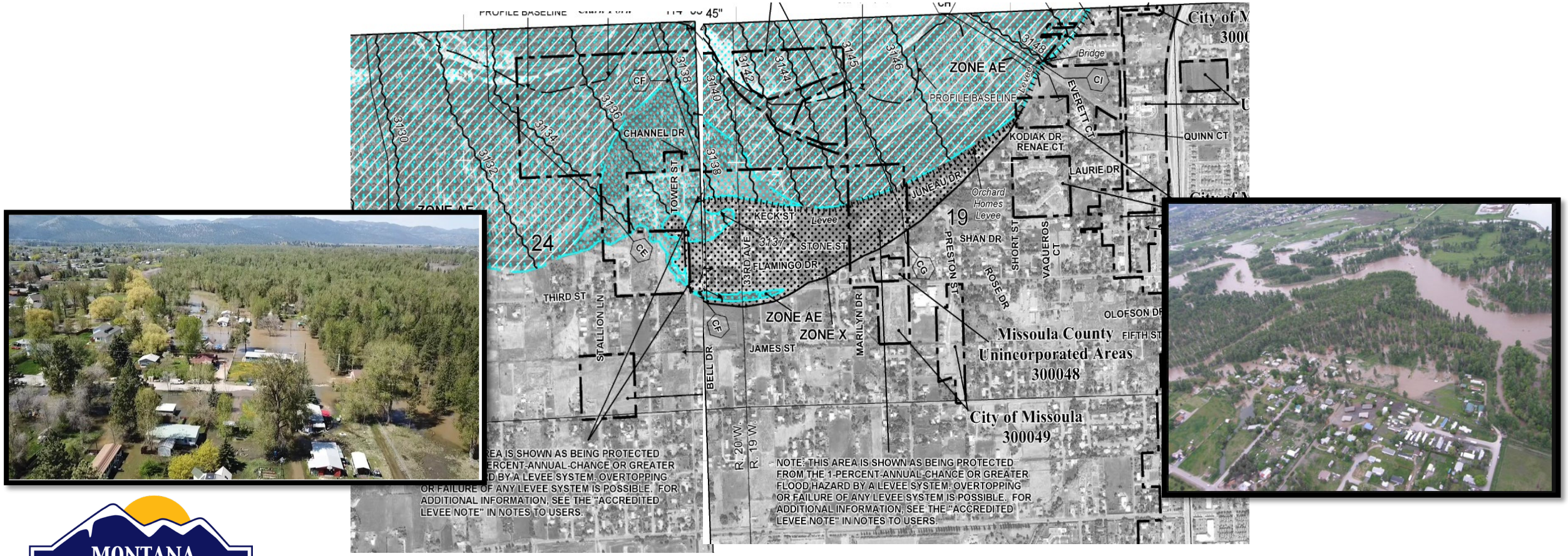
City of Missoula Consultation Coordination Officer Meeting

November 12, 2025

Identifying Risk through Mapping



Flood Insurance Rate Maps

Floodplain Maps = Flood Insurance Rate Maps (FIRMs)

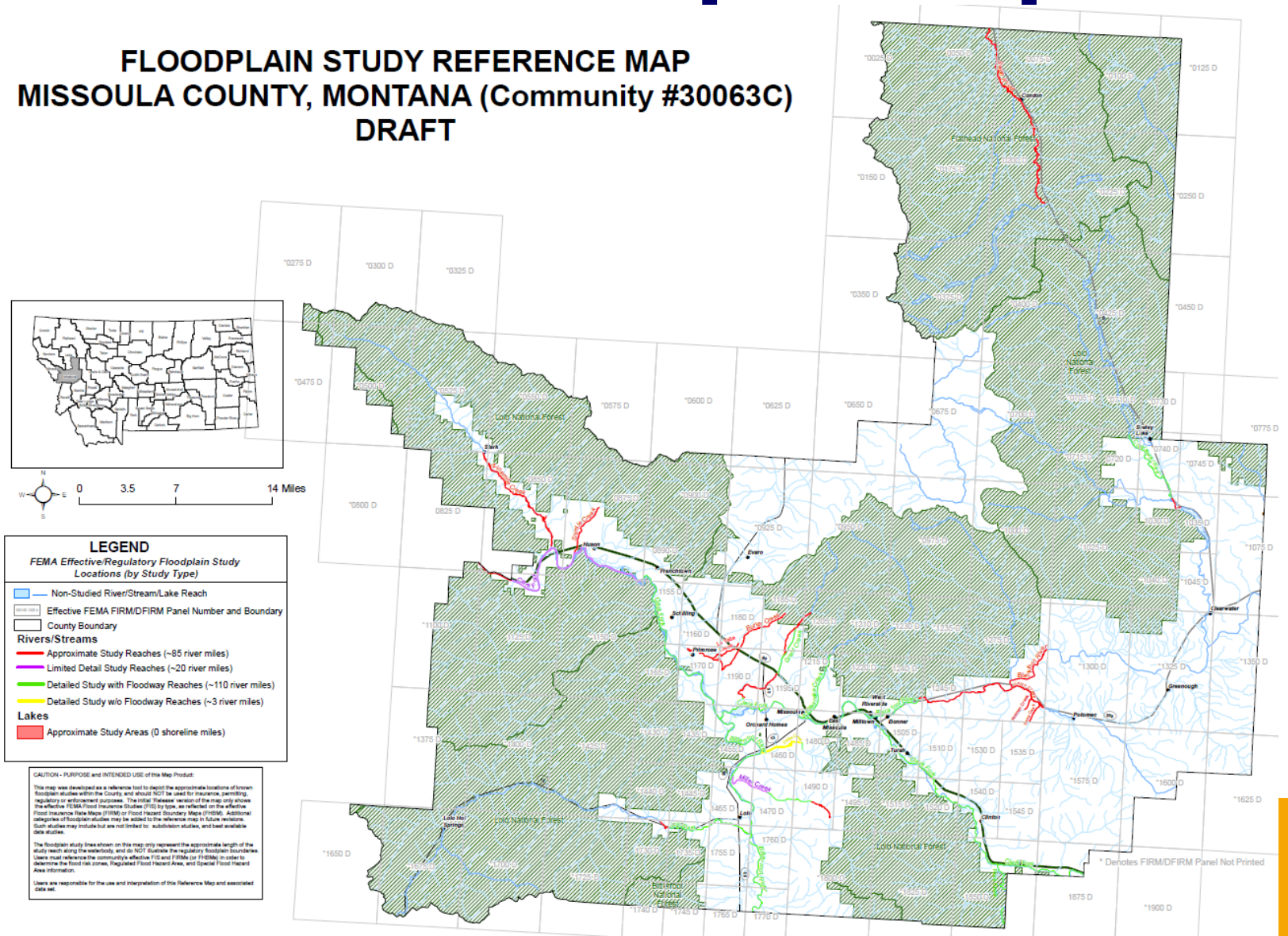
Used for various purposes

- Local floodplain regulations
- Local planning (growth and development)
- Emergency Managers
- County Sanitarian
- Mortgage companies
- Flood Insurance Premiums

Need updating

- New data available
- Change in the area

Missoula Floodplain Maps



1974
First flood maps issued

1977
New Set of FHBMs issued

1978
First flood study conducted

1983
First set of FEMA FIRMs issued

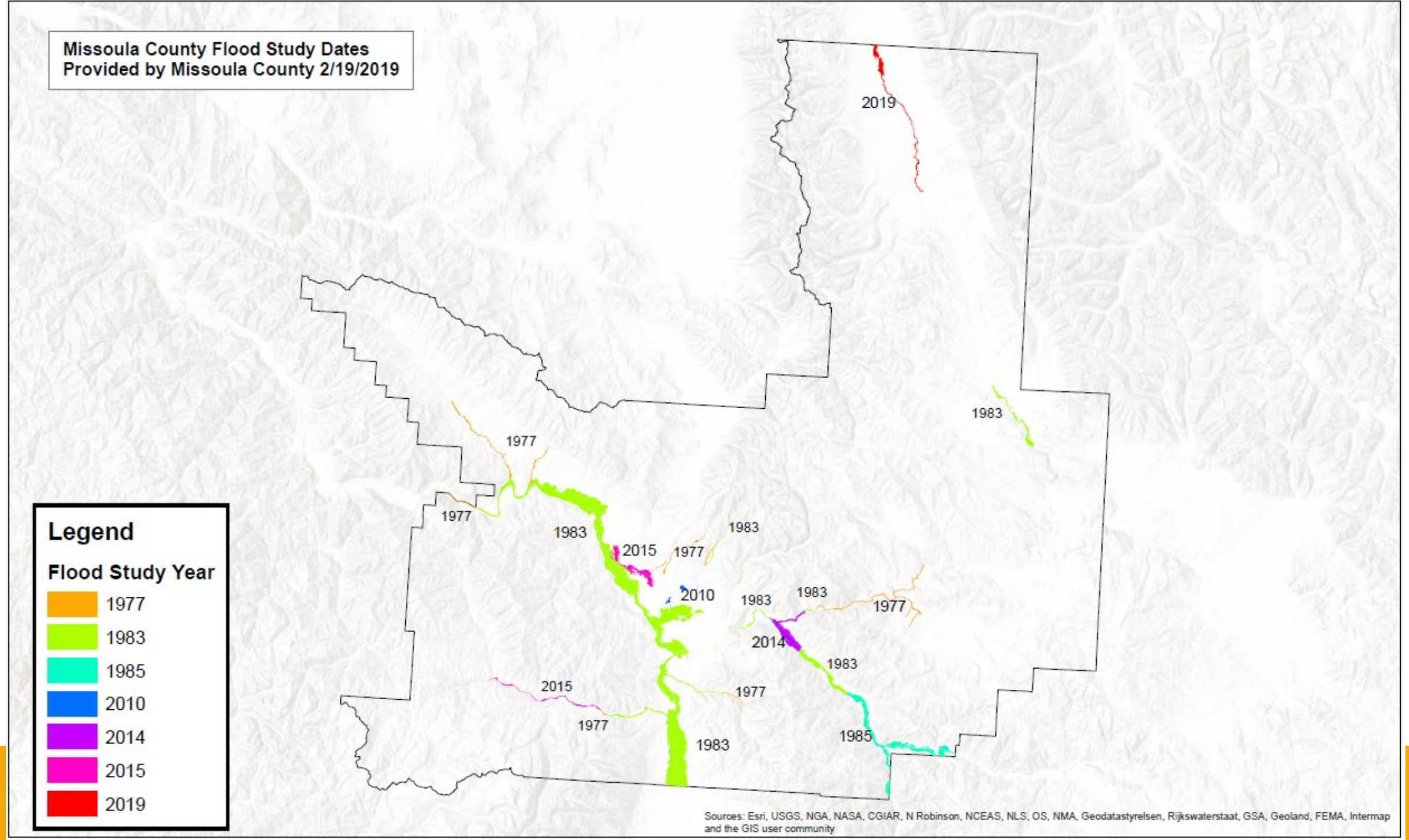
1985
Eastern part of County received first FIRMs

1985
New Flood Study was conducted

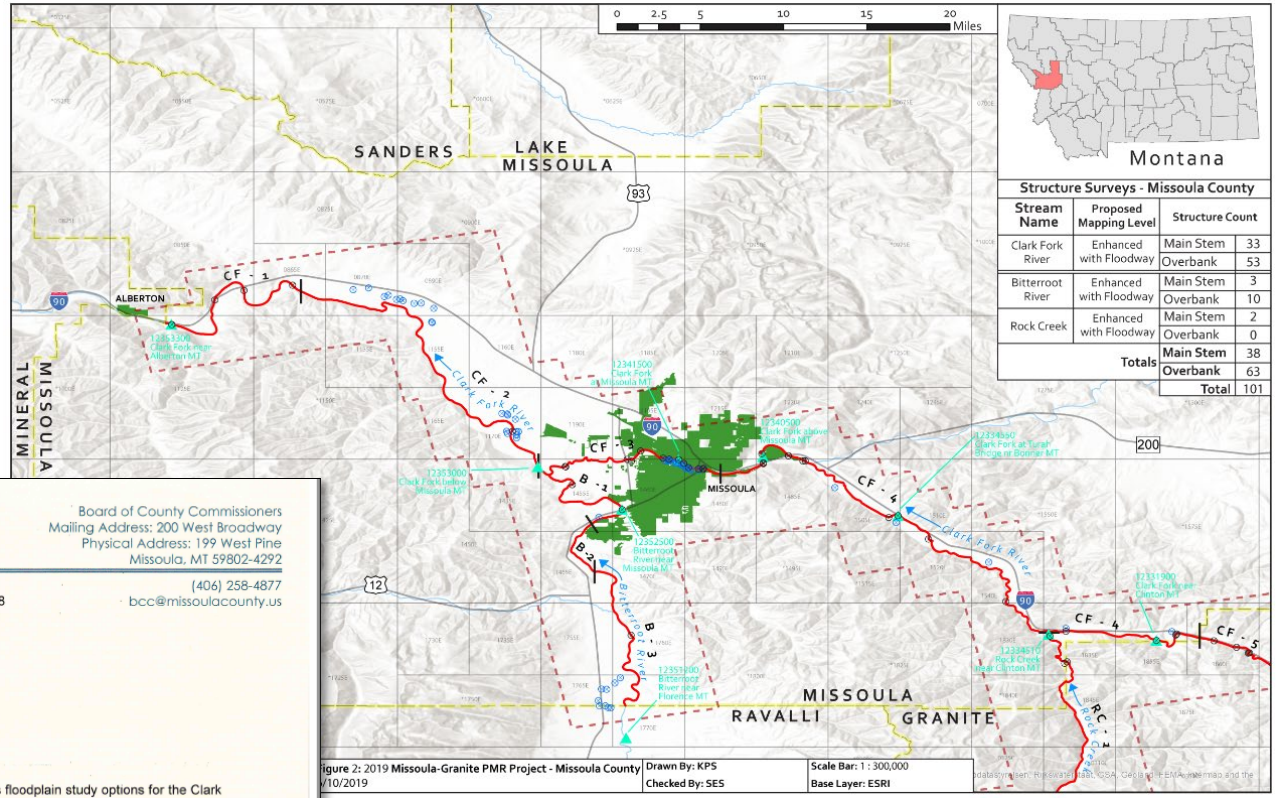
1988
Revised FIRMs

Additional Flood Studies Conducted

2015
Digital FIRMs


Missoula County Flood Study Dates
Provided by Missoula County 2/19/2019
2019
1983
1977
1977
1983
2015
1977
1983
2010
1983
1983
1977
2014
1983
2015
1977
1977
1983
1985
Legend
Flood Study Year
1977
1983
1985
2010
2014
2015
2019
Sources: Esri, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

Project Background



MISSOULA
OFFICE OF THE MAYOR
435 RYMAN MISSOULA, MONTANA 59802-4297 (406) 552-6001

July 1, 2019

Steve Story
Montana DNRC Water Operations
1424 9th Avenue
P.O. Box 201601
Helena, MT 59620-1601

Dear Mr. Story:

The City of Missoula supports efforts to update flood studies and existing floodplain maps in the city. Most of the mapped floodplains on our Flood Insurance Rate Maps are based on flood studies and information from the mid-1980s. As conditions and circumstances have changed – sometimes dramatically – in the intervening three decades, we believe that updating the floodplain studies to replace our existing, outdated floodplain maps is ever more critical.

As the City of Missoula continues to grow, there has been an increase in requests for development located closer to the many ditches, creeks, streams and rivers throughout the city. As of today, the City of Missoula has approximately 4,857 residential units, or 10,200 residents, within 150 feet of flowing water. In the last ten years more than 304 residential units, or 638 residents, have located in areas adjacent to streams and rivers. The city strives to foster smart development and encourage growth and updated flood studies are important in order for the city to do so in a manner that maintains the integrity of the riparian areas, while also protecting the safety of life and property located along the water's edge.

The City of Missoula is committed to protecting the river systems, managing flood risks and participating in the National Flood Insurance Program. Updated, detailed studies would be a benefit to City of Missoula residents and current information would allow for better regulation of flood prone areas.

Thank you for the opportunity to participate in this effort to update floodplain studies in the City of Missoula. Having better data is a long-standing need of both the city and Missoula County. To the extent we are able, we will be pleased to provide any support that will further the achievement of this project.

Sincerely,

John Engen
Mayor

MISSOULA COUNTY

Board of County Commissioners
Mailing Address: 200 West Broadway
Physical Address: 199 West Pine
Missoula, MT 59802-4292
(406) 258-4877
bcc@missoulacounty.us

BCC 2019-108
June 6, 2019

Steve Story, PE, CFM - Chief
DNRC – Water Resources Division
P.O. Box 201601
Helena, MT 59620-1601

RE: Floodplain Mapping Scoping Meeting, Feb. 19, 2019

Dear Mr. Story,

Thank you for visiting with us on Feb. 19, 2019, to discuss floodplain study options for the Clark Fork and Bitterroot Rivers as well as Rock Creek. We sincerely appreciate your willingness to come to Missoula and meet with us personally to explore options for updating the Federal Emergency Management Agency floodplain maps for these streams.

We understand that current LiDAR topography, as well as updated hydrology and new hydraulics, will be used to determine appropriate floodplain mapping for these areas. These are significant updates to our effective maps which, in some locations, use data that dates back to the 1960s. Missoula County fully supports these mapping efforts and is willing to provide our previously acquired LiDAR, limited on-the-ground survey and bathymetry, as well as a hard match of $8,500 for remapping some of these locations, per the effective BFEs to assist DNRC and FEMA.

An issue that we discussed on Feb. 19 relates to what we believe to be inappropriate floodplain mapping of stormwater-related issues in Missoula's South Hills. In particular, we believe that the AO floodplain designation identified on FEMA map panel #1460 associated with South Hills Drive is not associated with a watercourse or drainway as defined by MCA 76-5-103 and should not have been identified as a designated, regulatory floodplain. We ask for your assistance in requesting a formal evaluation of this location from FEMA.

Once again, we thank you and your staff for your efforts and assistance to define and manage flood risks in Missoula County. If you have questions concerning this letter, please feel free to contact Todd Klietz, floodplain administrator, at 406-258-4841 or via email at tklietz@missoulacounty.us.

Sincerely,

BOARD OF COUNTY COMMISSIONERS

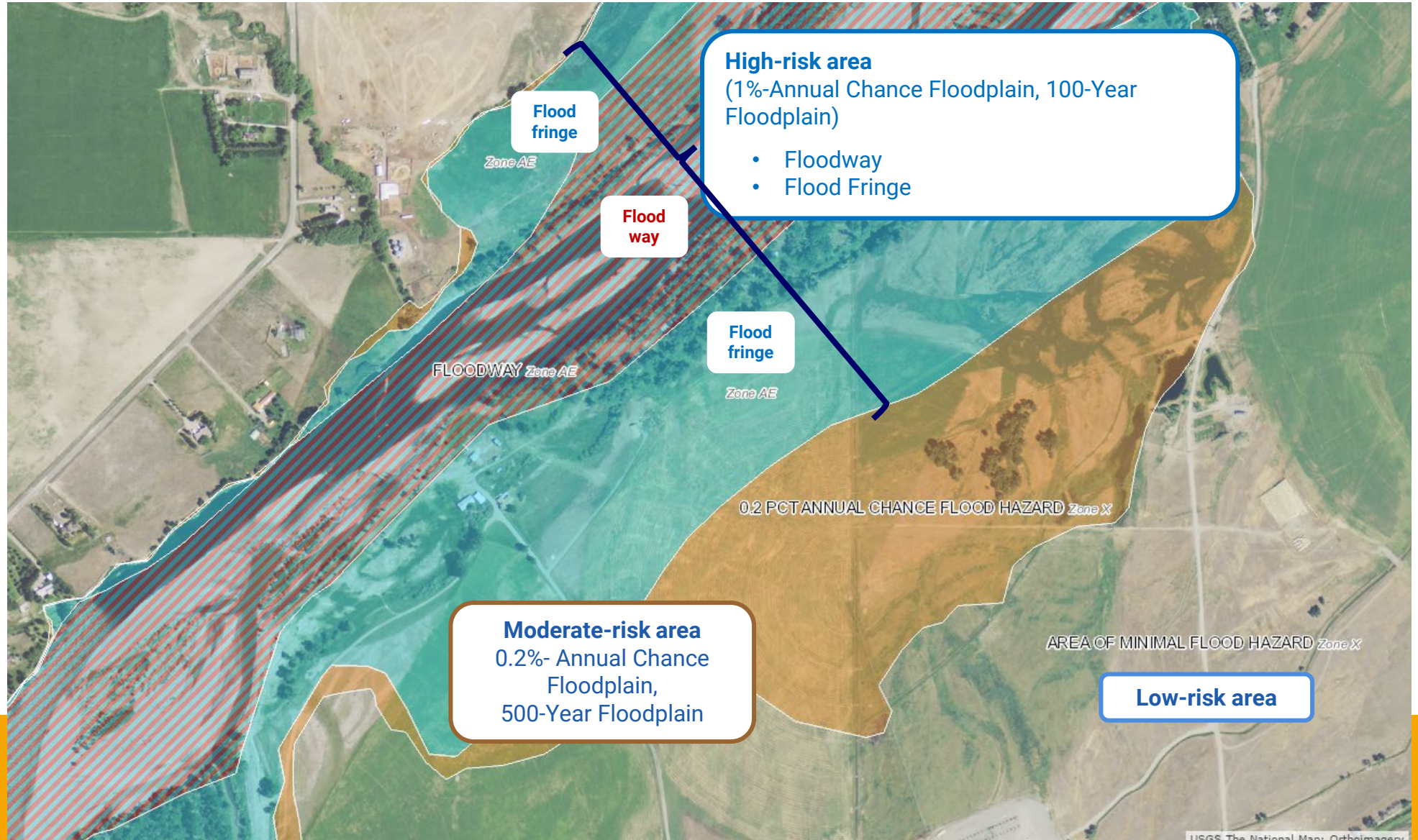
Nicole Rowley, Chair

Josh Slotnick, Commissioner

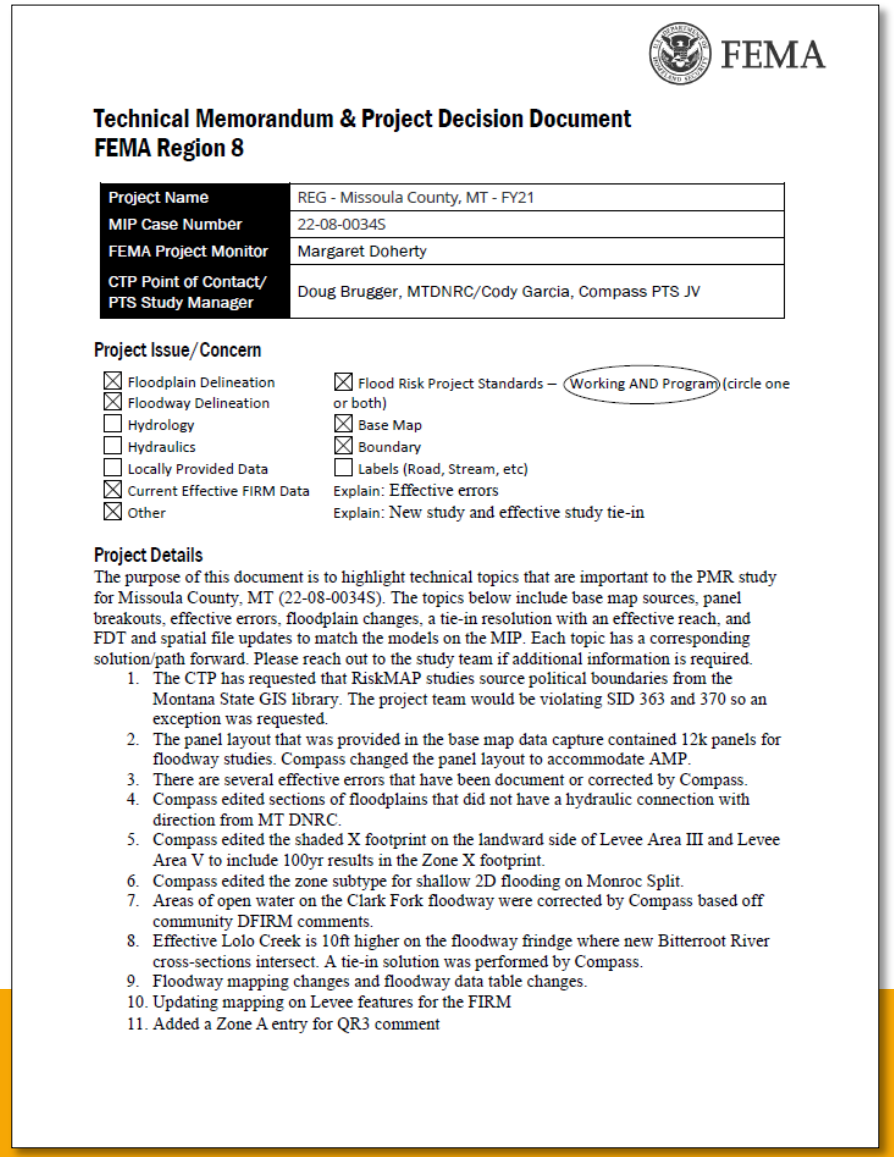
David Strohmaier, Commissioner

RECEIVED
JUN 10 2019
D.N.R.C

Flood Zones


Flood fringe
Zone AE
Flood way
Flood fringe
Zone AE
FLOODWAY Zone AE
0.2 PCT ANNUAL CHANCE FLOOD HAZARD Zone X
AREA OF MINIMAL FLOOD HAZARD Zone X
High-risk area
(1%-Annual Chance Floodplain, 100-Year Floodplain)
• Floodway
• Flood Fringe
Moderate-risk area
0.2%- Annual Chance Floodplain,
500-Year Floodplain
Low-risk area

Changes from Draft to Prelim



FEMA

Technical Memorandum & Project Decision Document
FEMA Region 8

Project Name	REG - Missoula County, MT - FY21
MIP Case Number	22-08-0034S
FEMA Project Monitor	Margaret Doherty
CTP Point of Contact/ PTS Study Manager	Doug Brugger, MTDNRC/Cody Garcia, Compass PTS JV

Project Issue/Concern

- ☒ Floodplain Delineation
- ☒ Floodway Delineation
- ☐ Hydrology
- ☐ Hydraulics
- ☐ Locally Provided Data
- ☒ Current Effective FIRM Data
- ☒ Other
- ☒ Flood Risk Project Standards – (Working AND Program) (circle one or both)
- ☒ Base Map
- ☒ Boundary
- ☐ Labels (Road, Stream, etc)

Explain: Effective errors

Explain: New study and effective study tie-in

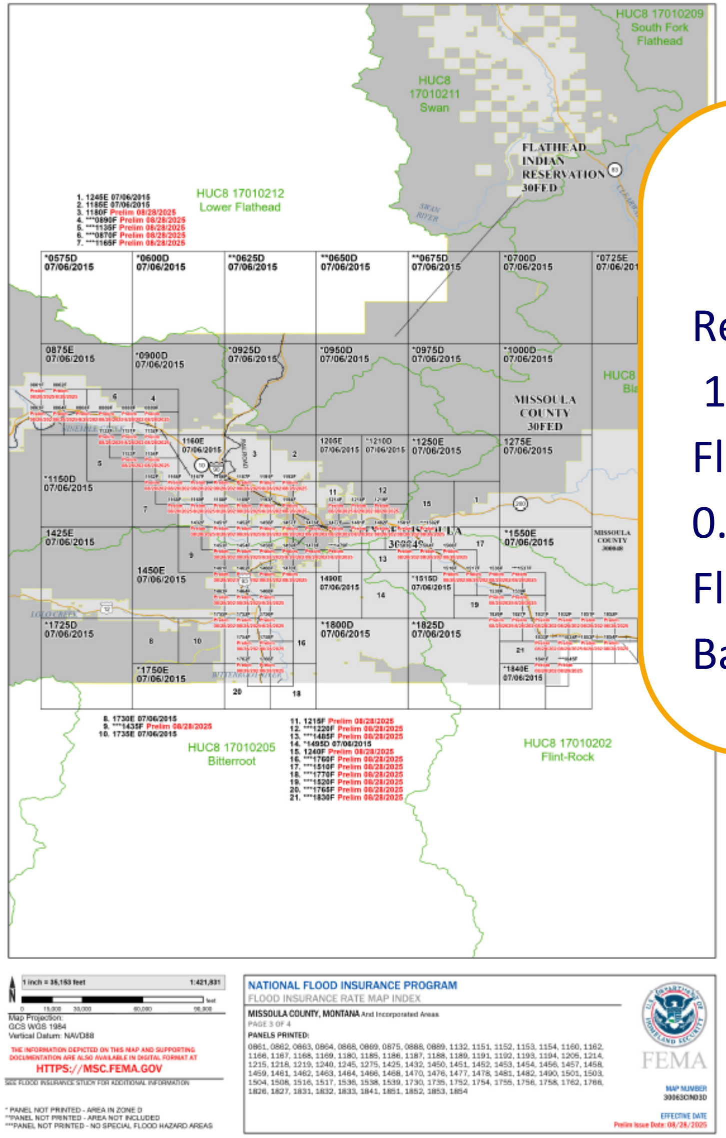
Project Details

The purpose of this document is to highlight technical topics that are important to the PMR study for Missoula County, MT (22-08-0034S). The topics below include base map sources, panel breakouts, effective errors, floodplain changes, a tie-in resolution with an effective reach, and FDT and spatial file updates to match the models on the MIP. Each topic has a corresponding solution/path forward. Please reach out to the study team if additional information is required.

1. The CTP has requested that RiskMAP studies source political boundaries from the Montana State GIS library. The project team would be violating SID 363 and 370 so an exception was requested.
2. The panel layout that was provided in the base map data capture contained 12k panels for floodway studies. Compass changed the panel layout to accommodate AMP.
3. There are several effective errors that have been document or corrected by Compass.
4. Compass edited sections of floodplains that did not have a hydraulic connection with direction from MT DNRC.
5. Compass edited the shaded X footprint on the landward side of Levee Area III and Levee Area V to include 100yr results in the Zone X footprint.
6. Compass edited the zone subtype for shallow 2D flooding on Monroc Split.
7. Areas of open water on the Clark Fork floodway were corrected by Compass based off community DFIRM comments.
8. Effective Lolo Creek is 10ft higher on the floodway frindge where new Bitterroot River cross-sections intersect. A tie-in solution was performed by Compass.
9. Floodway mapping changes and floodway data table changes.
10. Updating mapping on Levee features for the FIRM
11. Added a Zone A entry for QR3 comment

- Draft data
  - Initial results of the flood study
  - Before in depth review by FEMA
  - We the state share those early results
- FEMA issues Preliminary Maps
- There have been changes from Draft to Preliminary
  - Changes happed to comply with FEMA standards and guidance
- All changes were captured and provided to the city

Preliminary FIRMs and FIS



<u>Preliminary Flood Insurance Rate Maps & Flood Insurance Study:</u>

Represent study results:

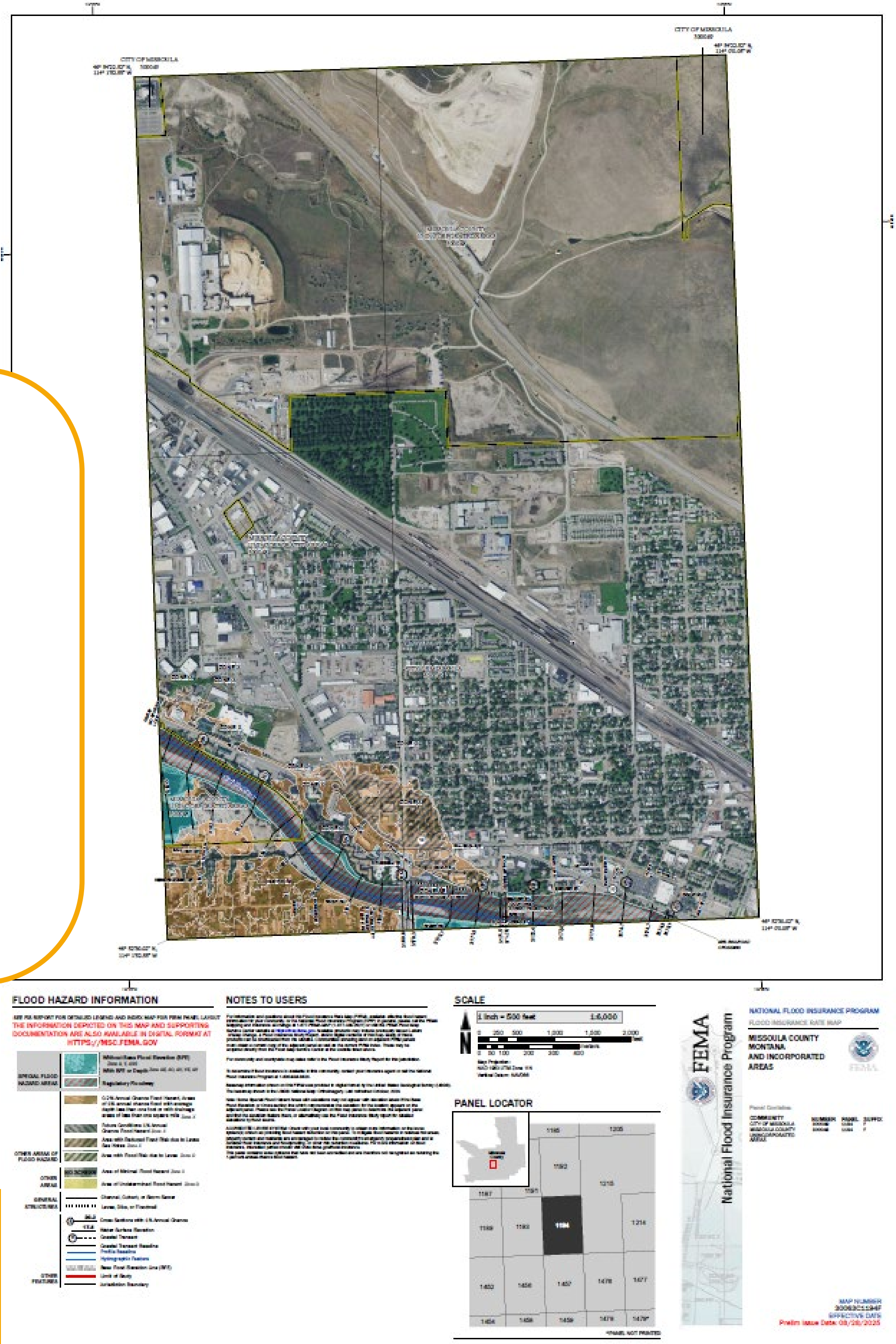
1% annual chance (100-year) Floodplain

Floodway (within 100-year floodplain)

0.2% annual chance (500-year) Floodplain

Flood Elevations (Base Flood Elevations)

Basis for 90-day Appeal & Comment Period



Preliminary FIRMs and FIS

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 4

MISSOULA COUNTY, MONTANA

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
MISSOULA COUNTY, UNINCORPORATED AREAS	300048
MISSOULA, CITY OF	300049

Preliminary Date: 8/28/2025

EFFECTIVE:

TBD

FLOOD INSURANCE STUDY NUMBER
30063CV001D
Version Number 2.6.4.6

FEMA

SOMA-1

PRELIMINARY SUMMARY OF MAP ACTIONS

Community: MISSOULA, CITY OF Community No: 300049

To assist your community in maintaining the Flood Insurance Rate Map (FIRM), we have summarized below the effect of the enclosed revised FIRM panel(s) on previously issued Letter of Map Change (LOMC) actions (i.e., Letters of Map Revision (LOMRs), Letter of Map Revision based on Fill (LOMR-Fs), and Letters of Map Amendment (LOMAs)).

1. LOMCs Incorporated

The modifications effected by the LOMCs listed below have been reflected on the Preliminary copies of the revised FIRM panels. In addition, these LOMCs will remain in effect until the revised FIRM becomes effective.

LOMC	Case No.	Date Issued	Project Identifier	Original Panel	Current Panel
LOMR	21-08-0878P	4/27/2022	Middle Grant Creek LOMR	30063C1195E	30063C1191F
LOMR	21-08-0781P	6/27/2022	Rattlesnake Dam Removal Project	30063C1215E	30063C1215F
LOMR	22-08-0126P	5/22/2023	BUTLER CREEK	30063C1190E	30063C1186F 30063C1187F 30063C1180F

2. LOMCs Not Incorporated

The modifications effected by the LOMCs listed below are either not located on revised FIRM panels, or have not been reflected on the Preliminary copies of the revised FIRM panels because of scale limitations or because the LOMC issued had determined that the lot(s) or structure(s) involved were outside the Special Flood Hazard Area, as shown on the FIRM. These LOMCs will be revalidated free of charge 1 day after the revised FIRM becomes effective through a single revalidation letter that reaffirms the validity of the previous LOMCs.

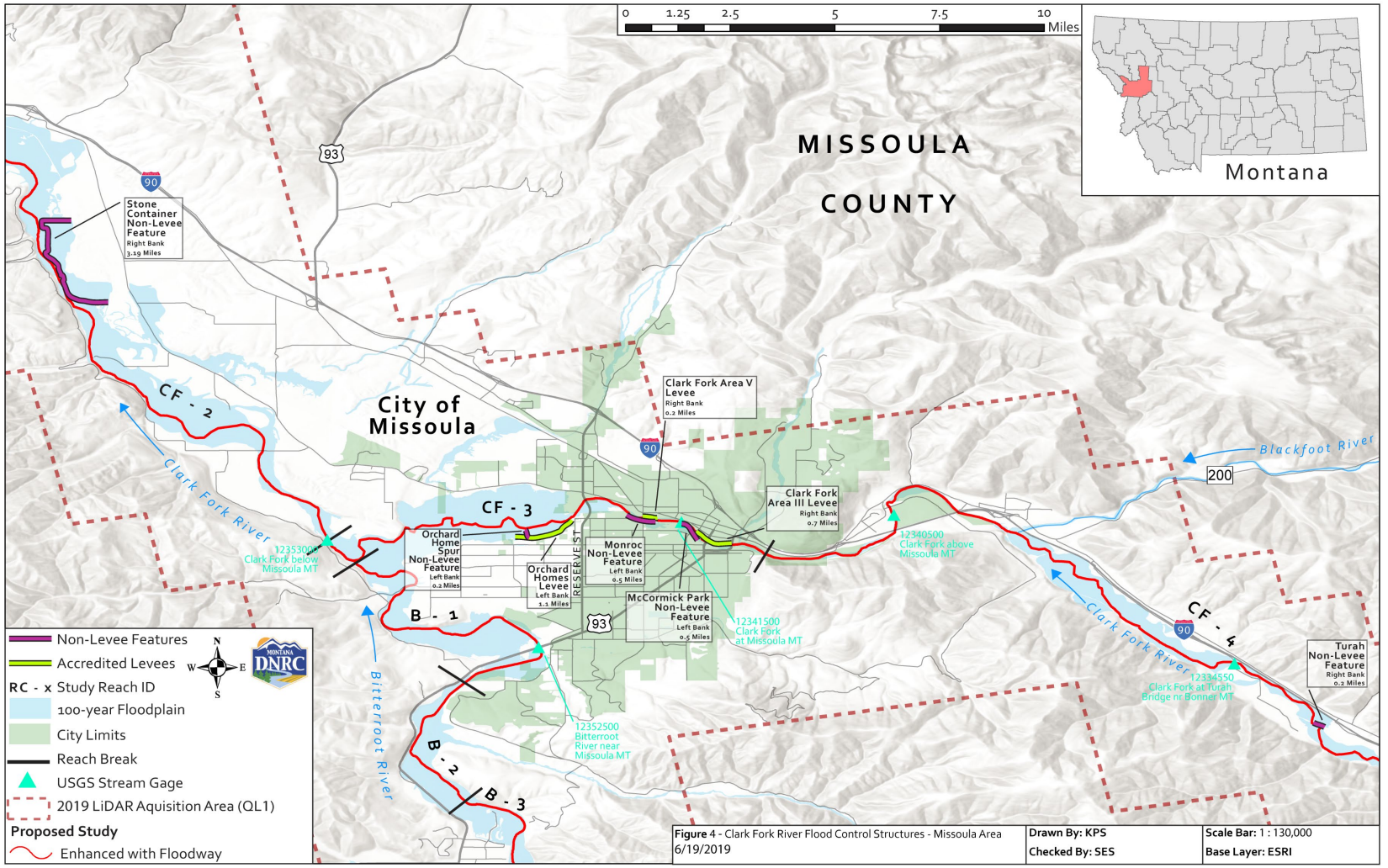
Changes from last FIRM

City of Missoula Changes since last FIRM						
	Structures Over 400 Sq.		Structures Under 400 Sq. Ft.		Area (Acres)	
	Floodway*	Floodplain	Floodway*	Floodplain	Floodway	Floodplain
Added	1	126	0	13	53.95	107.83
Removed	18	56	2	10	54.67	105.24
Unchanged	0	55	1	20	333.7	563.77

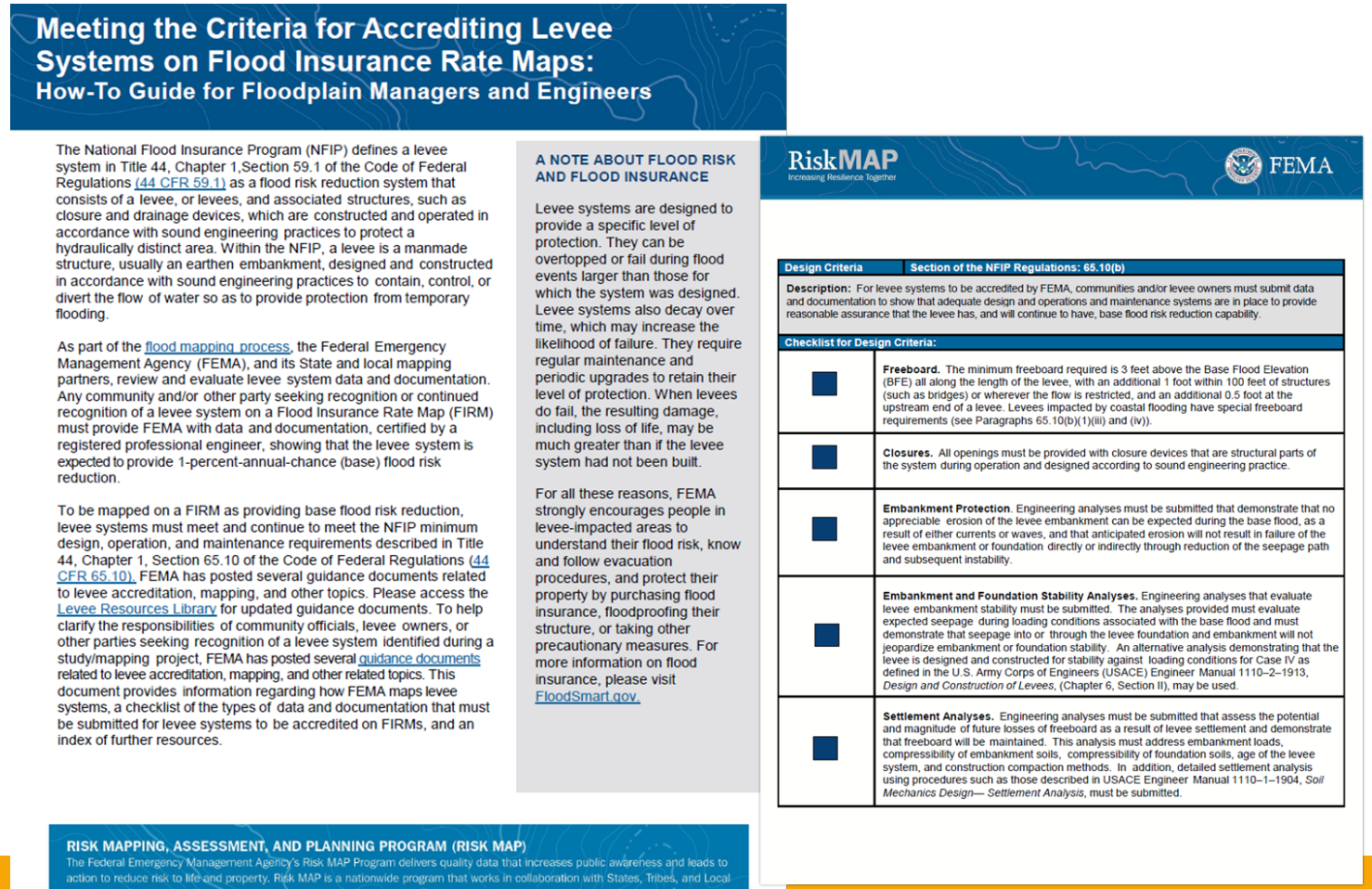
* floodway numbers for structures are also counted in the floodplain column
Area/Acres column numbers should only be referenced directly in each column

Levees

- Identified levees in study area.
  - 5 within the City
    - McCormick Park
    - Monroc
    - Orchard Homes
    - Area III
    - Area V



Levees



Meeting the Criteria for Accrediting Levee Systems on Flood Insurance Rate Maps:
How-To Guide for Floodplain Managers and Engineers

The National Flood Insurance Program (NFIP) defines a levee system in Title 44, Chapter 1,Section 59.1 of the Code of Federal Regulations (44 CFR 59.1) as a flood risk reduction system that consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices to protect a hydraulically distinct area. Within the NFIP, a levee is a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

As part of the flood mapping process, the Federal Emergency Management Agency (FEMA), and its State and local mapping partners, review and evaluate levee system data and documentation. Any community and/or other party seeking recognition or continued recognition of a levee system on a Flood Insurance Rate Map (FIRM) must provide FEMA with data and documentation, certified by a registered professional engineer, showing that the levee system is expected to provide 1-percent-annual-chance (base) flood risk reduction.

To be mapped on a FIRM as providing base flood risk reduction, levee systems must meet and continue to meet the NFIP minimum design, operation, and maintenance requirements described in Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10). FEMA has posted several guidance documents related to levee accreditation, mapping, and other topics. Please access the Levee Resources Library for updated guidance documents. To help clarify the responsibilities of community officials, levee owners, or other parties seeking recognition of a levee system identified during a study/mapping project, FEMA has posted several guidance documents related to levee accreditation, mapping, and other related topics. This document provides information regarding how FEMA maps levee systems, a checklist of the types of data and documentation that must be submitted for levee systems to be accredited on FIRMs, and an index of further resources.

A NOTE ABOUT FLOOD RISK AND FLOOD INSURANCE

Levee systems are designed to provide a specific level of protection. They can be overtopped or fail during flood events larger than those for which the system was designed. Levee systems also decay over time, which may increase the likelihood of failure. They require regular maintenance and periodic upgrades to retain their level of protection. When levees do fail, the resulting damage, including loss of life, may be much greater than if the levee system had not been built.

For all these reasons, FEMA strongly encourages people in levee-impacted areas to understand their flood risk, know and follow evacuation procedures, and protect their property by purchasing flood insurance, floodproofing their structure, or taking other precautionary measures. For more information on flood insurance, please visit FloodSmart.gov.

RISK MAPPING, ASSESSMENT, AND PLANNING PROGRAM (RISK MAP)

The Federal Emergency Management Agency's Risk MAP Program delivers quality data that increases public awareness and leads to action to reduce risk to life and property. Risk MAP is a nationwide program that works in collaboration with States, Tribes, and Local communities using best available science, rigorously vetted standards, and expert analysis to identify risk and promote mitigation action, resulting in safer, more resilient communities.

RiskMAP Increasing Resilience Together

FEMA

RiskMAP Increasing Resilience Together

FEMA

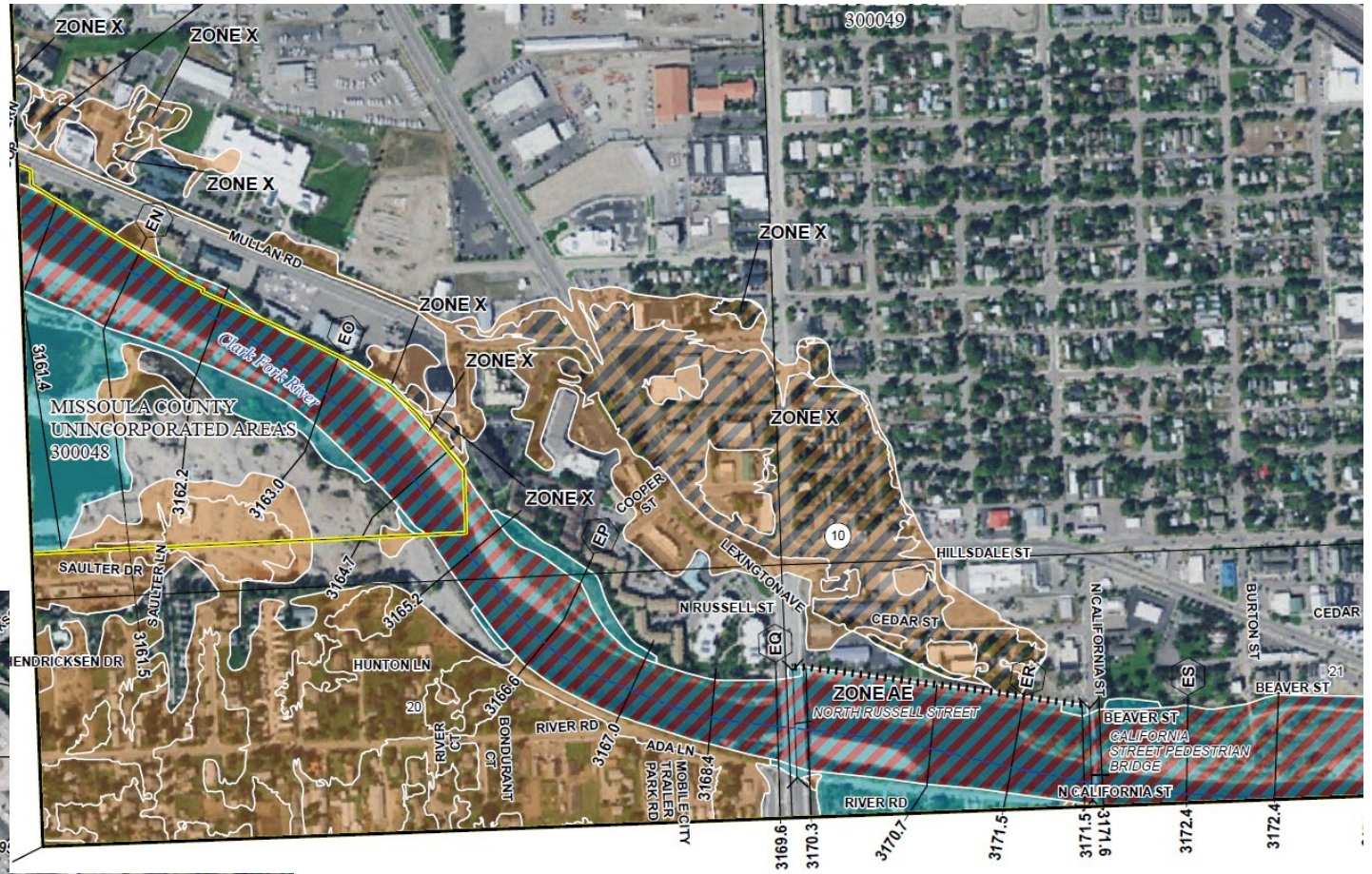
Design Criteria	Section of the NFIP Regulations: 65.10(b)
Description: For levee systems to be accredited by FEMA, communities and/or levee owners must submit data and documentation to show that adequate design and operations and maintenance systems are in place to provide reasonable assurance that the levee has, and will continue to have, base flood risk reduction capability.	
Checklist for Design Criteria:	
☐	**Freeboard.** The minimum freeboard required is 3 feet above the Base Flood Elevation (BFE) all along the length of the levee, with an additional 1 foot within 100 feet of structures (such as bridges) or wherever the flow is restricted, and an additional 0.5 foot at the upstream end of a levee. Levees impacted by coastal flooding have special freeboard requirements (see Paragraphs 65.10(b)(1)(iii) and (iv)).
☐	**Closures.** All openings must be provided with closure devices that are structural parts of the system during operation and designed according to sound engineering practice.
☐	**Embankment Protection.** Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.
☐	**Embankment and Foundation Stability Analyses.** Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and must demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (USACE) Engineer Manual 1110–2–1913, *Design and Construction of Levees*, (Chapter 6, Section II), may be used.
☐	**Settlement Analyses.** Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in USACE Engineer Manual 1110–1–1904, *Soil Mechanics Design— Settlement Analysis*, must be submitted.

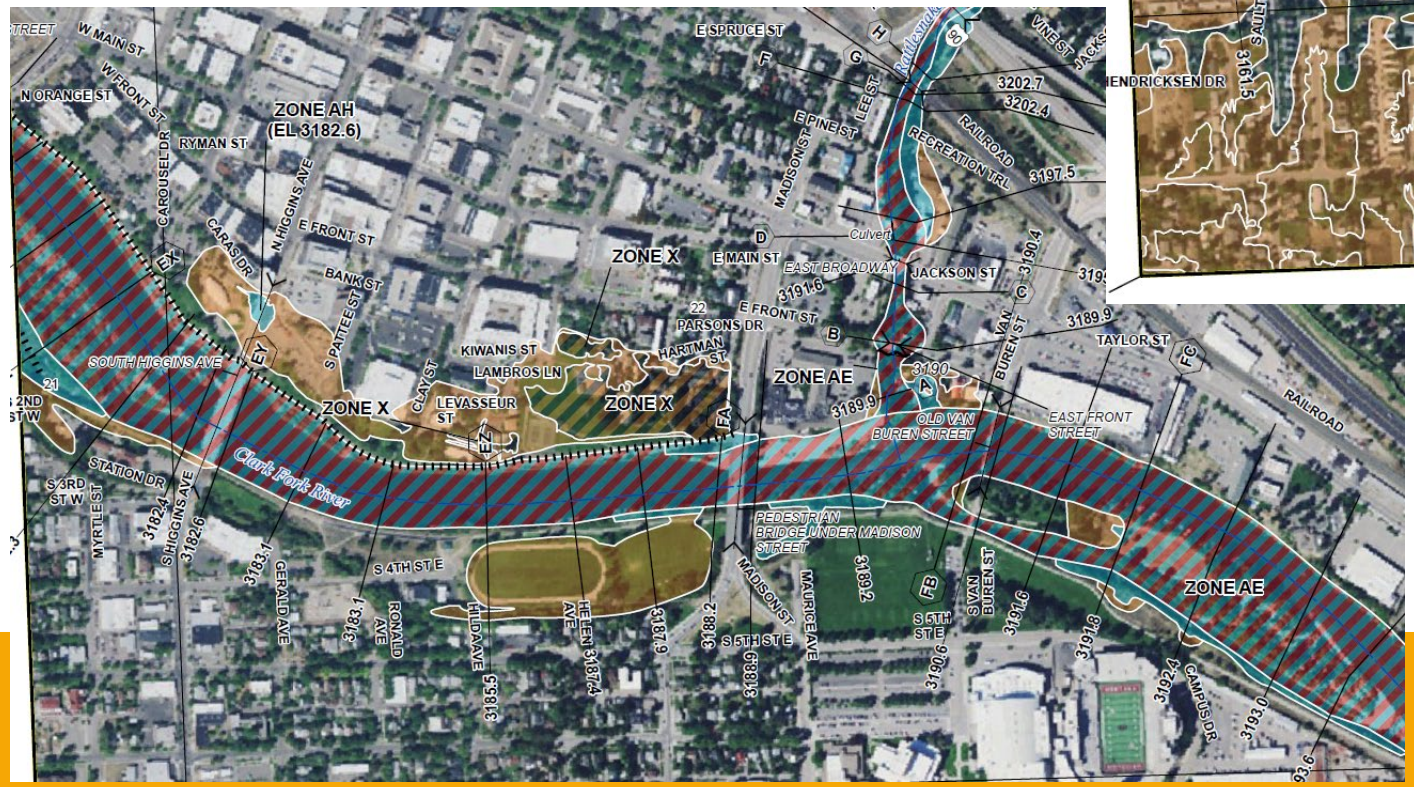
- Certified- done by a PE or federal agency to show the levee meets standards and guidance. Sent to FEMA for review and consideration.
- Accredited- a determination made by FEMA for levees that meet standards and guidance. Shows a reduced flood risk landward on floodplain maps.

Levees

- Accredited Levees

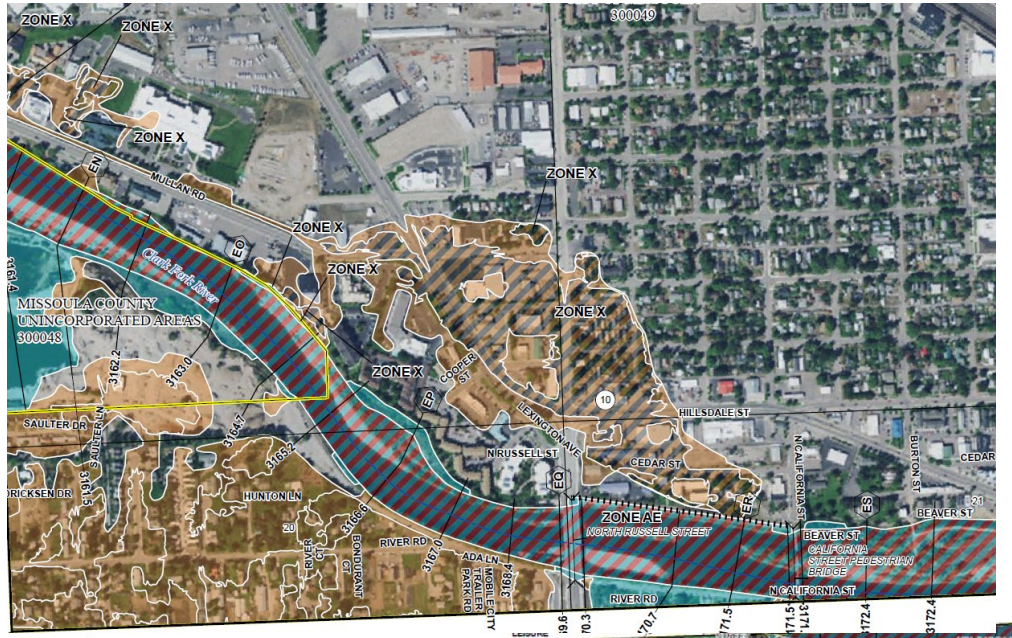
Area III and Area V

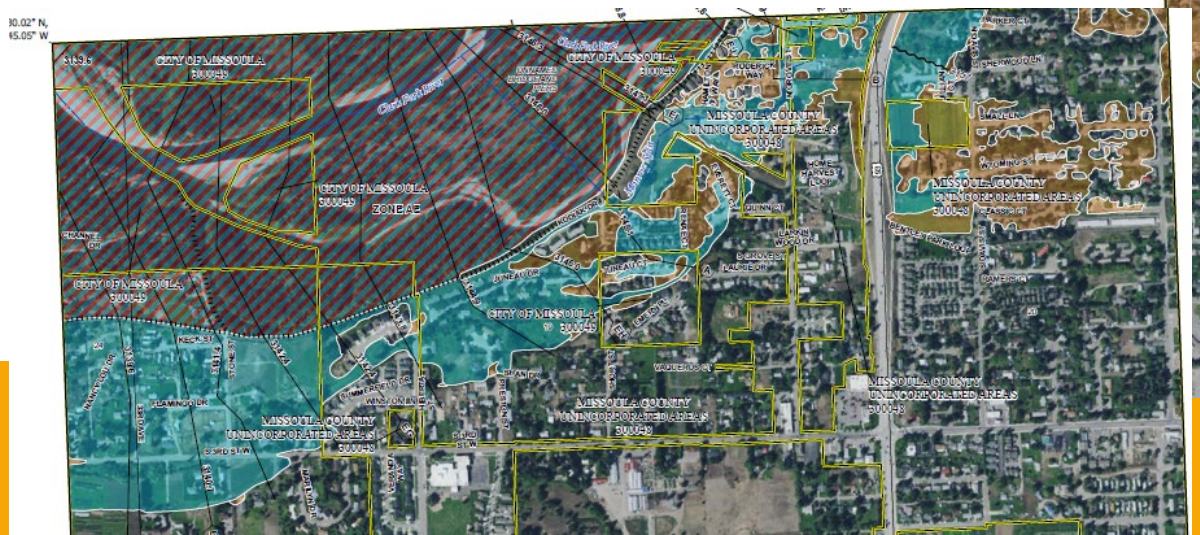




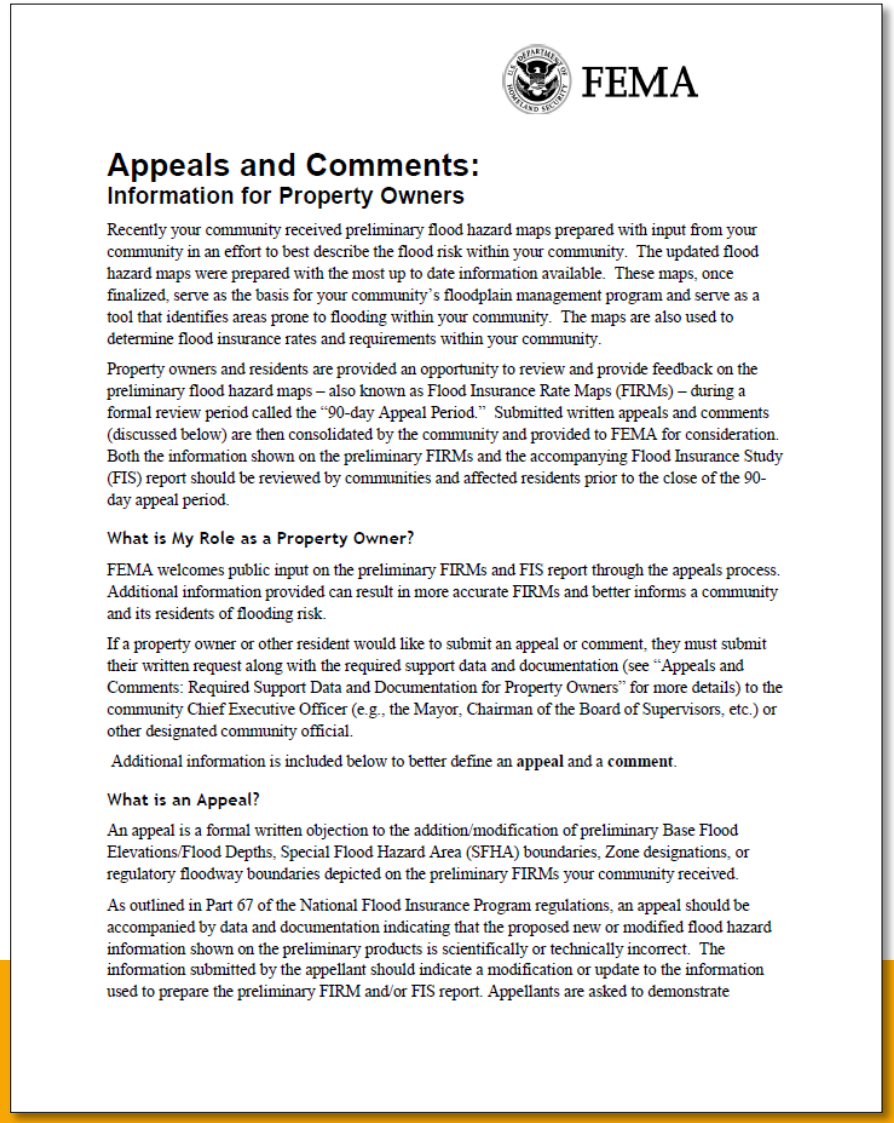
Levees

- Non-Accredited Levees
  - FIRM panel 30063C1457E
    - McCormick Park & Moncroc
  - FIRM panel 30063C1456E
    - Moncroc and Orchard Homes
  - FIRM panel 30063C1193E
    - Monroc





90 Day Appeal & Comment Period



FEMA

Appeals and Comments:
Information for Property Owners

Recently your community received preliminary flood hazard maps prepared with input from your community in an effort to best describe the flood risk within your community. The updated flood hazard maps were prepared with the most up to date information available. These maps, once finalized, serve as the basis for your community's floodplain management program and serve as a tool that identifies areas prone to flooding within your community. The maps are also used to determine flood insurance rates and requirements within your community.

Property owners and residents are provided an opportunity to review and provide feedback on the preliminary flood hazard maps – also known as Flood Insurance Rate Maps (FIRMs) – during a formal review period called the "90-day Appeal Period." Submitted written appeals and comments (discussed below) are then consolidated by the community and provided to FEMA for consideration. Both the information shown on the preliminary FIRMs and the accompanying Flood Insurance Study (FIS) report should be reviewed by communities and affected residents prior to the close of the 90-day appeal period.

What is My Role as a Property Owner?

FEMA welcomes public input on the preliminary FIRMs and FIS report through the appeals process. Additional information provided can result in more accurate FIRMs and better informs a community and its residents of flooding risk.

If a property owner or other resident would like to submit an appeal or comment, they must submit their written request along with the required support data and documentation (see "Appeals and Comments: Required Support Data and Documentation for Property Owners" for more details) to the community Chief Executive Officer (e.g., the Mayor, Chairman of the Board of Supervisors, etc.) or other designated community official.

Additional information is included below to better define an **appeal** and a **comment**.

What is an Appeal?

An appeal is a formal written objection to the addition/modification of preliminary Base Flood Elevations/Flood Depths, Special Flood Hazard Area (SFHA) boundaries, Zone designations, or regulatory floodway boundaries depicted on the preliminary FIRMs your community received.

As outlined in Part 67 of the National Flood Insurance Program regulations, an appeal should be accompanied by data and documentation indicating that the proposed new or modified flood hazard information shown on the preliminary products is scientifically or technically incorrect. The information submitted by the appellant should indicate a modification or update to the information used to prepare the preliminary FIRM and/or FIS report. Appellants are asked to demonstrate

- 6-9 months from now
  - Must follow county public comment processes.
  - DNRC has templates that we will provide once we know the dates.
  - We post all appeal information on the project website.

Flood Insurance

Flood insurance is mandatory for buildings with a federally backed loan in a high-risk flood zone.

Flood insurance is not mandatory in a lower risk zone but is highly recommended. Lenders can always require insurance in any zone.

Flood insurance is a tool that can be used to manage flood risk and is an important form of economic protection against flooding.

Rate Explanation Guide

FEMA's new rating methodology, **Risk Rating 2.0: Equity in Action**, considers specific characteristics of a building – the **Where, How, and What** – to provide a more modern, individualized, and equitable flood insurance rate. Understanding these characteristics helps to identify the building's unique flood risk and associated premium.

WHERE It Is Built (Property Address)

FEMA uses the building's property address to determine flood risk for the property. The property address is used to determine:

- **A building's distance to flooding sources,** *including the distance to the coast, ocean, rivers, and Great Lakes.*
- **The ground elevation** *where the building is located relative to the elevation of the surrounding area and the elevation of nearby flooding sources.*
- **Other characteristics** *such as the community where the building is located and how that relates to the Community Rating System discount or whether the building is on a barrier island.*

HOW It Is Built (Building Characteristics)

Knowing the physical characteristics of a building provides a deeper understanding of the building's individual flood risk and how it may impact premium. Relevant variables include:

Building Occupancy

The type (and use) of the building being insured sets available coverage limits and determines what is covered as indicated in the policy form.

Foundation Type

The foundation type provides important insight as to where the flood risk is likely to begin. For instance, risk varies based on whether a building's foundation is underground, at ground, or above ground.

First Floor Height

Buildings whose first floor is higher off the ground have lower flood risk.

Number of Floors

Buildings with more floors spread their risk over a higher area.

Unit Location

Individual units on higher floors have lower flood risk than units on lower floors.

Construction Type

Masonry walls perform better in different flooding events than wood frame walls.

Flood Openings

Flood openings can lower a building's flood risk as they allow floodwaters to flow through a building's enclosure or crawlspace.

Machinery & Equipment

Elevating above the first floor lowers the risk of damage to machinery & equipment covered in the policy.

FEMA

WHAT Is Built and Covered (Replacement Cost and Coverage)

The building's replacement cost value, the amount of coverage requested, and the deductible choices influence the insurance premium.

Building Replacement Cost Value*

Buildings with higher costs to repair generally result in higher losses, resulting in higher premiums.

Building and Contents Coverage

Policies with higher coverage limits have higher potential loss costs, which lead to higher premiums. Building coverage and contents coverage amounts are selected separately.

Building and Contents Deductible

Policyholders who choose higher deductibles are assuming more of the risk during a flood event, which can result in a lower overall premium. Choosing a higher deductible means policyholders will need to cover more of the cost to rebuild out of pocket.

** The Building Replacement Cost Value used for rating does not affect the replacement cost value determined at time of loss.*

Learn more at fema.gov/flood-insurance/risk-rating

Missoula Flood Study Project

RiskMAP Increasing Resilience Together

The Montana Department of Natural Resources & Conservation

This is an estimated timeline for project completion

Completed in 2020	Completed in 2022	Completed in 2022	Preliminary Maps issued 8/28/2025	Mid to late 2027
Measurements are made of the topography around the river, along with any culverts, bridges, and road crossings. LiDAR uses an airplane to collect ground elevation over a large area, and ground survey supplements the airborne data. Flood flow data determines how much water there will be in a river during a flood event.	The elevation and survey data are combined with flood flow data to determine where the water will go and how far it will spread out. The area shown to be underwater and at high risk is mapped as the regulatory floodplain.	Draft data is delivered to the communities. Public open houses will be held to review the information. Public Open houses held October 2022	FEMA Preliminary Maps are produced and ready for public review and comment period. 90-day official comment & appeal period early 2026.	FEMA Flood Insurance Rate Maps finalized and issued to the community.
Data gathering	**Engineering and floodplain modeling**	**Draft Data available public review**	**Preliminary Data public comment and appeal period**	**Flood Insurance Rate Maps become effective**

Steps of a flood study.

1) Survey & LiDAR
2) Hydrology (flood flow)
3) Hydraulics (engineering)
4) Mapping (delineation)

Public Review

A public open house is held after draft data is available and before preliminary maps are released.

During this time public comments are encouraged. There will be an official 90-day appeal period after the maps become preliminary.

Resiliency and Mitigation efforts

Once the flood study is completed the community can determine what mitigation efforts it would like to pursue to reduce flood risks.

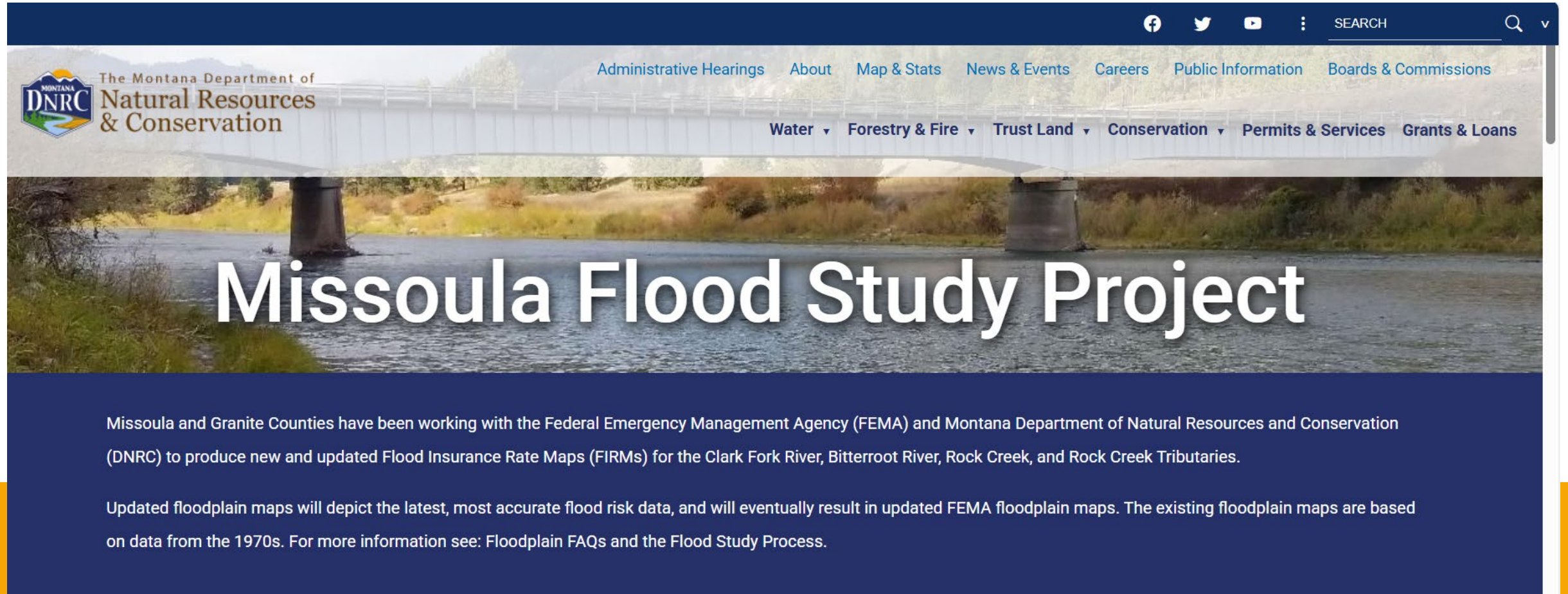
Community Work

Update local floodplain ordinances.

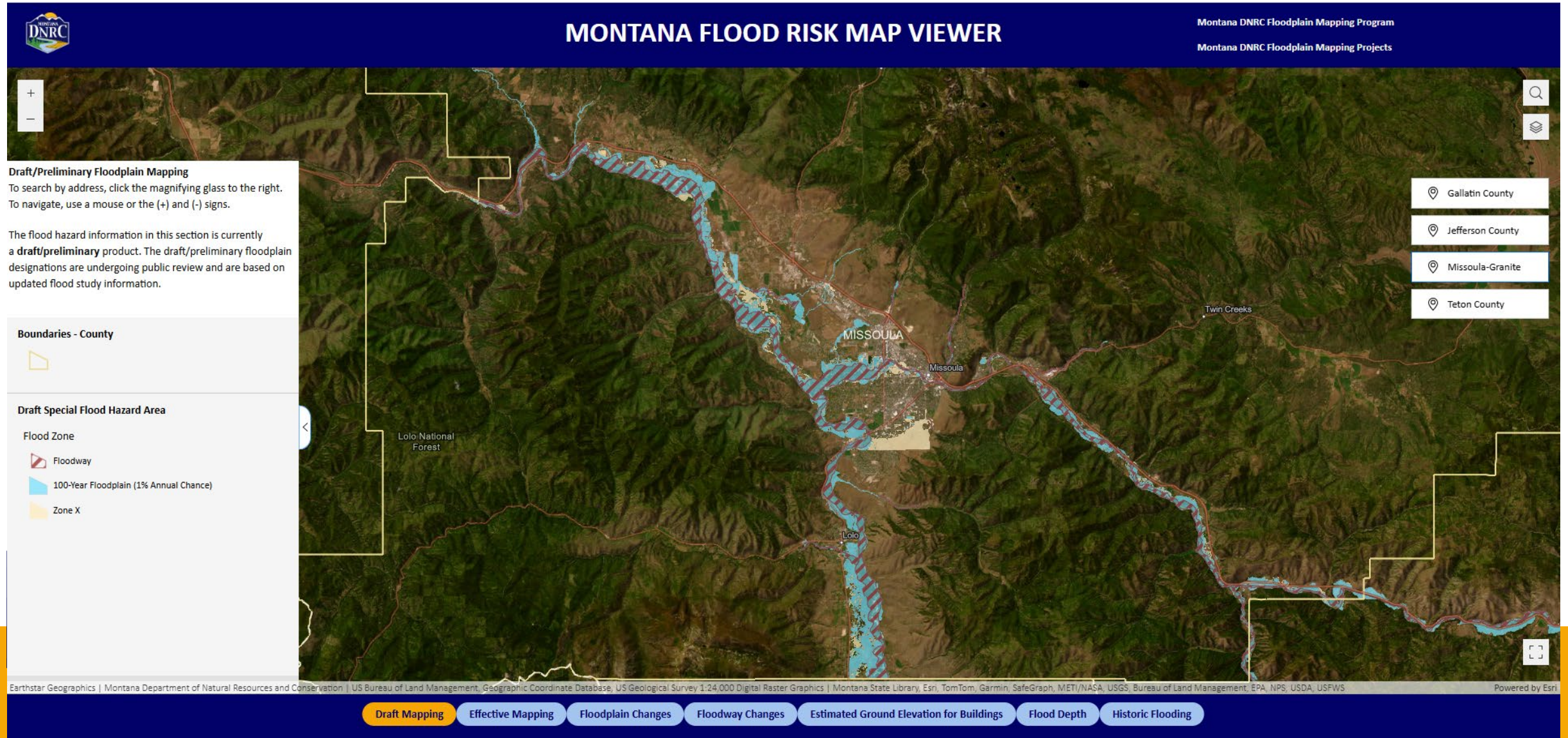
Prepare initiatives to reduce flood risk.

Project website

- https://dnrc.mt.gov/Water-Resources/Floodplains/Floodplain-Mapping-Updates/Missoula-Granite-Floodplain-Maps-Updates



DNRC flood hazard viewer




Thank you