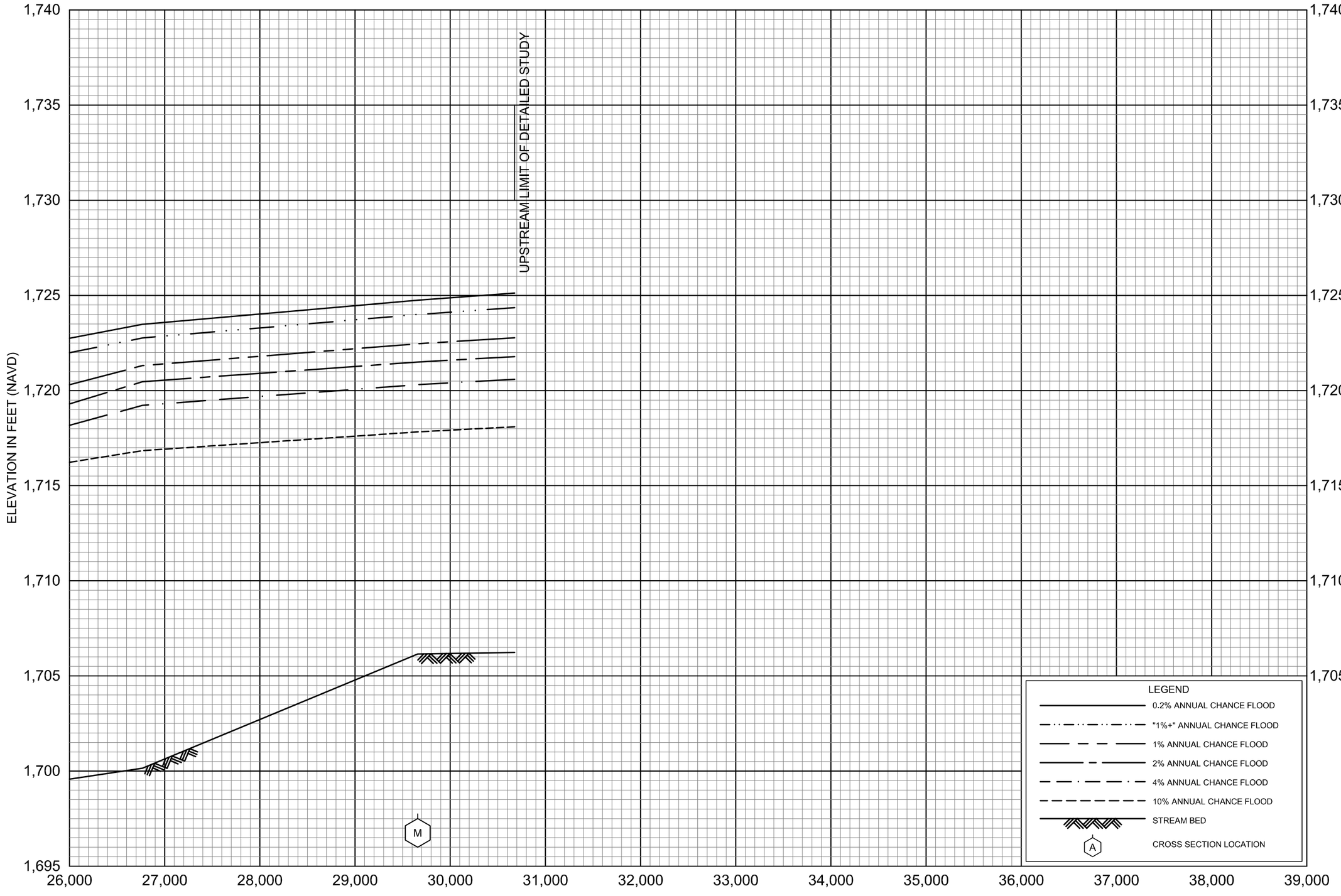
BEAVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

02P



FLOOD PROFILES

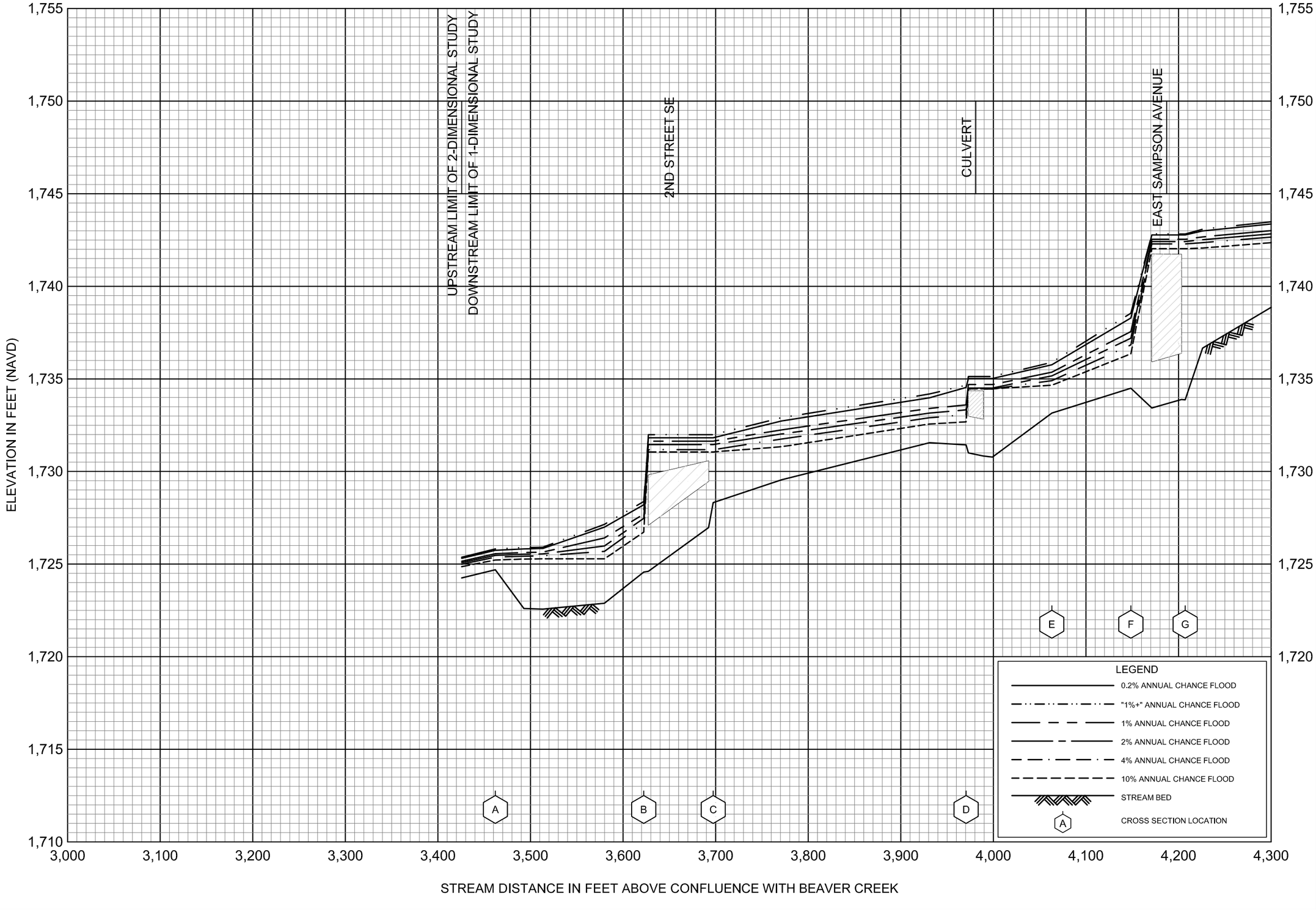
BEAVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

03P



FLOOD PROFILES

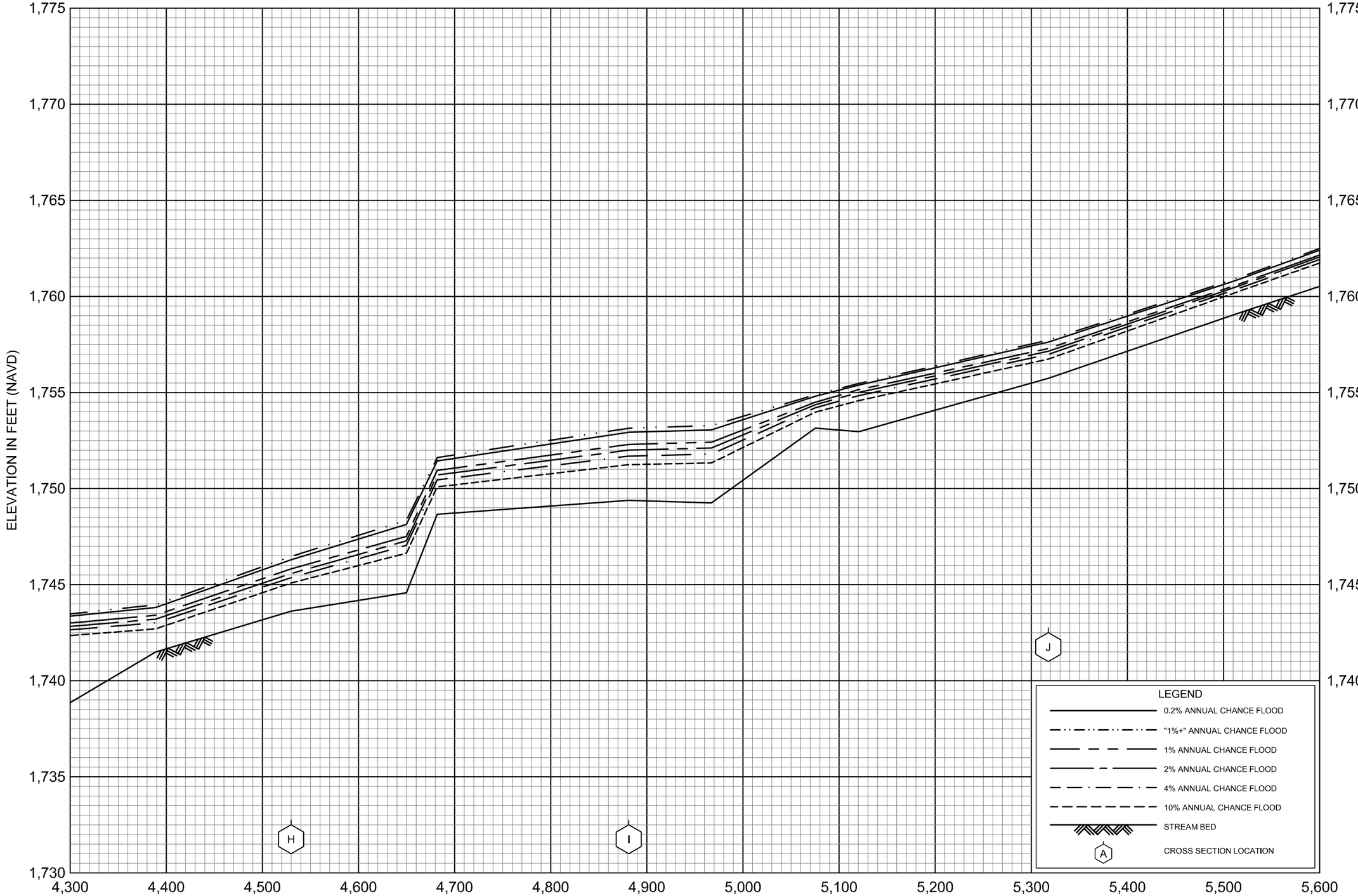
HORNER'S RAVINE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

04P



FLOOD PROFILES

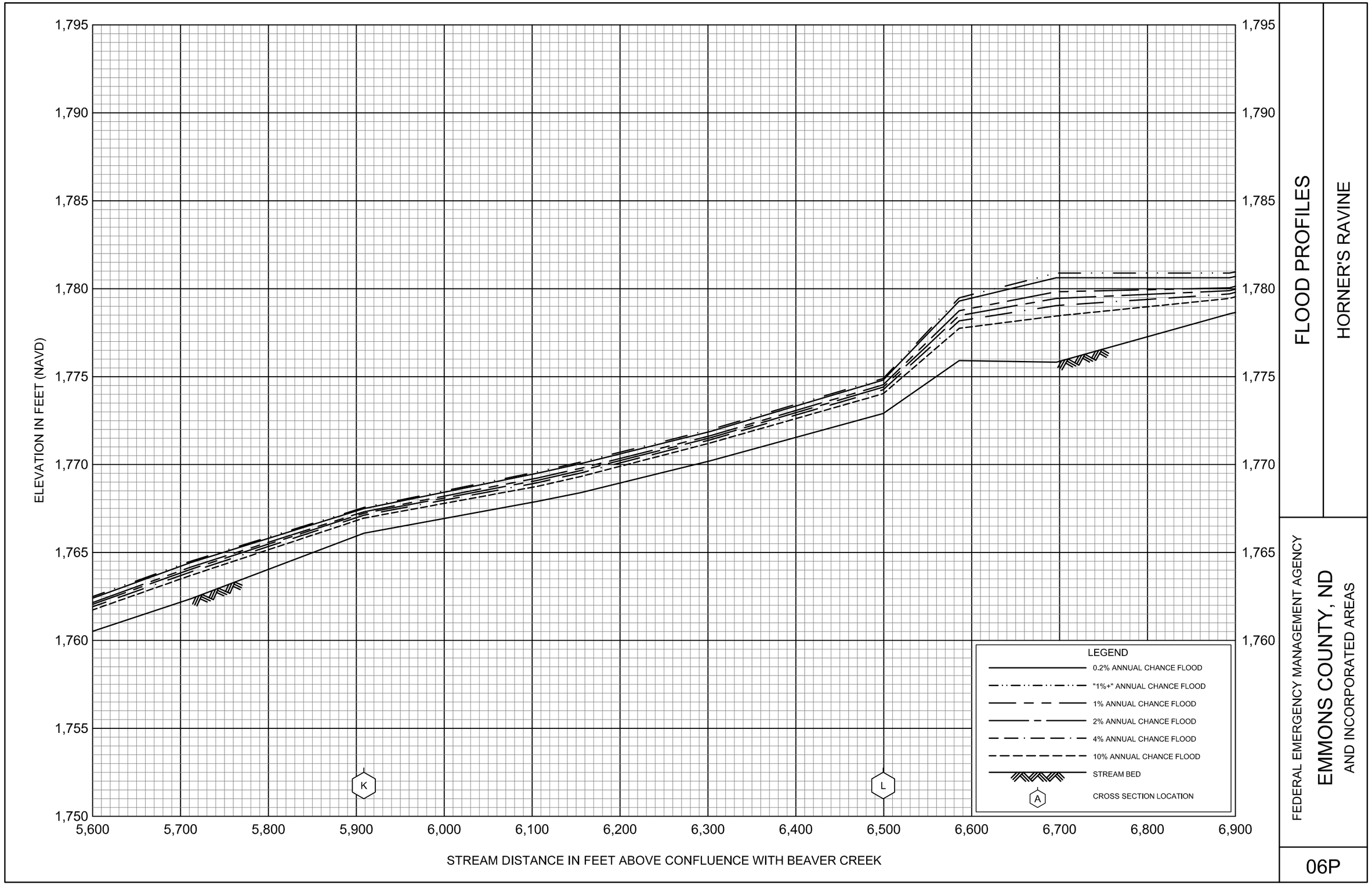
HORNER'S RAVINE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

05P



FLOOD PROFILES

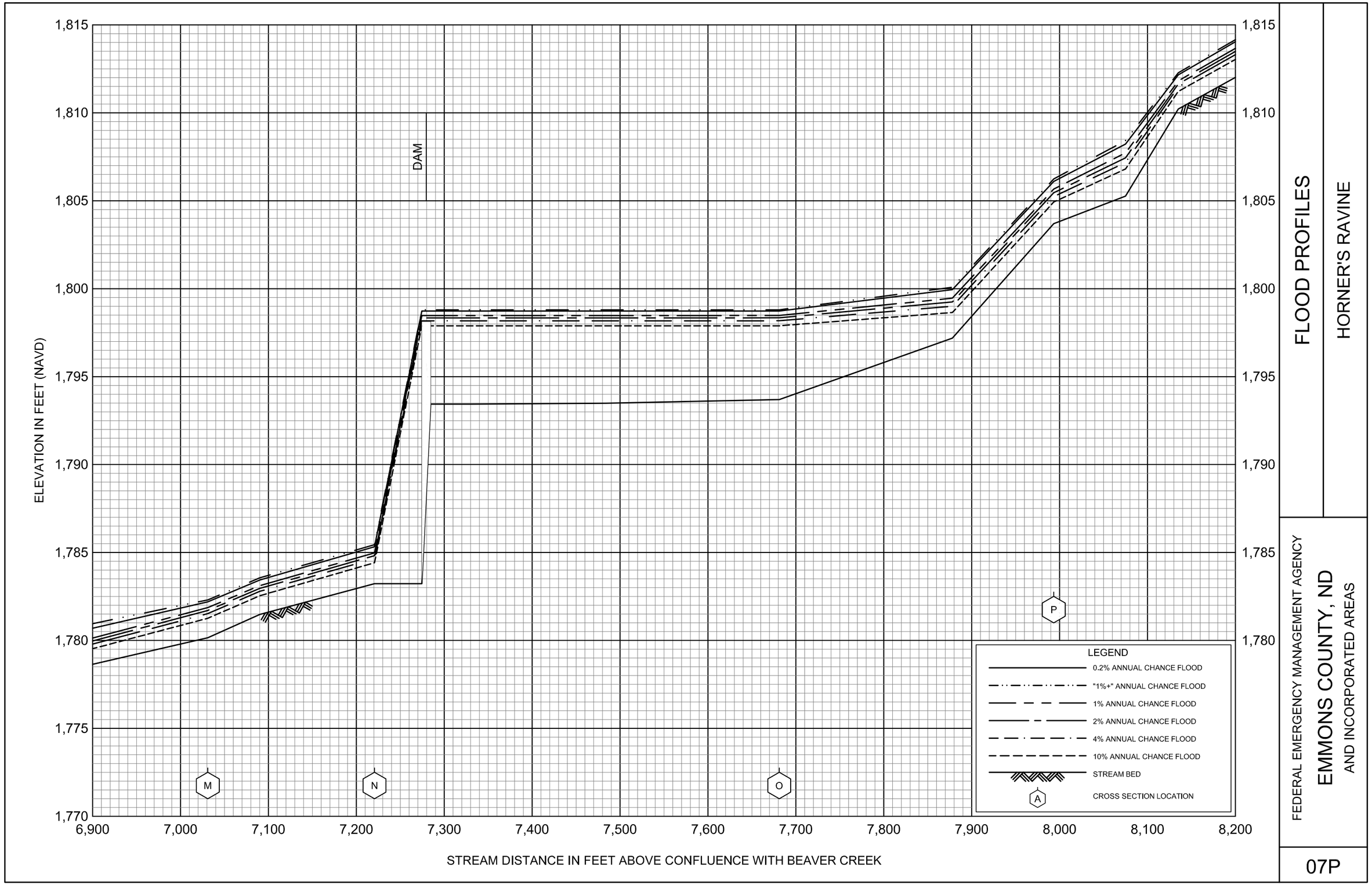
HORNER'S RAVINE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

06P



FLOOD PROFILES

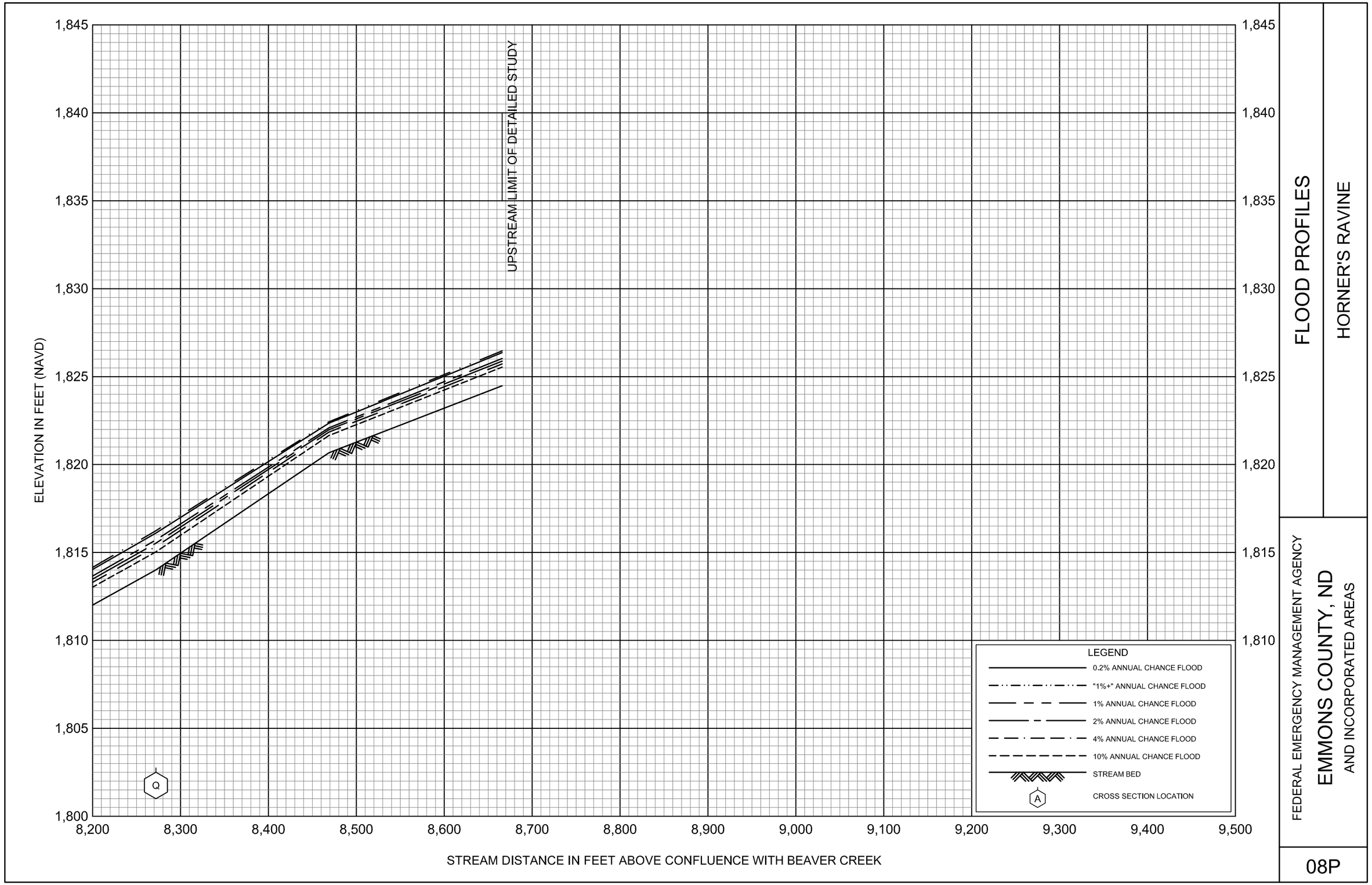
HORNER'S RAVINE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

07P



FLOOD PROFILES

HORNER'S RAVINE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

08P

1% ANNUAL CHANCE BACKWATER EFFECTS FROM SPRING CREEK OVERFLOW

CONFLUENCE WITH SPRING CREEK OVERFLOW

PRIVATE DRIVEWAY

NORTH BROADWAY STREET

ELEVATION IN FEET (NAVD)

1,750
1,745
1,740
1,735
1,730
1,725
1,720
1,715
1,710
1,705

0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH SPRING CREEK OVERFLOW

A
B
C
D
E
F
G
H

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- "1%+" ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 4% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION (A)

FLOOD PROFILES

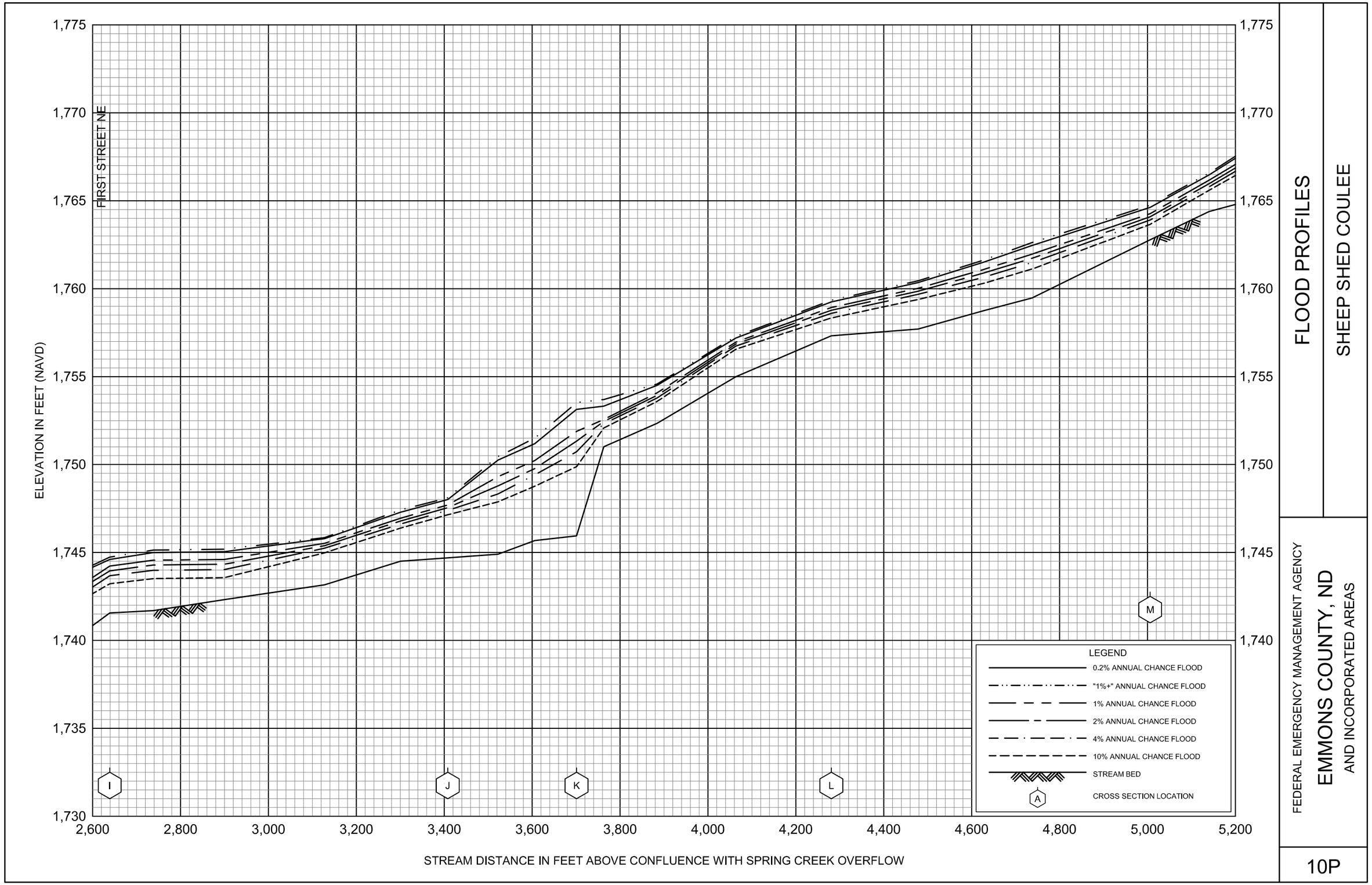
SHEEP SHED COULEE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

09P



FLOOD PROFILES

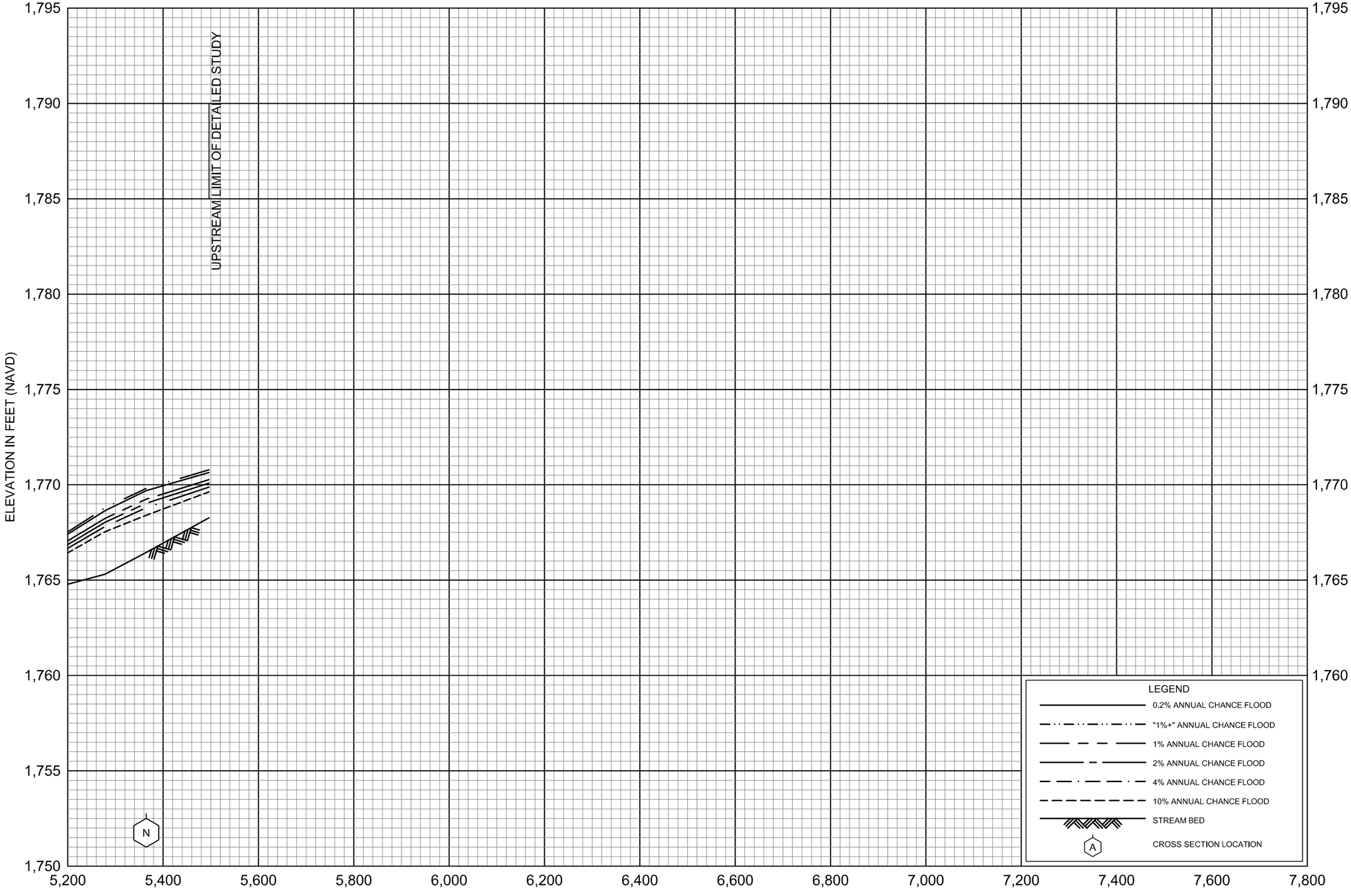
SHEEP SHED COULEE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

10P



FLOOD PROFILES

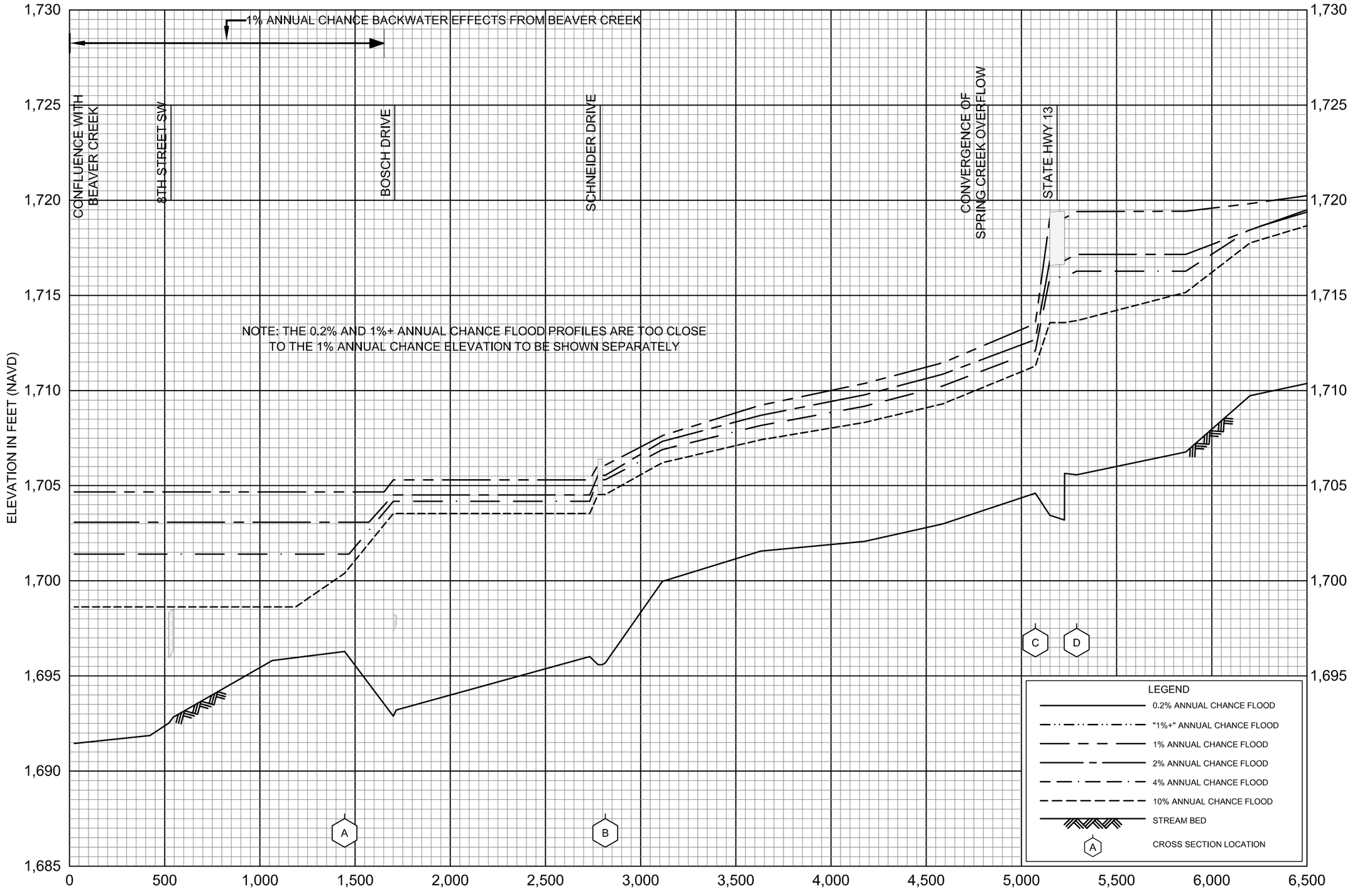
SHEEP SHED COULEE

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

11P



FLOOD PROFILES

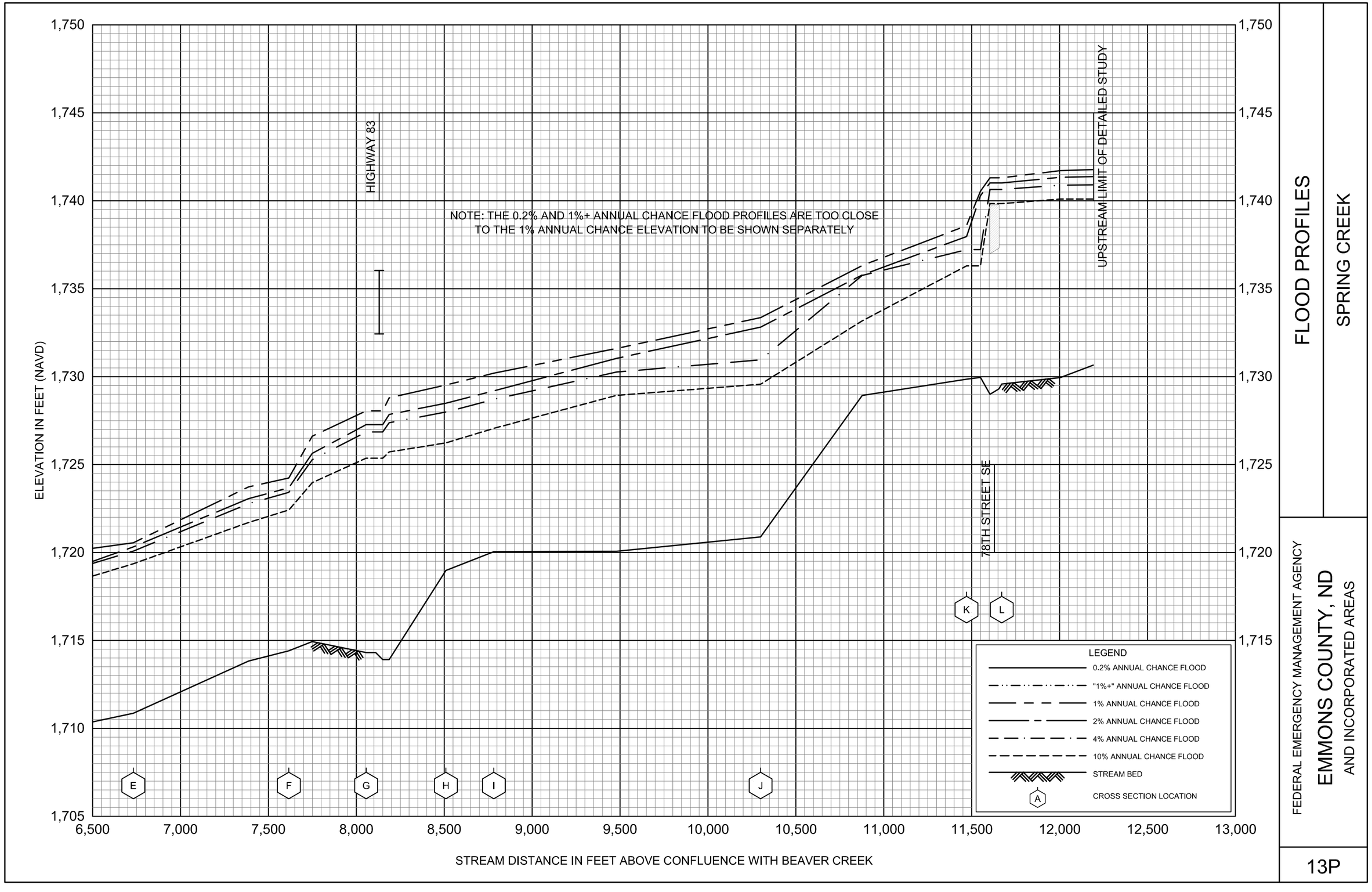
SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

12P



FLOOD PROFILES

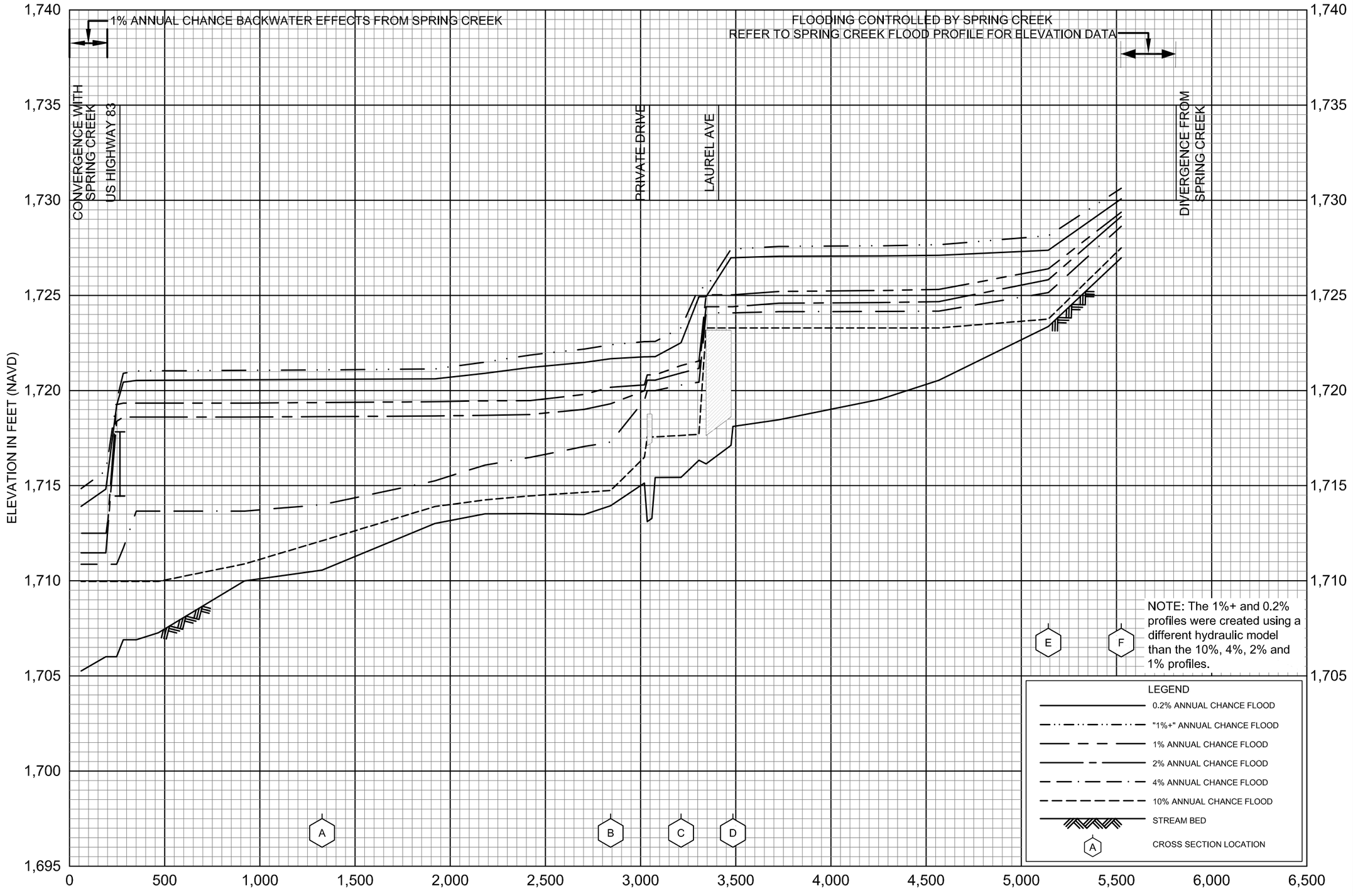
SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

13P



FLOOD PROFILES

SPRING CREEK OVERFLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

EMMONS COUNTY, ND

AND INCORPORATED AREAS

14P