2022

BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Mo-Kan
224 N. 7th St.
St. Joseph, MO 64501
(816) 233-3144

Buchanan County Hazard Mitigation Planning Committee

Jurisdictional Representatives

Name		Title	Department	Jurisdiction/Agency/Organiz
Bill	Brinton	Emergency Management Director	Emergency Man.	Buchanan County
Bill	Lamar	Emergency Planner	Fire Dept.	City of St. Joseph
Lee	Sawyer	Presiding Commissioner	Co. Commission	Buchanan County
Scott	Burnham	Commissioner	Co. Commission	Buchanan County
Ron	Hook	Commissioner	Co. Commission	Buchanan County
Heather	Marti	City Clerk	City Council	Village of Agency
Sally	McDowell	City Clerk	City Council	Village of Easton
Matt	Larkin	Chairman	City Council	Village of Lewis and Clark
Gary	Black	Mayor	City Council	Rushville
Travis	Dittemore	Superintendent	Administration	Buchanan County R-IV
Robert	Sigrist	Director of Non-Academic Services	Administration	St. Joseph School District
Jay	Albright	Superintendent	Administration	Mid-Buchanan School District
John	Newell	Superintendent	Administration	East-Buchanan School District
Bryan	Adkins	Director	Physical Plant	Missouri Western State University

Stakeholder Representatives

Name		Title	Department	Agency/Organization
Adam	Perry	Chairperson	---	Buchanan County LEPC
Micky	Gill	Director of Operations	---	St. Joseph School District
Jeff	Atkins	Asst. Parks Director	Parks	City of St. Joseph
Ryan	Pummell	Code Enforcement	---	Buchanan County
Ralph	Dishong	Disaster Programs Specialist	---	American Red Cross
Mindy	Andrasevits	Fire Inspector	Fire	City of St. Joseph
Dennis	Johnson	Fire Chief	Fire	So. Central Buchanan Co. FPD
John	Hontz	Operations Manager	---	Missouri American Water
Mickey	Gill	Director of Operations	---	St. Joseph School District
Craig	Darrough	Environmental Safety Coordinator	---	Missouri Western State University
Colleen	Armstrong	Stormwater Quality Coordinator	Water Protection	City of St. Joseph
Katie	Bruegge	Interim Technical Services Manager	Water Protection	City of St. Joseph
Jennifer	Protzman	Detective Sergeant	---	St. Joseph Police Department
Eric	Protzman	Commander in Chief	---	St. Joseph Police Department
Jeff	Wilson	Public Info Officer	---	St. Joseph Police Department
Mike	Sobetski	---	---	Lifeline Foods
Lauren	Williams-Caudle	Environmental Manager	---	Clarios
Bill	Murray	Mayor	---	City of St. Joseph

TABLE OF CONTENTS

CONTRIBUTORS.....
Buchanan County Hazard Mitigation Planning Committee.....
Stakeholder Representatives.....

TABLE OF CONTENTS .....*i*

EXECUTIVE SUMMARY.....*ii*

PREREQUISITES.....*xii*
Model Resolution xiii

1 Introduction and Planning Process 1.1

2 Planning Area Profile and Capabilities.....2.1

3 Risk Assessment 3.1

4 Mitigation Strategy 4.1

5 Plan Maintenance Process.....5.1

Appendix A: References
Appendix B: Planning Process Documentation
Appendix C: Completed/Deleted Mitigation Actions
Appendix D: Adoption Resolutions
Appendix E: Critical/Essential Facilities (Redacted from Public Version)

EXECUTIVE SUMMARY

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Buchanan County and participating jurisdictions and school/special districts developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses from hazard events to the County and its communities and school/special districts. The plan is an update of a plan that was approved on May 12, 2017. The plan and the update were prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 to result in eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

The County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following jurisdictions that participated in the planning process:

- Buchanan County
- Agency
- Easton
- Lewis and Clark Village
- Rushville
- St. Joseph
- Buchanan County R-IV School District
- East Buchanan School District
- Mid-Buchanan School District
- St. Joseph School District
- Missouri Western State University

DeKalb was invited to participate in the planning process but did not meet all the established requirements for official participation. When the future five-year update is developed for this plan, this community again will be invited again to participate.

Buchanan County and the entities listed above developed a Multi-Jurisdictional Hazard Mitigation Plan that was approved by FEMA on May 12, 2017. This current planning effort serves to update that previously approved plan.

The plan update process followed a methodology in accordance with FEMA guidance, which began with the formation of a Mitigation Planning Committee (MPC) comprised of representatives from County A and participating jurisdictions. The MPC updated the risk assessment that identified and profiled hazards that pose a risk to County A and analyzed jurisdictional vulnerability to these hazards. The MPC also examined the capabilities in place to mitigate the hazard damages, with emphasis on changes that have occurred since the previously approved plan was adopted. The MPC determined that the planning area is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Riverine and flash flooding, winter storms, severe thunderstorms/hail/lightning/high winds, and tornadoes are among the hazards that historically have had a significant impact.

Based upon the risk assessment, the MPC updated goals for reducing risk from hazards. The goals are listed below:

1. Protect the Lives, Property and Livelihoods of All Citizens.
2. Provide Mitigation to Lessen the Impact in Hazard Prone Areas.
3. Increase Resources Available to Citizens via Education and Preparedness.
4. Ensure Continued Operation of Government and Emergency Functions in a Disaster.
5. Identify Critical Infrastructure Components.

To advance the identified goals, the MPC developed recommended mitigation actions, as summarized in the table on the following pages. The MPC developed an implementation plan for each action, which identifies priority level, background information, ideas for implementation, responsible agency, timeline, cost estimate, potential funding sources, and more. These additional details are provided in Chapter 4.

Table I. Mitigation Action Matrix

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
	Prevention Public Education							
1.1.6	Incorporate hazard buffer zones into subdivision platting regulations.	St. Joseph	Medium	1	Flood, dam failure, levee failure, etc.	✓	✓	✓
1.1.12	Implement snow day policies for employees to reduce the number of people on the roadway during severe winter weather.	Missouri Western State University	Medium	1	Severe winter weather	n/a	n/a	n/a
1.1.13	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.	St. Joseph	Low	1	Severe winter weather	✓	✓	n/a
1.1.14	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.	Missouri Western State University	Low	1	Severe winter weather	✓	✓	n/a
1.1.15	Review emergency access routes and evacuation routes and mitigate any problem areas.	Lewis and Clark Village	Medium	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
1.1.16	Review emergency access routes and evacuation routes and mitigate any problem areas.	St. Joseph	Medium	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
4.1.1	Maintain a publicly accessible list of names, positions, contact information, roles and responsibilities for all public safety positions and departments	Buchanan County	Low	4	All	n/a	n/a	n/a
	Structure and Infrastructure Projects							

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.1.3	Adding shelters in the construction of new public facilities like libraries, community centers, etc.	Buchanan County	Low	1	Thunderstorm, tornado	x	✓	✓
1.1.4	Adding shelters in the construction of new public facilitates like libraries, community centers, etc.	St. Joseph	Low	1	Thunderstorm, tornado	x	✓	n/a
1.1.5	Submit NOI for construction of safe rooms across the University campus.	Missouri Western State University	Low	1	Thunderstorm, tornado	x	✓	n/a
1.1.9	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	Buchanan County	Medium	1	Tornadoes, thunderstorm	✓	✓	✓
1.1.10	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	Agency	Medium	1	Tornadoes, thunderstorm	✓	✓	✓
1.1.11	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	St. Joseph	Medium	1	Tornadoes, thunderstorm	✓	✓	✓
1.1.18	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	Rushville	Low	1	Tornadoes, thunderstorm	✓	✓	✓
1.2.5	Place warning sirens in densely populated unincorporated areas	Buchanan County	High	1	Flood, thunderstorm, tornado, etc.	✓	✓	✓
1.3.3	Accommodate individuals with special/functional needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).	Buchanan County	High	1	Earthquake, flood, severe winter weather, heat wave, etc.	✓	✓	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.3.4	Accommodate individuals with special/functional needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).	Easton	High	1	Earthquake, flood, severe winter weather, heat wave, etc.	✓	✓	n/a
2.1.11	Amend municipal ordinances to include a section mandating the building of a storm shelter with a capacity to handle the expected population in any new mobile home park or park undergoing renovation or expansion.	St. Joseph	Low	2	Thunderstorm wind, tornado	✓	✓	n/a
	Natural Systems Protection							
2.1.1	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.	Agency	High	2	Flood	✓	✓	✓
2.1.2	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.	Lewis and Clark Village	High	2	Flood	✓	✓	✓
2.1.3	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)	Buchanan County	High	2	Flood	✓	✓	✓
2.1.4	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)	Agency	High	2	Flood	✓	✓	✓
2.1.5	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)	Lewis and Clark Village	High	2	Flood	✓	✓	✓
2.1.6	Construction of detention basin, small lakes, and greenways or riparian corridors to channel and catch storm water, thereby reducing the likelihood of flooding as part of a countywide storm water management plan.	Agency	High	2	Flood	✓	✓	✓

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
2.1.7	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.	Agency	Low	2	Flood	✓	✓	✓
2.1.8	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.	St. Joseph	Low	2	Flood	✓	✓	✓
2.1.9	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.	Agency	Low	2	Flood	✓	✓	✓
2.1.10	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.	Lewis and Clark Village	Low	2	Flood	✓	✓	✓
	Emergency Services							
1.1.7	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.	Buchanan County	Medium	1	Earthquake, flood, severe winter weather, tornado, etc.	n/a	n/a	n/a
1.1.8	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.	Missouri Western State University	Medium	1	Earthquake, flood, severe winter weather, tornado, etc.	n/a	n/a	n/a
1.2.1	NOAA weather radio on continuous operation in university facilities.	Missouri Western State University	Medium	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	n/a	n/a	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.2.2	Keep areas of the city covered with storm siren alerts	St. Joseph	High	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
1.2.3	Keep areas of the city covered with storm siren alerts	Buchanan County	High	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
1.3.5	Update inventory of facilities with generators and emergency power than can be used as shelters in the event of a disaster. Retrofit shelters to be equipped to connect with generators.	Missouri Western State University	High	1	Earthquake, flood, severe winter weather, heat wave, etc.	✓	✓	n/a
2.3.1	Encourage up-to-date commercial and industrial disaster plans that are coordinated with community disaster plans.	St. Joseph	Medium	2	All	n/a	n/a	n/a
2.3.2	Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents	Buchanan County	High	2	Flood	✓	✓	✓
2.3.3	Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents	St. Joseph	High	2	Flood	✓	✓	✓
2.3.4	Maintain and update list of names, phone numbers and duties for all employees during regular operation and off hours.	Missouri Western State University	High	2	All	n/a	n/a	n/a
4.1.2	Execute mutual aid agreements with all relevant agencies	Buchanan County	High	4	All	n/a	n/a	n/a
4.1.3	Execute mutual aid agreements with all relevant agencies	Agency	High	4	All	n/a	n/a	n/a
4.1.4	Execute mutual aid agreements with all relevant agencies	Easton	High	4	All	n/a	n/a	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
4.1.6	Maintain offsite data backup of county records and safeguard data that does not have backups.	Buchanan County	High	4	All	✓	✓	✓
5.1.1	Assess critical facilities and infrastructure for needed upgrades and retrofits	Buchanan County	High	5	All	✓	✓	✓
5.1.2	Assess critical facilities and infrastructure for needed upgrades and retrofits	St. Joseph	High	5	All	✓	✓	✓
5.1.3	Assess critical facilities and infrastructure for needed upgrades and retrofits	Missouri Western State University	High	5	All	✓	✓	✓
4.1.4	Work with utility providers to assess vulnerability to hazards and to implement needed upgrades and retrofits	St. Joseph	Low	5	All	✓	✓	✓
	Education and Outreach							
1.1.1	Public education outreach to inform residents to purchase weather radios to ensure they have sufficient access to information in times of disasters.	Buchanan County	Low	1	Flood, heat wave, severe winter weather, tornado, etc.	✓	✓	n/a
1.1.2	Increase public notification through use of Nixle alerts	St. Joseph	High	1	Flood, heat wave, severe winter weather, tornado, etc.	✓	✓	n/a
1.1.17	Form and train Community Response Teams in cities and neighborhood associations.	St. Joseph	High	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	n/a	n/a	n/a
1.2.4	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.	Buchanan County	High	1	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.	n/a	n/a	✓

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.2.6	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.	Buchanan County School District	High	1	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.	n/a	n/a	n/a
1.2.7	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.	Mid-Buchanan School District	High	1	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.	n/a	n/a	n/a
1.3.1	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.	Buchanan County	High	1	Flood, severe winter weather, heat wave, thunderstorm, tornado, etc.	n/a	n/a	n/a
1.3.2	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.	St. Joseph	High	1	Flood, severe winter weather, heat wave, thunderstorm, tornado, etc.	n/a	n/a	n/a
3.1.1	Develop an ongoing campaign to educate the community about seasonal hazards and coordinate the campaign with a variety of promotional resources	Buchanan County	Low	3	All	n/a	n/a	n/a
3.1.2	Educate children in disaster preparedness and how to survive disasters	St. Joseph School District	High	3	All	n/a	n/a	n/a
3.1.3	Conduct a public education campaign to inform citizens across the region of the benefits of constructing a tornado safe room in their homes	St. Joseph School District	High	3	All	n/a	n/a	n/a
3.1.4	Promote Ready-In-Three Campaign	Easton	Low	3	All	n/a	n/a	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.1.5	Promote Ready-In-Three Campaign	Lewis and Clark Village	Low	3	All	n/a	n/a	n/a
3.1.6	Educate children in disaster preparedness and how to survive disasters	Buchanan County School District	High	3	All	n/a	n/a	n/a
3.1.7	Educate children in disaster preparedness and how to survive disasters	Mid-Buchanan School District	High	3	All	n/a	n/a	n/a
4.1.5	Make GIS hazard information available online to county and permitting departments	Buchanan County	High	4	All	✓	✓	✓

44 CFR requirement 201.6(c)(5): The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan. For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

This plan has been reviewed by and adopted with resolutions or other documentation of adoption by all participating jurisdictions and schools/special districts. The documentation of each adoption is included in Appendix D, and a model resolution is included on the following page.

The jurisdictions listed in the Executive Summary participated in the development of this plan and have adopted the multi-jurisdictional plan.

Model Resolution

(*LOCAL GOVERNING BODY/SCHOOL DISTRICT*), Missouri RESOLUTION NO. _____

A RESOLUTION OF THE (*LOCAL GOVERNING BODY /SCHOOL DISTRICT*) ADOPTING THE (*PLAN NAME*)

WHEREAS the (*local governing body/school district*) recognizes the threat that natural hazards pose to people and property within the (local governing body/school district); and

WHEREAS the (*local governing body/school district*) has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the (*plan name*), hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the *(local governing body/school district*) from the impacts of future hazards and disasters; and

WHEREAS the (*local governing body*) recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the (*local governing body/school district*) will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by the (*local governing body/school district*) demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY THE (*LOCAL GOVERNMENT/SCHOOL DISTRICT*), in the State of Missouri, THAT:

In accordance with (*local rule for adopting resolutions*), the (*local governing body/school district*) adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of_____in favor and__against, and__abstaining, this_____day of _____,_____.

By (Sig): _____

Print name: _____

ATTEST:

By (Sig.): _____

Print name: _____

APPROVED AS TO FORM:

By (Sig.): _____

Print name: _____

1 INTRODUCTION AND PLANNING PROCESS

1 INTRODUCTION AND PLANNING PROCESS 1.1
1.1 Purpose 1.1
1.2 Background and Scope 1.2
1.3 Plan Organization 1.2
1.4 Planning Process 1.3
1.4.1 Multi-Jurisdictional Participation 1.5
1.4.2 The Planning Steps 1.7

1.1 PURPOSE

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. Mitigation activities may be implemented prior to, during or after an incident. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs (http://www.fema.gov/what-mitigation).

Federal Emergency Management Agency (FEMA) has implemented the various hazard mitigation planning provisions through the Code of Federal Regulations (CFR) at 44 CFR Part 201. The CFR provisions set forth the mitigation plan requirement for local and tribal governments as a condition of receiving FEMA hazard mitigation assistance. Under 44 CFR §201.6, local governments, schools or other publicly funded districts must have adopted a FEMA-approved local hazard mitigation plan in order to apply for hazard mitigation project grants. Section 322 of the Robert T. Stafford Relief and Emergency Assistance Act (P.L. 93-288), as amended by the Disaster Mitigation Act of 2000 (DMA) (P.L. 106-390), provides for States, Tribes and local governments to undertake a risk-based approach to reducing risks to natural hazards through mitigation planning.

The plan also meets the minimum planning requirements for all FEMA mitigation programs, such as Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation (PDM) and where appropriate, other FEMA mitigation related programs such as the National Earthquake Hazards Reduction Program (NEHRP), the National Flood Insurance Program (NFIP) and the Community Rating System (CRS). Entities that do not adopt the plan will not be eligible for mitigation grants.

The Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule were published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act or DMA). The DMA established the requirements for local hazard mitigation plans are in the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). The communities and school districts were informed that adopting the plan is a prerequisite for mitigation grant eligibility. Entities that do not adopt the plan will not be eligible for mitigation grants.

1.2 BACKGROUND AND SCOPE

As required by 44 CFR §201.6(d)(3), local jurisdictions must review and revise their plan to reflect changes in development, progress in local mitigation efforts and changes in priorities and resubmit it for approval every five (5) years in order to continue to be eligible for mitigation project grant funding. The 2021 Andrew County Multi-Jurisdictional Hazard Mitigation Plan is a revision of the previous five-year update adopted in March 2016 which was the second update of the original plan.

Jurisdictions that participated in the last plan and are continuing participation in the 2021 include:

- Buchanan County
- Village of Agency
- Village of Easton
- Village of Lewis and Clark
- Village of Rushville
- Unincorporated areas of Buchanan County
- Buchanan County R-IV School District
- Mid-Buchanan County R-V School District
- St. Joseph School District

Information in the plan will be used to help guide and coordinate mitigation activities and decisions for local land use policies in the future.

1.3 PLAN ORGANIZATION

The 2021 HMP is organized into five chapters, which are:

- Chapter 1: Introduction and Planning Process
- Chapter 2: Planning Area Profile and Capabilities
- Chapter 3: Risk Assessment
- Chapter 4: Mitigation Strategy
- Chapter 5: Plan Maintenance Process
- Appendices:
  Appendix A: References
  Appendix B: Planning Process Documentation
  Appendix C: Completed/Deleted Mitigation Actions
  Appendix D: Adoption Resolutions
  Appendix E: Critical/Essential Facilities (Redacted from Public Version)

The plan format has been standardized across the state in order to create hazard mitigation plans that are more consistent with each other, making it easier to locate information, as well as making plans more consistent from update to update. Chapter 5, Plan Maintenance Process, was added to expand the amount of information on maintaining the plan between updates. In the 2016 update, plan maintenance information was located in Section 4, Mitigation Strategy. Routine review and maintenance of mitigation actions and goals is important to make sure actions are being implemented on schedule and for the plan's goals to guide mitigation efforts. By increasing

the focus on plan maintenance through the addition of a separate chapter, this aspect will receive the attention it deserves.

The table below (Table 1.1) shows each chapter and summarizes the changes made in the update.

Table 1.1 Changes Made in Plan Update

2016 HMP	2021 HMP
Section 1: Community Profiles	Chapter 1: Introduction and Planning Process
Section 2: Hazard Identification	Chapter 2: Planning Area Profile and Capabilities
Section 3: Vulnerability and Capability Assessment	Chapter 3: Risk Assessment
Section 4: Mitigation Strategy	Chapter 4: Mitigation Strategy
	Chapter 5: Plan Maintenance Process (new chapter)
Appendices	Appendices

1.4 PLANNING PROCESS

44 CFR Requirement 201.6(c)(1): [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Mo-Kan Regional Council contracted to facilitate the plan's updating process. Mo-Kan staff will meet with the Buchanan County Presiding Commissioner and Emergency Management Director during the informational meeting to develop a list of area stakeholders and local jurisdiction representatives for the Mitigation Planning Committee (MPC). The updating process will include a kick-off meeting and three subsequent MPC meetings, as well as Local Emergency Planning Committee (LEPC) meeting. Mo-Kan staff will produce a draft and final plan update in a FEMA approved document, and coordinated with the Missouri State Emergency Management Agency (SEMA) and FEMA plan reviews.

The main topics at the MPC meetings will be discussed in Section 1.4.2. Mo-Kan solicited public involvement in the planning process. Appendix A provides the results from the survey that was distributed to the public for input into the risk analysis and planning process. Appendix B provides documentation of the planning process including public involvement solicitations and meeting notices.

The draft of the plan will be posted on the Mo-Kan website for public review and comment. A press release will be sent to notify the public that the plan is available for comment. Input from city and county officials will be solicited through distribution of drafts of the plan to their jurisdictions.

Table 1.2 shows the representatives from local jurisdictions and stakeholders that attended meetings and participated on the MPC.

Table 1.2 Jurisdictional Representatives Buchanan County Mitigation Planning Committee

Name		Title	Department	Jurisdiction/Agency/Organiz
Bill	Brinton	Emergency Management Director	Emergency Man.	Buchanan County
Bill	Lamar	Emergency Planner	Fire Dept.	City of St. Joseph
Lee	Sawyer	Presiding Commissioner	Co. Commission	Buchanan County
Scott	Burnham	Commissioner	Co. Commission	Buchanan County
Ron	Hook	Commissioner	Co. Commission	Buchanan County
Heather	Marti	City Clerk	City Council	Village of Agency
Sally	McDowell	City Clerk	City Council	Village of Easton
Matt	Larkin	Chairman	City Council	Village of Lewis and Clark
Gary	Black	Mayor	City Council	Rushville
Travis	Dittemore	Superintendent	Administration	Buchanan County R-IV
Robert	Sigrist	Director of Non-Academic Services	Administration	St. Joseph School District
Jay	Albright	Superintendent	Administration	Mid-Buchanan School District
John	Newell	Superintendent	Administration	East-Buchanan School District
Bryan	Adkins	Director	Physical Plant	Missouri Western State University

Table 1.3. Stakeholder Representatives Buchanan County Mitigation Planning Committee

Name		Title	Department	Agency/Organization
Adam	Perry	Chairperson	---	Buchanan County LEPC
Micky	Gill	Director of Operations	---	St. Joseph School District
Jeff	Atkins	Asst. Parks Director	Parks	City of St. Joseph
Ryan	Pummell	Code Enforcement	---	Buchanan County
Ralph	Dishong	Disaster Programs Specialist	---	American Red Cross
Mindy	Andrasevits	Fire Inspector	Fire	City of St. Joseph
Dennis	Johnson	Fire Chief	Fire	So. Central Buchanan Co. FPD
John	Hontz	Operations Manager	---	Missouri American Water
Mickey	Gill	Director of Operations	---	St. Joseph School District
Craig	Darrough	Environmental Safety Coordinator	---	Missouri Western State University
Colleen	Armstrong	Stormwater Quality Coordinator	Water Protection	City of St. Joseph
Katie	Bruegge	Interim Technical Services Manager	Water Protection	City of St. Joseph

Jennifer	Protzman	Detective Sergeant	---	St. Joseph Police Department
Eric	Protzman	Commander in Chief	---	St. Joseph Police Department
Jeff	Wilson	Public Info Officer	---	St. Joseph Police Department
Mike	Sobetski	---	---	Lifeline Foods
Lauren	Williams-Caudle	Environmental Manager	---	Clarios
Bill	Murray	Mayor	---	City of St. Joseph

Table 1.4. MPC Capability with Six Mitigation Categories

Community Department/Office	Prevention	Structure and Infrastructure Projects		Natural Systems Protection	Education and Awareness Programs	Emergency Services
		Property Protection	Structural Flood Control Projects			
Buchanan County Sheriff's Office						✓
Buchanan County Emergency Management	✓					✓
Buchanan County Floodplain Administrator	✓		✓	✓		
South Central Buchanan County Fire District	✓	✓				✓
St. Joseph Fire Department	✓	✓				✓
City of St. Joseph		✓		✓		✓
Village of Agency		✓				
Village of DeKalb		✓				
Village of Easton		✓				
Village of Lewis and Clark		✓				
Village of Rushville		✓				
Levy Districts				✓		
Buchanan County R-IV School District					✓	
East Buchanan School District					✓	
Mid-Buchanan County R-V School District					✓	
St. Joseph School District					✓	
Missouri Western State University					✓	✓

1.4.1 Multi-Jurisdictional Participation

44 CFR Requirement §201.6(a)(3): Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan.

Each jurisdiction is required to participate in the planning process and officially adopt the plan, in order to be eligible for mitigation funding grants. The MPC established some minimum criteria that each jurisdiction must meet in order to be considered a "participant." Plan participation requirements were defined as:

- Designation of a representative from each participating jurisdiction to serve on the MPC;
- Participation in two MPC meetings by either direct participation or authorized representation or host a work session with the specific jurisdiction;
- Each participating jurisdiction must provide to the MPC sufficient information to support plan development by completion and return of data collection questionnaires and validating/correcting critical facility inventories;
- Eliminated actions from the previously approved plan that were not implemented because they were impractical, inappropriate, not cost-effective, or were otherwise not feasible;
- Review and comment on plan drafts;
- Actively solicit input from the public, local officials, and other interested parties about the planning process and provide an opportunity for them to comment on the plan;
- Provide documentation to show time donated to the planning effort; and
- All participants should formally adopt the mitigation plan prior to submittal to FEMA for final approval.

Communities with full-time staff were able to attend meetings, in general, but the communities without full-time staff had difficulty. The MPC agreed that if a jurisdiction was unable to attend the meetings that participation could be met by communicating with Mo-Kan to receive meeting materials and submitting necessary paperwork. See **Table 1.5** for jurisdictional involvement in the planning process. Step 2 lists some of the additional meetings held with jurisdictions unable to attend meetings. The Village of DeKalb is not considered a participating jurisdiction.

Table 1.5. Jurisdictional Participation in Planning Process

Jurisdiction	Kick-off Meeting	Meeting #2	Meeting #3	Meeting #4	Data Collection Questionnaire Response	Update/Develop Mitigation Actions
Buchanan County	Y	Y	Y	Y	Y	Y
Village of Agency	N	N	N	Y	Y	Y
Village of DeKalb	N	N	N	N	N	N
Village of Easton	Y	Y	N	Y	Y	Y
Village of Lewis & Clark	N	N	Y	N	Y	Y
Village of Rushville	N	N	N	N	Y	N

Buchanan County R-IV School District	N	N	N	N	Y	Y
East Buchanan School District	N	N	Y	N	Y	Y
Mid-Buchanan County R-V School District	N	N	N	N	Y	Y
St. Joseph School District	Y	Y	N	Y	Y	Y
Missouri Western State University	Y	Y	Y	N	Y	Y

1.4.2 The Planning Steps

FEMA's Local Mitigation Planning Handbook (March 2013), Local Mitigation Plan Review Guide (October 1, 2013), and Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials (March 1, 2013) were used as the sources for the HMP update. The update followed the 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. The10-step process allows the Plan to meet funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program. **Table 1.6** shows how the CRS process aligns with the Nine Task Process outlined in the 2013 Local Mitigation Planning Handbook.

Table 1.6. County Mitigation Plan Update Process

Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
Step 1. Organize	Task 1: Determine the Planning Area and Resources
	Task 2: Build the Planning Team 44 CFR 201.6(c)(1)
Step 2. Involve the public	Task 3: Create an Outreach Strategy 44 CFR 201.6(b)(1)
Step 3. Coordinate	Task 4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)
Step 4. Assess the hazard	Task 5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)
Step 5. Assess the problem	
Step 6. Set goals	Task 6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(ii); and 44 CFR 201.6(c)(3)(iii)
Step 7. Review possible activities	
Step 8. Draft an action plan	
Step 9. Adopt the plan	Task 8: Review and Adopt the Plan
Step 10. Implement, evaluate, revise	Task 7: Keep the Plan Current

	Task 9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)

Step 1: Organize the Planning Team
(Handbook Tasks 1, 2, and 4)

In October 2020, Mo-Kan entered into cooperative agreements with SEMA and Buchanan County to prepare this multi-jurisdictional plan for local jurisdictions in Buchanan County. Discussions on the development of the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan began on November 9, 2020, with a meeting attended by Mo-Kan staff, Buchanan County Commissioners and the Emergency Management Director for the county. This meeting was conducted to discuss the timeline for developing the hazard mitigation plan, the planning process, identification of stakeholders and community organizations to include in the planning process and a date for the kick-off meeting. Attendees identified a list of potential participants to invite, and Mo-Kan staff mailed invitations letters for the kick-off meeting. The list of invitees included local elected officials, municipal and county government staff, emergency services personnel, school administrators, past hazard mitigation plan participants, private industry and utility providers, and volunteer organizations. For a complete list of those invited to participate, see Appendix C.

The MPC met on four occasions from December 2020 to May 2021 to collaborate on the plan update. Participants assisted in data collection; reviewed and revised goals, objectives, and mitigation strategies; and provided reviews and comments on the plan throughout the update process. Communication with MPC members occurred throughout the planning process through face-to-face meetings, phone interviews, and email correspondence in addition to committee meetings. Public notices, press releases, agendas and sign-in sheets for those meetings are in Appendix B. Because COVID-19 restrictions were in place through much of the planning process, hybrid meetings (in-person and via Zoom) were offered for two of the four meetings.

Table 1.6. Schedule of MPC Meetings

Meeting	Topic	Date
Informational Meeting	Mo-Kan staff met with commissioners and EMD to discuss potential MPC participants and the timeline for updating the plan, including setting the kick-off meeting date. Jurisdictions were mailed questionnaire forms after this meeting.	11-9-20
Kick-off Meeting	Discussed background and importance of HMP, timeline, participation requirements, data collection & next steps	12-8-2020
Planning Meeting #2	Discussed hazards in the county, outreach opportunities, and reviewed goals and objectives	2-23-21
Planning Meeting #3	Workshop session to review/update previous mitigation actions and develop new actions	3-23-21

Planning Meeting #4	Discussed mitigation actions and plan maintenance	5-4-2021

Step 2: Plan for Public Involvement
(Handbook Task 3)

44 CFR Requirement 201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

The MPC held its kick-off meeting on December 8, 2020. Some of the MPC members had participated in the 2016 update but the updating process was new for several attendees. There was discussion on soliciting public input and the importance of public outreach. It was determined to hold a series of public meetings and to present HMP update information at city council meetings and Local Emergency Planning Committee (LEPC) meetings. Mo-Kan staff and local jurisdictions disseminated public notices and press releases to the media, urging public attendance and input.

A survey was created to get the public's feedback about what hazards they were the most concerned with and what mitigation actions they would like to see included in the update. The survey was posted on the county's website and a link was posted in the local newspaper, the *Savannah Reporter*. The survey results are in Appendix A. Additionally, an HMP informational brochure was developed to distribute at various meetings, such as at local fire chiefs and Kiwanis meetings.

Discussions regarding the hazard mitigation plan also occurred at the April 22, 2021 and May 27, 2021 LEPC meetings, and Ready-In-Three materials were distributed to the public graduation ceremonies for the St. Joseph School District in May 2021 and during Region D Recycling Household Hazardous Waste and Ag Chemicals events at the Faucett facility in June 2021.

Step 3: Coordinate with Other Departments and Agencies and Incorporate Existing Information
(Handbook Task 3)

44 CFR Requirement 201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process. (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

At the informational meeting, held November 9, 2020, the Buchanan County Emergency Manager Director and commissioners assisted with compiling a list of organizations they determined to be integral to hazard mitigation planning to invite to participate in the plan update. Invitations were sent to all jurisdictions located in Buchanan County, school districts, emergency service personnel, and private industry representatives. A list of organizations and agencies that received invitations is in Appendix B. The MPC was comprised of those who responded to plan update invitations.

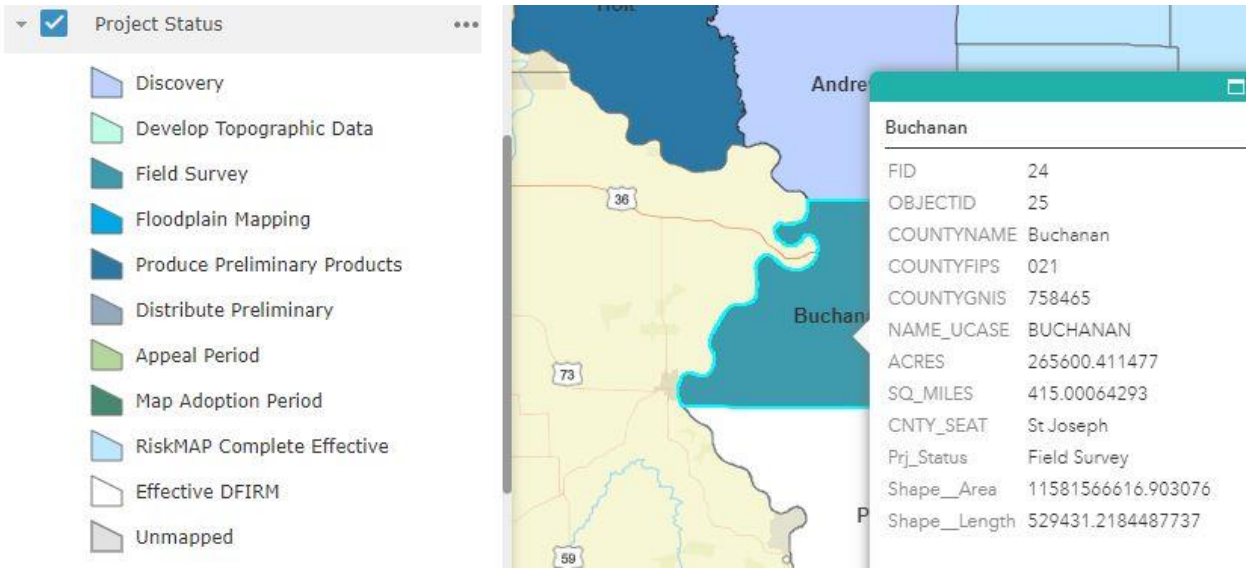
Coordination with FEMA Risk MAP Project

Risk Mapping, Assessment, and Planning (Risk MAP) is the Federal Emergency Management Agency (FEMA) Program that provides communities with flood information and tools they can use to enhance their mitigation plans and act to better protect their citizens. Through collaboration with State, Tribal, and local entities, Risk MAP delivers quality data that increases public awareness and leads to action that reduces risk to life and property.

FEMA is in the process of performing a field survey in Buchanan County, which includes the Independence-Sugar, One Hundred Two and Platte watersheds, to update flood maps. While there are several preliminary FIS/DFIRMs (available from the Map Service Center), the most current DFIRM for the county is from 1984. Preliminary information was used for the floodplain maps created for this update, but this data had not been adopted by FEMA at the writing of this plan. At a planner's meeting in June 2021, it was announced that the new floodplain maps would be ready for approval in December 2022 or January 2023.

Figure 1.1 illustrates the status of Buchanan County in regard to RiskMap projects, including Buchanan County.

Figure 1.1. RiskMAP Study Status Map



Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=2ac0864241b747b4b11302f2c4cc7bc9

Integration of Other Data, Reports, Studies, and Plans

Additional input was solicited from other agencies and organizations that were not able to attend planning committees. Data was collected and reviewed from multiple sources, which are referenced throughout the document. These sources include, but are not limited to, the US Census, Andrew and Buchanan Counties HMPs (adjacent counties), Flood Insurance Studies (FIS), Flood Insurance Rate Maps (FIRMS), State Department of Natural Resources (DNR) dam information, National Inventory of Dams (NID), dam inspection reports, local comprehensive plans and land use plans, US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics.

Step 4: Assess the Hazard: Identify and Profile Hazards
(Handbook Task 5)

At the first MPC meeting, held on December 8, 2020, hazards from the 2018 plan were briefly identified and profiled. The MPC agreed that historically, flooding and levee failure have been the most costly hazards; tornadoes and severe weather have also been areas of concern. At the second MPC meeting, held on February 23, 2021, the hazards were discussed in more detail. A survey was also distributed to get the public's feedback on which hazards were of most concern.

A list of previous disaster declarations was available to jurisdictions to assist in their individual risk assessments, but this list was not reviewed at an MPC meeting. The data collection questionnaire information was used by the individual jurisdictions in evaluating their risk assessment and by Mo-Kan staff in generating the data for risk assessments in Chapter 3. The MPC did not review each jurisdiction's data collection questionnaire, but collectively reviewed and discussed the draft document on flooding from Chapter 3 at the fourth meeting, held May 4, 2021, which included questionnaire information.

The 2018 Buchanan County HMP and the 2018 State Plan provided a basis for the 2022 Buchanan County HMP. Andrew County's HMP was also referred to, as it is a nearby county that also recently went through a hazard mitigation plan update.

Step 5: Assess the Problem: Identify Assets and Estimate Losses
(Handbook Task 5)

Jurisdictions identified their respective assets on their Data Collection Questionnaire form, as well as during work sessions. These assets were compared against various GIS layers and HAZUS to access their vulnerability to disasters.

The city clerks, mayors and/or city council members of their respective jurisdictions collaborated to complete the data collection questionnaires. Buchanan County and the City of St. Joseph have full-time staff, but other communities have only one or no full-time staff. Providing information on the data collection questionnaires often fell to one person. The superintendents and/or principals completed the data collection questionnaires for their school districts. Most of the data on the school questionnaire forms was readily available, in a different format, for school emergency plans. The data retrieved from the questionnaires can be found in Chapter 3. This data includes information on regulatory, personnel, fiscal and technical capabilities, and existing mitigation initiatives.
Inventory estimates for each jurisdiction's building stock in the county were derived by using HAZUS MH 4.2. The methodology for estimating losses varies by hazard. Loss estimates are

included for various hazard profiles in the Risk Assessment chapter.

Step 6: Set Goals
(Handbook Task 6)

During the third MPC meeting, held February 23, 2021, participants reviewed the plan's previous goals, and they decided to continue with the same goals and objectives in this plan. The 2018 and 2022 goals and objectives are:

Goal 1: Protect the Lives, Property and Livelihoods of All Citizens.
1. Objective: Protect citizens' lives and property.
2. Objective: Provide sufficient warning of impending disasters.
3. Objective: Identify the citizens most vulnerable to disasters and plan accordingly.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas.
1. Objective: Lessen the impact of certain disasters and reduce the damage of disasters.
2. Objective: Decrease the cost of the next disaster.
3. Objective: Increase our economic resilience to disasters.

Goal 3: Increase Resources Available to Citizens via Education and Preparedness Information.
1. Objective: Increase knowledge among citizens about disaster safety and preparedness.

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster.
1. Objective: Increase disaster mitigation management capability in local governments.

Goal 5: Identify Critical Infrastructure Components.
1. Objective: Increase mitigation strategies to support those infrastructures.

Step 7: Review Possible Mitigation Actions and Activities
(Handbook Task 6)

At the third MPC meeting, held on March 23, 2021, the mitigation strategy from the previous plan was reviewed and a new strategy was discussed. Representatives from the jurisdictions also reviewed the previous actions and reported on progress made on previously proposed actions. A packet for each jurisdiction was provided that included evaluation and STAPLEE forms, information on how to complete the forms and the actions to be evaluated. How to evaluate the past actions was discussed during the meeting but due to the sheer number of actions needing to be evaluated, jurisdiction representatives evaluated actions outside of the scheduled MPC meetings.

Participants were to consider the potential cost of each action in relation to the anticipated future cost savings. Members were encouraged to continue forwarding only those actions that substantively addressed long-term risks identified in the risk assessment. There was little difference in the risk assessment of natural hazards from the former plan. However, the members elected to add man-made disasters to the update. Man-made disasters are situations that the jurisdictions want to prepare for.

The jurisdictions independently prioritized their actions. The methodology from the 2016 plan was used, in which jurisdictions self-determined which actions were high, medium, and low priorities. Consideration included the action's potential to save lives and protect property, cost, and local capacity to implement/pursue. STAPLEE methodology was not used but available to jurisdictions if they wanted to use it. Actions followed the SMART criteria of being Specific, Measurable, Action oriented, Relevant and Time-bound. The goals and actions were consistent with the hazards identified in the plan and reflected the local priorities and vulnerability to hazards.

MPC members were encouraged to continue actions that addressed long-term risks identified in the risk assessment. Copies of the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)* were made available for jurisdictions to reference.

Step 8: Draft an Action Plan
(Handbook task 6)

At the third and fourth MPC meetings, held March 23 and May 4, 2021, new actions were discussed. The individual jurisdictions submitted their new actions after discussion with their respective city council or school board. It was at the individual jurisdiction's discretion on whether to include actions with low STAPLEE scores.

The action worksheets, including the plan for implementation, submitted by each jurisdiction for the updated Mitigation Strategy are included in Chapter 4.

Step 9: Adopt the Plan
(Handbook Task 8)

Jurisdictions were provided a digital link to the plan to make available to the public. The public and the jurisdictions were asked for feedback. The plan went before the Buchanan County Commissioners and the other jurisdictions for public comment in July for adoption in August and September. Adoption resolutions can be found in Appendix D.

Step 10: Implement, Evaluate, and Revise the Plan
(Handbook Tasks 7 & 9)

At each MPC meeting, plan maintenance was briefly discussed, and participants were reminded that the plan is a living document and periodic review of it will keep it current and relevant. At the fourth MPC meeting, held on May 4, 2021 the discussion was more in depth, including strategies for plan implementation, monitoring and plan review dates. Buchanan County, and other jurisdictions established general dates to review the plan so they can monitor and evaluate their progress on obtaining the plan's goals and completing the actions. During a review of the plan, the public will be notified and invited to participate. Details of plan maintenance and review are in Chapter 5.

.

2 PLANNING AREA PROFILE AND CAPABILITIES

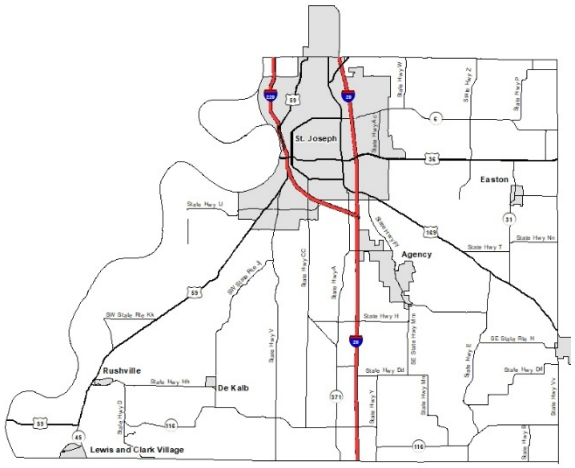
Planning Area Profile and Capabilities……2.1
2.1 Buchanan County Planning Area Profile……2.1
2.1.1 Geography, Geology, and Topography……2.2
2.1.2 Climate……2.3
2.1.3 Population/Demographics……2.3
2.1.4 History……2.6
2.1.5 Agriculture……2.7
2.1.6 Occupations……2.7
2.1.7 FEMA Hazard Mitigation Assistance (HMA Grants in Planning Areas)……2.7
2.2 Jurisdictional Profiles and Mitigation Capabilities……2.14
2.2.1 Unincorporated Buchanan County……2.14
2.2.2 Agency……2.18
2.2.3 Easton……2.20
2.2.4 Lewis and Clark Village……2.22
2.2.5 Rushville……2.26
2.2.6 St. Joseph……2.29
2.2.7 Missouri Western State University……2.31
2.2.8 School Districts……2.33

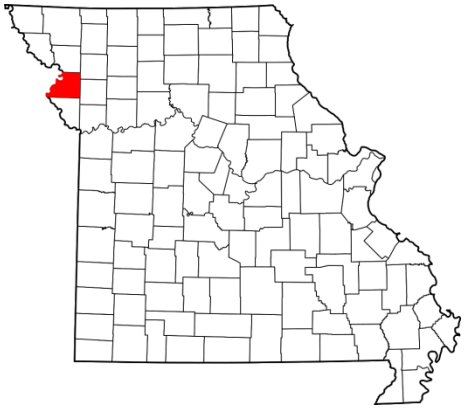
2.1 BUCHANAN COUNTY PLANNING AREA PROFILE

Buchanan County is located in Northwest Missouri, approximately 47 miles north of Kansas City, and is bordered by the counties of Andrew, Dekalb, Clinton, and Platte on the Missouri side, and Atchison and Doniphan counties in Kansas. The Missouri River forms the western border of the county between Kansas and Missouri. The county seat of Buchanan County is St. Joseph, which is the most populated city at 75,913, and is located near the geographic center of the county. Other incorporated communities in the county are Agency, Dekalb, Easton, Lewis and Clark Village, and Rushville. Unincorporated communities include Faucett, Halls, and Wallace.

Figure 2.1 shows the county's location in Missouri and the incorporated cities in the county.

Figure 2.1 Map of Buchanan County





Source: http://publicrecords.onlinesearches.com/maps/map-of-Buchanan-County-Missouri.php

According to the U.S. Census Bureau 2019 Annual Population Estimates, the population of Buchanan County is 87,364. This is approximately 2,000 fewer people than the 2000 U.S. Census, which reported a population of 89,201. This decrease represents a two percent population decline. This population decline contrasts both state and national population increases, as Missouri experienced a growth rate of 2.5 percent from 2010 to 2019, and the United States experienced a growth rate of .66 percent during the same timeframe. According to the 2019 American Community Survey, Buchanan County's median household income (MHI) increased 27 percent from $41,627 in 2010 to $55,020 in 2019. During the same timeframe, Missouri and the United States experienced an increase in median income of 22 percent and 31 percent, respectively. From 2010 to 2019, the median house value in the county rose from $107,800 to $122,200, an increase of 13 percent. Both the state and national median house values saw similar increases, with a 14 percent jump from $137,700 to $157,000 at the state level, and a 15 percent jump from $188,400 to $217,500 for the nation (Source: http://www factfinder.census.gov).

2.1.1 Geography, Geology, and Topography

Buchanan County has a total area of 415 square miles: 410 square miles of land and five square miles of water. The Missouri River flows along the western edge of the county and forms a border between Kansas and Missouri. St. Joseph, the county seat of Buchanan County, is located at 39º 47' North and 94º55' West. The area is served by Interstate 29 along with other federal and state highways. Commercial railroad and port services are available within the county.

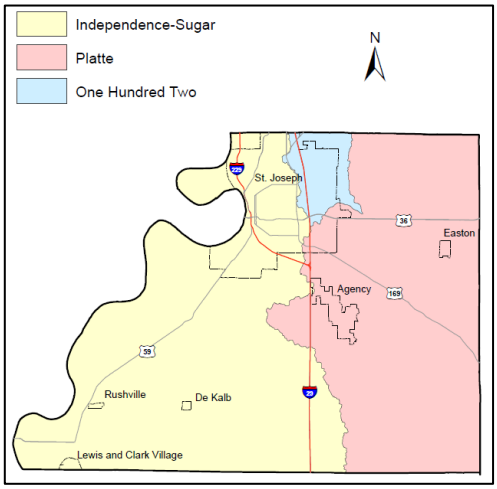
The topography of Buchanan County consists of rolling hills, valleys, and ample drainage. Ground elevations along Missouri range from 800 to 900 feet above sea level. Ground elevations along the Northern border of the region are 900 feet at the Missouri River to 1,100 feet in southern Buchanan County. The majority of the land space throughout the region is approximately 900 feet above sea level.

The bedrock of Buchanan County formed during the Quaternary and Pennsylvanian Periods approximately 300 million years ago. Alluvium soil formed in the Missouri River Floodplain consisting mainly of a rich mixture of sand, silt, and clay. These soils are 100 to 150 feet thick. The rest of the region is underlain with bedrock from the Upper Pennsylvanian Age

and is characterized by an alternation of thin shale, limestone and sandstones. In some places, the limestone may be up to 300 feet thick, but usual thicknesses are only a few feet.

There are three watersheds in Buchanan County. The Independence-Sugar watershed includes the communities of Dekalb, Lewis and Clark Village, Rushville, and St. Joseph. The One Hundred Two Watershed includes St. Joseph. The Platte River Watershed includes the communities of Agency, Easton, and St. Joseph. **Figure 2.2** shows the three watersheds in the county (Source: MoDNR).

Figure 2.2 Watersheds in Buchanan County



Source: https://dnr.mo.gov/omw/OMWWatersheds.htm

2.1.2 Climate

The climate of Northwest Missouri is continental in nature with cold winters and hot summers and is subject to extreme changes in temperature, humidity, cloudiness, and wind speeds. The National Weather Service (NWS) data shows Buchanan County has an annual mean temperature of 53.4 degrees Fahrenheit. Based on weather data from 1981 to 2010, July is the warmest month and has an average mean temperature of 87.0 degrees Fahrenheit. January is the coldest month with the mean average temperature of 17.4 degrees Fahrenheit. The wind average in 2015 was 8.4 mph and usually comes from the south. The average rainfall is 37.7 inches per year, and the average snowfall is 18.3 inches per year. The average growing season is 170 days.
Source: http://w2.weather.gov/climate/ index.php?wfo=eax

2.1.3 Population/Demographics

Table 2.1 shows the population of the communities in Buchanan County from 2000 to 2019. During this time, the county added 2,462 people to its overall population, a 2.9 percent growth rate. Agency increased its population by 38 percent; St. Joseph faced a 1.21 percent population decrease; Dekalb saw an increase in population of 18 percent; and Easton experienced a 14 percent decrease in population from 2010-2019. Rushville saw a six percent decline over the same period, and Lewis and Clark Village's population decreased by 1.5 percent.

Table 2.1. Buchanan County Population 2000-2019 by Community

Jurisdiction	2000 Population	2010 Population	2019 Annual Population	# Change (2010-2019)	% Change (2010-2019)
Buchanan County	85,998	89,201	88,460	-741	-0.83%
Agency	662	528	733	205	38.82%
Dekalb	257	220	260	40	18.18%
Easton	258	236	203	-33	-13.98%
Lewis & Clark Village	155	132	130	-2	-1.51%
Rushville	280	303	283	-20	-6.6%
City of St. Joseph	74,972	76,843	75,913	-930	-1.21%
Missouri	5,595,211	5,988,927	6,104,910	115,983	1.93%
United States	281,421,906	308,745,538	324,697,795	15.952,257	5.16%

Source: U.S. Bureau of the Census, Decennial Census, annual population estimates/ 5-Year American Community Survey 2019;
*population includes the portions of these cities in adjacent counties

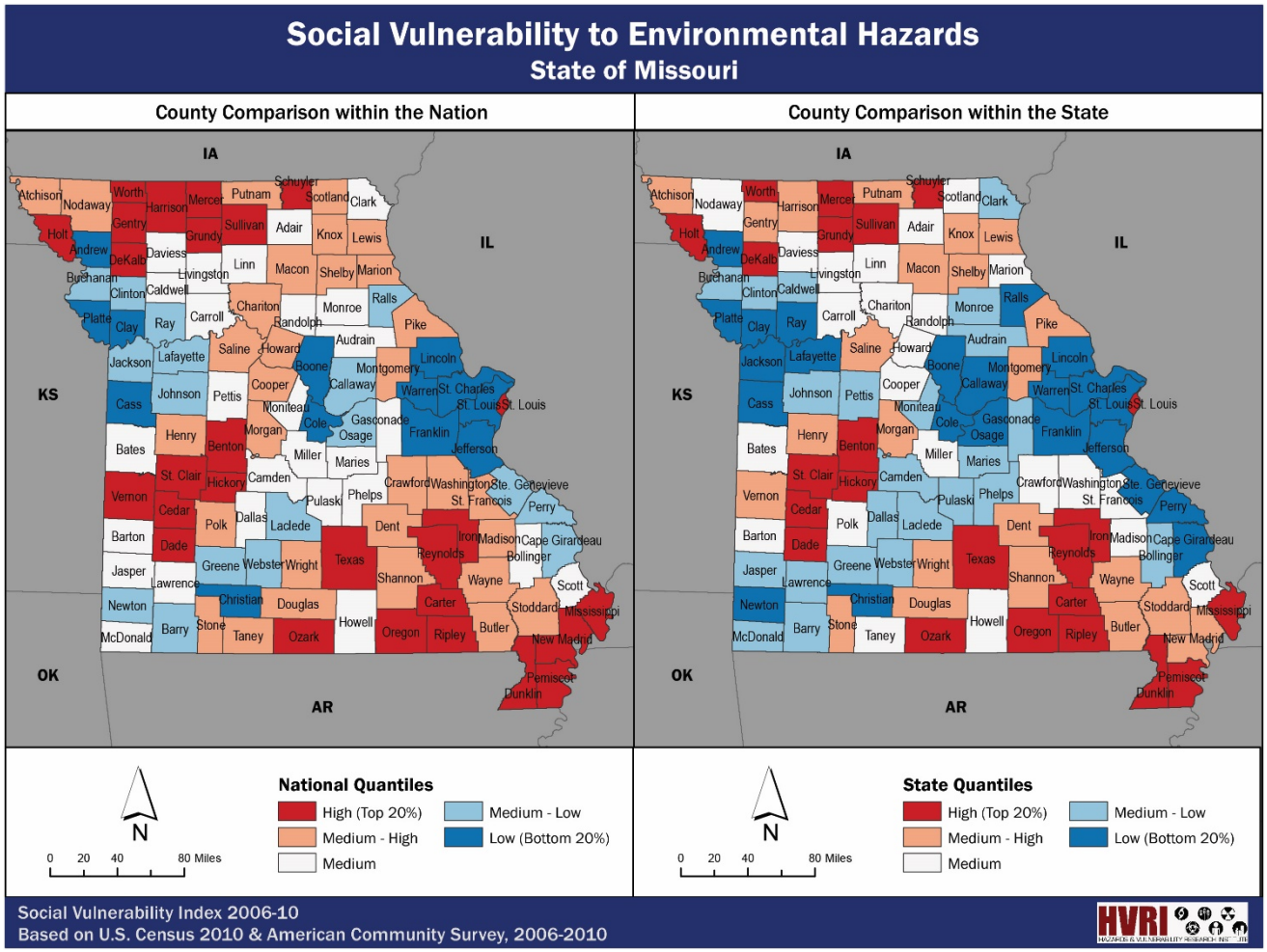
According to the US Census American Community Survey (ACS) five-year estimate for 2015-2019, Buchanan County is slightly above state and national averages regarding the percentage of the population under the age of five. Buchanan County's percentage is 6.4 percent while Missouri and the United States are 6.0 percent and 5.9 percent, respectively. The 65-years-of-age and over population for Buchanan County is 16.20 percent, a little lower than the state average and a little higher than the national average. Missouri and United States are 17.2 percent and 16.5 percent respectively.

The United States has 122,802,852 total households, with an average household size of 2.61. Missouri has 2,458,337 total households, with an average of 2.43 household size. Buchanan County has 33,984 total households, with an average household size of 2.44, which is lower than the national average but comparable to the Missouri average.

The University of South Carolina developed an index to evaluate and rank the ability to respond to, cope with, recover from, and adapt to disasters. The index synthesizes 30 socioeconomic variables which research literature suggests contributes to a reduction in a community's ability to prepare for, respond to, and recover from hazards. SoVI ® data sources include primarily those from the United States Census Bureau. Buchanan County has a SoVI score of -0.655624 and in a national percentile of 39.29%, placing the county in the medium range for resiliency.

Figure 2.3 shows how Buchanan County compares to the state in social vulnerability to environmental hazards. A higher percentage indicates a higher vulnerability. Scores in the top 20 percent of the United States are more vulnerable counties (red) and scores in the bottom 20 percent of the United States indicate the least vulnerable counties (blue). Buchanan County scores in the medium-low range for vulnerability.

Figure 2.3 **Social Vulnerability Index**



Source: http://artsandsciences.sc.edu/geog/hvri/sites/sc.edu.geog.hvri/files/attachments/Missouri_0610.pdf

Table 2.2 below provides additional demographic and economic indicators for the county.

Table 2.2. **Unemployment, Poverty, Education, and Language Percentage Demographics, Buchanan County, Missouri**

Jurisdiction	Total in Labor Force	Percent of Population Unemployed	Percent of Families Below the Poverty Level	Percentage of Population (High School graduate)	Percentage of Population (Bachelor's degree or higher)	Percentage of population with spoken language other than English
Buchanan County	70,761	4.6%	11.19%	89.6%	19.6%	6.2%
Agency Village	564	4.3%	8.16%	95.1%	12.5%	1.2%
DeKalb Town	201	1.4%	8.96%	92.7%	14.6%	0.4%
Easton	182	2.1%	11.65%	83.6%	6.2%	1.0%
Lewis & Clark	109	3.2%	3.67%	92.7%	2.1%	0%
City of St. Joseph	60,611	12.18%	4.7%	87.4%	20.5%	6.2%
Missouri	4,918,035	5.4%	12.9%	90.7%	30.2%	6.6%
United States	259,662,880	6.3%	10.9%	88.6%	33.1%	22.0%

Source: U.S. Census, 2019 American Community Survey, 5-year Estimates and 2019 ACS 1 Year Estimates.

2.1.4 History

The Native American residents included the tribes of the Kanza, Iowa, Sac, Fox, Delaware, Kickapoo, and a few Pottawatomie.

The early settlers to the region were fur traders who trapped beaver along the Missouri River in the late 1700s. The river provided not only an abundant home for fur-bearing animals, but also a relatively accessible and dependable means of transportation. Explorers Lewis and Clark, leading the Corps of Discovery, passed through the area in the summer of 1804 as they explored the newly obtained Louisiana Purchase territory. On July 4, 1804, President Jefferson's Corps of Discovery celebrated the birth of the nation in what is today Lewis and Clark Village, located on the east bank of the Missouri River.

The area west of what was then the state border of Missouri and east of the Missouri River was granted to the Native American tribes in residence by the Prairie-du-Chien treaty with the French government, the landholders before the advent of the Louisiana Purchase. By June 1836, the treaty was amended to extinguish Indian claims to land in Northwest Missouri.

The federal government paid the resident tribes Native Americans $7,500 for the six counties of the Platte Purchase. In 1837, President Van Buren declared the Platte Region an extension of the State of Missouri and open for settlement.

Settlers from Virginia and Kentucky moved into the area as the frontier grew westward. Businesses sprang up in St. Joseph supplying the pioneers that traveled westward and serving the growing communities down the Missouri River. The City of St. Joseph was named after the Patron Saint Joseph. Joseph Robidoux founded the city in 1843, a local fur trader serving a once lone standing trading post.

Agency was laid out in 1865 and is a former site of Sac and Fox Indians. The village is 4.30 square miles.

DeKalb was originally known as Bloomington. It was renamed in 1851 for Baron De Kalb, a major general in the American Revolutionary War.

Easton was platted in 1854. The name is directional, literally east of St. Joseph, and Rushville, named from the dense growth of rushes in the region, was platted in 1847.

2.1.5 Occupations

Table 2.3 shows occupation statistics for Buchanan County in relation to state and national occupation statistics.

Table 2.3. Occupation Statistics, Buchanan County, Missouri

Place	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Buchanan County	11,549 (29.1%)	5,821 (14.6%)	8,150 (20.5%)	3,743 (9.4%)	10,407 (26.2%)
Agency Village	123 (24.6%)	87 (17.4%)	79 (15.8%)	41 (8.2%)	70 (14%)
DeKalb Town	29 (20.4%)	24 (16.9%)	16 (11.2%)	35 (24.6%)	38 (26.7%)
Easton	20 (21.0%)	16 (16.8%)	27 (28.4%)	10 (10.5)	22 (23.1%)
Lewis and Clark	14 (22.9%)	17 (27.8%)	7 (11.4%)	4 (6.5%)	19 (31.1%)
Saint Joseph	9,486 (27.8%)	5,278 (15.4%)	6,867 (20.1%)	3,007 (8.8%)	9,467 (27.7%)
Missouri	1,129,701 (38.3%)	497,954 (16.9%)	618,371 (21.0%)	259,697 (8.8%)	436,736 (14.8%)
United States	63,267,357 (39.8%)	28,093,795 (17.6%)	32,354,582 (20.3%)	14,041,340 (8.8%)	21,001,720 (13.2%)

Source: U.S. Census, 2019 American Community Survey, 5-year Estimates

2.1.6 Agriculture

According to the USDA 2017 Census on Agriculture, Buchanan County has 797 farms with a total
acreage of 184,062 acres. The neighboring counties of Andrew, Clinton and DeKalb have 706, 684 and 708 farms, respectively. The average size per farm is 231 acres, which is slightly lower than
the state average of 293 acres. The market value of agricultural products sold is $66,887, with $59,750 coming from crops, nursery, and greenhouse products and $7,137 from livestock, poultry, and their products, with cattle being the major commodity at $5,808. Beef cattle production has seen a slight decline since 2012, with an inventory of 14,508 cattle and calves reported in 2017 compared with 14,727 reported in 2012. The top crop in the county in terms of total acres is soybeans at 63,769 acres, followed by corn, at 51,722 acres, and forage at 16,156 of the total 133,748 acres in crops reported in 2017. With a total of 1,300 agricultural producers in the county in 2017, most were white males, 35 years of age and older. The 2015-2019 Community Survey 5-Year Estimates show 161 were employed in agriculture, fishing and forestry operations, which is 0.18% of the Buchanan County workforce.

2.1.7 FEMA Hazard Mitigation Assistance (HMA) Grants in Planning Area

Buchanan County has received three Hazard Mitigation Assistance (HMA) grants since 1993. These are listed in **Table 2.4**.

Table 2.4. FEMA HMA Grants in County from 1993-2020

Disaster Declaration	Project Type	Sub-Grantee	Date Approved	Project Total
NA	200.1: Acquisition of Private Real Property (Structures and Land) - Riverine	Buchanan	July 9, 1993	$964,929
NA	200.1: Acquisition of Private Real Property (Structures and Land) - Riverine	Agency	April 5, 2006	$22,679
NA	206.2: Safe Room (Tornado and Severe Wind Shelter) - Public Structures	Mid-Buchanan School District	August 12, 2011	$1,625,744
Total	NA	NA	NA	$2,613,352

Source: Federal Emergency Management Agency, assessed July 9, 2020

2.1.8 FEMA Hazard Mitigation Assistance (HMA) Grants in Planning Area

The table below lists the Public Assistance (PA) grants awarded to Buchanan County between 2007-2020.

Table 2.5. Table 2.5. FEMA PA Grants in Buchanan County from 2007-2020

Disaster Declaration	Disaster Type	Project Type	Project Size (small or large)	Project Total
1736	Severe Ice Storm	Public Buildings	Small	$4,604.35
1736	Severe Ice Storm	Recreational or Other	Small	$13,875.00
1736	Severe Ice Storm	Protective Measures	Small	$1,091.70
1736	Severe Ice Storm	Debris Removal	Large	$231,781.38
1736	Severe Ice Storm	Debris Removal	Small	$14,186.03
1736	Severe Ice Storm	Public Buildings	Small	$1,738.53
1736	Severe Ice Storm	Protective Measures	Small	$8,856.38
1736	Severe Ice Storm	Protective Measures	Small	$333,158.42
1736	Severe Ice Storm	Debris Removal	Large	$8,454.40
1736	Severe Ice Storm	Protective Measures	Small	$6,759.49
1736	Severe Ice Storm	Debris Removal	Large	$65,645.24
1736	Severe Ice Storm	Protective Measures	Large	$225.00
1736	Severe Ice Storm	Protective Measures	Large	$351,428.60
1736	Severe Ice Storm	Debris Removal	Large	$16,768.50

1736	Severe Ice Storm	Public Buildings	Small	$183,375.89
1934	Severe Storm(s)	Protective Measures	Small	$39,206.25
1934	Severe Storm(s)	Protective Measures	Small	$ 951.38
1934	Severe Storm(s)	Debris Removal	Large	$3,240.38
1934	Severe Storm(s)	Protective Measures	Small	$2,320.23
1934	Severe Storm(s)	Public Utilities	Large	$63,463.11
1934	Severe Storm(s)	Roads and Bridges	Small	$24,750.74
1934	Severe Storm(s)	Protective Measures	Small	$75,000.00
1934	Severe Storm(s)	Protective Measures	Small	$36,024.20
1961	Severe Storm(s)	Protective Measures	Small	$9,302.23
1961	Severe Storm(s)	Roads and Bridges	Small	$3,100.74
1961	Severe Storm(s)	Protective Measures	Small	$4,849.32
1961	Severe Storm(s)	Protective Measures	Small	$5,341.91
1961	Severe Storm(s)	Protective Measures	Small	$20,153.37
1961	Severe Storm(s)	Roads and Bridges	Small	$37,063.49
4012	Flood	Public Utilities	Small	$6,277.92
4012	Flood	Protective Measures	Small	$15,883.21
4012	Flood	Public Buildings	Small	$8,917.06
4012	Flood	Recreational or Other	Small	$4,207.73
4012	Flood	Debris Removal	Small	$23,371.85
4012	Flood	Roads and Bridges	Small	$1,419.77
4012	Flood	Recreational or Other	Small	$22,630.85
4012	Flood	Public Utilities	Small	$28,691.52
4012	Flood	Protective Measures	Small	$4,738.75
4012	Flood	Roads and Bridges	Small	$22,282.54
4012	Flood	Protective Measures	Small	$19,108.02
4012	Flood	Protective Measures	Large	$1,104.47
4012	Flood	Protective Measures	Small	$2,894.26
4012	Flood	Debris Removal	Small	$319,581.57
4012	Flood	Debris Removal	Large	$23,956.83
4012	Flood	Water Control Facilities	Small	$24,002.52

4012	Flood	Public Buildings	Small	$69,164.88
4012	Flood	Water Control Facilities	Small	$18,503.41
4012	Flood	Protective Measures	Small	$3,676.97
4012	Flood	Protective Measures	Small	$28,239.38
4012	Flood	Recreational or Other	Small	$1,875.00
4012	Flood	Recreational or Other	Small	$1,897.50
4012	Flood	Protective Measures	Small	$41,250.00
4012	Flood	Recreational or Other	Small	$ -
4012	Flood	Recreational or Other	Small	$1,897.50
4012	Flood	Protective Measures	Small	$15,993.75
4012	Flood	Protective Measures	Small	$14,242.50
4012	Flood	Roads and Bridges	Large	$11,330.25
4012	Flood	Protective Measures	Small	$2,974.70
4012	Flood	Debris Removal	Small	$90,814.48
4012	Flood	Recreational or Other	Small	$24,308.36
4012	Flood	Protective Measures	Small	$46,851.98
4012	Flood	Debris Removal	Small	$13,790.52
4012	Flood	Recreational or Other	Small	$8,827.20
4012	Flood	Recreational or Other	Small	$6,862.50
4012	Flood	Recreational or Other	Small	$13,423.85
4012	Flood	Protective Measures	Large	$21,083.98
4012	Flood	Debris Removal	Small	$16,258.20
4012	Flood	Roads and Bridges	Large	$179,513.22
4012	Flood	Roads and Bridges	Small	$12,817.80
4012	Flood	Debris Removal	Small	$16,729.16
4012	Flood	Protective Measures	Small	$18,002.24
4012	Flood	Debris Removal	Small	$10,165.35
4012	Flood	Protective Measures	Small	$ 908.63
4012	Flood	Protective Measures	Small	$8,286.00
4012	Flood	Protective Measures	Small	$7,819.15
4012	Flood	Recreational or Other	Small	$9,502.81

4012	Flood	Protective Measures	Small	$24,028.02
4012	Flood	Recreational or Other	Large	$34,838.30
4012	Flood	Protective Measures	Small	$9,222.59
4012	Flood	Recreational or Other	Small	$46,829.02
4012	Flood	Protective Measures	Small	$1,022.38
4012	Flood	Recreational or Other	Small	$3,295.72
4012	Flood	Protective Measures	Large	$1,679.50
4012	Flood	Public Utilities	Small	$13,559.50
4012	Flood	Protective Measures	Small	$72,143.69
4012	Flood	Protective Measures	Small	$ 4,639.63
4012	Flood	Protective Measures	Small	$2,301.92
4012	Flood	Roads and Bridges	Large	$2,221.46
4012	Flood	Recreational or Other	Small	$9,101.63
4012	Flood	Protective Measures	Large	$46,887.46
4012	Flood	Roads and Bridges	Small	$40,670.99
4012	Flood	Debris Removal	Small	$230,545.02
4012	Flood	Protective Measures	Small	$3,248.36
4012	Flood	Protective Measures	Small	$4,097.48
4012	Flood	Protective Measures	Small	$24,035.45
4012	Flood	Protective Measures	Large	$3,749.26
4012	Flood	Roads and Bridges	Small	$5,475.72
4012	Flood	Debris Removal	Small	$182,250.69
4012	Flood	Protective Measures	Small	$9,278.79
4012	Flood	Recreational or Other	Small	$1,215.00
4012	Flood	Protective Measures	Large	$47,677.97
4012	Flood	Protective Measures	Small	$10,855.80
4012	Flood	Debris Removal	Small	$66,905.11
4012	Flood	Protective Measures	Small	$3,735.00
4012	Flood	Roads and Bridges	Large	$7,960.80
4012	Flood	Protective Measures	Large	$14,085.77
4012	Flood	Debris Removal	Small	$42,212.74

4012	Flood	Protective Measures	Small	$533,735.02
4012	Flood	Protective Measures	Small	$5,833.59
4012	Flood	Debris Removal	Small	$9,808.20
4238	Severe Storm(s)	Protective Measures	Small	$1,923.56
4238	Severe Storm(s)	Roads and Bridges	Small	$45,536.63
4238	Severe Storm(s)	Protective Measures	Small	$78,277.50
4238	Severe Storm(s)	Roads and Bridges	Small	$30,585.54
4238	Severe Storm(s)	Roads and Bridges	Small	$19,665.75
4238	Severe Storm(s)	Recreational or Other	Small	$82,368.15
4238	Severe Storm(s)	Roads and Bridges	Small	$3,005.91
4238	Severe Storm(s)	Roads and Bridges	Large	$ -
4238	Severe Storm(s)	Protective Measures	Small	$78,689.45
4238	Severe Storm(s)	Roads and Bridges	Small	$106,681.26
4238	Severe Storm(s)	Debris Removal	Small	$2,301.00
4435	Flood	Protective Measures	Small	$31,332.47
4435	Flood	Protective Measures	Large	$24,682.50
4435	Flood	Roads and Bridges	Small	$19,216.06
4435	Flood	Recreational or Other	Small	$ 141,942.00
4435	Flood	Protective Measures	Large	$6,246.17
4435	Flood	Debris Removal	Small	$3,602.63
4435	Flood	Debris Removal	Small	$339,870.75
4435	Flood	Recreational or Other	Small	$65,668.70
4435	Flood	Debris Removal	Small	$27,417.55
4435	Flood	Debris Removal	Small	$34,128.61
4435	Flood	Public Buildings	Small	$5,913.68
4435	Flood	Public Utilities	Large	$2,737.80
4435	Flood	Roads and Bridges	Small	$2,553.87
4435	Flood	Protective Measures	Small	$101,591.35
4435	Flood	Roads and Bridges	Small	$83,233.65
4435	Flood	Roads and Bridges	Small	$19,016.28
4451	Severe Storm(s)	Roads and Bridges	Small	$37,802.75

4451	Severe Storm(s)	Debris Removal	Large	$13,478.88
4435	Flood	State Management	Small	$52,091.05
4435	Flood	Protective Measures	Small	$134,280.61
4435	Flood	Recreational or Other	Small	$2,628.02
4435	Flood	Protective Measures	Large	$10,904.03
4435	Flood	Debris Removal	Small	$83,498.54
4435	Flood	Protective Measures	Small	$352,361.20
4451	Severe Storm(s)	Protective Measures	Small	$6,160.73
4451	Severe Storm(s)	Debris Removal	Small	$2,781.87
4435	Flood	Public Utilities	Small	$31,166.23
4435	Flood	Water Control Facilities	Large	$27,151.67
4435	Flood	Public Buildings	Small	$65,914.50
4451	Severe Storm(s)	Roads and Bridges	Small	$327,792.87
4451	Severe Storm(s)	Roads and Bridges	Large	$36,989.10
4451	Severe Storm(s)	Protective Measures	Large	$15,091.04
4451	Severe Storm(s)	Protective Measures	Large	$261,160.50
4451	Severe Storm(s)	Recreational or Other	Small	$428,852.65
4435	Flood	Protective Measures	Small	$515,797.49
4435	Flood	State Management	Small	$60,033.77
4451	Severe Storm(s)	State Management	Small	$40,845.80
4451	Severe Storm(s)	Protective Measures	Small	$31,933.98
4435	Flood	Protective Measures	Large	$40,198.87
4435	Flood	State Management	Small	$ 1,956.48
4435	Flood	Protective Measures	Small	$288,577.01
4451	Severe Storm(s)	Protective Measures	Small	$41,989.92

Source: Federal Emergency Management Agency, accessed June 3, 2021

2.2 JURISDICTIONAL PROFILES AND MITIGATION CAPABILITIES

Buchanan County's Emergency Management Department has one full-time staff, the Emergency Management Director (EMD), who is responsible for:

• Planning, organizing and directly the county's emergency management plan with other government
and business officials
• Speaking before various groups to promote interest and cooperation in emergency situations
• Advising and assisting businesses in industrial emergency management programs
• Meeting with state and federal officials to coordinate county program
• Preparing necessary documentation to affected agencies
• Planning and coordinating county's disaster drills

The EMD organizes the Local Emergency Planning Committee (LEPC) monthly meetings and works
closely with the local chapter of the American Red Cross. The LEPC meetings have a cross-section of agencies, organizations and businesses in regular attendance.

2.2.1 Unincorporated Buchanan County

This section will include individual profiles for each participating jurisdiction in Buchanan County. A summary table indicating specific information for each jurisdiction is provided.

Buchanan County
Buchanan County's jurisdiction includes all unincorporated areas within the county boundaries. The governing body of Buchanan County is the County Commission, which consists of a presiding Commissioner, a Western Commissioner, and an Eastern Commissioner. The departments include:

Board of Commissioners
- Lee Sawyer (Presiding Commissioner)
- Scott Burnham (Eastern District Commissioner)
- Ron Hook (Western District Commissioner)

County Auditor
- Tara Horn

County Clerk
- Mary Baack- Garvey (County Clerk)

County Prosecuting Attorney
- Ronald R Holliday

County Recorder
- Becky Dunlap (Recorder of Deeds)

County Sheriff
- Bill Puett

Collector of Revenue
- Peggy Campbell

County Treasurer
- John D. Nash

GIS Coordinator
- Marcus Larson

Human Resources
- Annette Lanham

Emergency Management Coordinator
- Bill Brinton

Interim Emergency Manager
- Bill Lamar

Public Administrator
- Megan Stickley

Purchasing
- Kim Hartman (Purchasing Agent)

County Zoning Administrator
- Denise Embrey (Director of Planning and Zoning)

Assessor
- Scot Van Meter

Staff capabilities of the Buchanan County community are abundant. The Assessor places value on all taxable real and personal property for all three classes of property; commercial, residential, and agriculture. The auditor develops and oversees the county's budget including audits and processing of requisitions for payment. Planning and zoning enforces the existing zoning order for the county. They assist property owners to change zoning for land use purposes and issue conditional use permits. The roles and responsibilities of the County Emergency Management Department include planning, organizing, and directing a plan. They are also responsible for planning and coordination of the county's disaster drills.

Table 2.6. Buchanan County Mitigation Capabilities

Capabilities	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Capital Improvement Plan	No
County Emergency Operations Plan	2004, updated 2021
Local Recovery Plan	No
County Recovery Plan	No
County Mitigation Plan	Yes, this plan
Debris Management Plan	No
Economic Development Plan	No
Land Use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Public Education/Awareness	Yes
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	No
Floodplain Ordinance	Yes, 12/21/2001
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Stormwater Ordinance	No
Drainage Ordinance	No
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	No
Landscape Ordinance	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
Hazard Awareness Program	No
National Flood Insurance Program (NFIP)	Yes
National Community Rating System (CRS) program	No
National Weather Service (NWS) Storm Ready Certification	No
Firewise Community Certification	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	Rating: N/A
Economic Development Program	No
Land Use Program	Yes
Public Education/Awareness	Yes
Property Acquisition	Yes
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	

Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	Yes
Evacuation Route Map	Yes, for Halls Levee District Evac
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	Yes, Denise Embry
Building Inspector	Yes, Ryan Pummell
Mapping Specialist (GIS)	Yes, Marcus Larson
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Director	Yes, Bill Brinton
NFIP Floodplain Administrator	Yes, Bill Brinton
Emergency Response Team	Yes, Bill Brinton
Hazardous Materials Expert	Yes, Bill Brinton
Local Emergency Planning Committee	Yes
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	Yes
Economic Development Department	No
Housing Department	No
Historic Preservation	No
Non-Governmental Organizations (NGOs)	**Is there a local chapter?**
American Red Cross	Yes
Salvation Army	Yes
Veterans Groups	Yes
Local Environmental Organization	Yes
Homeowner Associations	Yes
Neighborhood Associations	Yes
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.)	Yes
Local Funding Availability	
Apply for Community Development Block Grants	No
Ability to fund projects through Capital Improvements funding	Yes
Capabilities	**Status Including Date of Document or Policy**
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewage, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2020

2.2.2 Agency

Agency is located in Eastern Buchanan County on Missouri Route FF along the Platte River. The community's population is 739, which has grown eight percent since 2010, and is governed by a board of trustees. The median income is $71,364. There are three outdoor warning sirens that provide full coverage within the city limits. The community has one part-time staff (city clerk) and relies on the county for emergency management, public safety and public education programs.

The government structure includes a Board of Trustees with a chairman, approximately five board members, and one clerk. There are no current FEMA mitigation grant projects at this time, nor any hazard-related concerns or issues regarding the vulnerability of special needs populations, according to information provided by community officials. There are no public tornado shelters or saferooms in the mitigation planning area. No residential, commercial, or industrial development is planned in the jurisdiction.

Portions of the community are susceptible to flooding. Of particular concern is the limited access caused by flooding on Route FF. The community has been involved in several flood mitigation efforts, including participation in NFIP, buyouts for repetitive loss properties and elevating structures. Bryan Gabriel is the current floodplain chair. Agency requires residents to get a floodplain permit and structures are required to elevated. Critical structures include the Agency Community Center (local government meetings are held at the center), South Central Buchanan Co. Fire Station and post office. It is in the Mid-Buchanan School District, and the community does not have Reverse 911.

South Central Buchanan Co. Fire Station and post office. It is in the Mid-Buchanan School District and the community does not have Reverse 911 or a public safe room.

Table 2.7. Agency Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	Yes, 12/27/2012
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
Emergency Operations Plan	No
Debris Management Plan	Yes, in comprehensive plan
County Emergency Plan	No
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes, in comprehensive plan
Transportation Plan / Highway Department	Yes, in comprehensive plan
Land-use Plan	Yes, in comprehensive plan
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No

Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	No
Floodplain Ordinance	Yes, included in zoning ordinance
Subdivision Ordinance	Yes, included in zoning ordinance
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Capability	
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Iowa Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
Firewise Community Certification	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	No
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	Yes
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	Yes
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	Yes, through the Buchanan County GIS Specialist
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Coordinator	No
NFIP Floodplain Administrator	Yes, Bill Brinton
Emergency Response Team	No
Hazardous Materials Expert	No
Emergency Management Coordinator	Yes, Bill Brinton
Local Emergency Planning Committee	No
County Emergency Management Commission	No

Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	No
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.	No
Local Funding Availability	
Ability to apply for Community Development Block Grants	Unsure
Ability to fund projects through Capital Improvements funding	Unsure
Authority to levy taxes for a specific purpose	Unsure
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	Unsure
Ability to incur debt through general obligation bonds	Unsure
Ability to incur debt through special tax bonds	Unsure
Ability to incur debt through private activities	Unsure
Ability to withhold spending in hazard prone areas	Unsure

Source: Data Collection Questionnaire, 2021

2.2.3 Easton

Easton is located in northeastern Buchanan County on Missouri Highway 31, off U.S. Highway 36. The community's population is 203, which has decreased eight percent since 2010, and is governed by a mayor and city council. The median household income is $43,182. The city is in the East Buchanan Middle School District. The rest of the school district's facilities are located outside of Buchanan County. Besides the middle school, other critical infrastructure include the U.S. Post Office, St. Joseph's Catholic Church and Fellowship Hall, Easton Park Shelter and concession stand. Easton has three part-time staff members (city clerk, police officer and building inspector/official). The community relies on the county for emergency management, public safety and public education programs. Easton has one warning siren, which is linked to St. Joseph's warning system. The community does not have a public safe room or Reverse 911.

Table 2.8. Easton Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	Yes (3/9/2020)
Local Emergency Plan	No
County Emergency Plan	No
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes

Capability	Status Including Date of Document or Policy
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	No

Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes (following Buchanan County codes)
Floodplain Ordinance	No
Subdivision Ordinance	Yes
Tree Trimming Ordinance	No
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Seismic Construction Ordinance	No
Capability	
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Iowa Wetlands and Riparian Areas Conservation Plan	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant	No
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	Yes
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	No. (City- No, Fire Dept- Yes)
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	Yes, Part Time
Building Inspector	Yes, Part Time
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No

Public Works Official	Yes, Part Time
Emergency Management Coordinator	Yes, Bill Brinton
NFIP Floodplain Administrator	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	No
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	No
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.	No
Local Funding Availability	
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	N/A
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	N/A
Ability to withhold spending in hazard prone areas	N/A

Source: Data Collection Questionnaire, 2020

2.2.4 Lewis and Clark Village

Lewis and Clark Village is located in southwest Buchanan County, near Sugar Lake, an oxbow lake of the Missouri River. Its location near the Missouri River makes the village susceptible to flooding.The community's population is 130, which has decreased seven percent since 2010, and is governed by a village council and mayor. The median household income is $37,500. The community is adjacent to the Lewis and Clark State Park, which draws a number of visitors and campers. Critical structures are Village Hall and Southwest Buchanan Co. Fire Station. The village is in the Buchanan Co. R-IV School District. There is a volunteer city clerk, and the community relies on the county for most of its emergency management and public safety needs. There is one warning siren that is linked to Atchison, Kansas.

The Government structure for Lewis and Clark consists of a mayor and a city council with four active members. There are no ongoing projects/programs designed to reduce disaster losses, and community officials reported no hazard related concerns at this time regarding the vulnerability of special needs populations. There is one warning siren in the jurisdiction that is located at the local fire station. There are no public tornado shelters or safe rooms. The community has been in a rebuilding stage since the 2019 flood, and there are not currently any plans for new facilities or infrastructure in the planning area. Lewis and Clark participates in the NFIP and issues building permits, base flood elevation requirements, and enforces floodplain ordinances.

Table 2.9. Lewis & Clark Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
County Emergency Plan	No
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes
Economic Development Plan	No
Transportation Plan	No
Land-use Plan	No
Flood Mitigation Assistance (FMA) Plan	
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	Yes
Building Code	Yes
Floodplain Ordinance	Yes
Subdivision Ordinance	No
Tree Trimming Ordinance	No
Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Capability	
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Landscape Ordinance	No
Debris Management Plan	No
Program	
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	No
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	No
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Capability	**Status Including Date of Document or Policy**
Property Acquisition	No
Planning/Zoning Boards	No

Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	Yes
Evacuation Route Map	Yes
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Coordinator	Yes, Bill Brinton
NFIP Floodplain Administrator	Yes, Jack Rodkey
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No
Local Emergency Planning Committee	No
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	No
Planning Consultant	No
Regional Planning Agencies	Yes
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	No

Local Funding Availability	
Ability to apply for Community Development Block Grants	No
Capability	**Status Including Date of Document or Policy**
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2021

2.2.5 Rushville

Rushville is a village located on the axis of Missouri Highways 59 and 116 and is governed by a board of trustees. The median household income is $51,250. The village is surrounded by farmland with patches of dense treescapes. Lost Creek traces the village east to west. The population stays around 300, with 120 (a five-year average) housing units. The small village was laid out in 1847, and the name was derived from the dense growth of “rushes” that thrived in the area. Community assets include Southwest Buchanan County Fire District, Rushville Lodge (AF & AM), Rushville Christian Church, Rushville Fertilizer Plant Garden Center, and Rushville Elementary School. Critical facilities include Rushville Elementary School, Southwest Buchanan County Fire District, and the Rushville Sugar Lake non-federal levee located along the community’s south boundary.

The government structure of Rushville consists of a Board of Trustees. There are no past or ongoing projects at this time for FEMA mitigation grants, and community officials reported no hazard-related concerns or issues regarding the vulnerability of special needs populations in this area. There is one outdoor warning siren in the community which is activated in cooperation with Buchanan County. There are no designated public tornado shelters or saferooms in the community. There are no current residential, commercial, or industrial development projects in this jurisdiction and no future development plans. The jurisdiction does not participate in NFIP. The floodplain area remains unmapped, with the last FEMA-approved map dated 8/1/83.

Table 2.10. Rushville Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No
Builder's Plan	No
Capital Improvement Plan	No
Local Emergency Plan	No
County Emergency Plan	No
Local Recovery Plan	No
County Recovery Plan	No
Local Mitigation Plan	No
County Mitigation Plan	Yes
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	No
Transportation Plan / Highway Department	No
Land-use Plan	No
Flood Mitigation Assistance (FEMA) Plan	No
Watershed Plan	No
Firewise or other fire mitigation plan	No
School Mitigation Plan	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	
Zoning Ordinance	No
Building Code	No
Floodplain Ordinance	No
Subdivision Ordinance	No
Tree Trimming Ordinance	No

Nuisance Ordinance	No
Storm Water Ordinance	No
Drainage Ordinance	No
Capability	
Site Plan Review Requirements	No
Historic Preservation Ordinance	No
Capability	**Status Including Date of Document or Policy**
Landscape Ordinance	No
Debris Management Plan	No
Zoning/Land Use Restrictions	No
Codes Building Official / Building Inspection	No
National Flood Insurance Program (NFIP) Participant	No, unmapped currently (8/1/83 was the last time)
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	No
National Weather Service (NWS) Storm Ready	No
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	Rating: 10
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	No
Property Acquisition	No
Planning/Zoning Boards	No
Stream Maintenance Program	No
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	NA
Studies/Reports/Maps	
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	No
FEMA Flood Insurance Study (Detailed)	No
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	No
Staff/Department	
Building Code Official	No
Building Inspector	No
Mapping Specialist (GIS)	No
Engineer	No
Development Planner	No
Public Works Official	No
Emergency Management Coordinator	No
NFIP Floodplain Administrator	No
Bomb and/or Arson Squad	No
Emergency Response Team	No
Hazardous Materials Expert	No

Local Emergency Planning Committee	No
County Emergency Management Commission	No
Sanitation Department	No
Transportation Department	No
Economic Development Department	No
Housing Department	No
Planning Consultant	No
Capability	**Status Including Date of Document or Policy**
Regional Planning Agencies	Yes
Historic Preservation	No
Non-Governmental Organizations (NGOs)	
American Red Cross	No
Salvation Army	No
Veterans Groups	No
Environmental Organization	No
Homeowner Associations	No
Neighborhood Associations	No
Chamber of Commerce	No
Community Organizations (Lions, Kiwanis, etc.)	No
Local Funding Availability	
Ability to apply for Community Development Block Grants	No
Ability to fund projects through Capital Improvements funding	No
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	Yes
Ability to withhold spending in hazard prone areas	Yes

Source: Data Collection Questionnaire, 2021

2.2.6 ST. JOSEPH

St. Joseph is the county seat and is located in northwest Buchanan County on Interstate 29 and U.S. Highway 36 along the Missouri River. City government consists of a mayor, city council and a city manager who conducts the day-to-day operations. There are 740 city employees, including an emergency manager, police chief and fire chief. The population is 75,053 and there has been a two percent decrease since the 2010 Census. The median household income is $48,197.

The city's health department and regional MoDOT office provide child safety seat training. The Safety Council is also involved in a number of safety programs, including bicycle safety. There are 21 sirens located in city limits and there is Reverse 911.

Mosaic Life Care and several health care facilities are located in St. Joseph. Government buildings in the city include the Buchanan County Courthouse, St. Joseph City Hall, Law Enforcement Center, Missouri State Highway Patrol Troop H Headquarters, Missouri Department of Transportation Regional Office, Missouri Department of Conservation Regional Office, Missouri State Office Building and U.S. Federal Building which includes the U.S. Post Office. The city also has the Western Reception, Diagnostic and Correctional Center and Northwest Missouri Psychiatric Rehabilitation Center. St. Joseph is in the St. Joseph School District.

An estimated 10,274 homes were built prior to 1939 and there are approximately 911 mobile homes. According to the 2011-2015 American Community Survey, 1,261 people don't speak English very well.

Table 2.12. St. Joseph Mitigation Capabilities

Capability	Status Including Date of Document or Policy
Planning Capabilities	
Comprehensive Plan	No, 1999
Builder's Plan	No
Capital Improvement Plan	Yes, 2019
Local Emergency Plan	Yes, 2019
County Emergency Plan	Yes
Local Recovery Plan	No
County Recovery Plan	Yes, 2012
Local Mitigation Plan	No
County Mitigation Plan	Yes, 2015
Local Mitigation Plan (PDM)	No
County Mitigation Plan (PDM)	No
Economic Development Plan	Yes
Transportation Plan	Yes, SJATSO 2040 MTP
Land-use Plan	Yes, Jul 15, 2009
Flood Mitigation Assistance (FMA) Plan	No
Watershed Plan	Yes
Firewise or other fire mitigation plan	No
School Mitigation Plan	Yes
Critical Facilities Plan (Mitigation/Response/Recovery)	No
Policies/Ordinance	**Status Including Date of Document or Policy**

Zoning Ordinance	Yes
Building Code	Yes
Floodplain Ordinance	Yes, 2001
Subdivision Ordinance	Yes
Tree Trimming Ordinance	Yes
Nuisance Ordinance	Yes
Storm Water Ordinance	No
Drainage Ordinance	No
Capability	**Status Including Date of Document or Policy**
Site Plan Review Requirements	Yes
Historic Preservation Ordinance	Yes
Landscape Ordinance	Yes
Debris Management Plan	No (Handled by Buchanan County)
Program	**Status Including Date of Document or Policy**
Zoning/Land Use Restrictions	Yes
Codes Building Site/Design	Yes
National Flood Insurance Program (NFIP) Participant	Yes
NFIP Community Rating System (CRS) Participating Community	No
Hazard Awareness Program	Yes
National Weather Service (NWS) Storm Ready	Yes
Building Code Effectiveness Grading (BCEGs)	No
ISO Fire Rating	3
Economic Development Program	No
Land Use Program	No
Public Education/Awareness	Yes - numerous
Property Acquisition	No
Planning/Zoning Boards	Yes
Stream Maintenance Program	Yes
Tree Trimming Program	No
Engineering Studies for Streams (Local/County/Regional)	No
Mutual Aid Agreements	Yes, Platte County – Region H Hazmat, all 15 counties
Studies/Reports/Maps	**Status Including Date of Document or Policy**
Hazard Analysis/Risk Assessment (Local)	No
Hazard Analysis/Risk Assessment (County)	No
Flood Insurance Maps	Yes
FEMA Flood Insurance Study (Detailed)	Yes
Evacuation Route Map	No
Critical Facilities Inventory	No
Vulnerable Population Inventory	No
Land Use Map	Yes, 2009
Staff/Department	**Status Including Date of Document or Policy**
Building Code Official	Yes
Building Inspector	Yes
Mapping Specialist (GIS)	No
Engineer	Yes
Development Planner	Yes
Public Works Official	Yes
Emergency Management Director	Yes, William Brinton
NFIP Floodplain Administrator	Yes
Bomb and/or Arson Squad	No
Emergency Response Team	No, Buchanan County
Hazardous Materials Expert	No, Buchanan County
Local Emergency Planning Committee	Yes
County Emergency Management Commission	N/A
Sanitation Department	Yes
Transportation Department	Yes
Economic Development Department	Yes
Housing Department	Yes
Planning Consultant	Yes

Regional Planning Agencies	Yes
Historic Preservation	Yes
Non-Governmental Organizations (NGOs)	**Status Including Date of Document or Policy**
American Red Cross	Yes
Salvation Army	Yes
Capability	**Status Including Date of Document or Policy**
Veterans Groups	Yes
Environmental Organization	Yes
Homeowner Associations	Yes
Neighborhood Associations	Yes
Chamber of Commerce	Yes
Community Organizations (Lions, Kiwanis, etc.	Yes
Local Funding Availability	**Status Including Date of Document or Policy**
Ability to apply for Community Development Block Grants	Yes
Ability to fund projects through Capital Improvements funding	Yes
Authority to levy taxes for a specific purpose	Yes
Fees for water, sewer, gas, or electric services	Yes, sewer only
Impact fees for new development	No
Ability to incur debt through general obligation bonds	Yes
Ability to incur debt through special tax bonds	Yes
Ability to incur debt through private activities	No
Ability to withhold spending in hazard prone areas	No

Source: Data Collection Questionnaire, 2021

Public School District Profiles and Mitigation Capabilities

2.2.7 Missouri Western State University

Missouri Western State University, located on more than 700 acres in St. Joseph, Mo., serves Missouri and surrounding states. Originally founded as St. Joseph Junior College in 1915, Missouri Western was transformed into a four-year college in 1969 and became a full member of the State of Missouri system in 1977. In 2005, Missouri Western received university designation and changed its name to Missouri Western State University. Missouri Western offers Certificates, Associate's, Bachelor's and Master's degrees. Student-centered, high-quality instruction emphasizes experience-based learning and community service.

At Missouri Western Campus, all buildings in all classrooms are equipped with (Alertus) systems which notify students, staff, and faculty in the event of an on-campus emergency. The residence halls are equipped with alarm strobe lights, horns, and a public address system. Buchanan County tornado sirens can be heard across the campus during a severe weather event. The University also uses the Griffon alert cell phone system to notify all students who are enrolled in the program. Severe weather alerts or emergency notifications are also made through local television and radio stations.

There are NOAA weather radios located and monitored in The Physical Plant Office located on West Campus and The University Police Office located in Blum Hall. Missouri Western State University has Emergency Mitigation plans in place which are reviewed annually. They include:

-A written EOP (Emergency Operations Plan) last updated 2020. This follows comprehensive planning in all aspects of University life and operations for students, staff, and faculty.
-Active participation in the LEPC, Local Emergency Planning Committee for Northwest Missouri.

-Active participation with the St. Joseph Fire Department and Fire Marshall's Office.
-Active participation with the St. Joseph Health Department regarding pandemic/immunization plans.
-Active participation in the form of mutual aid agreements with the American Red Cross Office in St. Joseph. Past participation included pandemic pod plans and emergency shelter operations.
-Shelter in place plans for all classroom buildings and residence halls.
-Active shooter exercises.
-Fire/Tornado drills in the residence halls.
-Residence Assistant hall training for student leaders.
-All University Police Officers are Post certified and participate in periodic training activities.

Other past or ongoing projects/programs designed to reduce disaster losses aim to protect critical facilities. Comprehensive visual inspection happens for all facilities for mechanical integrity in operation and safely. This event is completed with a representative from the University's insurance carrier. This event includes boiler inspections, inferred thermal scans of electrical systems, inspection of halon gas system to protect the computer centers, and testing the onsite tornado sirens and strobes. On-site visits from the National Weather Service at Pleasant Hill, Missouri to walk and inspect the campus for improvement recommendations concerning the campus Severe Weather/Tornado Shelter Plan. There is regular attendance and participation in the area of safety programs by the mechanical maintenance technicians focusing on electrical, HVAC, and construction issues. Approximately 60-80 students, staff, and faculty members are annually instructed on how to use fire extinguishers. This hands-on program uses live fire exercises followed up by a classroom text. CPR and tourniquet training are used for select staff and University Police Officers in the event of mass casualties. Safety training occurs for maintenance employees operating skid loaders, large trucks, and scissor lifts.

The Kit Bond Science and Technology Incubator Building has two designated restrooms identified as tornado shelters. Many of the campus building restrooms are listed and identified as secondary tornado shelter location in the "Shelter in Place" Plan. However, no tornado or saferoom shelters have been constructed on campus fit FEMA standards.

Since 2010, the institution made additions to buildings and constructed new buildings. Remington Hall was listed as new construction in 2010. Griffon Hall listed as new construction in 2010. Baker Family Fitness Center underwent renovations and additions in 2012. The Griffon Indoor Sports Complex and Stadium underwent new construction in 2016. There are no new construction or remodeling projects projected in the near future. The university does not lay in any known high hazard areas.

Five-year projected enrollment is expected to decrease due to a nation-wide downward trend in student enrollment. Many factors such as Covid-19 pandemic, lower employment opportunities, and general apathy with higher education have negatively affected enrollment. New strategies are being discussed by the administration to overcome these negative effects.

The University has an independent police force. All the officers are Post certified with full enforcement and arresting powers. Several officers are multi-year veterans of the St. Joseph Police Department. The University Police has a 24-hour a day presence on campus. In the event additional security is needed, the St. Joseph Police Department or Missouri Highway Patrol will respond to help mitigate the problem.

Table 2.13. Missouri Western State University Mitigation Capabilities

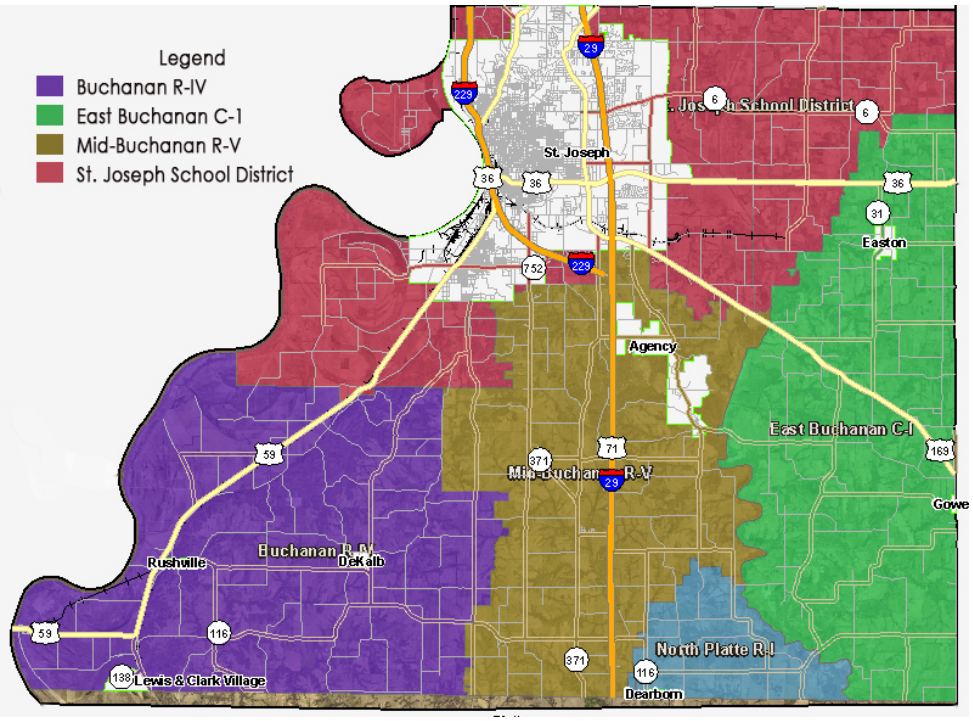
Capability	Missouri Western State University
Planning Elements	
Master Plan/ Date	Yes, 2021
Capital Improvement Plan/Date	Yes, 2021
School Emergency Plan / Date	Yes, 2020
Weapons Policy/Date	Yes, 2020
Personnel Resources	
Emergency Manager	Yes, University Police, Jill Voltmer (Chef)
Grant Writer	No
Public Information Officer	Yes, Public Affairs, Kent Heir
Full-time building Official	Yes, President, Elizebeth Kennedy (Interim)
Financial Resources	
Capital Improvement Projects funding	Yes
Local Funds	No
General Obligation Bond	No
Special Tax Bonds	No
Private Activities/Donations	Yes
State and Federal Funds	Yes

Source: Data Collection Questionnaire, 2021

2.2.8 Public School District Profiles and Mitigation Capabilities

This section provides general information about participating school districts in Buchanan County. There are four school districts with facilities in Buchanan County and three are participants in the plan. The East Buchanan School District and North Platte have most of their facilities in other counties. **Figure 2.4** is a map of school district boundaries in Buchanan County.

Figure 2.4. School Districts in Buchanan County



Source: Buchanan County GIS

Buchanan County R-IV School District

Buchanan County R-IV School District resides within the southern east boundary of the county. There are predominately three surrounding towns within this area: Rushville, DeKalb, and Lewis and Clark Village. There are two schools within this jurisdiction; DeKalb Middle and High School within the same building and two, Rushville Elementary. At Rushville Elementary, there are 21 Teachers and 202 students. At DeKalb Middle and High School, there are 20 teachers and 120 enrolled students. (Source Buchanan County I-IV http://buchananrivmo.apptegy.us/o/district/browse/167143)

The Buchanan County R-IV School District recently voted for a motion to raise hourly pay rate for teachers and substitute teachers. Recent approved bids for snow removal have been decided to save on next fiscal year. The district's health protocols and winter activities are under current review.

Table 2.14. Buchanan County R-IV School District Buildings and Enrollment Data, 2020-2021

District Name	Building Name	Building Enrollment
Buchanan County R-IV	DeKalb Middle and High School	120
Buchanan County R-IV	Rushville Elementary	202

Source: Missouri Department of Elementary and Secondary Education
https://mogov.maps.arcgis.com/apps/webappviewer/index.html?id=42394a81012c4737a705d8e943b6fda5)

Buchanan County R-IV School District is equipped with public address PA systems and in use during emergency alerts. There are NOAA Weather Radios in use for this jurisdiction. Recent projects or programs designed to reduce disaster losses include a Safe room built in the New VO-AG Building in 2014. On-going projects and programs aimed at reducing disaster losses include annual review of fire, tornado, and earthquake practices. Regular scheduled drills. There is a safe room in the Vocational Agriculture building since it is separate from MS/HS buildings. There is no plan to remodel or construct any building in the next 5 years. There are no potential hazards in the planning areas at this time. The projected enrollment is expected to decrease three to five percent over the next five years. There is no clear campus police policy indicated at this time. There is a Student Resource Officer through the Buchanan County Sherriff's Department provide by one percent sales tax.

Table 2.15 lists buildings in the school district/ institution including square footage, values, and occupancy/capacity in relation to natural hazard assessment inventory. Natural Hazard product key is as follows: Flooding-RF, Levee Failure-LF, Dam Failure-DF, Earthquake-EQ, Land Subsidence/Sinkholes-LSS, Drought-D, Extreme Temperature-ET, Severe Thunderstorms (including winds, hail, lightning)-ST, Severe Winter Weather (including snow, ice, severe cold)-SWW, Tornadoes-T, Wildfire-WF.

Table 2.15. Buchanan County School District Asset Inventory

Name of Asset	Address	Area	Replacement Value	Contents Value	Occupancy/Capacity	Natural Hazards
DeKalb MS/HS	702 Main Street / Dekalb	17,000	$17 Million	$4 Million	650	N/A
Vocational Agriculture Building	702 Main Street / Dekalb	5,500	$2 Million	$700 K	55	N/A
Rushville Elementary	8681 SE State Hwy 116 / Rushville	11,000	$13 Million	$3 Million	350	N/A

Source: Data Collection Questionnaire, 2021

East Buchanan School District

East Buchanan C-1 has one elementary school (grades K-6), one middle school (grades 7-8) and one high school (grades 9-12). According to the Missouri Department of Elementary and Secondary Education, the assessed valuation of the district is $69,579,392, and the adjusted tax rate of the district is $4.4776. The total enrollment as of November 2020 was 712 K-12 students and five preschoolers.

The district has indoor intercom systems at each building, as well as NOAA weather radios. It is in the process of improving indoor air quality at each building and has ongoing crisis preparation in the form of emergency drills at each school. The high school has a FEMA-rated safe room and completed other additions to the high school in 2015. In the next five years, the district plans to build

a new middle school, as enrollment numbers are expected to remain constant. There are no police officers on campus, but the district utilizes the services of the Gower Police Department as needed.

Table 2.16. East Buchanan School District Buildings and Enrollment Data 2020-2021

District Name	Building Name	Building Enrollment
East Buchanan School District	East Buchanan Senior High School	204
East Buchanan School District	East Buchanan Elementary School	324
East Buchanan School District	East Buchanan Middle School	188

Source: https://mogov.maps.arcgis.com/apps/webappviewer/index.html?id=42394a81012c4737a705d8e943b6fda5

Table 2.17 below lists buildings in the school district/ institution including square footage, values, and occupancy/capacity in relation to natural hazard assessment inventory. Natural Hazard product key is as follows: Flooding-RF, Levee Failure-LF, Dam Failure-DF, Earthquake-EQ, Land Subsidence/Sinkholes-LSS, Drought-D, Extreme Temperature-ET, Severe Thunderstorms (including winds, hail, lightning)-ST, Severe Winter Weather (including snow, ice, severe cold)-SWW, Tornadoes-T, Wildfire-WF.

Table 2.17. East Buchanan School District Asset Inventory

Name of Asset	Address	Area	Replacement Value	Contents Value	Occupancy /Capacity	Natural Hazards
East Buchanan Elementary	100 Smith St., Gower, MO 64454	67,551	$11,210,268	$1,860,901	500	T, ST
Vocational Building	100 Smith St., Gower, MO 64454	12,500	$2,048,729	$797,198	200	T, ST
East Buchanan Middle School	301 N. County Park Rd., Easton, MO 64443	21,546	$3,703,581	$595,487	300	T, ST
East Buchanan High School	100 Smith St., Gower, MO 64454	63,854	$15,871,215	$1,676,784	500	T, ST
Maintenance Building	100 Smith St., Gower, MO 64454	5,000	$175,802	$45,554	NA	T,ST

Source: Data Collection Questionnaire, 2021

Mid-Buchanan School District

Mid-Buchanan R-V has one elementary school and one high school. The elementary school serves K-6. The high school serves 7-12. The primary campus is located in Faucett, Missouri. According to the Missouri Department of Elementary and Secondary Education, the assessed valuation is $70,948,120. There is a Tax Levy in the amount of $5.5774. There are 98 faculty/staff and 757 enrolled students.

The District utilizes Missouri Western and Northwest for the provision of academic coursework including dual credit. The A+ Programs is a continued program being utilized and monitored. They are in the process of continuing to upgrade technology infrastructure to move towards a 1:1 model. The elementary school is being outfitted for new Smart TVs. Assessment on similar devices are being conducted for the High School classrooms at this time. The district will be putting out a bid for security camera projects on all interior and exterior areas that will also have the capacity to house a server with longer camera footage storage time. An approval of a $750,00 lease purchase

agreement went through this year. Bid packets are being put together to secure contractors to complete the first phase of roof improvements along with putting new asphalt down for the entire district as well as a new parking lot behind the building.

Table 2.18. Mid-Buchanan School District Buildings and Enrollment Data, 2020-2021

District Name	Building Name	Building Enrollment
Mid-Buchanan School District	Mid- Buchanan Senior High School	313
Mid-Buchanan School District	Mid- Buchanan Elementary school	443

Source: Mid-Buchanan R-V School District Preliminary Budget Fiscal Year 2020/2021
http://www.midbuchanan.k12.mo.us/common/pages/DisplayFile.aspx?itemId=12577643

Mid-Buchanan School District is equipped with a public address (PA) system or other emergency alert systems. There is a full building indoor PA system. The PA tones for fire and tornado. The schools within the Mid-Buchanan School District do not have AM NOAA Weather Radios. Past or ongoing projects or programs designed to reduce disaster losses include moving drainage systems prior to laying new asphalt for the driveway and parking lot in the back of the building. It is unclear at this time if there are any past or ongoing programs designed to reduce disaster losses within critical facilities within Mid-Buchanan schools. There is one listed Saferoom available and is up to FEMA saferoom approved standards. Since 2010, the Mid-Buchanan School district made an addition consisting of the erection of a maintenance pole barn. The institution plans to remodel within the next five years to add new classrooms. Projected enrollment is expected to increase 5 percent within the next five years. SRO is listed as the response to the inclusion of campus police and security staffing needs.

Table 2.19 below lists buildings in the school district/ institution including square footage, values, and occupancy/capacity in relation to natural hazard assessment inventory. Natural Hazard product key is as follows: Flooding-RF, Levee Failure-LF, Dam Failure-DF, Earthquake-EQ, Land Subsidence/Sinkholes-LSS, Drought-D, Extreme Temperature-ET, Severe Thunderstorms (including winds, hail, lightning)-ST, Severe Winter Weather (including snow, ice, severe cold)-SWW, Tornadoes-T, Wildfire-WF.

Table 2.19. Mid-Buchanan School District Asset Inventory

Name of Asset	Address	Area	Replacement Value	Contents Value	Occupancy/Capacity	Natural Hazards
Main Building	3221 SE State RT H Faucett, MO 64448	118,267	$19,793,061	3,749,448	NA	RF, ST, SWW, T
Concessions Building	Same	1,500	276,437	6,072	NA	RF,ST,SWW,T
AG Building	Same	3,200	449,901	126,538	NA	RF, ST, SWW, T
FEMA Saferoom	Same	10,540	2,603,690	111,785	NA	RF,ST,SWW,T
Track and Field Storage (sic)	Same	1,200	16,528	51,250	NA	ST, SWW, T
Maintenance Pole Barn	Same	960	17,000	80,000	NA	ST, SWW, T

St. Joseph School District

The St. Joseph School District has 14 elementary schools, four middle schools, three high schools, and seven targeted schools, according to the Missouri Department of Elementary and Secondary Education. During the 2020-2021 school year, the district employed 960 teachers and total student enrollment was 10,944, according to DESE. The assessed value of the district as of 2020 was $1,116,295,741 with an adjusted tax rate of $3.7328.

Table 2.20. St. Joseph School District Buildings and Enrollment Data, 2020-2021

District Name	Building Name	Building Enrollment
St. Joseph School District	Benton High School	702
St. Joseph School District	Central High School	1,693
St. Joseph School District	Lafayette High School	748
St. Joseph School District	Bode Middle School	525
St. Joseph School District	Edison Elementary School	375
St. Joseph School District	Bessie Ellison	354
St. Joseph School District	Eugene Field Elementary	308
St. Joseph School District	Coleman Elementary	369
St. Joseph School District	District Maintenance Building	-
St. Joseph School District	Hosea Elementary	489
St. Joseph School District	Hyde Elementary	342
St. Joseph School District	Lake Contrary Elementary	302
St. Joseph School District	Mark Twain Elementary	355
St. Joseph School District	Parkway Elementary	396
St. Joseph School District	Pershing Elementary	284
St. Joseph School District	Robidoux Middle School	442
St. Joseph School District	Skaith Elementary	391
St. Joseph School District	Spring Garden Middle School	537
St. Joseph School District	Lindbergh Elementary	515
St. Joseph School District	Truman Middle School	485
St. Joseph School District	Webster	75
St. Joseph School District	District Warehouse	-
St. Joseph School District	Keatley Center	-
St. Joseph School District	Administration Building	-
St. Joseph School District	Hillyard Technical Center	-
St. Joseph School District	Warehouse	-
St. Joseph School District	Carden Park Elementary	606
St. Joseph School District	Oak Grove Elementary	741
St. Joseph School District	Buchanan Co. Academy	-
St. Joseph School District	Pickett Elementary	291

Source: https://mogov.maps.arcgis.com/apps/webappviewer/index.html?id=42394a81012c4737a705d8e943b6fda5

St. Joseph School District (SJSD) is equipped with a public (PA) system in the form of an intercom system in all buildings. There are VOIP phone systems in all classrooms and offices. There are district wide alert systems in place. The alerts are sent out via social media and the district's app. Ongoing and recent projects or programs designed to reduce disaster losses include security upgrades to entrances. SJSD is in the beginning stages of an installation of environmental sensors that sensor temperature, hazardous chemicals, and humidity. Security camera upgrades are an on-going project. There are regularly scheduled safety drills and trainings. There are no designated tornado shelters or safe rooms constructed in accordance with FEMA standards. The school district constructed new buildings and made additions since the last plan update in 2018, including a new science lab addition at Hillyard Technical Center. Pending voter approval, the following projects have been discussed: possible renovations or remodel to Benton High School, Central High School, and Lafayette High School; and a possible new high school construction. There is a projected one percent decrease in enrollment each year for the next five years. The district employs eight SJPD officers as

School Resource Officers (SROs) and one planned addition in the fall 2021 to bring that number up to nine SROs for coverage of various schools in the city and one Buchanan County Deputy as an SRO at Bessie Ellison Elementary School.

Table 2.25 below lists buildings in the school district/ institution including square footage, values, and occupancy/capacity in relation to natural hazard assessment inventory. Natural Hazard product key is as follows: Flooding-RF, Levee Failure-LF, Dam Failure-DF, Earthquake-EQ, Land Subsidence/Sinkholes-LSS, Drought-D, Extreme Temperature-ET, Severe Thunderstorms (including winds, hail, lightning)-ST, Severe Winter Weather (including snow, ice, severe cold)-SWW, Tornadoes-T, Wildfire-WF.

Table 2.21. St. Joseph School District Asset Inventory

Name of Asset	Address	Area (sq.ft.)	Replacement Value (Insured) ($)	Contents Value ($)	Occupancy/ Capacity (#)	Natural Hazards
Benton High School	5655 S. 4th Street 64504	122,967	20,268,466	1,628,070	886	ST, SWW, T
Central High School	2602 Edmond 64501	238,109	53,652,550	2,119,241	1618	ST, SWW, T
Lafayette High School	412 Highland Ave 64505	156,641	33,093,370	2,005,541	1090	ST, SWW, T
Bode Middle School	720 Noyes 64506	66,606	12,761,692	1,107,323	448	ST, SWW, T
Robidoux Middle School	4212 St. Joseph Ave 64505	54,602	9,523,070	866,525	432	ST, SWW, T
Spring Garden Middle School	5802 S. 22nd 64503	59,752	9,853,164	887,998	500	ST, SWW, T
Truman Middle School	3227 Olive 64507	63,100	13,856,946	1,064,170	466	ST, SWW, T
Carden Park Elementary School	1510 Duncan 64503	75,844	13,973,576	396,290	616	ST, SWW, T
Coleman Elementary School	3312 Beck Rd 64506	44,867	9,823,607	626,362	442	ST, SWW, T
Edison Elementary School	512 N. 22nd 64501	44,442	8,631,226	479,190	410	ST, SWW, T
Ellison Elementary School	45 SE 85th Rd 64507	44,264	7,476,600	444,378	360	ST, SWW, T
Field Elementary School	2602 Gene Field Rd 64506	35,663	6,156,550	392,226	367	ST, SWW, T
Hosea Elementary School	6401 Gordon 64504	42,341	8,070,018	553,550	452	ST, SWW, T
Hyde Elementary School	509 Thompson 64504	39,224	7,610,525	444,767	409	ST, SWW, T
Lindbergh Elementary School	2812 St. Joseph Ave 64505	58,021	10,911,297	528,015	515	ST, SWW, T
Mark Twain Elementary School	705 S. 31st 64507	36,107	7,112,819	548,917	334	ST, SWW, T
Oak Grove Elementary School	4901 Cook Road 64505	80,969	15,854,497	396,290	789	ST, SWW, T
Parkway Elementary School	2900 Duncan 64507	43,118	7,471,534	393,352	437	ST, SWW, T
Pershing Elementary School	2610 Blackwell Rd 64507	35,055	5,210,868	396,032	291	ST, SWW, T

Name of Asset	Address	Area (sq.ft.)	Replacement Value (Insured) ($)	Contents Value ($)	Occupancy/ Capacity (#)	Natural Hazards
Pickett Elementary School	3923 Pickett Rd 64503	34,097	6,292,606	443,228	297	ST, SWW, T
Skaith Elementary School	4701 Schoolside Ln 64503	41,641	7,652,264	507,634	449	ST, SWW, T
Hillyard Technical Center	3434 Faraon 64506	119,500	23,057,609	3,444,513		ST, SWW, T
Webster Learning Center	1211 N. 18th 64501	37,060	8,052,150	394,144	350 (est)	ST, SWW, T
District Offices	925 Felix 64501	17,562	7,986,197	1,036,658		ST, SWW, T
District Maintenance	1000 S. 9th 64501	60,988	6,548,206	1,582,092		ST, SWW, T
Keatley Center	1202 S. 28th 6507	21,216	3,000,178	476,345		ST, SWW, T
Troester Media Center	3401 Renick 64507	21,116	3,986,328	5,026,722		ST, SWW, T
Noyes Elementary School	1415 N. 26th 64506	30,991			358 (2014)	ST, SWW, T
District Warehouse	2735 Pear St 64503	33,000	3,159,999	471,877		ST, SWW, T
Lake Contrary Elementary	1800 Alabama St 64505	37,035			302 (2014)	ST, SWW, T
District Operations/Warehouse	801 S. 9th St 64501	25,380	3,340,239	322,434		
BHS Field House	5655 S. 4th St 64504	8,640	1,424,931	0		
LHS Field House	412 Highland Ave 64505	6,242	212,057	0		

Source: Data Collection Questionnaire, 2021

Table 2.22 below summarizes the school districts' capacity for hazard mitigation.

Table 2.22. Summary of Mitigation Capabilities- School Districts in Buchanan County

Capability	Buchanan County School District	East Buchanan School District	Mid-Buchanan School District	St. Joseph School District
Planning Elements				
Master Plan	Yes, 2016	No	No	No
Capital Improvement Plan	Yes, 2020, 2019 Building Projects	Yes	No	No
School Emergency Plan "Shelter in Place" protocols and Evacuation	Yes, 2021	Yes, August 2018	Yes, 2019-2020	Yes, July 2020
Weapons Policy/Date	Yes, 2014, Board Policy	Yes, 2013	Yes, 2014	Yes, 2019 (Board Policy ECA)
Personnel Resources				
Emergency Manager	Yes, SRO	No	Yes, Superintendent / SRO	Yes, Director of Student Services
Grant Writer	No	No	Yes, varies	No
Public Information Officer	No	No	Yes, Superintendent	Yes, Eileen Houston-Stewart

Full-Time Building Official	Yes, President for both MS and HS	Yes, one at each of three buildings	Yes, Superintendent	Yes, Principal
Financial Resources				
Capital Improvement Projects funding	Yes	Yes	Yes	Yes
Local Funds	Yes	Yes	Yes	Yes
General Obligation Bond	Yes	Yes	Yes	Yes
Special Tax Bonds	No	No	No	No
Private Activities/Donations	No	Yes	Yes	Yes
State and Federal Funds	Yes	Yes	Yes	Yes

Source: Data Collection Questionnaire, 2021

44 CFR Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

The goal of the risk assessment is to estimate the potential loss in the planning area, including loss of life, personal injury, property damage, and economic loss from a hazard event. The risk assessment process allows communities and school/special districts in the planning area to better understand their potential risk to the identified hazards. The risk assessment will provide a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This plan is an update of the original plan which was adopted in 2005 and reviewed and updated in 2012 and 2017. Some changes have occurred since the 2017 update that may have impacted risk in Buchanan County. Industrial development along the Missouri River in the St. Joseph area has continued and will be addressed later in the chapter.

Also, Census data shows that the number of privately owned residential building permits issued in the county between 2017 and 2019 have ranged between 93 and 220 annually. Most of the building permits in the county are for single family homes.

This chapter is divided into four main parts:

- **Section 3.1 Hazard Identification** identifies the hazards that threaten the planning area and provides a factual basis for elimination of hazards from further consideration.
- **Section 3.2 Assets at Risk** provides the planning area's total exposure to natural hazards, considering critical facilities and other community assets at risk.
- **Section 3.3 Land Use and Development** discusses development that has occurred since the last plan update and any increased or decreased risk that resulted. This section also discusses areas of planned future development and any implications on risk/vulnerability.
- **Section 3.4 Hazard Profiles and Vulnerability Analysis** provides more detailed information about the hazards impacting the planning area. For each hazard, there are three sections: 1) Hazard Profile provides a general description and discusses the threat to the planning area, the geographic location at risk, potential Strength/Magnitude/Extent, previous occurrences of hazard events, probability of future occurrence, risk summary by jurisdiction, impact of future development on the risk; 2) Vulnerability Assessment further defines and quantifies populations, buildings, critical facilities, and other community/school or special district assets at risk to natural hazards; and 3) Problem Statement briefly summarizes the problem and develops possible solutions.

3.1 HAZARD IDENTIFICATION

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

The plan profiles all natural hazards that can affect Buchanan County. The natural hazards that can affect the county have been identified in the 2018 Buchanan County Hazard Mitigation Plan and the 2018 Missouri State Plan. Natural hazards are naturally occurring climatological, hydrological, or geologic events that have a negative effect on people and the built environment. Technological hazards refers to hazards that stem from technological or industrial conditions that can include hazardous materials events, national security hazards, power failure, telecommunications failure, etc. Natural hazards and manmade hazards are included.

3.1.1 Review of Existing Mitigation Plans

The Mitigation Planning Committee (MPC) reviewed hazards identified in the original plan to determine if any conditions had changed. The Missouri Hazard Mitigation Plan was considered in determining local hazards. Buchanan County was determined not to be at risk for some natural hazards, due to location, climate or soil structure. These hazards which are not included in the hazard mitigation plan are tsunamis, volcanoes, avalanches, hurricanes, coastal storms, coastal erosion, expansive soils and landslides. Hazards which are included in the mitigation plan, in alphabetical order, are: dam failure, drought, earthquakes, flooding, levee failure, heat waves, land subsidence, severe winter weather, thunderstorms which includes wind and hail storms, tornadoes and fires. Due to the impact of Covid-19 pandemic throughout 2020, the MPC has added public health outbreaks to the HMP.

3.1.2 Review Disaster Declaration History

Federal disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

FEMA also issues emergency declarations, which are more limited in scope and do not include the long-term federal recovery programs of major disaster declarations. Determinations for declaration type are based on scale and type of damages and institutions or industrial sectors affected.

Table 3.1 lists the federal FEMA disaster declarations that have occurred in Buchanan County from 1965 to present.

Table 3.1. FEMA Disaster Declarations that included Buchanan County, MO, 1965-Present

Disaster Number	Description	Declaration Date Incident Period	Individual Assistance (IA) Public Assistance (PA)
DR-203	Flood, Severe Storms & Flooding	July 27, 1965 July 27, 1965 - July 27, 1965	IA, PA
DR-327	Severe Storm(s), Heavy Rains, Tornadoes & Flooding	April 19, 1973 April 19, 1973 - April 19, 1973	IA, PA
DR-407	Severe Storm, Flooding	November 1, 1973 November 1, 1973 - November 1, 1973	IA, PA
DR-439	Flood, Severe Storms & Flooding	June 10, 1974 June 10, 1974 - June 10, 1974	IA, PA
DR-538	Severe Storms, Flooding	September 14, 1977 September 14, 1977 - September 14, 1977	IA, PA
DR-713	Severe Storms, Flooding	June 21, 1984 June 6, 1984 - June 16, 1984	IA, PA
DR-995	Flooding, Severe Storm	July 9, 1993 June 10, 1993 - October 25, 1993	IA, PA
DR-1403	Severe Ice Storm, Severe Winter Ice Storm	February 6, 2002 January 29, 2002 – February 13, 2002	IA
DR-1463	Severe Storms, Tornadoes and Flooding	May 6, 2003 May 4, 2003 - May 30, 2003	IA
DR-1524	Severe Storms, Tornadoes, and Flooding	June 11, 2004 May 18, 2004 - May 31, 2004	IA
DR-1708	Severe Storms and Flooding	June 11, 2007 May 5, 2007 - May 18, 2007	IA
DR-1736	Severe Winter Storms	December 27, 2007 December 6, 2007 - December 15, 2007	PA
DR-1773	Severe Storms and Flooding	June 25, 2008 June 1, 2008 - August 13, 2008	PA
DR-1934	Severe Storms, Flooding, and Tornadoes	August 17, 2010 June 12, 2010 - July 31, 2010	PA
DR-1961	Severe Winter Storm and Snowstorm	March 23, 2011 January 31, 2011 - February 5, 2011	PA
DR-4012	Flooding	August 12, 2011 June 1, 2011 - August 1, 2011	PA
DR-4238	Severe Storms, Tornadoes, Straight-line Winds, and	August 7, 2015 May 15, 2015 - July 27, 2015	PA
DR-4435	Severe Storms, Straight-line Winds, and Flooding	May 20, 2019 March 11, 2019 - April 16, 2019	PA
DR-4451	Severe Storm(s)l Severe Storms, Tornadoes, and Flooding	July 9, 2019 April 29, 2019 – July 6, 2019	PA

DR-4490	Covid-19 Pandemic	March 26, 2020 January 20, 2020 - continuing	IA, PA

Source: Federal Emergency Management Agency, https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants

3.1.3 Research Additional Sources

Below are sources of data on locations and past impacts of hazards in the planning area:

- Missouri Hazard Mitigation Plans (2010 and 2013)
- Previously approved planning area Hazard Mitigation Plan (2018)
- Federal Emergency Management Agency (FEMA)
- Missouri Department of Natural Resources (MDNR)
- National Drought Mitigation Center Drought Reporter
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- National Agricultural Statistics Service (Agriculture production/losses)
- Data Collection Questionnaires completed by each jurisdiction
- State of Missouri GIS data
- Environmental Protection Agency
- Flood Insurance Administration
- Hazards US (HAZUS)
- Missouri Department of Transportation
- Missouri Division of Fire Marshal Safety
- Missouri Public Service Commission
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC)
- Pipeline and Hazardous Materials Safety Administration
- Buchanan County and local Comprehensive Plans to the extent available
- County Emergency Management
- County Flood Insurance Rate Map, FEMA
- Flood Insurance Study, FEMA
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers
- U.S. Department of Transportation
- United States Geological Survey (USGS)

The only centralized source of data for many of the weather-related hazards is the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC). Although it is usually the best and most current source, there are limitations to the data which should be noted. The NCDC documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, property damage, and/or disruption to commerce. In addition, it is a partial record of other noteworthy meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with

another event. Some information appearing in the NCDC may be provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, private companies, individuals, etc. An effort is made to use the best available information but because of time and resource constraints, information from these sources may be unverified by the NWS. Using information from NCDC does not guarantee the accuracy or validity of the information, but it is an important source to base estimate.

The NCDC damage amounts are estimates received from a variety of sources, including those listed above in the Data Sources section. For damage amounts, the NWS makes a best guess using all available data at the time of the publication. Property and crop damage figures should be considered as a broad estimate. Damages reported are in dollar values as they existed at the time of the storm event. They do not represent current dollar values.

The database currently contains data from January 1965 to March 2020, as entered by the NWS. Due to changes in the data collection and processing procedures over time, there are unique periods of record available depending on the event type. The following timelines show the different time spans for each period of unique data collection and processing procedures:

1. Tornado: From 1950 through 1954, only tornado events were recorded.
2. Tornado, Thunderstorm Wind and Hail: From 1955 through 1992, only tornado, thunderstorm wind and hail events were keyed from the paper publications into digital data. From 1993 to 1995, only tornado, thunderstorm wind and hail events have been extracted from the Unformatted Text Files.
3. All Event Types (48 from Directive 10-1605): From 1996 to present, 48 event types are recorded as defined in NWS Directive 10-1605.

Injuries and deaths caused by a storm event are reported on an area-wide basis. With NCDC data, a death or injury listed in connection with that county search may not necessarily occur in that county.

3.1.4 Hazards Identified

The hazards that significantly impact the planning area were chosen for further analysis in alphabetical order. Not all hazards impact every jurisdiction, although most do. The table below provides a summary of the jurisdictions impacted by each hazard. An “x” indicates the jurisdiction is impacted by the hazard, and a "-" indicates the hazard is not applicable to that jurisdiction. For example, St. Joseph and Lewis and Clark Village are located near the Missouri River and prone to flooding, but De Kalb experiences minimal flood events. However, De Kalb is located on higher ground and may be more susceptible to damage from a tornado or high wind. Earthquakes and sinkholes are uncommon in Buchanan County, but they were included due to recent events. Tremors from an earthquake in Oklahoma were felt in many parts of Buchanan County and a sinkhole occurred from a sewer line break. The sinkhole was caused by a man-made event, but sinkholes can occur after flooding, which is an identified hazard.

Table 3.2. Hazards Identified for Each Jurisdiction

Jurisdiction	Dam Failure	Drought	Earthquake	Extreme Temperatures	Fires (Structural/Urban/Wild)	Flooding (River and Flash)	Land Subsidence/Sinkholes	Levee Failure	Severe Winter Weather	Thunderstorm/Lightning/ Hail/High Wind	Tornado	Public Health Emergencies/ Environmental Issues
Buchanan County	x	x	x	x	x	x	x	x	x	x	x	x
Agency	x	x	x	x	x	x	x	-	x	x	x	x
Easton	-	x	x	x	x	x	x	-	x	x	x	x
Lewis & Clark Village	-	x	x	x	x	x	x	x	x	x	x	x
Rushville	-	x	x	x	x	x	x	x	x	x	x	x
St. Joseph	-	x	x	x	x	x	x	x	x	x	x	x
Buchanan County School District	-	-	x	x	x	x	x	-	x	x	x	x
Mid-Buchanan School District	-	-	x	x	x	x	x	x	x	x	x	x
St. Joseph School District	-	-	x	x	x	x	x	x	x	x	x	x
Missouri Western State University	-	x	x	x	x	x	x	x	x	x	x	x

3.1.5 Multi-Jurisdictional Risk Assessment

The risk assessment evaluates each participating jurisdiction's vulnerability to each hazard that can affect the planning area. Many of the hazards identified in the risk assessment have the same probability of occurrence throughout the planning area. The hazards that vary across the planning area in terms of risk include dam failure, flash flood, structural or wildland fire, riverine flood and flash flood. These differences are detailed in each hazard profile under geographic location and vulnerability.

Buchanan County is fairly uniform in terms of climate, topography, and building construction characteristics. St. Joseph is the only urbanized area within the planning area which has more assets at a greater density. Therefore, it has greater vulnerability to weather-related hazards. Conversely, rural areas have agricultural assets (crops/livestock) that are vulnerable to hail damages. These differences will be discussed in greater detail in the vulnerability sections of each hazard.

3.2 ASSETS AT RISK

This section assesses the planning area population, structures, critical facilities and infrastructure, and other important assets that may be at risk to hazards. The inventory of assets for each jurisdiction were derived from parcel data from the Buchanan County Assessor, the Buchanan County structures dataset downloaded from Missouri Spatial Data Information Service (MSDIS), local jurisdiction data collection questionnaires, and HAZUS MH 4.2.

3.2.1 Total Exposure of Population and Structures

Unincorporated Buchanan County and Incorporated Cities

In the following three tables, population data is based on 2010 Census Bureau data. Building counts and building exposure values are based on parcel data developed by the State of Missouri Geographic Information Systems (GIS) database. This data, organized by County, is available on Google Drive through this link: https://docs.google.com/spreadsheets/d/1fMhAlZERunnWCCZh7-FA4-gm9g8dHe5M/edit#gid=224301997 Contents exposure values were calculated by factoring a multiplier to the building exposure values based on usage type. The multipliers were derived from the Hazus and are defined below in **Table 3.3**. Land values have been purposely excluded from consideration because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Another reason for excluding land values is that state and federal disaster assistance programs generally do not address loss of land (other than crop insurance). It should be noted that the total valuation of buildings is based on Buchanan County assessors' data which may not be current. In addition, government-owned properties are usually taxed differently or not at all, and so may not be an accurate representation of true value. Note that public school district assets and special districts assets are included in the total exposure tables assets by community and county.

Table 3.3 shows the total population, building count, estimated value of buildings, estimated value of contents and estimated total exposure to parcels for the unincorporated Buchanan County and each incorporated city. For multi-county communities, the population and building data may include data on assets located outside the planning area. **Table 3.4** provides the building value exposures for Buchanan County and each city in the planning area broken down by usage type. Finally, **Table 3.5** provides the building count total for the Buchanan County and each city in the planning area broken out by building usage types (residential, commercial, industrial, educational,

and agricultural).

Table 3.3. Maximum Population and Building Exposure by Jurisdiction

Jurisdiction	2019 Annual Population Estimate	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Agency	733	403	$48,240.00	$28,201.00	$76,441.00
Buchanan - Unincorp	88,460	11,578	$882,055.00	$491,057.00	$1,373,112.00
Easton	203	126	$21,493.00	$11,257.00	$32,750.00
Lewis and Clark Village	130	72	$10,261.00	$5,277.00	$15,538.00
Rushville	283	164	$30,096.00	$24,930.00	$55,026.00
St. Joseph	75,913	28,486	$5,422,674.00	$3,378,652.00	$8,801,326.00
Totals		**40,849**	**$6,414,742.00**	**$3,940,830.00**	**$10,358,572.00**

Source: U.S. Bureau of the Census, Annual population estimates/ 5-Year American Community Survey 2019; Building Count and Building Exposure, Missouri GIS Database from SEMA Mitigation Management; Contents Exposure derived by applying multiplier to Building Exposure based on Hazus MH 2.1 standard contents multipliers per usage type as follows: Residential (50%), Commercial (100%), Industrial (150%), Agricultural (100%). For purposes of these calculations, government, school, and utility were calculated at the commercial contents rate.

Table 3.4. Building Values/Exposure by Usage Type

Jurisdiction	Residential	Commercial	Industrial	Agricultural	Educational	Governmental	Total
Agency	$39,631.00	$6,352.00	$1,127.00	$787.00	$0.00	$343.00	$48,240.00
Buchanan - Unincorp	$718,694.00	$84,486.00	$21,178.00	$38,033.00	$4,207.00	$15,456.00	$882,055.00
Easton	$16,985.00	$1,906.00	$0.00	$61.00	$1,683.00	$0.00	$21,493.00
Lewis and Clark Village	$9,867.00	$0.00	$0.00	$50.00	$0.00	$859.00	$10,261.00
Rushville	$17,632.00	$4,447.00	$7,435.00	$67.00	$0.00	$0.00	$30,096.00
St. Joseph	$4,112,718.00	$950,313.00	$238,370.00	$1,664.00	$105,185.00	$343.00	$5,422,674.00
Totals	**$4,918,439.00**	**$1,047,504.00**	**$268,110.00**	**$40,674.00**	**$111,075.00**	**$17,001.00**	**$6,417,742.00**

Source: Missouri GIS Database, https://docs.google.com/spreadsheets/d/1fMhAlZERunnWCCZh7-FA4-gm9g8dHe5M/edit#gid=224301997 SEMA Mitigation Management Section

Table 3.5. Building Counts by Usage Type

Jurisdiction	Residential Counts	Commercial Counts	Industrial Counts	Agricultural Counts	Educational Counts	Governmental Counts	Total
Agency	245	10	5	141	0	2	403
Buchanan - Unincorp	4,443	133	94	6,813	5	90	11,578
Easton	105	3	0	11	2	0	126
Lewis and Clark Village	61	0	0	9	0	5	72
Rushville	109	7	33	12	0	0	164

St. Joseph	25,425	1,496	1,058	298	125	2	28,486
Totals	30,406	1,649	1,190	7,286	132	99	40,849

Source: Missouri GIS Database, https://docs.google.com/spreadsheets/d/1fMhAlZERunnWCCZh7-FA4-gm9g8dHe5M/edit#gid=224301997 SEMA Mitigation Management Section; Public School Districts and Special Districts

Even though schools and special districts' total assets are included in the tables above, additional discussion is needed, based on the data that is available from the districts' completion of the Data Collection Questionnaire and district-maintained websites. The number of enrolled students at the participating public school districts is provided in **Table 3.6** below. Additional information includes the number of buildings, building values (building exposure) and contents value (contents exposure). These numbers will represent the total enrollment and building count for the public school districts regardless of the county in which they are located.

Table 3.6. Population and Building Exposure by Jurisdiction-Public School Districts

Public School District	Enrollment	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Buchanan County R-IV	295	3	$32,000,000.00	$7,700,000.00	$39,700,000.00
Mid-Buchanan County R-5	722	6	$5,342,917.00	$4,125,093.00	$9,468,010.00
St. Joseph School District	10,922	33	$358,992,455.00	$28,983,884.00	$387,976,339.00

Source: https://apps.dese.mo.gov/mcds/home.aspx, https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?Reportid=f04838c4-c116-4ee1-b9b2-8eb6c4cfab45 school finance report contains enrollment numbers, 2019 was utilized for this table as 2020 had yet to be reported. The Building Exposure, Contents Exposure, and Total Exposure amounts come from the completed Data Collection Questionnaires from Public School Districts. In general, the school districts obtain this information from their insurance coverage amounts.

3.2.2 Critical and Essential Facilities and Infrastructure

This section will include information from the Data Collection Questionnaire and other sources concerning the vulnerability of participating jurisdictions' critical, essential, high potential loss, and transportation/lifeline facilities to identified hazards. Definitions of each of these types of facilities are provided below.

- Critical Facility: Those facilities essential in providing utility or direction either during the response to an emergency or during the recovery operation.
- Essential Facility: Those facilities that if damaged, would have devastating impacts on disaster response and/or recovery.
- High Potential Loss Facilities: Those facilities that would have a high loss or impact on the community.
- Transportation and lifeline facilities: Those facilities and infrastructure critical to transportation, communications, and necessary utilities.

Table 3.7 includes a summary of the inventory of critical and essential facilities and infrastructure in the planning area. The list was compiled from the Data Collection Questionnaire as well as the following sources:

- Files from the Emergency Management Director, including Chemical Facilities (Tier II Facilities) information
- LEPC members
- HAZUS MH 4.2

- Meetings with city councils, boards, and agencies

Table 3.7. Inventory of Critical/Essential Facilities and Infrastructure by Jurisdiction

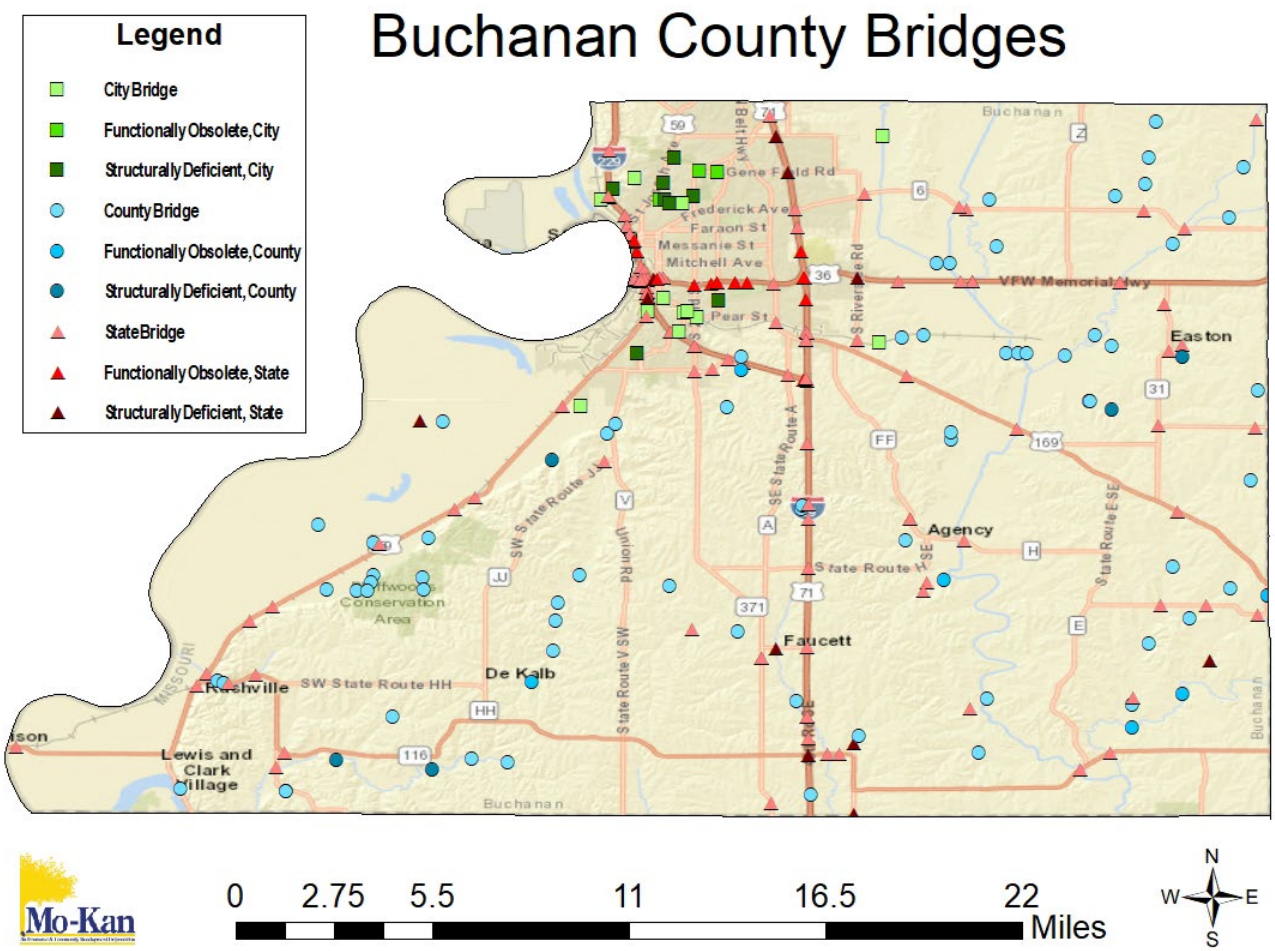
Jurisdiction	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	TOTAL
Buchanan County			1	8		1		1			12	2				1								26
Agency							1																	1
Easton							2	1								1				1				5
Lewis & Clark Village							1	1																2
Rushville							2	1									1			1				5
St. Joseph			36	4	1	1	11					4			25		1			44			4	131
Totals			38	12	1	2	17	4			12	6			25	2	2			46			4	170

Source: Missouri 2018 State Hazard Mitigation Plan and Hazard Mitigation Viewer; Data Collection Questionnaires; Hazus, etc.

Bridges: **Figure 3.1** shows the location of bridges in Buchanan County included in the National Bridge Inventory data set. There are 249 bridges in the county and 25 of these are structurally deficient and 28 are functionally obsolete. Structurally deficient bridges are categorized on the map below based on whether it is a city, county, or state bridge.

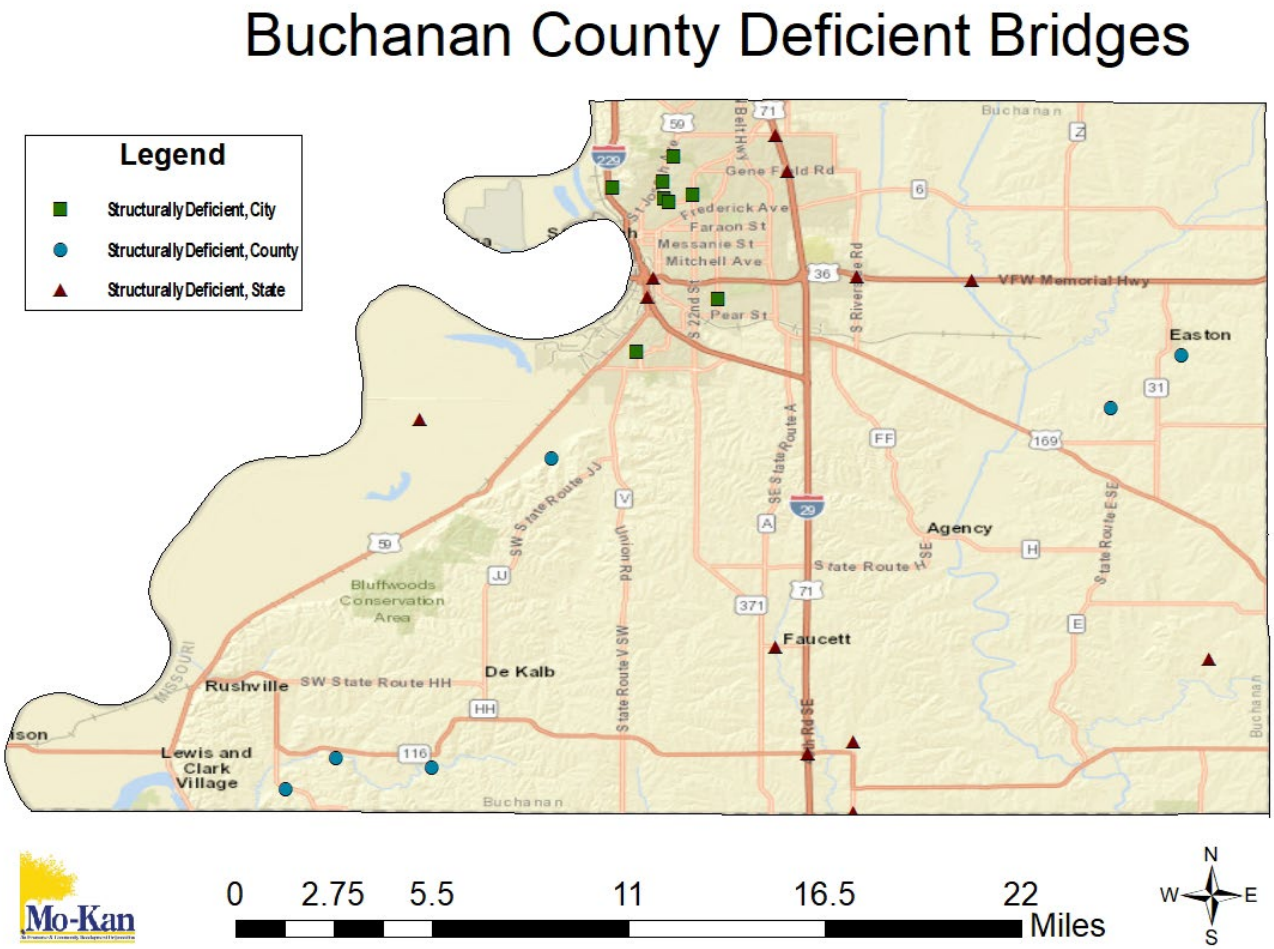
The term scour critical refers to one of the database elements in the National Bridge Inventory. This element is quantified using a "scour index", which is a number indicating the vulnerability of a bridge to scour during a flood. Bridges with a scour index between 1 and 3 are considered "scour critical", or a bridge with a foundation determined to be unstable for the observed or evaluated scour condition. There are no scour critical bridges identified in Buchanan County.

Figure 3.1. Buchanan County Bridges



Source: Hazus 4.2

Figure 3.2. Buchanan County Structurally Deficient Bridges



Source: Hazus 4.2

3.2.3 Other Assets

Assessing the vulnerability of the planning area to disaster also requires data on the natural, historic, cultural, and economic assets of the area. This information is important for many reasons.

- These types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- Knowing about these resources in advance allows for consideration immediately following a hazard event, which is when the potential for damages is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- The presence of natural resources can reduce the impacts of future natural hazards, such as wetlands and riparian habitats which help absorb floodwaters.
- Losses to economic assets like these (e.g., major employers or primary economic sectors) could have severe impacts on a community and its ability to recover from disaster.

Threatened and Endangered Species: **Table 3.8** shows Federally Threatened, Endangered, Proposed and Candidate Species in the county.

Table 3.8. Threatened and Endangered Species in Buchanan County

Common Name	Scientific Name	Status
Gray Bat	*Myotis grisecens*	Endangered
Indiana Bat	*Myotis sodalist*	Endangered
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened
Pallid Sturgeon	*Scaphirhynchus albus*	Endangered

Source: U.S. Fish and Wildlife Service, http://www.fws.gov/midwest/Endangered/lists/missouri-cty.html, or https://ecos.fws.gov/

Natural Resources: The Missouri Department of Conservation (MDC) provides a database of lands the MDC owns, leases, or manages for public use. Table 3.9 lists the names and locations of parks and conservation areas (CA) in the planning area.

Table 3.9. Parks in Buchanan County

Park / Conservation Area	Address	City
Agency Access	Route H	Agency
Agency Conservation Area	Rock Creek Rd	Agency
Anthony and Beatrice Kendzora Conservation Area	North Platte Avenue/Union Mill Road	Edgerton
Arthur DuPree Memorial Conservation Area	Dupree Rd	St. Joseph
Bee Creek Conservation Area	Interurban Road SE, north 0.25 miles	Faucett
Belcher Branch Lake Conservation Area	70th Rd SE	Faucett
Bluffwoods Conservation Area	SW Bluff Rd	St. Joseph
Bluffwoods Conservation Area-Goodell Memorial Annex	SW Bluff Rd	St. Joseph
Burton Bridge Access	Loutermilch Rd	Agency
Caroline Sheridan Logan Memorial Wildlife Area	Huntoon Rd	St. Joseph
Everyday Pond (Missouri Western State University)	James McCarthy Dr	St. Joseph
French Bottom Access (St. Joseph)	NW Dupree Rd	St. Joseph
Gasper Landing (Buchanan County)	Lake Front Ln	St. Joseph
Krug Park Lagoon (St. Joseph)	Myrtle Ave	St. Joseph

Mark Youngdahl Urban Conservation Area	S 32nd St	St. Joseph
MO Western State University Skeet Range	Mitchell Ave	St. Joseph
Northwest Regional Office	701 James Mccarthy Dr	St. Joseph
Pigeon Hill Conservation Area	50th Rd SE	St. Joseph
Saxton Access	Saxton Easton Rd SE	St. Joseph
Sunbridge Hills Conservation Area	Huntoon Rd	St. Joseph
Wilfrid V. and Anna C. Kneib Memorial Conservation Area	Nelson Rd	St. Joseph

Source: http://mdc7.mdc.mo.gov/applications/moatlas/AreaList.aspx?txtUserID=guest&txtAreaNm=s
The best source for park information is usually Buchanan County and community websites.

Historic Resources: The National Register of Historic Places is the official list of registered cultural resources worthy of preservation. It was authorized under the National Historic Preservation Act of 1966 as part of a national program. The purpose of the program is to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Register is administered by the National Park Service under the U.S Secretary of the Interior. Properties listed in the National Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture.
St. Joseph is a local certified government that employs a Preservation Planner. There is a Landmark Commission and several historical neighborhood groups and organizations that focus on historic preservation. There are 63 Historic Places in Buchanan County listed on the National Register, all of which are within St. Joseph. **Table 3.10** lists properties that are on the National Register of Historic Places.

Table 3.10. Buchanan County Properties on the National Register of Historic Places

Property	Address	City	Date Listed
The Benton Club of St. Joseph	402 N. 7th St.	St. Joseph	10/02/17
Buchanan County Courthouse and Jail	Courthouse Sq.	St. Joseph	08/21/72
Buchanan County Infirmary	3500 N. Village Dr.	St. Joseph	01/29/09
Charles A. and Annie Buddy House	424 S. 9th St.	St. Joseph	05/14/04
Burnside-Sandusky Gothic House	720 S. 10th St.	St. Joseph	01/19/05
Cathedral Hill Historic District	North 9th Street, Powell Street and 13th Street	St. Joseph	06/15/00
Central/North Commercial Historic District	Roughly bounded by N 4th, Main, Francis, and Robidoux Sts.	St. Joseph	03/08/91
Central Police Station	701 Messanie	St. Joseph	11/05/09
Century Apartments	627 N. 25th Street	St. Joseph	07/05/01
Christian Sachau Saloon	1613-1615 Frederick Ave.	St. Joseph	10/25/85
City Hose Company #9	2217 Frederick Ave.	St. Joseph	10/25/85

Corby-Forsee Building	5th and Felix Sts.	St. Joseph	03/27/80
Dewey Avenue-West Rosine Historic District	Roughly bound by Prospect Ave., Dewey Avenue and West Rosine St.	St. Joseph	08/01/02
Edmond Jacques Eckel House	515 N 4th St.	St. Joseph	01/31/80
Everett School	826 S. 14th St.	St. Joseph	09/15/05
Enoch Madison Fenton House	SE of Rushville	Rushville	04/12/82
Dr. Jacob Geiger House	2501 Frederick Ave.	St. Joseph	03/12/86
German-American Bank Building	624 Felix St.	St. Joseph	11/24/78
Hall School	2509 Duncan St.	St. Joseph	01/31/17
Hall Street Historic District	Roughly bounded by Isadore, Corby, 6th and 9th Sts.	St. Joseph	07/17/79
Harris Addition Historic District	Roughly bounded by 16th St., Dalton St., 22nd St. and Edmond St.	St. Joseph	01/13/03
Alois Herbert Double House	620 S. 10th St.	St. Joseph	05/29/07
Jesse James House	12th St. and Mitchell Ave.	St. Joseph	09/04/80
Kelley and Browne Flats	1208-1216 Frederick Ave.	St. Joseph	08/03/89
Kemper Addition Historic District	Portion of Clay, Union, Kemper and Bon Ton Sts.	St. Joseph	09/20/02
Krug Park Place Historic District	Roughly bounded by St. Joseph Ave. Myrtle St., Clark St., and Magnolia	St. Joseph	08/01/02
Lawler Motor Co. Building	1224 Frederick Ave.	St. Joseph	01/08/09
Livestock Exchange Building	601 Illinois Ave.	St. Joseph	04/20/04
John Sublett Logan Jr. and Caroline Ashton Logan House	1906 N. 22nd St.	St. Joseph	05/07/07
“Maple Grove” Joseph Davis House	2100 N. 11th St.	St. Joseph	10/16/74
Market Square Historic District	Roughly bounded by Edmond, Felix, N. 3rd Sts. and Market Pl.	St. Joseph	02/17/72
McIntyre-Burri House	808 N. 24th St.	Saint Joseph	12/23/05
Issac Miller House	3003 Ashland Ave.	St. Joseph	09/17/80
Miller-Porter-Lacy House	2912 Frederick Blvd.	St. Joseph	09/09/82
Missouri Theater and Missouri Theater Building	112-128 S. 8th and 713-721 Edmond St.	St. Joseph	10/11/79
Missouri Valley Trust Company Historic District	Felix and 4th Sts.	St. Joseph	03/04/75
Mount Mora Cemetery	824 Mount Mora Rd.	St. Joseph	07/19/06
Museum Hill Historic District	Roughly bounded by 9th, Francis, 12th, Jules, 15th and Messanie Sts.	St. Joseph	03/08/91
Museum Hill Historic District	321 and 323 N. 15th and 1510 Faraon St.	St. Joseph	08/05/09
Neely Elementary School	1909 S. 12th St.	St. Joseph	06/23/14
Nelson-Pettis Farmsteads Historic District	4401 Ajax Rd., 3412 Pettis Rd.	St. Joseph	05/11/95

John Patee House	12th and Penn Sts.	St. Joseph	10/15/66
Patee Town Historic District	Roughly bounded by Penn St., S. 11th St., Lafayette St. and S. 15th St.	St. Joseph	08/01/02
Pleasant Ridge School	St. Joseph vicinity	St. Joseph	05/02/85
Pony Express Stables (Pike's Peak Stables)	914 Penn St.	St. Joseph	04/03/70
John D. Richardson Dry Goods Co. (American Electric Co.)	300 N. 3rd St.	St. Joseph	04/12/82
Robidoux Hill Historic District	Roughly bounded by Franklin St., Robidoux St., Fourth St., Louis St. and Fifth St.	St. Joseph	08/03/89
Robidoux Row	219-225 E. Poulin St.	St. Joseph	03/07/73
Robidoux School (Junior College Archive Building)	201 S. 10th St.	St. Joseph	08/11/83
Ryan Block	1137-1141 Frederick Ave.	St. Joseph	01/29/13
St. Joseph City Hall	Frederick at 11th St.	St. Joseph	10/25/85
St. Joseph Park and Parkway System	Roughly, along Northwest, Northeast, Corby Grove, Southwest, and A Pkwys. And Noyes Blvd. from Krug Park to Hyde Park	St. Joseph	01/20/95
St. Joseph Public Library-Carnegie Branch	316 Massachusetts St.	St. Joseph	05/20/99
St. Joseph Public Library (Free Public Library, Public Museum, Public Library, Board of Education Building	10th and Felix Sts.	St. Joseph	09/20/82
St. Joseph's Commerce and Banking Historic District	Roughly bounded by Francis, Edmond, Third, and Ninth streets	St. Joseph	07/05/01
South Fourth Street Commercial Historic District	Roughly bounded by S. 3rd, S. 5th, Charles, and Messanie Sts.	St. Joseph	03/08/91
Sugar Lake State Park Open Shelter	Rushville vicinity off MO 138	Rushville	02/28/85
Thompson-Brown-Sandusky House	207 E. Cliff St.	St. Joseph	02/10/83
Virginia Flats	516-518 and 520-528 N. 10th St.	St. Joseph	05/21/92
Vosteen-Hauck House	913 N. 2nd St.	St. Joseph	09/23/82
Western Tablet and Stationery Co., Building #2	1300 S. 12th St.	St. Joseph	08/16/07
Wholesale Row	Bounded by Jules, 3rd, 4th and Francis Sts.	St. Joseph	09/19/77
Wyeth Flats San Regis Apartments	1015-1031 Faraon	St. Joseph	10/25/85

Source: Missouri Department of Natural Resources – Missouri National Register Listings by County http://dnr.mo.gov/shpo/mnrlist.htm

Economic Resources: While St. Joseph's largest single employer is the hospital system, the city has a diversified employment base which helps to maintain a healthy and growing economy. Major employers range from education to automotive battery production, aerial work platform manufacturing, and animal pharmaceutical research and production. Numerous global leaders have operations in St. Joseph and continue to invest and expand. **Table 3.11** shows major non-government employers in the planning area.

Table 3.11. Major Non-Government Employers in Buchanan County

Employer Name	Main Locations	Product or Service	Employees
Mosaic Life Care	St. Joseph	Health Care	4,072
Triumph Foods	St. Joseph	Food Processing	2,900
St. Joseph School District	St. Joseph	Education	1,853
Boehringer Ingelheim	St. Joseph	Animal Pharmaceuticals	1,191
American Family Insurance	St. Joseph	Insurance	793
Missouri Western State University	St. Joseph	Education	757
Wal-Mart	St. Joseph	Retail	740
Tyson Foods	St. Joseph	Food Processing	670

Source: https://choosesaintjoseph.com/site-selection/data/largest-employers/

Agriculture, Animal Science and Food Processing: Agriculture has traditionally been an important part of the county's economy. The area has also become a major center for food processing companies and animal pharmaceuticals. Boehringer Ingleheim Vetmedica, an animal pharmaceuticals company, employees 1,191 people at its facility in St. Joseph. According to the ACS 5-year estimate, 448 people are employed in the Agriculture, Forestry, Fishing & Hunting Industry in Buchanan County.

3.3 LAND USE AND DEVELOPMENT

3.3.1 Development Since Previous Plan Update

The population in Buchanan County has remained relatively stable, which is fortunate since many smaller counties are experiencing out-migration. **Table 3.12** shows the population growth statistics for all cities in Buchanan County as well as the county as a whole.

Table 3.12. County Population Growth, 2010-2020

Jurisdiction	Total Population 2010	Total Population 2020	2010-2020 # Change	2000-2020 % Change
Agency	684	733	+49	0.71%
De Kalb	220	260	+40	18.2%
Easton	236	203	-33	-14%
Lewis & Clark	132	130	-2	-1.5%
Rushville	303	283	-20	-6.6%
St. Joseph	76,843	75,913	-930	-1.21%
Total (including unincorporated areas)	89,201	88,460	-741	0.83%

Source: U.S. Bureau of the Census, Decennial Census, Annual Population Estimates, American Community Survey 5-year Estimates; Population Statistics are for entire incorporated areas as reported by the U.S. Census Bureau

Population growth or decline is generally accompanied by increases or decreases in the number of housing units. **Table 3.13** shows the change in numbers of housing units in the planning area from 2010 to 2020.

Table 3.13. Change in Housing Units, 2010-2020

Jurisdiction	Housing Units 2010	Housing Units 2020	2010-2020 # Change	2000-2020 % Change
Agency	209	264	+55	26.3%
De Kalb	97	111	+14	14.4%
Easton	111	113	+2	1.8%
Lewis & Clark	63	60	-3	-4.76%
Rushville	127	126	-1	-0.79%
St. Joseph	33,219	33,352	+133	0.4%
Total (including unincorporated areas)	38,427	38,750	+323	0.84%

Source: U.S. Bureau of the Census, Decennial Census, American Community Survey 5-year Estimates; Population Statistics are for entire incorporated areas as reported by the U.S. Census Bureau

The changes in development for each participating jurisdiction since the previous plan update are discussed below. Within each hazard section under the heading "Previous and Future Development" these changes in development that have impacted the community's vulnerability to specific hazards, will be discussed.

Agency

Agency has experienced a population increase, but there has been no subsequent commercial development. The population increase has not been significant enough to increase the hazard

vulnerability of the community. Minimal residential construction has occurred and what has occurred has been out of the flood prone areas. During the past decade, the city has been aggressive in annexing surrounding land, most of which has occurred to the north along Missouri State Route FF. Currently, Agency and the City of St. Joseph are in litigation regarding proposed annexation.

Easton
Easton has experienced minimal change since the last plan. The community's risk to natural hazards remains the same.

Lewis & Clark Village
Lewis & Clark Village has experienced rebuilding since the 2019 flood, issuing building permits and passing floodplain ordinances.

St. Joseph
Growth in St. Joseph continues to be north and northeast of the city and generally south and southwest of the city. The predominant residential growth is sprawl outside the city limits. Commercial growth continues to focus on the northeast along the I-29/US 169 corridor, with industrial growth centered around the Eastowne Business Park and the Stockyards areas.

3.3.2 Future Land Use and Development

The remaining discussion in this section provides future growth and development information, where available, relative to each participating jurisdiction, based on the format used above for the county information.

Buchanan County
County planning and zoning activities are managed through the County Planning Commission. The Planning Commission enforces existing zoning orders, plans for future land use, issues conditional permits, and allows property owners to change zoning for land purposes. The office falls under the direction of the County Commission.

Planning and Zoning staff rely on an existing comprehensive land use plan which was updated in 2018. Anticipated development in the unincorporated areas include immediately south and east of St. Joseph. This mirrors development for the city; additionally, growth patterns are limited to the north by county boundaries and west by the Missouri River.

Agency
The community has a comprehensive plan and land use plan. No future development is anticipated. As previously noted, the city is currently in litigation with the City of St. Joseph in regard to annexation, which may impact future development patterns.

Easton
The community does not have a comprehensive plan or land use plan. No future development is anticipated.

Lewis & Clark
The community does not have a comprehensive plan or land use plan. No future development is anticipated.

St. Joseph
The community does not have a comprehensive plan, but it does have a 20-year land use plan (2004-2024).

> *The Land Use Plan for the City of St. Joseph serves as the official policy to guide future growth of the City. The plan details and describes the activities related to land use and future growth areas. This document presents an update of St. Joseph's 1987 Land Use Plan. The plan is comprehensive in nature and includes a detailed analysis of the various factors that affect land development in the city. These include physical, economic, and demographic factors, as well as those considered part of St. Joseph's built environment. The report also lists specific recommendations and strategies for Plan Implementation.* (Source: Land Use Plan of the City of St. Joseph, Missouri: January 24, 2008)

The plan has components similar to what you would expect to see in a comprehensive plan but provides little analysis, structure, or specific direction. The result is the city does not have detailed strategies being implemented to encourage development and future growth. All new growth is determined by the private market.

The city also relies on a number of Precise Plans for specific areas of the community:

- Uptown Development
- Downtown
- Heartland Health
- North Land Development
- Tuscany Village
- Whitehead Plaza
- EBR Enterprises-Heartland Regional Medical Center
- Riverside Business Park
- Fountain Creek
- The Commons
- Retail Use of Sidewalks Policy
- Survey Control Requirements

The city has a Planning Commission that has three primary tasks: considers all zoning and subdivision ordinances and amendments for the purpose of promoting health, safety, and the general welfare of the community; makes recommendations to the city council before final action is taken by the council; and reviews the city's comprehensive plan and any respective updates. (Source: http://www.stjoemo.info/index.aspx?nid=358)

St. Joseph has a Five-Year Capital Improvement Plan (CIP) that is used to complete larger projects. The funds are allocated into a number of activities, but the majority of these dollars are directed to General Capital Projects, i.e. street and bridge improvements, public buildings and facility projects, and major capital outlays; and Wastewater treatment facility improvements.

School District Future Development

Buchanan R-IV School District
Buchanan R-IV School District is located in DeKalb and serves the areas surrounding the communities of Rushville and DeKalb. The District experienced a 3-5 percent decrease on average in the past five years. (Source: https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?Reportid=f04838c4-c116-4ee1-b9b2-8eb6c4cfab45)

The District added a vocational-agriculture building in 2014, which features a tornado safe room. The District also added a weight room in the middle school in 2020.

East Buchanan School District
Buchanan R-IV School District has facilities located in Easton and Gower and serves the areas surrounding Easton, Gower, residents of western Clinton County and eastern Buchanan County. Enrollment data from Missouri's Department of Elementary and Secondary Education (DESE) indicates the district is slight decline in students. The information covers a 10-year period (2011-2020) and includes ages from pre-school to 12th grade. The District has experienced a 5% decrease in enrollment over the 10-year period. (Source: https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?Reportid=f04838c4-c116-4ee1-b9b2-8eb6c4cfab45)

The District recently completed an addition to their high school facility in Gower.

Mid-Buchanan R-V School District
Mid-Buchanan R-V School District is located in Faucett and serves the areas in southern Buchanan County. Enrollment data from Missouri's Department of Elementary and Secondary Education (DESE) indicates the district has seen slight increase in students. The information covers a 10-year period (2011-2020) and includes ages from pre-school to 12th grade. The District indicated a 5 percent increase in enrollment over the 10-year period. (Source: https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?Reportid=f04838c4-c116-4ee1-b9b2-8eb6c4cfab45)

The District completed construction of a FEMA-funded tornado safe room. The District is planning the addition of a maintenance pole barn and possibly additional classrooms. Drainage was improved during the construction of a new asphalt drive and parking lot in the back of the building.

St. Joseph School District
The St. Joseph School District is located in St. Joseph and serves the city and areas immediately surrounding the community. Enrollment data from Missouri's Department of Elementary and Secondary Education (DESE) indicates the district has experienced a notable decrease in students. The information covers a 10-year period (2011-2020) and includes ages from pre-school to 12th grade. The District has experienced a 4 percent decrease in enrollment over a 10-year period. (Source: https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?Reportid=f04838c4-c116-4ee1-b9b2-8eb6c4cfab45)

The District has 33 total buildings/sites it maintains. This includes three high schools, four middle schools, and 16 elementary schools with the remainder either support, maintenance, or administration buildings. Improvements and new construction projects include: Pear Street Warehouse Freezer addition in 2011, Benton High School Fieldhouse in 2012, Central High School Morgan Building addition in 2012, Lafayette High School Fieldhouse in 2014, Carden Park Elementary School was constructed in 2014, Oak Grove Elementary School was constructed in 2014, and a Hillyard Technical Center Science Lab addition was completed in 2016.

A proposed $107 million bond proposal was voted down by a two-thirds electorate vote in 2021, so there is no future planned development at this time. (Source: https://www.newspressnow.com/news/local_news/education/sjsd-voters-dont-care-much-for-care-bond-issue/article_ada0ea8e-9731-11eb-9388-bbcbd87fe5f1.html)

Missouri Western State University
Missouri Western State University (MWSU) is located in St. Joseph and serves Missouri and the surrounding states. The university was founded in 1915 and joined the State of Missouri system in 1977. In 2005, MWSU received university designation. Due to a nation-wide downturn in student enrollment, the university's current student body is approximately 4,000 students. The

Covid-19 pandemic, lower employment opportunities, and general apathy with higher education have negatively affected enrollment. New strategies are being put forth by the administration to overcome these negative effects.

The following buildings were newly constructed between 2010 and 2016: Remington Hall, Griffon Hall, Baker Family Fitness Center, and Griffon Indoor Sports Complex and Stadium. There are no new construction or remodeling projects planned for the near future. The university is not in any known high hazard areas.

3.4 HAZARD PROFILES, VULNERABILITY, AND PROBLEM STATEMENTS

Each hazard will be analyzed individually in a hazard profile. The profile will consist of a general hazard description, location, strength/magnitude/extent, previous events, future probability, a discussion of risk variations between jurisdictions, and how anticipated development could impact risk. At the end of each hazard profile will be a vulnerability assessment, followed by a summary problem statement.

Hazard Profiles

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Each hazard identified in Section **3.1.4** will be profiled individually in this section in alphabetical order. The level of information presented in the profiles will vary by hazard based on the information available. With each update of this plan, new information will be incorporated to provide better evaluations and prioritization of the hazards that affect the planning area. Detailed profiles for each of the identified hazards include information categorized as follows:

- **Hazard Description:** This section consists of a general description of the hazard and the types of impacts it may have on a community or school/special district.
- **Geographic Location:** This section describes the geographic areas in the planning area that are affected by the hazard. Where available, maps are used to indicate the specific locations of the planning area that are vulnerable to the subject hazard. For some hazards, the entire planning area is at risk.
- **Strength/Magnitude/Extent:** This includes information about the strength, magnitude, and extent of a hazard. For some hazards, this is accomplished with description of a value on an established scientific scale or measurement system, such as an EF2 tornado on the Enhanced Fujita Scale. This section should also include information on the typical or expected strength/magnitude/extent of the hazard in the planning area. Strength, magnitude, and extent can also include the speed of onset and the duration of hazard events. Describing the strength/magnitude/extent of a hazard is not the same as describing its potential impacts on a community. Strength/magnitude/extent defines the characteristics of the hazard regardless of the people and property it affects.
- **Previous Occurrences:** This section includes available information on historic incidents and their impacts. Historic event records form a solid basis for probability calculations.
- **Probability of Future Occurrence:** The frequency of recorded past events is used to estimate the likelihood of future occurrences. Probability can be determined by dividing the number of recorded events by the number of years of available data and multiplying by 100. This gives the percent chance of the event happening in any given year. For events occurring more than once annually, the probability should be reported as 100% in any given year, with a statement of the average number of events annually. For hazards such as drought that may have gradual onset and extended duration, probability can be based on the number of months in drought in a given time-period and expressed as the probability for any given month to be in drought.
- **Changing Future Conditions Considerations:** In addition to the probability of future

occurrence, changing future conditions should also be considered, including the effects of long-term changes in weather patterns and climate on the identified hazards.

Vulnerability Assessments

Requirement §201.6(c)(2)(ii) :[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A) :The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B) :[The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Requirement §201.6(c)(2)(ii): (As of October 1, 2008) [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged in floods.

Following the hazard profile for each hazard will be the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to damages from natural hazards. The vulnerability assessments should be based on the best available data. The vulnerability assessments will be based on the best available county-level data which is in the 2018 State Hazard Mitigation Plan. Provided with the 2018 Hazard Mitigation Plan Update is online access to the risk assessment data and associated mapping for the 114 counties in the State, including the independent City of St. Louis. Through the web-based Missouri Hazard Mitigation Viewer, local planners or other interested parties can obtain all State Plan datasets. This effort removes from local mitigation planners a barrier to performing all the needed local risk assessments by providing the data developed during the 2018 State Plan Update.

The vulnerability assessments in the Buchanan County plan will also be based on:

- Written descriptions of assets and risks provided by participating jurisdictions;
- Existing plans and reports;
- Personal interviews with planning committee members and other stakeholders; and
- Other sources as cited.

Within the Vulnerability Assessment, the following sub-headings will be addressed:

- **Vulnerability Overview:** This provides an overall summary of each jurisdiction's vulnerability to the identified hazards. The overall summary of vulnerability identifies structures, systems, populations or other community assets as defined by the community that are susceptible to damage and loss for hazard events.

- **Potential Losses to Existing Development:** This describes the potential impacts of the hazard for each participating jurisdiction. Impact means the consequences of effect of the hazard on the jurisdiction and its assets. Assets are determined by the community and include, for example, people, structures, facilities, systems, capabilities, and/or activities that have value to the community.

- **Previous and Future Development:** This section includes information on how changes in development have impacted the community's vulnerability to this hazard. It describes how any changes in development that occurred in known hazard prone areas since the previous plan have increased or decreased the community's vulnerability. It also describes any anticipated future development in the county, and how that would impact hazard risk in the planning area.

- **Hazard Summary by Jurisdiction:** For hazard risks that vary by jurisdiction, this section provides an overview of the variation and the factual basis for that variation.

Problem Statements

Each hazard analysis concludes with a brief summary of the problems created by the hazard in the planning area, and possible ways to resolve those problems. The focus of the problem statements sub-section is to synthesize the "problems" revealed through the risk assessment and then through the process of updating the mitigation strategy, develop mitigation actions that are aimed at "solving" the identified problems. Problem statements should be as specific as possible; relating to specific jurisdictions as well as specific assets or areas of the planning area that are problematic. This should in turn prompt development of specific mitigation actions.

3.4.1 Dam Failure

Hazard Profile

Hazard Description

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams are typically constructed of earth, rock, concrete, or mine tailings. Dam failure is the uncontrolled release of impounded water resulting in downstream flooding, affecting both life and property. Dam failure can be caused by any of the following:

1. Overtopping: Inadequate spillway design, debris blockage of spillways or settlement of the dam crest.
2. Piping: Internal erosion caused by embankment leakage, foundation leakage and deterioration of pertinent structures appended to the dam.
3. Erosion: Inadequate spillway capacity causing overtopping of the dam, flow erosion, and inadequate slope protection.
4. Structural Failure: Caused by an earthquake, slope instability or faulty construction.

According to the Missouri Department of Natural Resources (MoDNR), Missouri had 5,535 recorded dams as of 2020. Of those, only 62 are federally regulated dams and 699 are state regulated dams. MDNR regulates dams that are over 35 feet in height and not already federally regulated. They ensure these dams are safely constructed, operated, and maintained pursuant to Chapter 236 of the Revised Statutes of Missouri. **Table 3.14** breaks down the hazard classification system the MoDNR uses for both regulated and non-regulated dams.

Federally regulated dams fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE) and the U.S. Department of Agriculture and Forest Service. The USACE maintains the National Inventory of Dams (NID), which includes the data and hazard classification system for dams described in **Table 3.15**.

Table 3.14. MoDNR Dam Hazard Classification Definitions

Hazard Class	Definition
Class I	The area downstream from the dam that would be impacted by inundation contains ten or more permanent dwellings or any public building. Inspection of these dams must occur every two years.
Class II	The area downstream from the dam that would be impacted by inundation contains one to nine permanent dwellings, or one or more campgrounds with permanent water, sewer, and electrical services, or one or more industrial buildings. Inspection of these dams must occur every three years.
Class III	The area downstream from the dam that would be impacted by inundation does not contain any of the structures identified in either Class I or Class II dams. Inspection of these dams must occur every five years.

Source: Missouri Department of Natural Resources, http://dnr.mo.gov/env/wrc/docs/rules_reg_94.pdf

Table 3.15. NID Dam Hazard Classification Definitions

Hazard Class	Definition
High Hazard	Failure results in likely loss of human life.
Significant Hazard	Possible loss of human life and likely significant property or environmental destruction
Low Hazard	Failure results in only minimal property damage

Source: National Inventory of Dams

In order to be catalogued in the NID system, "Low Hazard" dams must also be at least 25 feet in height, contain at least 15 acre-feet in storage, or, be at least six feet in height with at least 50 acre-feet in storage.

Geographic Location

Dams in the Planning Area

According to MoDNR's online GeoSTRAT tool, there are 32 dams located in Buchanan County. Of these dams, 11 fall under the USACE's "High Hazard" dam classification and of these 11 dams two are considered "Class I" hazards under the MoDNR classification system. **Table 3.3** lists the 11 NID defined "High Hazard" dams, along with details regarding their heigh, storage capacity, last inspection date, which river they connect to, and their nearest downstream city. Of these the majority are upstream from the city of Agency.

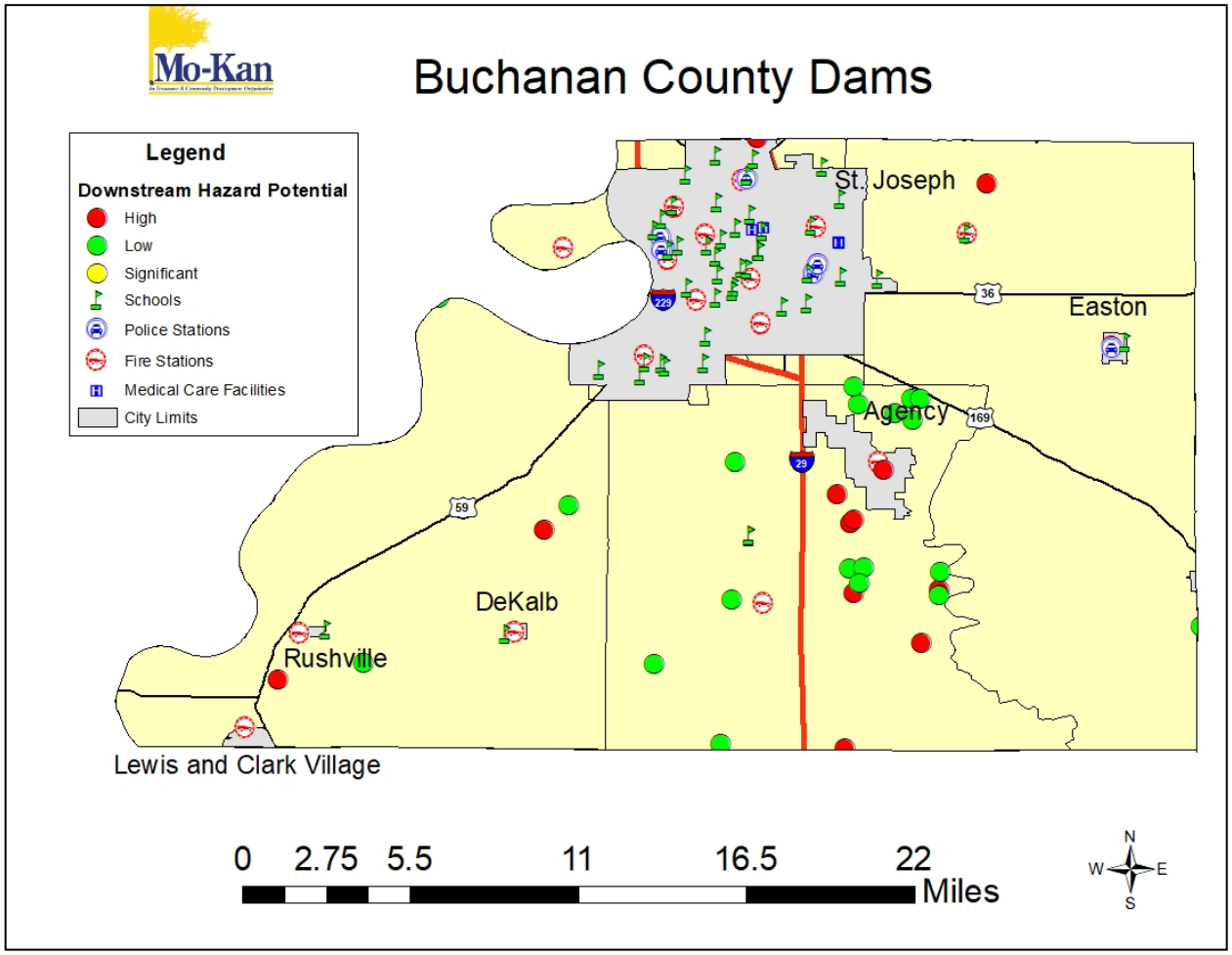
Figure 3.16 maps the location of all the dams in Buchanan County, distinguishing the NID defined "High Hazard" from the "Low Hazard" dams.

Table 3.16. High Hazard Dams in the Buchanan County Planning Area

Dam Name	Emergency Action Plan	Dam Height	Normal Storage (Acre-	Last Inspection Date	River	Nearest Downstream City	Distance To Nearest City	Dam Owner
Belcher Branch Lake Dam (Class II)	Yes	47	1,765	1/9/2018	TR - Belcher Branch	Faucett	4.1	MO Dept of Conservation
Dearborn Reservoir Dam (Class II)	No	28	180	N/A	TR – Bee Creek	Dearborn	1	City of Dearborn
Dead Man's Hole Dam (Class II)	No	32	51	N/A	TR – Missouri River	Atchison	6	Sonnenmoser Bros.
Grant Lake Dam – South (Class II)	No	20	86	N/A	TR – Platte River	Platte City	26	Claude S. Grant
Jones Dam (Class II)	No	26	67	N/A	Rock Creek	Agency	5	Larry A. Jones
Komer Lake Dam (Class II)	Yes	42	175	8/16/2016	TR – Possum Hollow	Agency	2.5	Evelyn Noland
Lake Flamingo Dam (Class II)	No	20	107	N/A	TR – Pigeon Creek	Agency	1.7	Glenn Hendrix
McPheeter's Lake Dam (Class I)	No	37	56	6/3/1980	TR – Platte River	Agency	1.6	Mrs. R.A. McPheeters
Scotty's Lake Dam (Class I)	No	25	80	3/27/1979	TR – Missouri River	Agency	5	Albert Scott Hall
Ussary Lake Dam (Class I)	No	33	141	6/2/1980	TR – Pigeon Creek	Agency	2	John Ussary
Wales Lake Dam (Class II)	No	20	160	N/A	TR – Platte River	Agency	11	Mrs. Russel Wales

Sources: Missouri Department of Natural Resources, https://dnr.mo.gov/geology/wrc/dam-safety/damsinmissouri.htm and National Inventory of Dams, http://nid.usace.army.mil/cm_apex/f?p=838:12.

Figure 3.3. High Hazard Dam Locations in Buchanan County and Areas Impacted in the Event of Breach



Source: Hazus 4.2

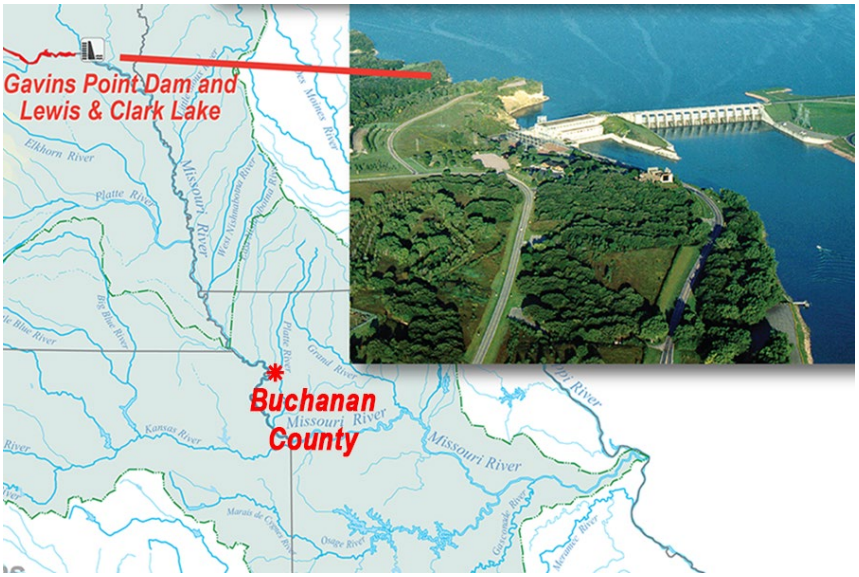
Upstream Dams Outside the Planning Area

The upstream dam with the most significant impact on the planning area is Gavins Point Dam in South Dakota. During past flood events the spring release pulses from this structure have become a point of contention. As reported in the last plan update, a record release of 160,700 cubic feet per second into the Missouri River in June/July 2011 to prevent overtopping of Gavins Point. The 2019 spring flooding season saw a maximum release of 90,000 cubic feet per second as the dam opened 12 of its 14 floodgates in order to relieve upstream flooding from the Niobrara River basin caused by rapid snow melt and heavy rains (Source: https://www.nwd.usace.army.mil/Media/News-Releases/Article/1785855/gavins-point-releases-reach-90k/).

Although the larger issue impacting flooding in the lower Missouri River basin appears to be levee failure, the USACE, with advocacy from Congress and state legislatures, has committed greater resources to studying the annual release schedule from Gavins Point. Future research may reshape the vision of river control with an eye towards increased releases from Gavins Point during the flooding off-season to improve river navigability and reduce buildup upstream

throughout the year (Source: https://www.newspressnow.com/news/local_news/corps-looking-at-missouri-river-navigation/article_d8db9fe4-60dd-11eb-8f46-171eae9c192f.html). **Figure 3.4** maps the location of the Gavins Point Dam along the flow of the Missouri River into the planning area.

Figure 3.4. Upstream Dams Outside Buchanan County



Source: U.S. Army Corps of Engineers, Missouri Department of Natural Resources

Strength/Magnitude/Extent

Based on the hazard class definitions provided by the NID and MoDNR, the strength/magnitude of dam failure would be similar in some cases to flood events (see the flood hazard vulnerability analysis and discussion). The strength/magnitude/extent of dam failure is related to the volume of water behind the dam as well as the potential speed of onset, depth, and velocity. For this reason, dam failures could flood areas outside of mapped flood hazards.

In an extended MoDNR inundation map for Belcher Branch Lake Dam, one of four dams regulated and inspected by the state, an estimate of the extent of flooding from a breach is described. In an estimated breach, flooding could spread southeast of the Belcher Lake Conservation Area in an area covering 1.7 miles in length by approximately 0.25 miles wide that would stretch to cover a section of State Route MM, all in the course of half-an-hour. By the one-hour mark, flooding would flow along the Platte River and extend to a total length of nearly 3.5 miles and cross MO State Highway 116.

Previous Occurrences

According to Stanford University's National Performance of Dams Program database there are no records of recent dam failure in Buchanan County. In 2001, the Lake Flamingo Dam (High Hazard, Class II) experienced a piping issue occurred that left 50-70 ft of piping exposed and bent down after soil collapsed underneath the piping. At the time, this was recognized as an ongoing problem with the dam and it was remarked that it was, "…just a matter of time until the dam fails," but there has been no record of dam failure since

(http://npdp.stanford.edu/dams_database). This dam is not regulated by either the state or federal government.

McPheeters Lake Dam was breached in 1993, but no damage was reported. It was filled shortly thereafter and it no longer contains water.

Probability of Future Occurrence

Since there are zero recorded events of a dam breach causing damage in the planning area, a calculation of a probability percent is not possible. According to information from the 2013 MO State Hazard Mitigation Plan, Missouri's percentage of high hazard dams in the MoDNR inventory puts the State at about the national average for that category.

However, it is important to note that of the 11 dams identified as "High Hazard" by the USACE, only two have Emergency Action Plans and have been inspected in the last six years. This is due to the fact that the majority of these dams are not under either federal or state regulation, despite have documented hazard ratings. Besides McPheeters Lake Dam, which was previously addressed, Ussary Lake Dam and Scotty's Lake Dam are both classified as "Class I" dams by MoDNR ratings but have no record of inspection in the past 40-plus years.

Changing Future Conditions Considerations

According to the 2018 MO State Hazard Mitigation Plan, studies have been conducted to investigate the impact of climate change scenarios on dam safety. Dam failure is already tied to flooding and the increased pressure flooding places on dams. The impacts of changing future conditions on dam failure will most likely be those related to changes in precipitation and flood likelihood. Changing future conditions projections suggest that precipitation may increase and occur in more extreme events, which may increase risk of flooding, putting stress on dams and increasing the likelihood of dam failure.

Vulnerability

Vulnerability Overview

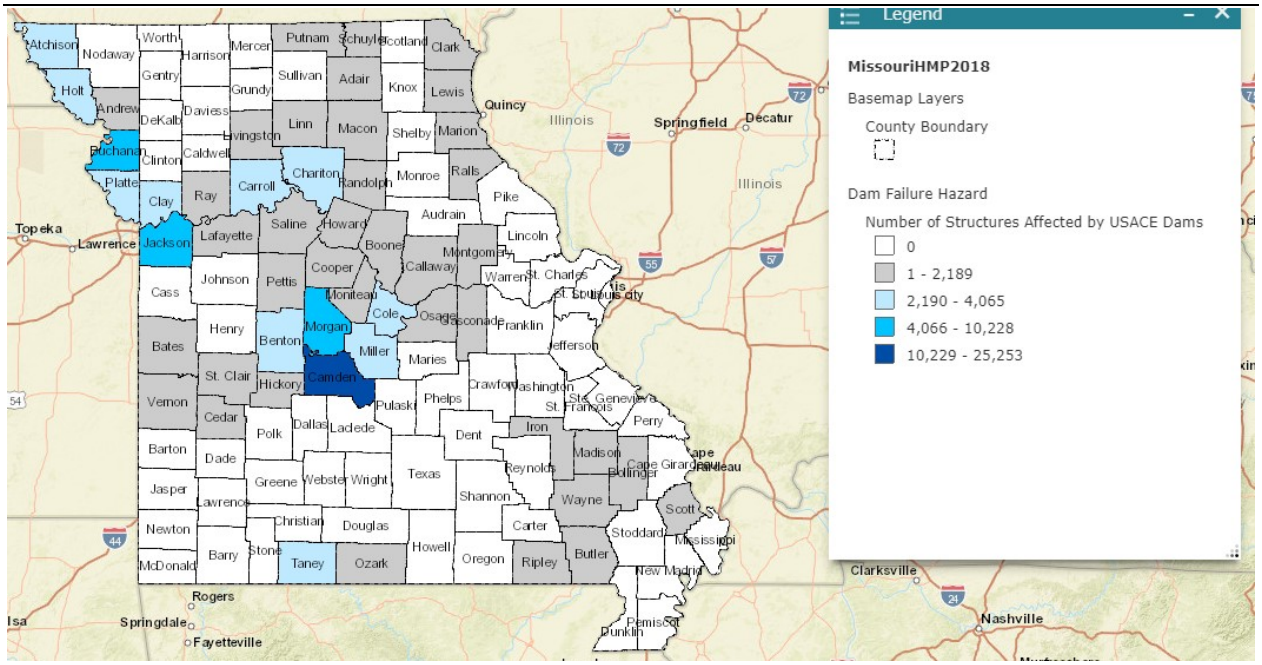
Vulnerability to dam failure in the planning area is limited to structures located in dam inundation zones. These dams are located in unincorporated parts of the county with no critical structures located in the inundation zones. Currently, there are only four state regulated dams with heights of 35 or greater: Belcher Branch Lake Dam (High Hazard, Class II), Komer Kale Dam (High Hazard, Class II), Bear Lake Dam (Low Hazard, Class III), and Farmland Industries Dam (Low Hazard, Class III). Although failure potential certainly exists for the non-regulated dams, it is very difficult to attempt to analyze vulnerability due to data limitations. There are no federally regulated dams in Buchanan County.

Potential Losses to Existing Development:
(including types and numbers, of buildings, critical facilities, etc.)

Figures 3.5-3.7, taken from the Missouri Hazard Mitigation Viewer indicate the following values in property and the total population in Buchanan County that could be affected by dam breaches:

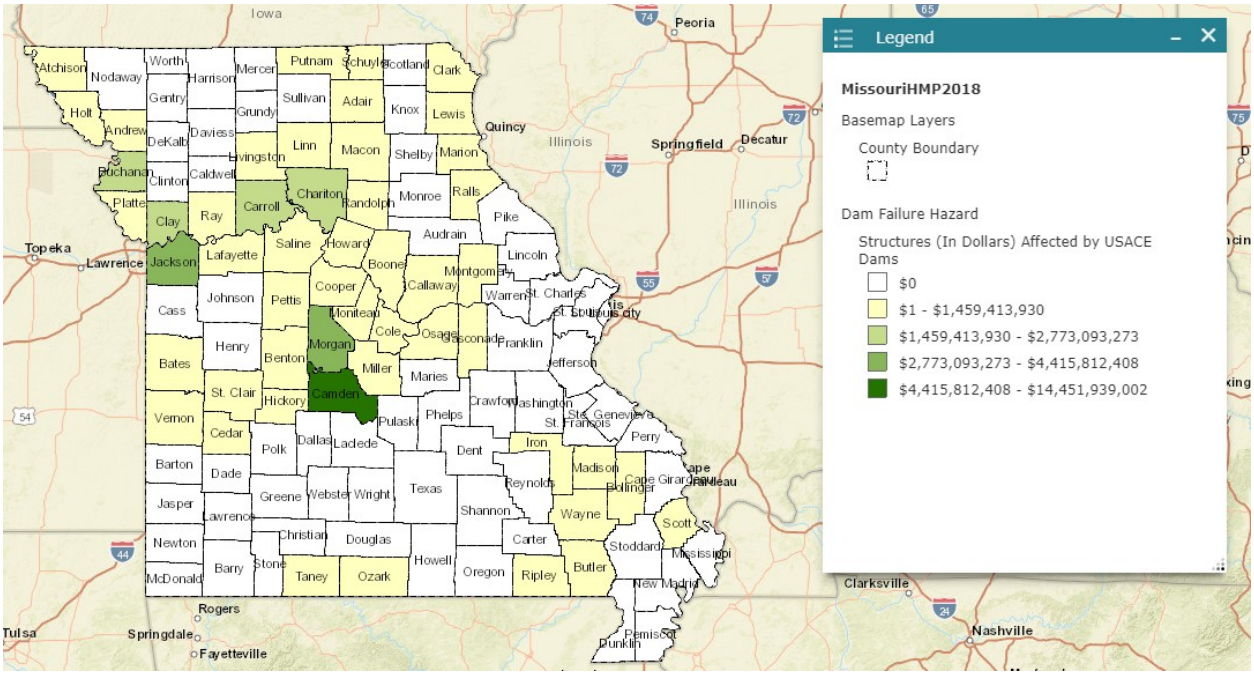
- 6,0638 structures affected by USACE dams
- $2,773,093,273.00 in structures affected by USACE dams
- 9,079 people affected by USACE dams

Figure 3.5. Number of Structures Affected by USACE Dams



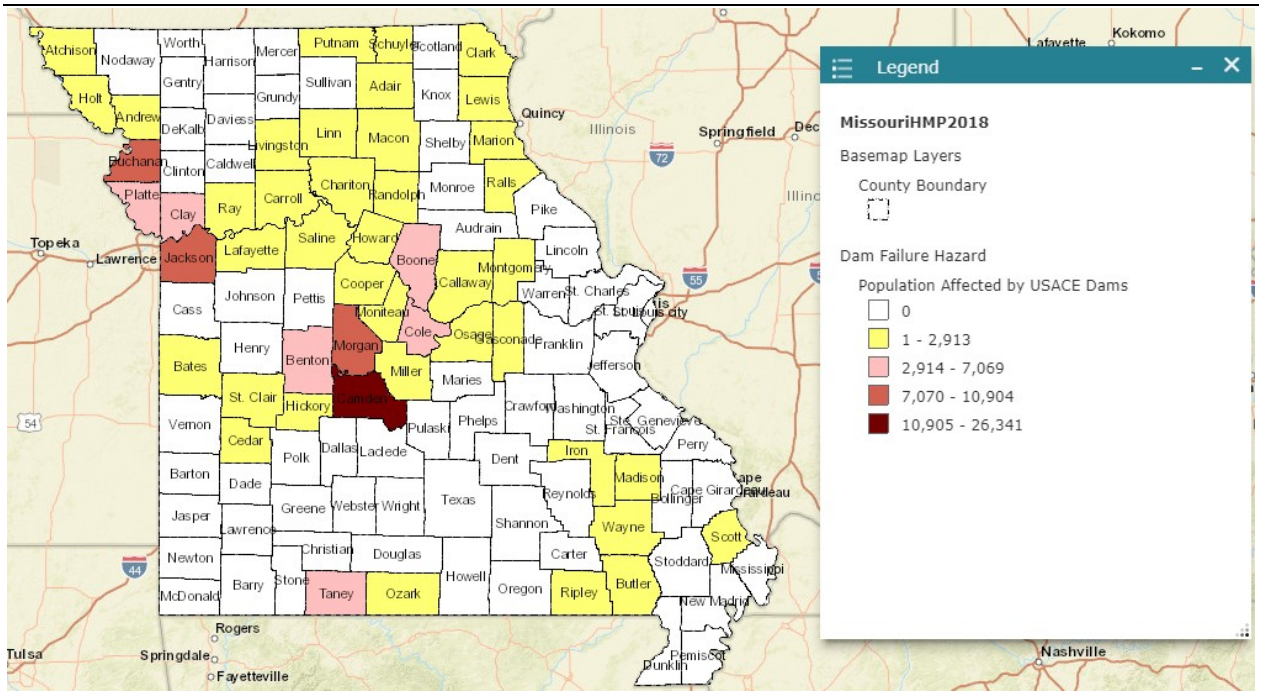
Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=d97d80d5cff04996bff54b2250e47d83

Figure 3.6. Structures (In Dollars) Affected by USACE Dam



Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=d97d80d5cff04996bff54b2250e47d83

Figure 3.7. Population Affected by USACE Dams



Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=d97d80d5cff04996bff54b2250e47d83

Impact of Previous and Future Development

Future development in Buchanan County could impact the amount of damages caused by a dam failure in the planning area if residential development occurs in the dam inundation area. Most of Buchanan County is rural in nature with little development occurring near High Hazard/Class I dams.

Hazard Summary by Jurisdiction

Vulnerability to dam failure varies across the planning area. No schools or community assets are located in known dam breach inundation areas. However, in the cases of Dead Man's Hole and Scotty's Lake Dam the unofficial inundation maps show residential and agricultural structure located in an inundation zone. In the cases of at least Belcher Branch Lake, Dearborn Reservoir, Flamingo Lake, and Grant Lake South dam, failure would result in the closure of parts of rural routes, state highways, or even total road closure in the case of Flamingo Lake that could potentially cut off residents in an unincorporated area. The unofficial map for the Komer Lake Dam in particular shows inundation snaking around several residential areas and could impact them. Other unofficial inundation zone maps are located in Appendix B, in which several show roads located in the unincorporated areas in the inundation zones.

Problem Statement

Although the probability of dam failure in the county is very low, the potential for damage remains. Only Belcher Branch Lake Dam (Class II and regulated) and Komer Lake Dam (Class II) have emergency action plans. None of the "High Hazard" Class I one dams are regulated by any entity, and the Missouri Hazard Mitigation Viewer estimates indicate the county could face a large financial impact from loss of structures in inundation areas and thousands of people could be impacted as well.

These dams are not likely to come under any agency regulation, but at the very least possible solutions could include the development of emergency action plans, evacuation plans, and review of local ordinances to determine potential for development restrictions within the inundation areas.

A lack of regular inspection/maintenance of un-regulated high hazard dams was noted by the Mitigation Planning Committee. Private owners could be assisted to develop regular maintenance schedules and qualified staff and/or consultant could be identified to assist with maintenance report submittal requirements.

3.4.2 Drought

Hazard Profile

Hazard Description

Drought is generally defined as a condition of moisture levels significantly below normal for an extended period of time over a large area that adversely affects plants, animal life, and humans. A drought period can last for months, years, or even decades. There are four types of drought conditions relevant to Missouri, according to the State Plan, which are as follows.

- Meteorological drought is defined in terms of the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. A meteorological drought must be considered as region-specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.

- Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (e.g., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts also are out of phase with impacts in other economic sectors.

- Agricultural drought focus is on soil moisture deficiencies, differences between actual and potential evaporation, reduced ground water or reservoir levels, etc. Plant demand for water depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil.

- Socioeconomic drought refers to when physical water shortage begins to affect people.

Geographic Location

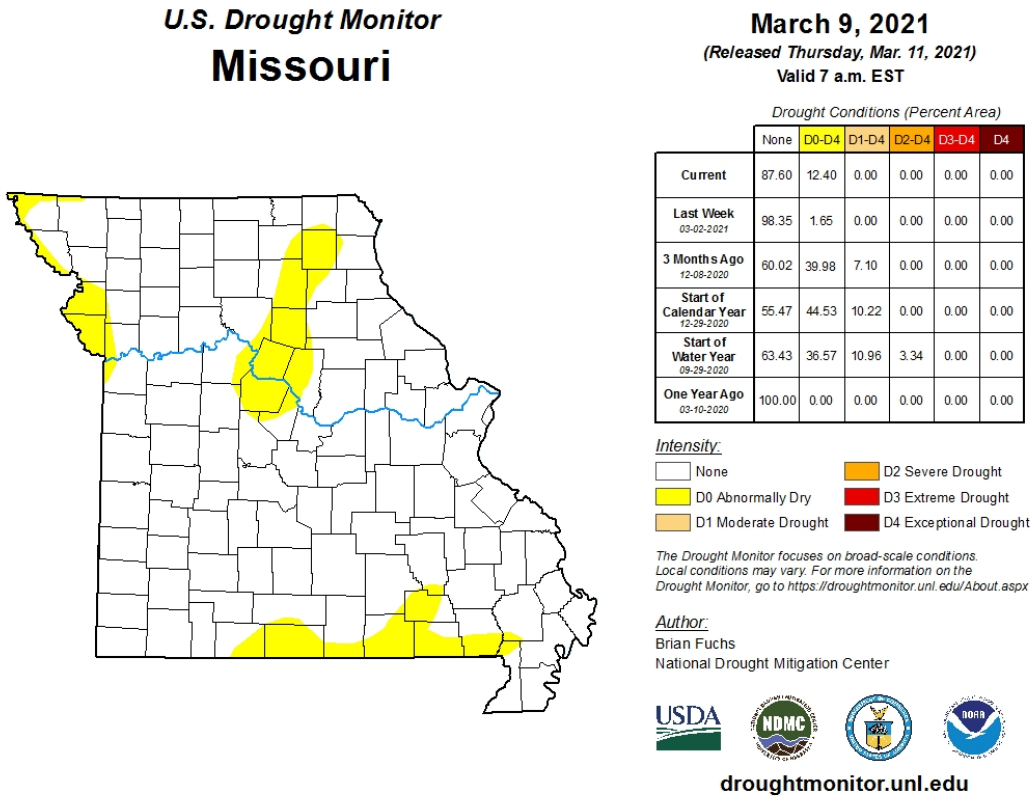
The entire planning area is at medium risk to drought. Drought most directly impacts the agricultural sector. Buchanan County covers 415 square miles and approximately 287.5 square miles (69 percent) is land in farm use. Farming is not concentrated in any geographical area within the county. Of the 184,062 acres of land in farm use, only 1,192 acres are irrigated. From 2012 to 2017, the amount of land in farm use decreased by 2 percent but the number of farms increased by 10 percent. Although the city of St. Joseph is not experiencing significant growth, new construction often occurs on the outskirts of town, resulting in conversion of agricultural land to economic and residential use (Source: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Missouri/cp29021.pdf).

Strength/Magnitude/Extent

The National Drought Monitor Center at the University of Nebraska at Lincoln summarized the potential severity of drought as follows. Drought can create economic impacts on agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to losses in yields in crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and disease to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Finally, while drought is rarely a direct cause of death, the associated heat, dust and stress can contribute to increased mortality.

Figure 3.8 below is a drought monitor map of Missouri. Buchanan County is in the yellow zone, indicating the county is currently experiencing abnormally dry conditions. The U.S. Drought Monitor is only a snapshot of conditions at a given moment in time.

Figure 3.8. U.S. Drought Monitor Map of Missouri on March 9, 2021



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	87.60	12.40	0.00	0.00	0.00	0.00
Last Week 03-02-2021	98.35	1.65	0.00	0.00	0.00	0.00
3 Months Ago 12-08-2020	60.02	39.98	7.10	0.00	0.00	0.00
Start of Calendar Year 12-29-2020	55.47	44.53	10.22	0.00	0.00	0.00
Start of Water Year 09-29-2020	63.43	36.57	10.96	3.34	0.00	0.00
One Year Ago 03-10-2020	100.00	0.00	0.00	0.00	0.00	0.00

Source: U.S. Drought Monitor, https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

The Palmer Drought Indices measure dryness based on recent precipitation and temperature. The indices are based on a “supply-and-demand model” of soil moisture. Calculation of supply is relatively straightforward, using temperature and the amount of moisture in the soil. However, demand is more complicated as it depends on a variety of factors, such as evapotranspiration and recharge rates. These rates are harder to calculate. Palmer tried to overcome these

difficulties by developing an algorithm that approximated these rates and based the algorithm on the most readily available data - precipitation and temperature.

The Palmer Index has proven most effective in identifying long-term drought of more than several months. However, the Palmer Index has been less effective in determining conditions over a matter of weeks. It uses a “0” as normal, and drought is shown in terms of negative numbers; for example, negative 2 is moderate drought, negative 3 is severe drought, and negative 4 is extreme drought. Palmer's algorithm also is used to describe wet spells, using corresponding positive numbers.

Palmer also developed a formula for standardizing drought calculations for each individual location based on the variability of precipitation and temperature at that location. The Palmer index can therefore be applied to any site for which sufficient precipitation and temperature data is available.

St. Joseph uses the Missouri River Alluvial aquifer and Agency uses the Platte River for their surface water sites. St. Joseph and Lewis and Clark Village have a groundwater site (Source: http://maps.waterdata.usgs.gov/mapper/index.html and Community Data Questionnaires). None of the participating communities use well water as the only source of water. However, many people residing in the unincorporated areas do.

Previous Occurrences

The USDA’s Risk Management Agency tracks insured crop loss payments in the county as a result of drought. **Table 3.17** shows the crop loss payments for drought in Buchanan County from 2010 to 2020. Crop loss payments were the highest for drought in 2012, with a total of $4,229,775.32.

Table 3.17. Crop loss payments in Buchanan County from 2010-2020

Year	Crop Loss Payment
2020	$37,110
2019	$0
2018	$728,412.70
2017	$260,807
2016	$118,709
2015	$0
2014	$21,491
2013	$1,182,293.55
2012	$4,229,775.32
2011	$9,493
2010	$7,981

Source: https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss

Table 3.18 includes NCEI reported events and damages for the past 10 years. No crop or property damage was reported in the county in the last decade.

Table 3.18. NCEI Buchanan County Drought Events Summary, 2010-2020

Type of Event	Inclusive Dates	Magnitude	# of Injuries	Property Damage	Crop Damages
Drought	07/01/2012	Below normal precipitation throughout July resulted in D3 extreme drought conditions, 0.82” of rain	0	$0	$0

Drought	08/01/2012	Below normal precipitation throughout August resulted in D3 extreme drought conditions, 1.66" of rain	0	$0	$0
Drought	09/01/2012	2.15" of rain	0	$0	$0
Drought	10/01/2012	D3 drought conditions prevailed across the county, 1.74" of rain	0	$0	$0
Drought	11/01/2012	Drought D2 conditions prevailed across the county, 1.79"of rain	0	$0	$0
Drought	12/01/2012	Drought D2 conditions prevailed across the county, 0.85"of precipitation	0	$0	$0
Drought	01/01/2013	Severe drought D2 conditions prevailed across the county, 0.95" of precipitation	0	$0	$0
Drought	02/01/2013	Severe D2 drought conditions prevailed across the county, 1.6" of precipitation	0	$0	$0
Drought	06/01/2018	Buchanan County declared in a D2 or worse drought from end of May through June	0	$0	$0
Drought	07/01/2018	D3 drought throughout July and into August	0	$0	$0
Drought	08/01/2018	Buchanan County reached or maintained D2 drought status for the entire month	0	$0	$0
Drought	10/01/2018	6-12" over a four day stretch in early October ended the widespread summer and fall dry conditions	0	$0	$0

Source: NCEI, data accessed 04/15/2021
https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=ALL&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2010&endDate_mm=12&endDate_dd=30&endDate_yyyy=2020&county=BUCHANAN%3A21&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=29%2CMISSOURI

Buchanan County experienced droughts in 1989, 2002, 2005-2006, 2012-2013, and 2018.

Starting at the very end of May and going into June 2018, the US Drought Monitor at the University of Nebraska declared portions of Missouri in a D2 or worse drought. http://droughtmonitor.unl.edu/data/png/20180626/20180626_wfoeax_trd.png The direct impact to Buchanan County is unclear, but statewide drought impacts are estimated around 2 billion dollars, per The University of Missouri Extension Center.

The drought also harmed pastures, with about three-quarters in poor or very poor conditions, according to the USDA report. Many pastures have not been able to support grazing cattle, prompting farmers to feed cattle with hay that might normally be saved for winter. The hay crop was down about one-third from normal.

The 2018 resulted in small corn ears. Some farmers did not wait until harvest, instead trying to get the most out of the crop by baling it or cutting it for silage for cattle (Source: https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Drought&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2016&endDate_mm=12&endDate_dd=31&endDate_yyyy=2020&county=BUCHANAN%3A21&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=29%2CMISSOURI)

Probability of Future Occurrence

Over a period of 20 years, there were 12 drought events in Buchanan County encompassing six months in 2012, two months in 2013, and four months in 2018. The calculated risk percent from the number of months of drought and the total number of months in the record period equates to the annual average percentage of 5 percent probability of drought occurrence in the county. Although drought is not predictable, long-range outlooks and predicted impacts of climate change could indicate an increased chance of drought persistence and severity (Source: https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Drought&beginDate_mm=01&beginDate_dd=01&beginDate_yy

yy=2010&endDate_mm=12&endDate_dd=31&endDate_yyyy=2020&county=BUCHANAN%3A21&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=29%2CMISSOURI).

Changing Future Conditions Considerations

The US Climate Resilience Toolkit predicts a very slight increase in average daily max temperature in Buchanan County over the next decade with a greater increase over the next 20 to 50 years. Total precipitation estimates remain stable for the next decade with potential years of low precipitation in 2028 and 2031 similar to the 2012 drought (Source: https://crt-climate-explorer.nemac.org/cards-home/?county=Buchanan+County&city=Buchanan+County,%20MO&fips=29021&lat=39.6349791&lon=-94.81059549999999&zoom=7&nav=undefined).

A new analysis, performed for the Natural Resources Defense Council, examined the effects of climate change on water supply and demand in the contiguous United States. The study found that more than 1,100 counties will face higher risks of water shortages by mid-century as a result of climate change. Two of the principal reasons for the projected water constraints are shifts in precipitation and potential evapotranspiration (PET). Climate models project decreases in precipitation in many regions of the U.S., including areas that may currently be described as experiencing water shortages of some degree.

The Natural Resources Defense Council developed a new water supply sustainability index. The risk to water sustainability is based on the following criteria:

- Projected water demand as a share of available precipitation
- Groundwater use as a share of projected available precipitation
- Susceptibility to drought
- Projected increase in freshwater withdrawals
- Projected increase in summer water deficit

The risk to water sustainability for counties meeting two of the criteria are classified as "moderate" while those meeting three of the criteria are classified as "high," and those meeting four or more are classified as "extreme." Counties meeting less than two criteria are considered to have low risk to water sustainability. According to the Natural Resources Defense Council, without climate change the water sustainability index for Buchanan County is low. With climate change, the water supply sustainability index increases to moderate (Source: https://www.nrdc.org/issues/climate-change).

Vulnerability

Vulnerability Overview

The 2018 State Plan places Buchanan County at medium risk of drought with a 9.7 percent likelihood of severe drought. For a 21-year period from 2010-2020, there was a total of $6,596,072.57 in crop losses in the county due to drought, according to the USDA Risk Management Agency. This averages at $314,098.69 of loss per year for the previous 21 years. There were 219 fewer cattle reported in the county from 2012-2017. This lessens the demand for stock ponds, but drought can still stress stock ponds water levels and be disruptive to crop production. Those relying on private wells are likely to be impacted by reductions in the groundwater supply (Sources: https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf, http://www.rma.usda.gov/data/cause.html, https://www.nass.usda.gov/AgCensus/).

Potential Losses to Existing Development

The 2013 State Plan shows that from 1998 through 2012 there were $7,893,030 in insured crop loss payments in Buchanan County (Source: https://archive.org/details/2013MOHazardMitigationPlan/mode/2up). In addition, according to the USDA Risk Management Agency, there was a total of $1,203,785 in insured crop loss payments from 2013-2015. (Source: http://www.rma.usda.gov/data/cause.html). According to this data, the total losses divided by the 18 year timeframe ($7,893,030 + $1,203,785/18) equals $505,378.61 per year. The previously stated 5-year average of $454,108 fits the trend of potential losses in the foreseeable future. There are no anticipated structural losses, loss of life or injuries associated with this hazard.

Impact of Previous and Future Development

Increases in acreage planted with crops would add to exposure to drought-related agricultural losses. In addition, increases in population result in increased demand for treated water, adding additional strain on water supply systems.

Hazard Summary by Jurisdiction

Although the probability of drought is the same for the entire county, farming, and livestock enterprises in the unincorporated parts of the county would feel the greatest impact. These impacts are mitigated somewhat by the purchase of crop insurance. The communities in Buchanan County are on water systems. Missouri American Water pumps groundwater from Andrew County to service the St. Joseph area. However, many rural residents rely on limited source wells, which would be impacted during water shortages. In cities, the drought conditions would be the same as those experienced in rural areas, but the magnitude would be different with only lawns and local gardens impacted. In addition, building foundations could be weakened due to shrinking and expanding soils. School and special districts would be the least impacted by drought; however, those districts in communities with single source wells may experience water shortages prior to those in larger communities.

Problem Statement

Although drought most likely will not cause structural damage, the impact is greatest on the agriculture sector and if persistent enough, could cause reductions in groundwater and water shortages in communities that provide potable water services. Potential solutions to mitigate the impact of drought would be for communities to develop an ordinance to restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc., during extreme drought periods. Schools can also implement water conservation measures at all district facilities.

3.4.3 Earthquakes

Hazard Profile

Hazard Description

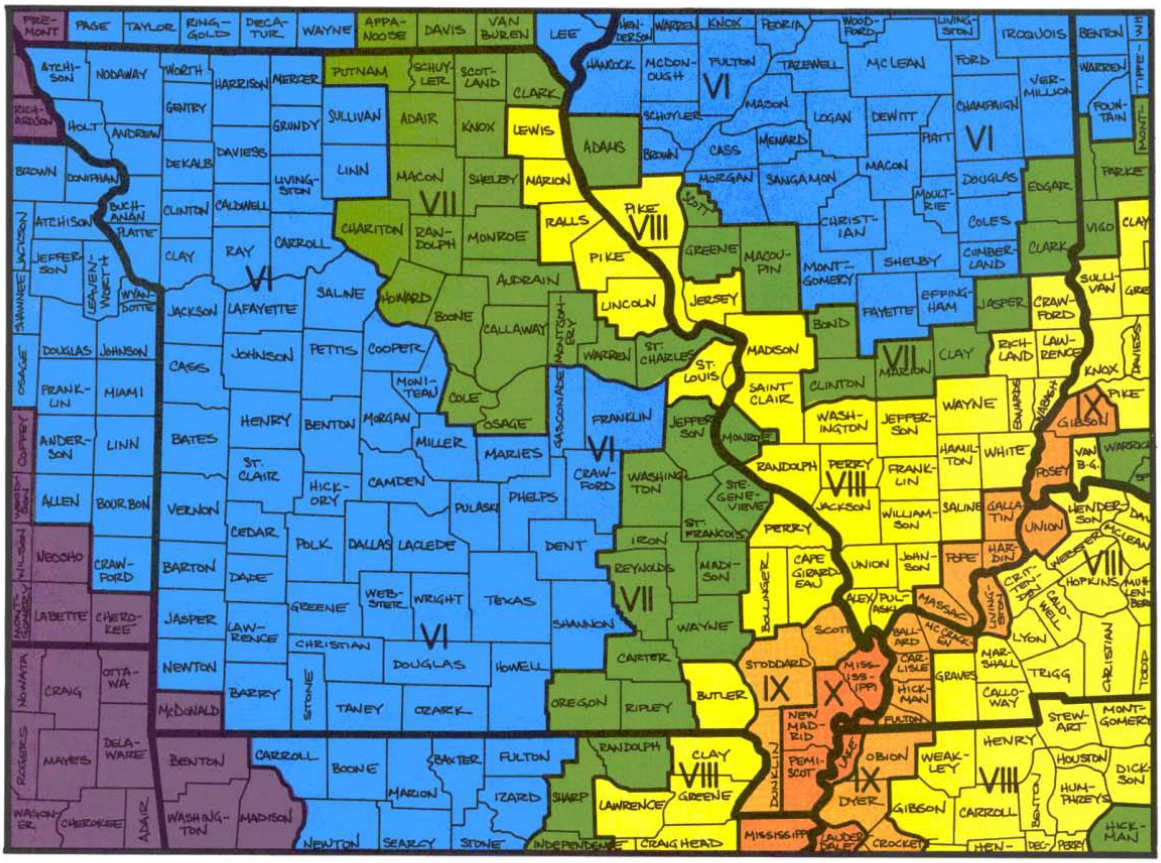
An earthquake is a sudden motion or trembling that is caused by a release of energy accumulated within or along the edge of the earth's tectonic plates. Earthquakes occur primarily along fault zones and tears in the earth's crust. Along these faults and tears in the crust, stresses can build until one side of the fault slips, generating compressive and shear energy that produces the shaking and damage to the built environment. Heaviest damage generally occurs nearest the earthquake epicenter, which is that point on the earth's surface directly above the point of fault movement. The composition of geologic materials between these points is a major factor in transmitting the energy to buildings and other structures on the earth's surface.

The greatest hazard from earthquakes in Buchanan County comes from the New Madrid Seismic Zone situated in the bootheel area of southeast Missouri. The potential of high magnitude earthquakes occurring along the New Madrid fault presents risk that does not vary across the planning area. The Nemaha uplift in central Kansas is also prone to seismic activity; however, the center of the Humbolt fault zone near the Nemeha Uplift is approximately 250 mile southwest of Buchanan County and produces lower magnitude seismic events.

Geographic Location

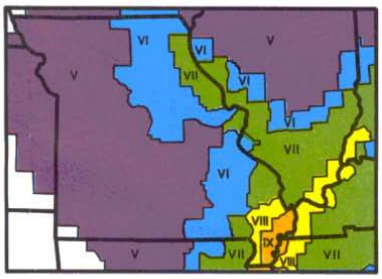
Figure 3.9 shows the highest projected Modified Mercalli intensities by county from a potential magnitude 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid Seismic Zone. The secondary maps in **Figure 3.9** show the same regional intensities for 6.7 and 8.6 earthquake, respectively. **Figure 3.10** includes descriptions of the level of damage expected based on the intensity scale.

Figure 3.9. Impact Zones for Earthquake Along the New Madrid Fault



This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 7.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

6.7

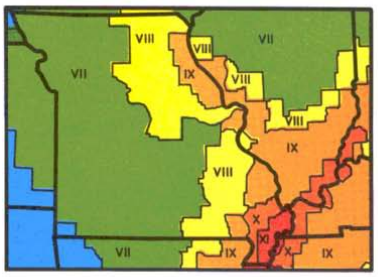


7.6

This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 6.7 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

This map shows the highest projected Modified Mercalli intensities by county from a potential magnitude – 8.6 earthquake whose epicenter could be anywhere along the length of the New Madrid seismic zone.

8.6



Source: https://sema.dps.mo.gov/docs/EQ_Map.pdf

Figure 3.10. Projected Earthquake Intensities

MODIFIED MERCALLI INTENSITY SCALE

I People do not feel any Earth movement.

II A few people might notice movement.

III Many people indoors feel movement. Hanging objects swing.

IV Most people indoors feel movement. Dishes, windows, and doors rattle. Walls and frames of structures creak. Liquids in open vessels are slightly disturbed. Parked cars rock.

V Almost everyone feels movement. Most people are awakened. Doors swing open or closed. Dishes are broken. Pictures on the wall move. Windows crack in some cases. Small objects move or are turned over. Liquids might spill out of open containers.

VI Everyone feels movement. Poorly built buildings are damaged slightly. Considerable quantities of dishes and glassware, and some windows are broken. People have trouble walking. Pictures fall off walls. Objects fall from shelves. Plaster in walls might crack. Some furniture is overturned. Small bells in churches, chapels and schools ring.

VII People have difficulty standing. Considerable damage in poorly built or badly designed buildings, adobe houses, old walls, spires and others. Damage is slight to moderate in well-built buildings. Numerous windows are broken. Weak chimneys break at roof lines. Cornices from towers and high buildings fall. Loose bricks fall from buildings. Heavy furniture is overturned and damaged. Some sand and gravel stream banks cave in.

VIII Drivers have trouble steering. Poorly built structures suffer severe damage. Ordinary substantial buildings partially collapse. Damage slight in structures especially built to withstand earthquakes. Tree branches break. Houses not bolted down might shift on their foundations. Tall structures such as towers and chimneys might twist and fall. Temporary or permanent changes in springs and wells. Sand and mud is ejected in small amounts.

IX Most buildings suffer damage. Houses that are not bolted down move off their foundations. Some underground pipes are broken. The ground cracks conspicuously. Reservoirs suffer severe damage.

X Well-built wooden structures are severely damaged and some destroyed. Most masonry and frame structures are destroyed, including their foundations. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, and lakes. Railroad tracks are bent slightly. Cracks are opened in cement pavements and asphalt road surfaces.

XI Few if any masonry structures remain standing. Large, well-built bridges are destroyed. Wood frame structures are severely damaged, especially near epicenters. Buried pipelines are rendered completely useless. Railroad tracks are badly bent. Water mixed with sand, and mud is ejected in large amounts.

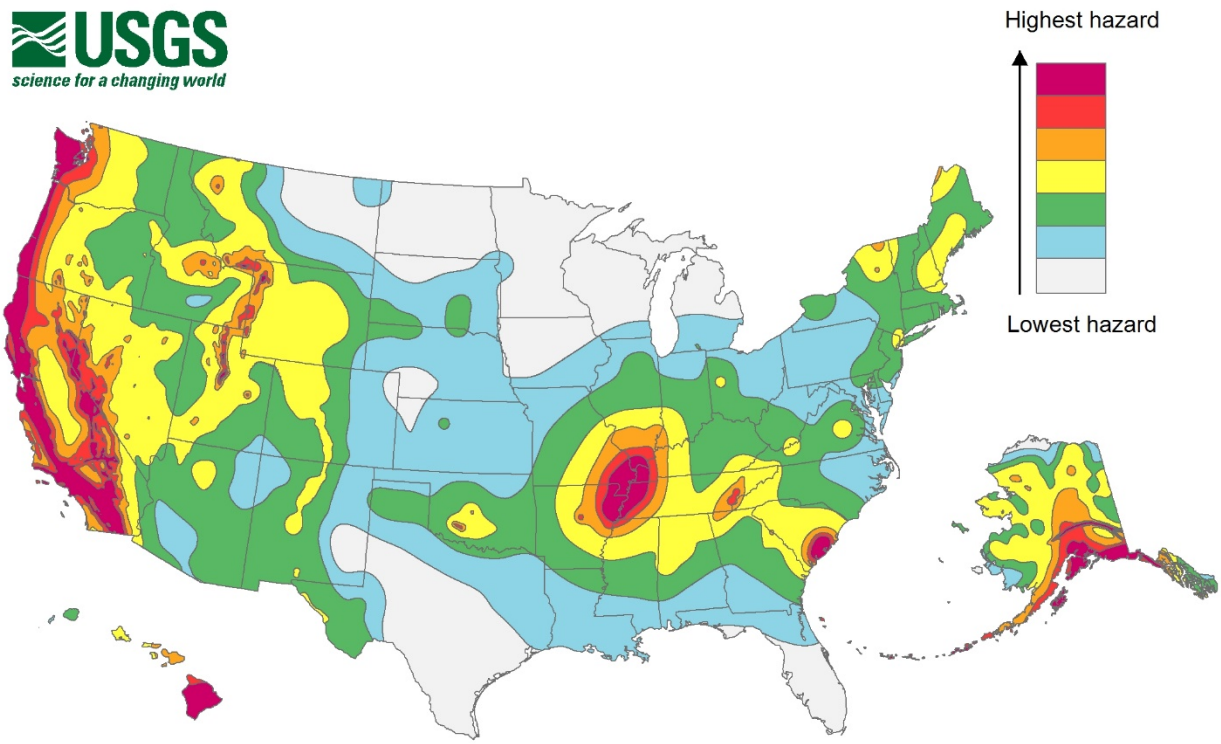
XII Damage is total, and nearly all works of construction are damaged greatly or destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move. Lakes are dammed, waterfalls formed and rivers are deflected.

Intensity is a numerical index describing the effects of an earthquake on the surface of the Earth, on man, and on structures built by man. The intensities shown in these maps are the highest likely under the most adverse geologic conditions. There will actually be a range in intensities within any small area such as a town or county, with the highest intensity generally occurring at only a few sites. Earthquakes of all three magnitudes represented in these maps occurred during the 1811 - 1812 "New Madrid earthquakes." The isoseismal patterns shown here, however, were simulated based on actual patterns of somewhat smaller but damaging earthquakes that occurred in the New Madrid seismic zone in 1843 and 1895.

Prepared and distributed by
THE MISSOURI STATE
EMERGENCY MANAGEMENT AGENCY
P.O. BOX 116
JEFFERSON CITY, MO 65102
Telephone: 573-526-9100

Figure 3.11 illustrates seismicity in the United States. Buchanan County is located in the blue zone, which is the second lowest hazard area. This area has risen northward since 2014.

Figure 3.11. United States Seismic Hazard Map



Source: United States Geological Survey at https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map

Strength/Magnitude/Extent

The extent or severity of earthquakes is generally measured in two ways: 1) the Richter Magnitude Scale is a measure of earthquake magnitude; and 2) the Modified Mercalli Intensity Scale is a measure of earthquake severity. The two scales are defined as follows.

Richter Magnitude Scale

The Richter Magnitude Scale was developed in 1935 as a device to compare the size of earthquakes. The magnitude of an earthquake is measured using a logarithm of the maximum extent of waves recorded by seismographs. Adjustments are made to reflect the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, comparing a 5.3 and a 6.3 earthquake shows that the 6.3 quake is ten times bigger in magnitude. Each whole number increase in magnitude represents a tenfold increase in measured amplitude because of the logarithm. Each whole number step in the magnitude scale represents a release of approximately 31 times more energy.

Modified Mercalli Intensity Scale

The intensity of an earthquake is measured by the effect of the earthquake on the earth's surface. The intensity scale is based on the responses to the quake, such as people awakening, movement of furniture, damage to chimneys, etc. The intensity scale currently used in the United States is the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 and is composed of 12 increasing levels of intensity. They range from imperceptible shaking to catastrophic destruction, and each of the twelve levels is denoted by a Roman numeral. The scale does not have a mathematical basis but is based on observed effects. Its use gives the laymen a more meaningful idea of the severity.

Previous Occurrences

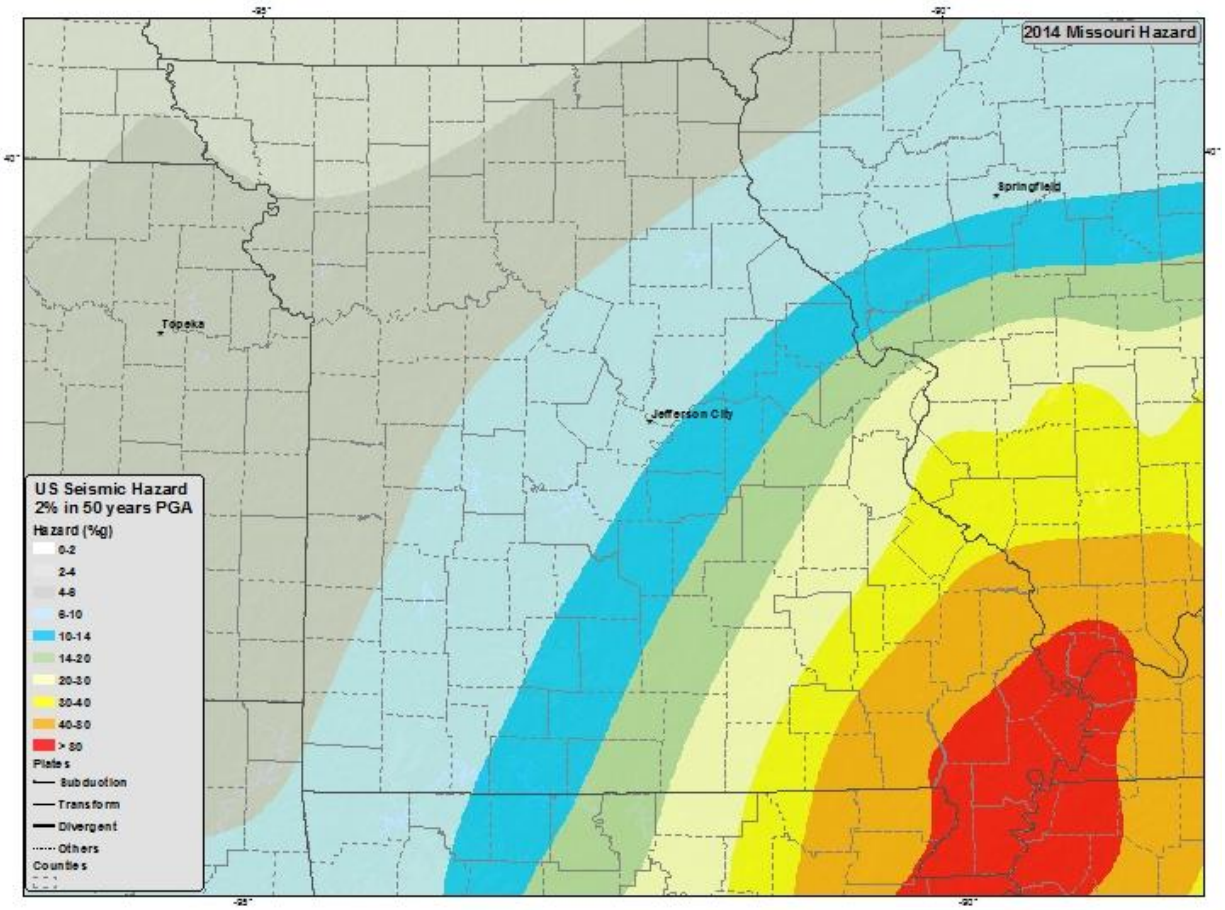
Earthquakes are rare in Buchanan County. The strongest occurred on April 24, 1867, when St. Joseph experienced a 7.0 earthquake. According to newspaper accounts, windows broke, plaster fell, solid bricks swayed, and walls cracked. It was reported that the brick wall of the schoolyard cracked several feet from the ground. There was no serious damage reported. Chris Rutt, author of the Buchanan County Histories, also reported earthquake events in September 1871 and the fall of 1896. On January 7, 1906, St. Joseph experienced a 5.0 to 6.0 earthquake. Newspaper accounts indicated the event rattled dishes and tinware, detached several pictures from walls, swayed floors, and frightened residents. There was no serious damage reported. A similar incident occurred in 1969.

On February 13, 2016 Buchanan County residents felt tremors from a 5.1 earthquake originating near Fairview, Oklahoma. No damage was reported. There is speculation that the earthquake was a result of man-made activity, fracking. On July 20, 2018, St. Joseph experienced a 2.6 magnitude earthquake from alleged fracking in or near the Missouri River.

Probability of Future Occurrence

According to the 2014 Seismic Hazard Map of Missouri, Buchanan County has a 14-20 percent chance of an earthquake in the next 50 years. **Figure 3.12** shows the Seismic Hazard probability for the next 50 years.

Figure 3.12. 2014 Seismic Hazard Map of Missouri



Source: https://www.usgs.gov/media/images/2014-seismic-hazard-map-missouri

Changing Future Conditions Considerations

Scientists are beginning to believe there may be a connection between changing climate conditions and earthquakes. Redistribution of weight over fault lines from changing ice caps and sea-level could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggests that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by changing future conditions.

Vulnerability

Vulnerability Overview

Ground shaking is the most damaging effect from earthquakes. Ground shaking will impact all structures and critical infrastructure such as roads and electrical transmission systems. Although Buchanan County has experienced some earthquakes, there were no documented damages associated with these events. In the event of a 7.6 magnitude earthquake, damage to structures would vary depending on the quality of construction. In addition, some underground utilities may be damaged. Injuries may occur but fatalities are unlikely.

Potential Losses to Existing Development

The Hazus building inventory counts are based on the 2010 census data adjusted to 2014 numbers using the Dun & Bradstreet Business Population Report. Inventory values reflect 2014 valuations, based on RSMeans (a supplier of construction cost information) replacement costs. Population counts are 2010 estimates from the U.S. Census Bureau. **Table 3.19** shows the potential economic losses in Buchanan County from the 2018 Missouri State Hazard Mitigation Plan.

Table 3.19. HAZUS-MH Earthquake Loss Estimation 2% Probability of Exceedance in 50 Years Scenario Direct Economic Losses Results Summary by County (All values are in thousands)

County	Cost Structural Damage	Cost Non-Structural Damage	Cost Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total
Buchanan	$8,580	$16,843	$5,189	$199	$5,166	$2,025	$2,853	$2,173	$43,028

Source: https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf

Potential losses to existing development include the total exposure for all communities listed in **Tables 3.3** and **3.4** in the Assets at Risk section of this chapter. The total exposure of each jurisdiction was used to estimate losses from a 7.6 earthquake along the New Madrid. A damage factor of 0.5% was applied to each jurisdiction's total building and contents based on the expected impact for Zone VI on the Modified Mercalli scale.

Table 3.20 depicts the estimated losses in each jurisdiction based on total exposure and a 0.5% damage factor.

Table 3.20. Estimated Earthquake Losses for Buchanan County

Jurisdictions	Estimated Potential Earthquake Losses
Unincorp. Buchanan County	$68,655.60
Agency	$3,822.05
Easton	$1,637.50
Lewis & Clark Village	$776.90
Rushville	$2,751.30
St. Joseph	$440,066.30
Buchanan School District	$1,985,000.00
Mid-Buchanan School District	$473,400.50
St. Joseph School District	$19,398,816.95

Source: Hazus MH 4.2 and questionnaire

Impact of Previous and Future Development

Future development is not expected to increase the risk other than contributing to the overall exposure of potential damage.

Hazard Summary by Jurisdiction

Since the earthquake intensity is not likely to vary greatly across the planning area, the risk will be the same throughout. As previously stated, damages could differ in communities that have older structures. **Table 3.21** lists the years structures were built in the county's jurisdictions.

Table 3.21. Age of Structures in Buchanan County

Year Structure Built	Buchanan County	Agency	Easton	Lewis & Clark Village	Rushville	St. Joseph
2014 or later	0.9%	3.4%	0%	0%	0%	0.9%
2010 to 2013	1.3%	2.6%	2.7%	0%	0.8%	0.6%
2000 to 2009	7.2%	5.3%	6.2%	0%	1.6%	6.7%
1980 to 1999	17.3%	51.1%	23%	28.3%	10.3%	15.3%
1960 to 1979	24.4%	26.9%	31.8%	30%	37.3%	24.5%
1940 to 1959	18.3%	5.7%	11.5%	31.7%	8.7%	19.9%
1939 or earlier	30.6%	5%	24.8%	10%	41.3%	32.1%

Source: US Census ACS 5-year 2015-2019

Problem Statement

Based on the intensity damage description in **Figure 3.10**, a 7.6 magnitude earthquake along the New Madrid fault may result in slight damage, if any, to older, poorly built structures. The majority of buildings in the county were constructed prior to 1939 and may be impacted. Potential damages to future development can be mitigated by all jurisdictions adopting and enforcing the 2018 International Building Code. Potential damages to older homes can be somewhat mitigated during remodeling and renovation.

3.4.4 Extreme Temperatures

Hazard Profile

Hazard Description

Extreme temperature events, both hot and cold, can impact human health and mortality, natural ecosystems, agriculture, and other economic sectors. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region, typically during summer months (June-September). Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature.

Extreme heat can lead to a broad array of injury & illnesses, known as "hyperthermia," in humans and animals including sunburns, heat stress, heat exhaustion, and heat stroke, in addition to dehydration, see **Table 3.22**.

Table 3.22. Typical Impacts of Extreme Heat

Heat Index (HI)	Disorder
80-90° F (HI)	Fatigue possible with prolonged exposure and/or physical activity
90-105° F (HI)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F (HI)	Heatstroke/sunstroke highly likely with continued exposure

Source: National Weather Service Heat Index Program, https://www.weather.gov/ama/heatindex

Extreme heat may also cause stress to crops and livestock. Extreme heat can also strain electricity delivery infrastructure overloaded during peak use of air conditioning during extreme heat events. Another type of infrastructure damage from extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

Extreme heat can also lead to other environmental and social hazards including:

- Drought & Water Shortages
- Heat Trapping Pollution in Cities
- Domestic Violence & Abuse
- Civil Disturbances & Riots

Extreme cold often accompanies severe winter storms and can lead to health risks in human and animals including hypothermia and frostbite. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is hazardous to health and safety. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. Power outages and unmonitored use of gas fueled heating instruments in efforts to keep warm can also lead to an increased risk of structure fires and CO_2 poisoning. Extreme cold also increases the likelihood for ice jams on flat rivers or streams.

The National Institute on Aging estimates that more than 2.5 million Americans are elderly and especially vulnerable to hypothermia, with isolated elders being most at risk. About 10 percent of people over the age of 65 have some kind of bodily temperature-regulating defect, and 3-4 percent of all hospital patients over 65 are hypothermic.

Also at risk, are those without shelter, those who are stranded, or who live in a home that is poorly insulated or without heat.

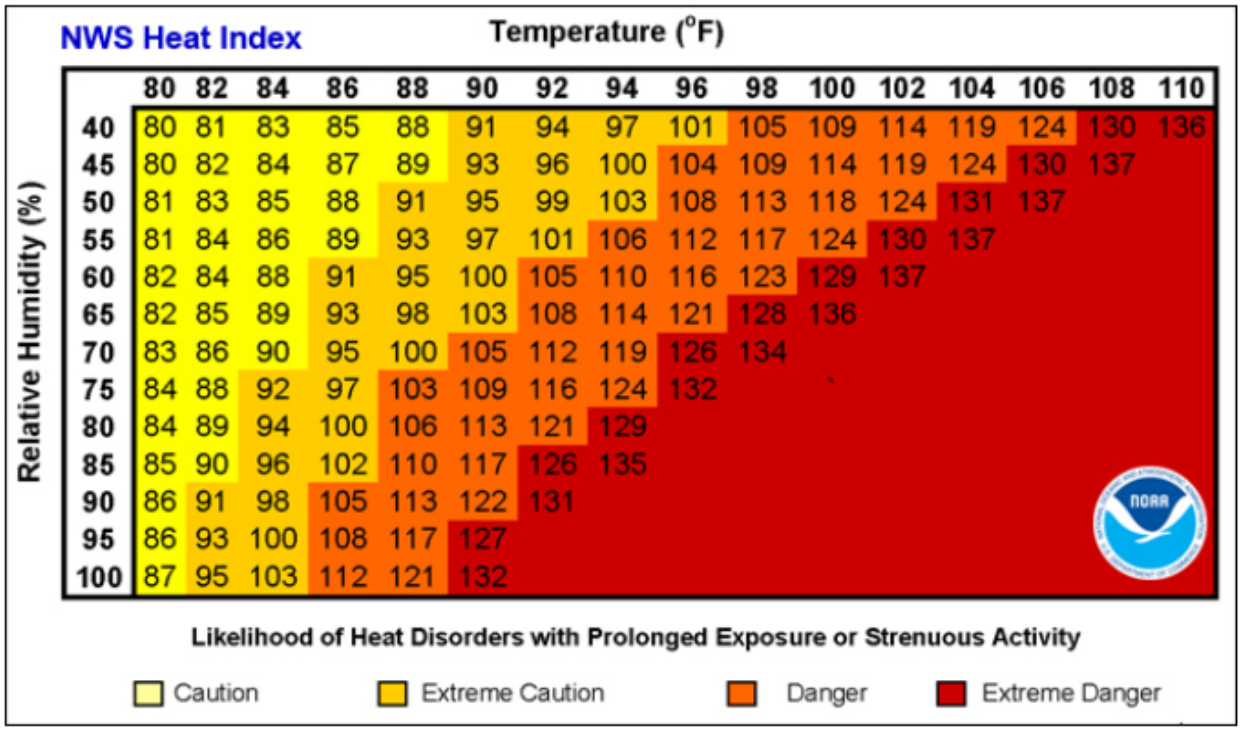
Geographic Location

Extreme temperatures are an area-wide hazard event, and while a planning area may be outside the epicenter of a winter storm event, extreme cold can still impact neighboring communities. In the case of extreme heat, temperatures, and their risk therein, will often not vary across the planning area.

Strength/Magnitude/Extent

The National Weather Service (NWS) has an alert system in place (advisories or warnings) when the Heat Index (**Figure 3.13**) is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing excessive heat alerts is when for two or more consecutive days: (1) when the maximum daytime Heat Index is expected to equal or exceed 105 degrees Fahrenheit (°F); and the night time minimum Heat Index is 80°F or above. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees.

Figure 3.13. Heat Index (HI) Chart



Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Source: National Weather Service (NWS); https://www.weather.gov/safety/heat-index
Note: Exposure to direct sun can increase Heat Index values by as much as 15°F. The shaded zone above 105°F corresponds to a HI that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

The NWS Wind Chill Temperature (WCT) index (**Figure 3.14**) uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures. The figure below presents wind chill temperatures which are based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 3.14. Wind Chill Chart

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

Source: https://www.weather.gov/safety/cold-wind-chill-chart

Previous Occurrences

The National Center for Environmental Information data shows 19 extreme temperature events in Buchanan County from 1997-2012, with 5 extreme cold events and 14 extreme heat events. Of these events the most recent cold event was recorded from January 5-6, 2014 when a polar plunge of artic air brought wind chill temperatures in Northwest Missouri to 30 degrees below in the Kansas City area According to USDA Risk Management Agency, there were 608.42 acres of crops lost in Buchanan County due to extreme cold weather valued at $94,768.00 reported during the winter of 2014. This was the largest crop loss during the 2010-2018 period for this type of hazard. For figures on deaths due to hypothermia cold-related deaths refer to **Figure 3.15**.

The National Center for Environmental Information dates the most recent extreme heat event as occurring from July 18-25, 2012. During this event the Heat Index in the planning area ranged from 100-110 degrees. The USDA Risk Management Agency documents that in 2012 there were 26,069 acres lost due to extreme heat conditions valued at $4,824,128.32. The U.S.

Drought Monitor ranks late summer 2012 as the most intense period of drought for Missouri in its 20-year record. For figures on deaths due to hyperthermia heat-related deaths refer to **Figure 3.16.** The National Weather Service has stated that among natural hazards, no other natural disaster—not lightning, hurricanes, tornadoes, floods, or earthquakes—causes more deaths.

Figure 3.15. Cold Related Deaths in Missouri, October 1989 – March 2012

Source: https://health.mo.gov/living/healthcondiseases/hypothermia/pdf/hypomap.pdf

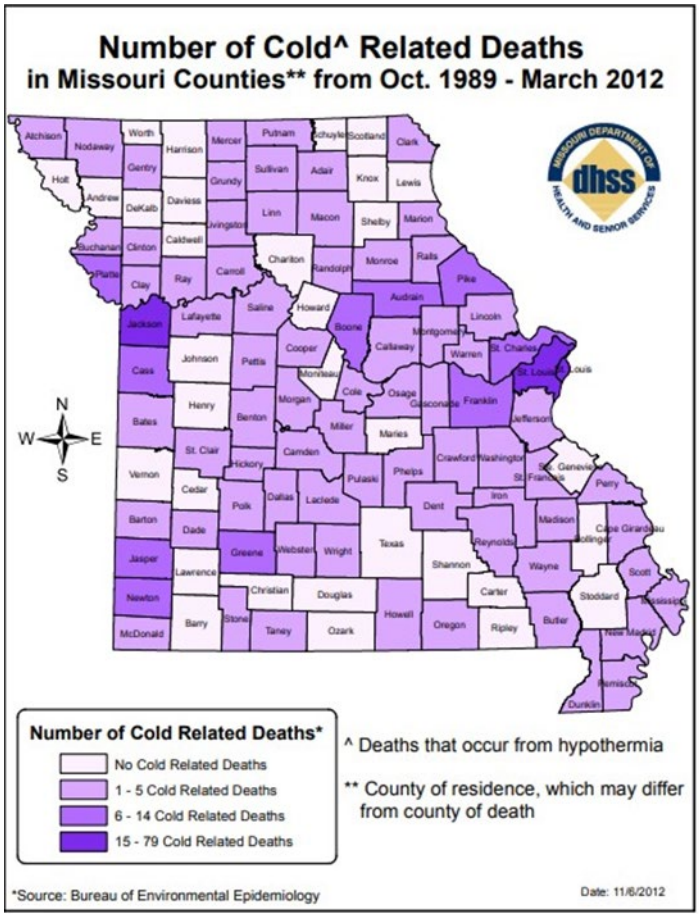
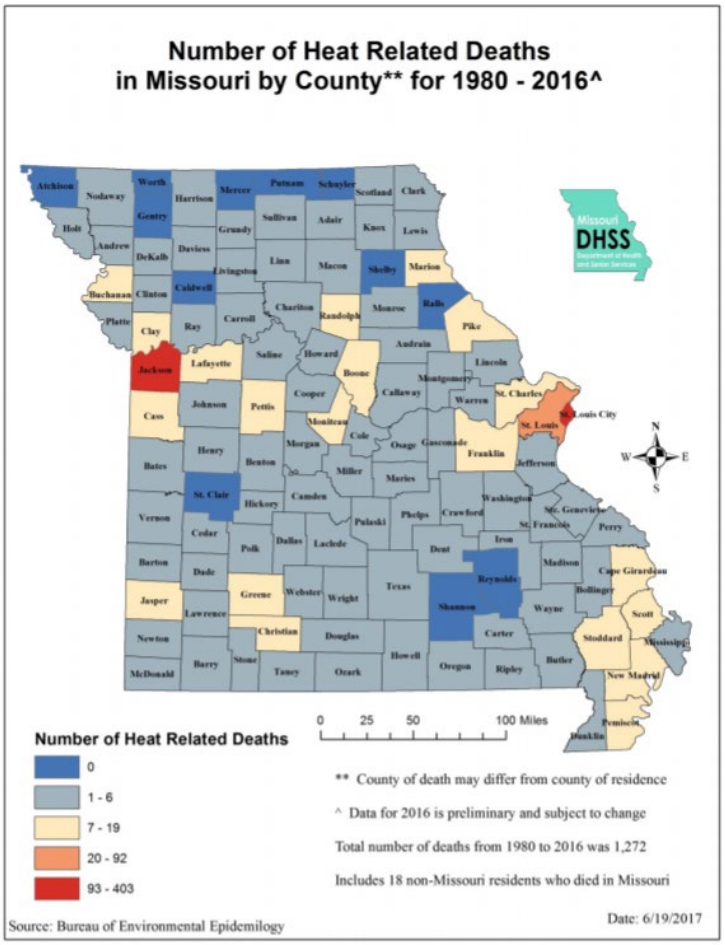


Figure 3.16. Heat Related Deaths in Missouri, 2000 - 2016



Source: https://health.mo.gov/living/healthcondiseases/hyperthermia/pdf/stat-report.pdf

Probability of Future Occurrence

There are 13 recorded heat events in the National Climatic Data Center (NCDC) database from 1995 to 2015 for Buchanan County. There was one death. No injuries or property or crop damage associated with these events in the NCDC data for Buchanan County.

The probability that an extreme heat event will occur in Buchanan County in any given year is 62%. This equates to dividing 21 years with 13, the number of events. Data limitation indicates that extreme heat events could be underreported in the NCDC. See **Table 3.23.**

Table 3.23. Likelihood of Occurrence (Based on Data 1995-2015)

Type of Event	Total Events	Likelihood of Occurrence (Total/21 years
Extreme Heat	17	0.81
Extreme Cold	**3**	0.14

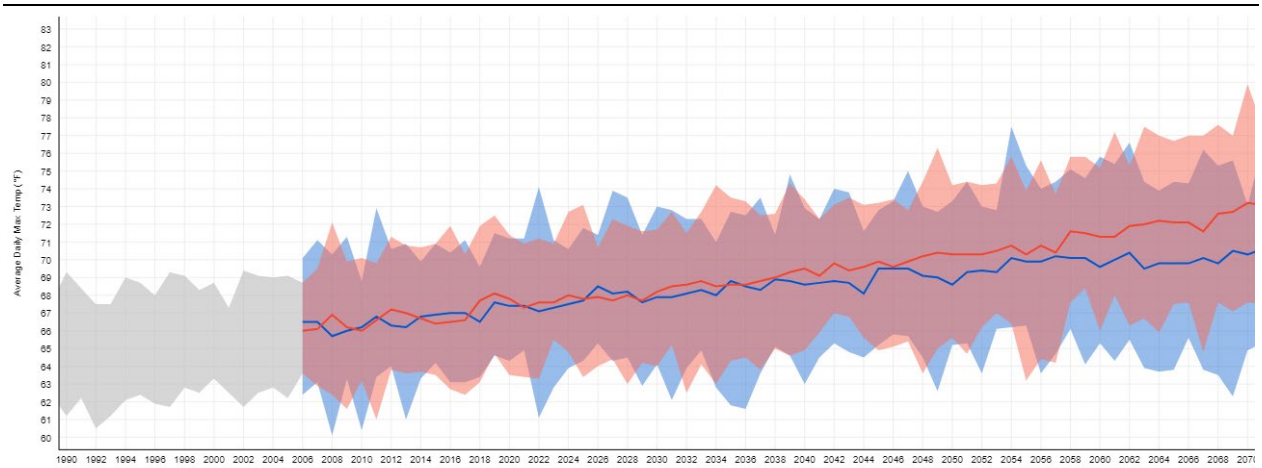
Source: 2018 Missouri Hazard Mitigation Plan

Changing Future Conditions Considerations

The 2018 Missouri Hazard Mitigation Plan notes that as greenhouse emissions increase, projected daily temperature is expected to increase at an exponential rate. Given this, it will be important for the planning area population to be made more aware of threats faced from hyperthermia-based overheating illnesses, such as dehydration and heat stroke and heat stress. Higher temperatures will also lead to greater strains on the electric grid as electric cooling demand grows, which could in turn lead to a preponderance of rolling blackouts.

The Climate Explorer modeling tool created by the NOAA gives a projection of what average daily max temperatures could look like if greenhouse emissions continue to rise. The blue line, representing lowered emissions, projects a steady increase in temperature, but one that does not vary much from average temperatures in decades past. The red line, representing higher emissions, keeps pace with the blue line at first but, by the 2040s, the variance between the two lines is 5 degrees warmer on average and increases in intensity with each decade. See **Figure 3.17**.

Figure 3.17. Saint Joseph, MO – Projected Avg Daily Max Temp (°F)



Source: https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=8b910d9c7b9744ea94e07d82f5420782

Vulnerability

Vulnerability Overview

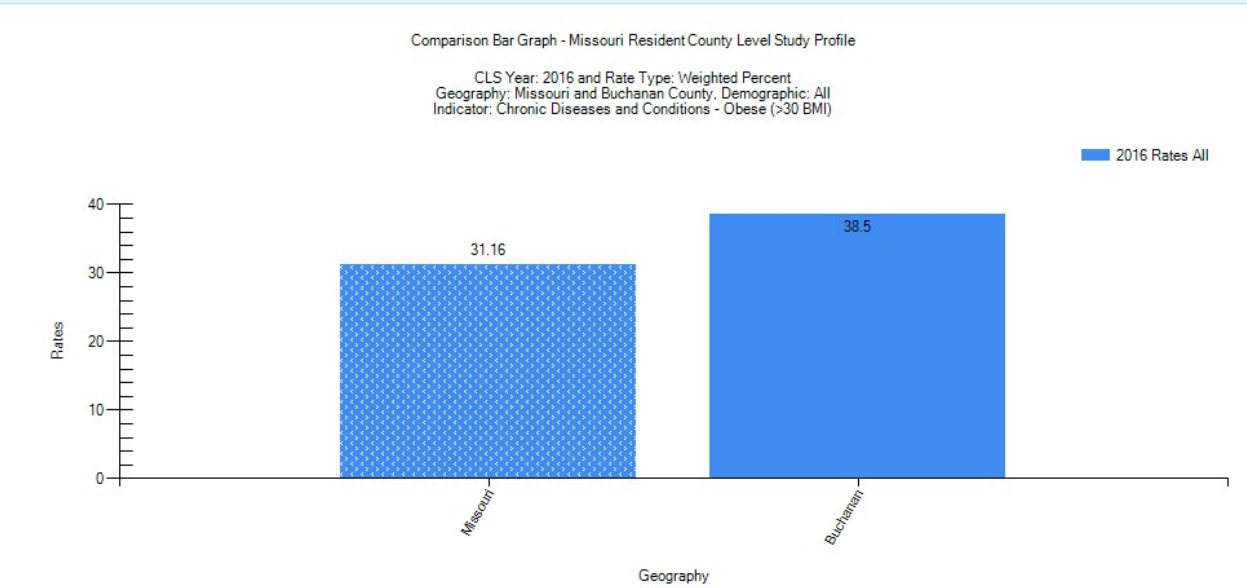
Those at greatest risk for heat-related illness include infants and children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. Children's bodies warm 3-5 times faster than that of adults, which is why being left in a hot car can be especially deadly for them.

According to U.S. census data, 15.8 percent of Buchanan County's overall population is aged 65 or older, but the 2018 Missouri plan rates this as a medium-low risk. The groups that may be a greater risk factor for the county though are the obese and cigarette smokers. **Figure 3.18** shows that based on 2016 data from Missouri Department of Health and Senior Services, the county obesity rate is 7 percent higher than the overall state average. **Figure 3.19** also shows that based on the same data, the county prevalence of cigarette smoking is 10 percent higher than the state average. Cigarette smokers are particularly at risk from the adverse health effects of extreme temperatures because they have decreased circulation capabilities, impacting their ability to regulate their internal body temperature.

However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. In agricultural areas, the exposure of farm workers, as well as livestock, to extreme temperatures is a major concern. Overall, it is important to note that when it comes to conditions involved with more severe exposure to extreme temperatures, such as frostbite, heat stroke, and dehydration, health impacts can be long-term when they result in tissue and organ damage.

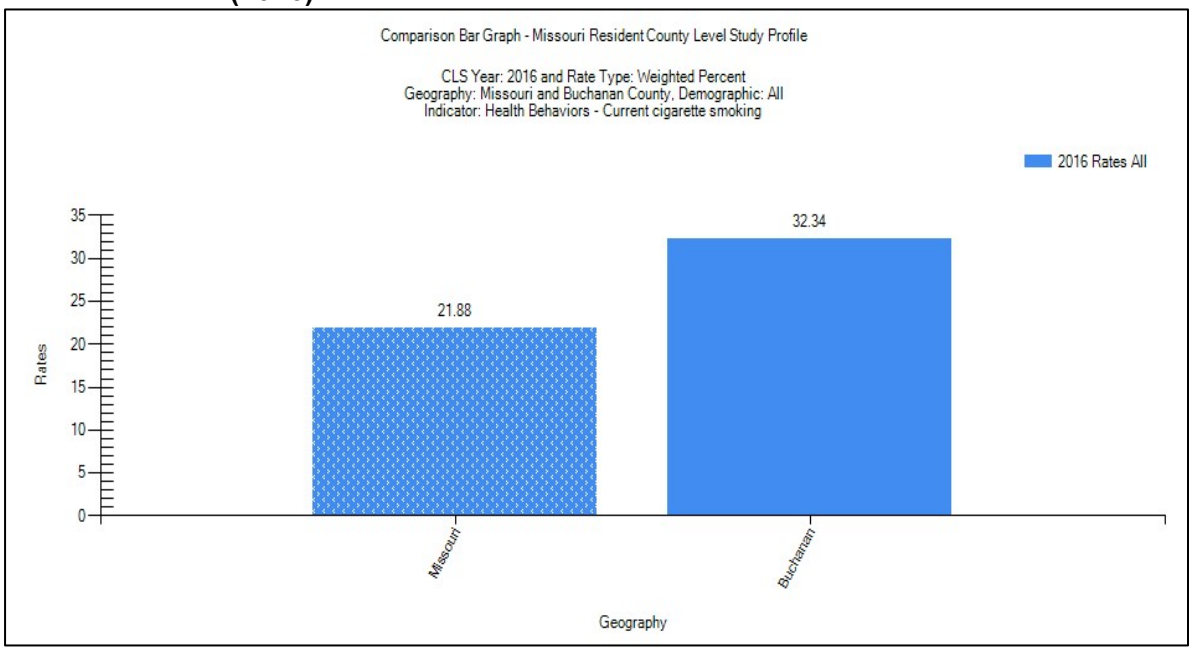
Based on the vulnerability ratings from the 2018 Missouri Hazard Mitigation Plan, Buchanan is rated as having "low" vulnerability for both extreme heat and extreme cold events.

Figure 3.18. MO DHSS Missouri and Buchanan County Obesity Rates (2016)



Source: https://healthapps.dhss.mo.gov/MoPhims/ProfileBuilder?pc=14

Figure 3.19. MO DHSS Missouri and Buchanan County Cigarette Smoking Rates (2016)



Source: https://healthapps.dhss.mo.gov/MoPhims/ProfileBuilder?pc=14

Potential Losses to Existing Development

Historical data on livestock loss is difficult to project, but data is widely available from the USDA Risk Management Agency on crop loss. For the decade of 2010-2019, crop losses for Buchanan County due to extreme temperatures averaged 4,787.77 acres valued at $763,089.40 per year. See **Table 3.24**. For a more specific example of how extreme temperatures impacted crop loss and refer to examples of extreme heat and extreme cold from 2012 and 2014 in the “Previous Occurrences” section.

It is also important to consider the longevity of electric power infrastructure, as extreme heat can lead to an in increased demand from consumers and overload of a system, while extreme cold and winter conditions can pose a threat to delivery infrastructure.

Table 3.24. Avg. Crop Loss in Buchanan Co., MO Per Year Due to Extreme Temperatures (2010-2018)

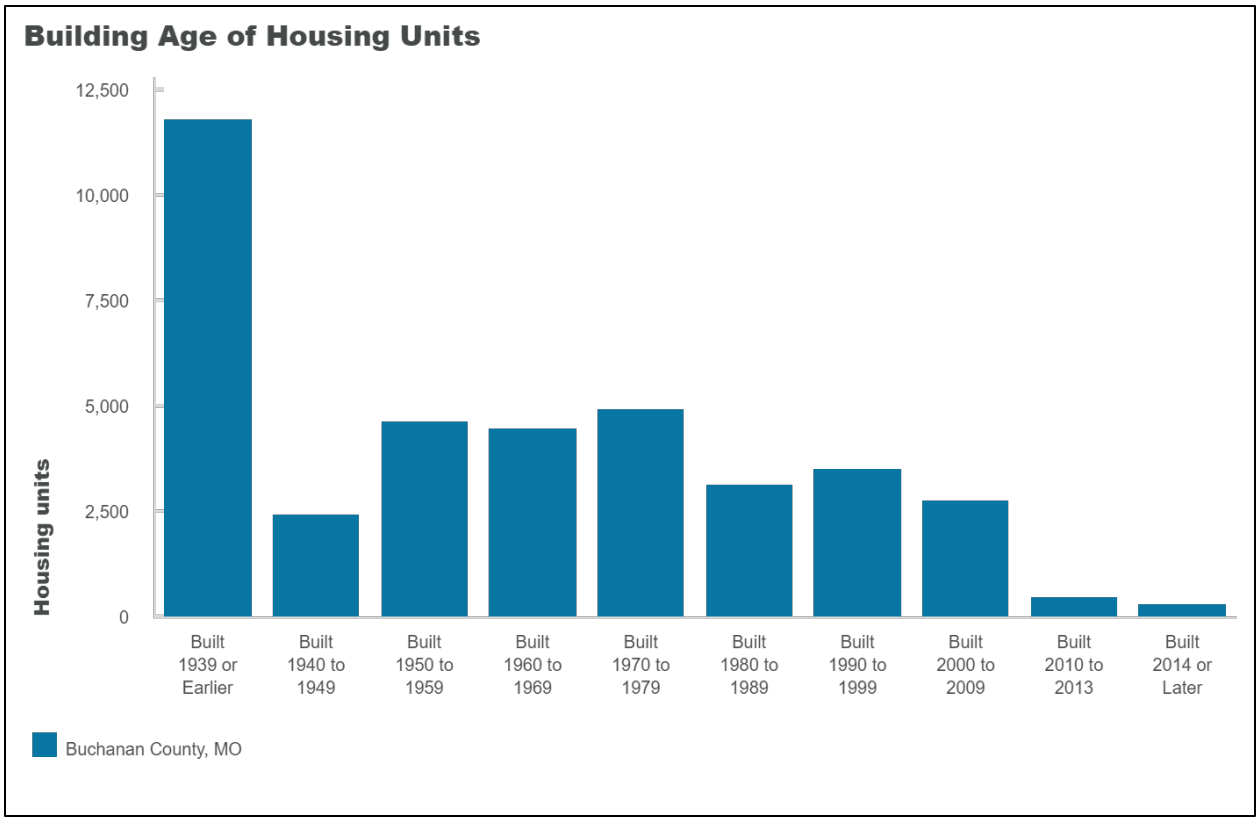
Type of Weather	Acreage Loss	Value
Extreme Cold (Cold Winter, Cold Wet Weather, Frost, Freeze)	181.71	$21,173.83
Extreme Heat (Heat, Drought, Hot Wind)	4,599.75	$744,209.08
Extreme Temperatures Overall	4,781.46	$765,382.91

Source: USDA Risk Management Association Risk of Crop Loss

Impact of Previous and Future Development

Buchanan County's median age is 37.8 years and the population is not currently showing signs of growth, so any increased demand on heating or cooling resources will be dependent on climate and economic factors. Factors to consider for future development might be the rate of weatherization in buildings if they are up to electrical wiring code. **Figure 3.20** depicts the breakdown of the age of structures in St. Joseph alone, showing that the majority of buildings were constructed in 1939 or earlier and may require significant modernization upgrades for heating and cooling.

Figure 3.20. Age of Buildings in St. Joseph, Mo



Source: U.S. Census, American Community Survey

Hazard Summary by Jurisdiction

Those at greatest risk for heat-related illness and deaths include children up to five years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations more vulnerable to extreme heat, demographic data was obtained from the 2010 census on population percentages in each jurisdiction comprised of those under age 5 and over age 65. Data was not available for overweight individuals and those on medications vulnerable to extreme heat. **Table 3.25** below summarizes vulnerable populations in the participating jurisdictions. Note that school and special districts are not included in the table because students and those working for the special districts are not customarily in these age groups.

Table 3.25. Buchanan County Population Under Age 5 and Over Age 65, 2019 American Community Survey

Jurisdiction	Population Under 5 Years	Population 65 Years and Over
*Buchanan County	5,666 (6%)	14,014 (15.8%)
St. Joseph	5,104 (6.7%)	11,802 (15.5%)
Agency	42 (5.7%)	90 (12.3%)
Easton	10 (4.9%)	51 (25%)
Lewis & Clark	6 (6.1%)	22 (16.9%)

Source: U.S. Census Bureau, (*) includes entire population of each city or county

Schools in Buchanan County have air conditioning in nearly all facilities. As of 2015 Mid-Buchanan School District School has 100 percent air-conditioned facilities. As part of their master facilities planning process, the St. Joseph School District (SJSD) recently had an architectural survey of its facilities completed by the DLR Group. The study rated various design factors on a 4-point scale, with a 1 indicating significant needs for improvement and a 4 indicating modern design standards for that facility type. **Figure 3.21** details the scoring across high schools, middle schools and elementary schools. Overall the SJSD facilities had mid-range scores, noting that two of the three high schools were lacking in HVAC and most buildings averaged at least a 2 on their electrical system rating. Three of the elementary schools had electrical systems that were described as “outmoded” and in need of “significant replacements.”

The school districts do not have policies mandating closure during high heat events, but monitor the situation, taking factors such as heat index into consideration, and making school closures accordingly. The same is true with winter weather as administrators take factors such as wind chill into account when deciding on closures.

Figure 3.21.

School Type	HVAC Rating Avg (1-4)	Electrical System Rating Avg (1-4)
High Schools (3)	1.56	2
Middle Schools (4)	2.75	2.09
Elementary (14)	3.2	2.08
All District Facilities	2.82	2.08

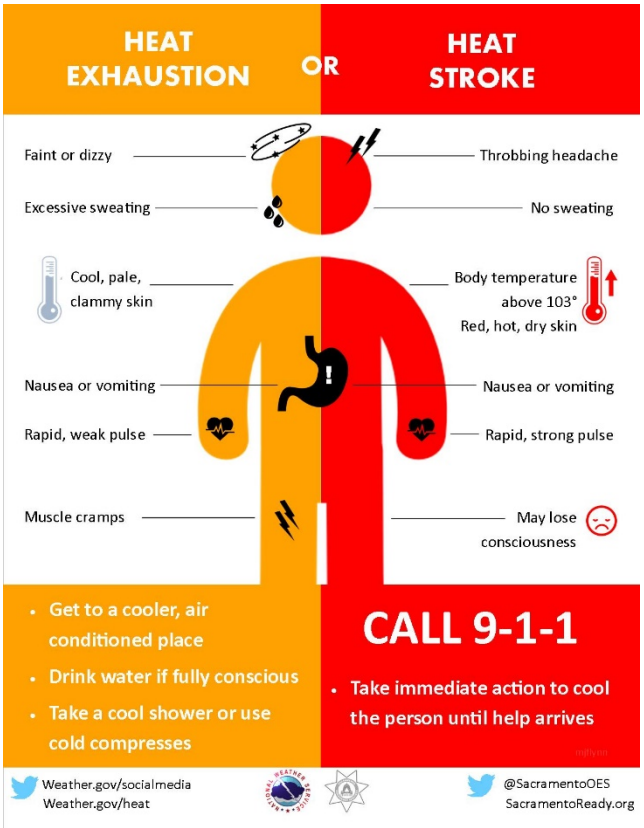
Source: https://www.sjsdfacilities.org/assessments

Problem Statement

While Buchanan is rated as having an overall low risk for extreme temperature events, demographic factors combined with aging electrical infrastructure could increase risks over time. The county has an aging population with above average measures for health risk factors such as obesity and cigarette smoking, all of which impact the ability to regulate body temperature under extreme conditions. The quantity of aging buildings also poses a risk for electrical hazards both in terms of community power outages from overloading or damage to electrical infrastructure, and in the potential to push individuals and families to rely more on heating sources that could introduce flame or carbon monoxide poisoning risks.

Education can play a significant role in mitigation. If individuals know that in the summer months, regardless of heat index, that they should apply sunblock and ensure they travel with water, then this could reduce the chances of short-term hyperthermia health risks or long-term risks like skin cancer. **Figure 3.22** gives an example of hyperthermia warning signs from the National Weather Service (NWS). Its is also vitally important that any educational services or materials are multi-lingual, particularly for Spanish speakers. The NWS as well as state and federal DHSS have an abundance of multi-lingual extreme temperature education resources, even for social media awareness.

Figure 3.22. NWS Hyperthermia Symptoms Guide



Source: https://www.weather.gov/safety/heat-illness

Residents of the county should also be aware of the risks of using vehicles in extreme temperatures. The NWS advises to prepare travel safety kits in case one is trapped in the cold or heat. Keeping automobiles fueled to at least a half-tank of gas and having necessary tools, nutrition, clothing, and a back-up batter for electronics in case of becoming stuck or stranded due to cold or heat.

Child safety with vehicles is also an important educational opportunity. Families and community members should know the importance of ensuring children are not left in or around unattended vehicles for risk of carbon monoxide poisoning or developing a heat stroke. Helpful tips can include remembering to lock vehicles, knowing where keys are, and even using notes or some kind of reminder on the dash or front-passenger seat of a vehicle as a reminder to check for children before exiting the vehicle.

Education and training for farmers could be helpful as well in best practices to prepare for extreme weather and what resources, financial or otherwise, might be available to them to either protect crops and livestock or recover after an extreme temperature event.

The most useful source of education might be for those who live with or near seniors. While it is important that seniors are aware that they are at greater risk, it is even more important that those around them are aware. It can be as simple as knowing to check on the elderly in the summer and winter, encouraging neighbors to shovel their sidewalk, or even helping connect them to food pantry resources if they will have difficulty leaving their house.

For at-risk populations, such as the homeless, Buchanan County has developed heating and cooling center capacities with 7 facilities in St. Joseph. Investing in water fountains with the ability to easily fill water bottles might also be advisable.

Data and technology resources for communities may also be helpful. OSHA has developed a heat index mobile app for Android and iOS devices that can deliver precise community measurements and offer specific safety advice for work and outdoor activities depending on the severity of the heat. Specific tools like this can help individuals and families make decisions to mitigate their own risks. Text alerts are already a useful community safety tool as well and could help provide directions to warming and cooling centers as well.

Finally, funding resources to prepare for extreme temperatures could help the most with mitigation. Funding to improve and maintain HVAC equipment in buildings, as well as updating electrical infrastructure can improve efficiency and reduce the risk of outages or fires. Assistance providing CO_2 detectors to make them as common as normal smoke detectors could also increase safety and reduce risk. Additionally, assistance providing back-up generators to could help to ensure critical facilities have at least some access to power in the event of an outage related to extreme temperatures where such an outage could potentially extend over days.

3.4.5 Flooding (Riverine and Flash)

Hazard Profile

Hazard Description

A flood is partial or complete inundation of normally dry land areas. Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt, or ice. There are several types of riverine floods, including headwater, backwater, interior drainage, and flash flooding. Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt or ice melt. The areas adjacent to rivers and stream banks that carry excess floodwater during rapid runoff are called floodplains. A floodplain is defined as the lowland and relatively flat area adjoining a river or stream. The terms “base flood” and “100- year flood” refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Floodplains are part of a larger entity called a basin, which is defined as all the land drained by a river and its branches.

Flooding caused by dam and levee failure is discussed in Section 3.4.1 and Section 3.4.7 respectively. It will not be addressed in this section.

A flash flood occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Flash flooding can happen in Special Flood Hazard Areas (SFHAs) as delineated by the National Flood Insurance Program (NFIP) and can also happen in areas not associated with floodplains.

Ice jam flooding is a form of flash flooding that occurs when ice breaks up in moving waterways, and then stacks on itself where channels narrow. This creates a natural dam, often causing flooding within minutes of the dam formation.

In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding is a dangerous form of flooding which can reach full peak in only a few minutes. Rapid onset allows little or no time for protective measures. Flash flood waters move at very fast speeds and can move boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding can result in higher loss of life, both human and animal, than slower developing river and stream flooding.

In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with rainfall trends and rainfall extremes all demonstrate the high probability, yet generally unpredictable nature of flash flooding in the planning area.

Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of the watershed

characteristics, modeling techniques, monitoring, and advanced warning systems has increased the warning time for flash floods.

Geographic Location

Riverine flooding is most likely to occur in SFHAs. Maps in **Figures 3.23 to 3.27** show SFHA's for Buchanan County and jurisdictions that have a 100-year floodplain in their city limits. The 100-year floodplain boundaries information is from the county's GIS website, which is based on preliminary FIRMS from 1983/84 that are awaiting adoption. According to these maps, no schools or critical facilities are located in SFHAs.

Figure 3.23. Buchanan County 100-Year Floodplain

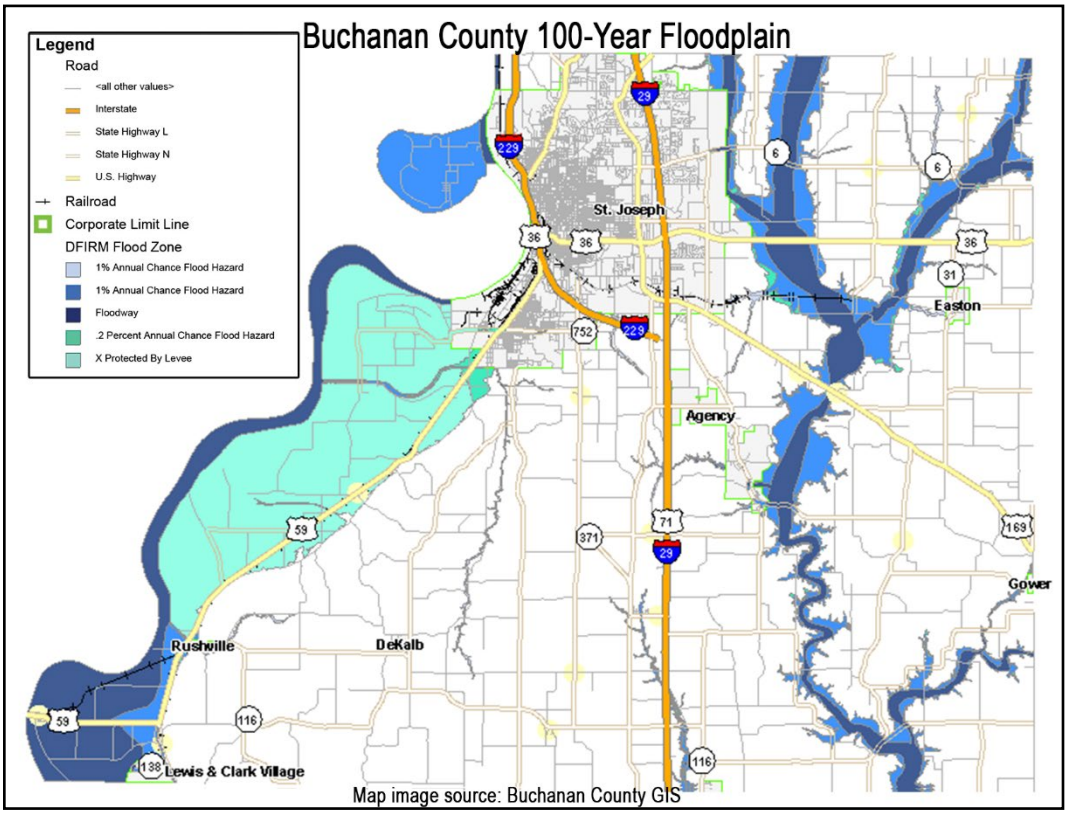
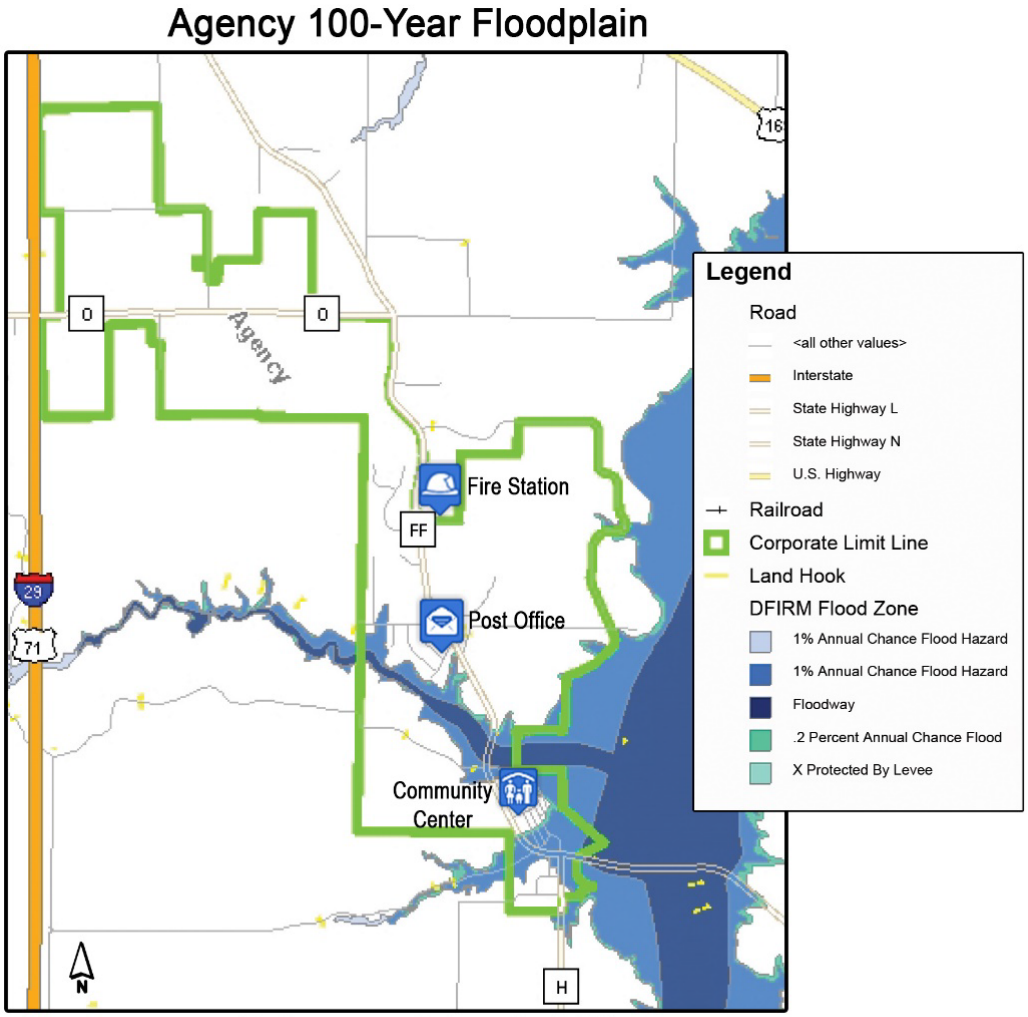
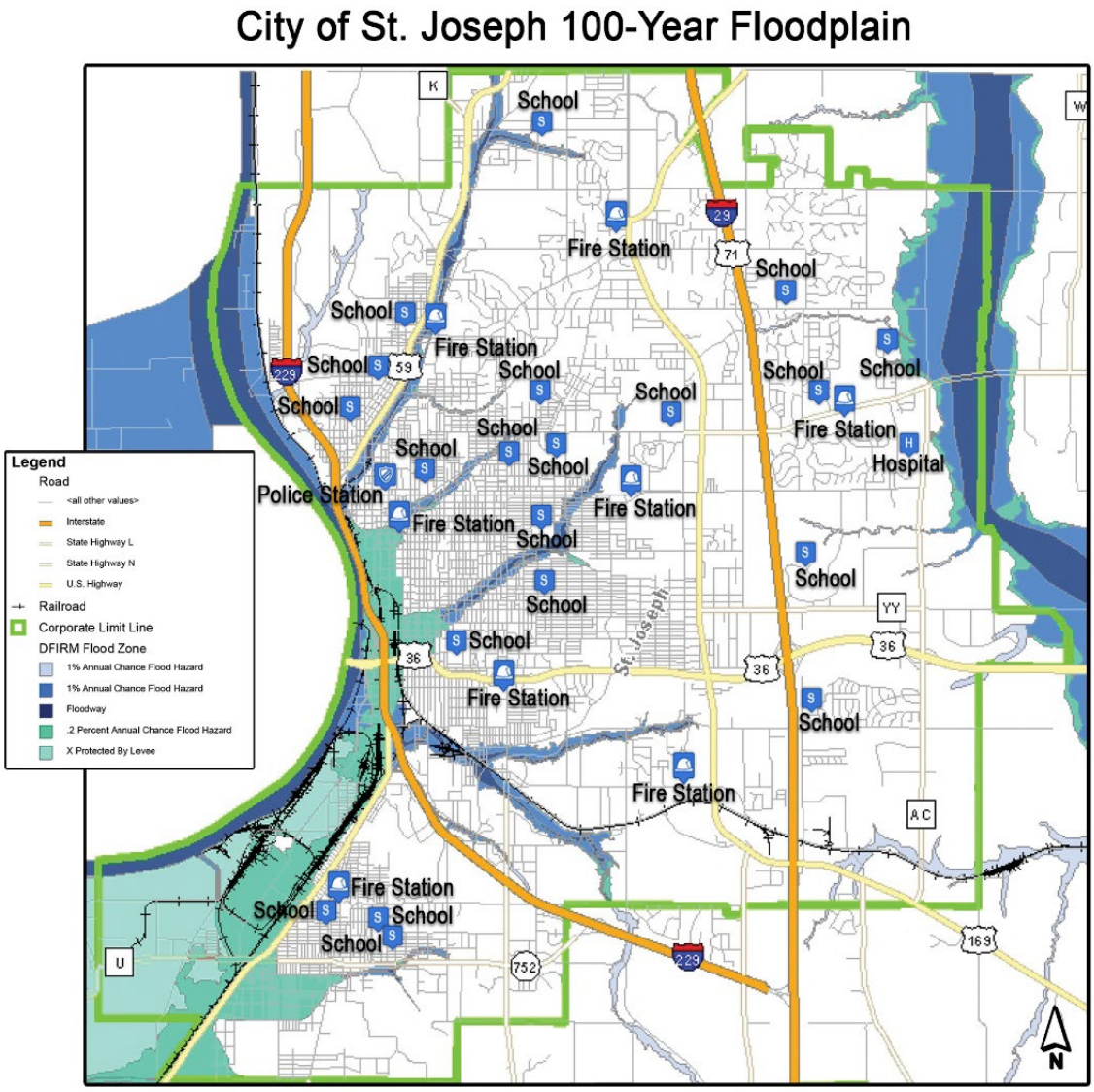


Figure 3.24. Agency 100-Year Floodplain with Critical Facilities



Map image source: Buchanan County GIS

Figure 3.25. City of St. Joseph's 100-Year Floodplain with Critical Facilities



Map image source: Buchanan County GIS

Figure 3.26. Lewis and Clark Village's 100-Year Floodplain with Critical Facilities

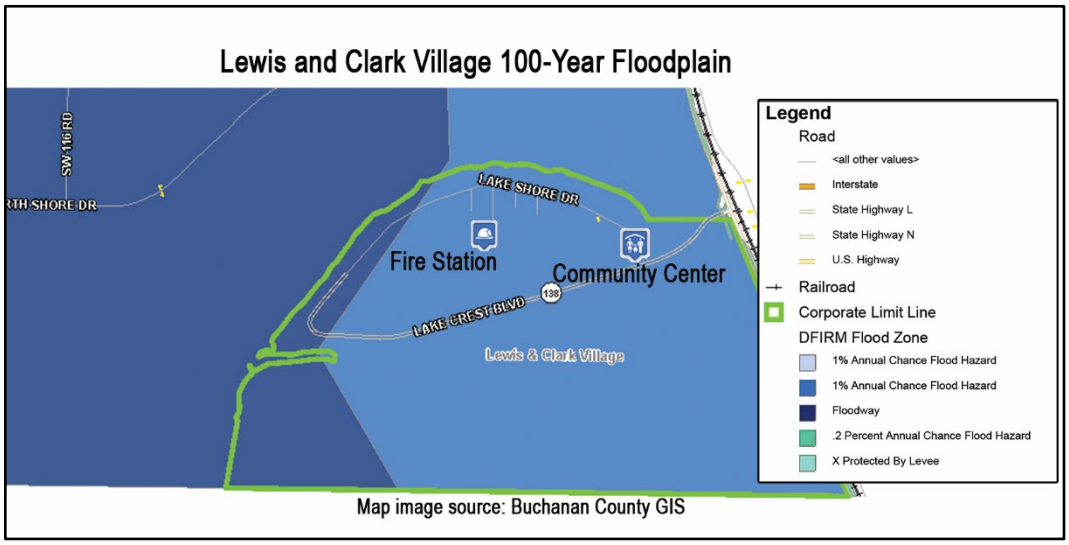
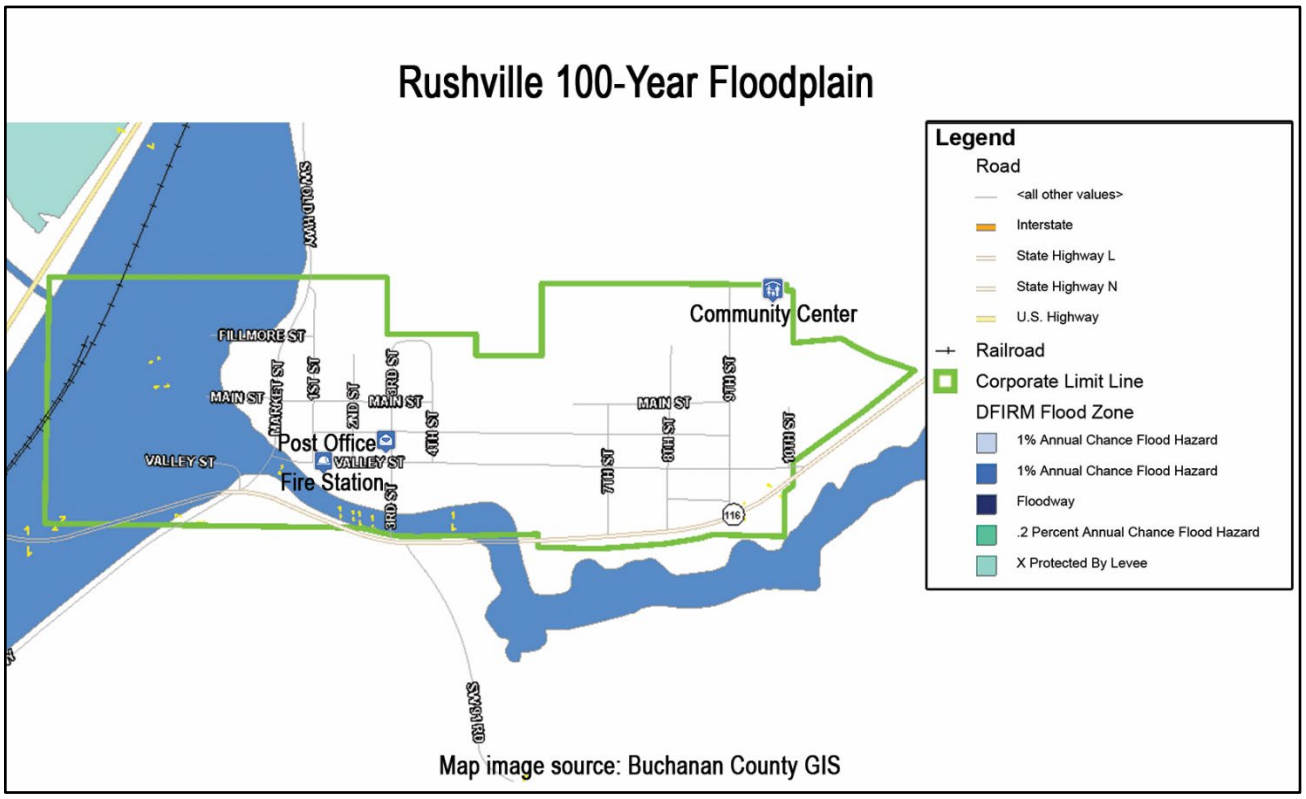


Figure 3.27. Rushville's 100-Year Floodplain with Critical Facilities



Full size 100-year floodplain maps are located in Appendix B.

Flash flooding events pose the most pervasive hazard of the two flood types in the county due

to permeability of soils, slopes, increasing urban development and the extensive network of streams and rivers. Sustained rainfall or downpours at the rate of one inch per hour have caused street flooding in incorporated areas and made a significant number of low water crossings impassible. In the instances of low water crossings, flash flooding occurs in the floodplain while low-lying areas in all jurisdictions are susceptible to flash floods outside the 100-year floodplain. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. A review of the NCDC storm event database determined which jurisdictions are most prone to flash flooding from 2000 to August 2020 are listed in **Table 3.26**.

Table 3.26. Buchanan County NCEI Flood Events by Location, 2000-2020

Location	# of Events
Buchanan County	43
-Buchanan County (unspecified)- 31 flood events	
-Buchanan County (Missouri River/St. Joseph)-8 flood events	
-Buchanan County (Platte River/Agency)- 4	
-Buchanan County (DeKalb/Easton)- 0	
Agency	4
-Agency (unspecified)- 0 flood events	
-Agency/Platte River- 4 flood events	
DeKalb	
-DeKalb (unspecified)- 0 flood events	
Easton	
-Easton (unspecified)- 0 flood events	
Lewis and Clark Village	
-Lewis and Clark Village (unspecified)- 0 flood events	
Rushville	
-Rushville (unspecified)- 0 flood events	
St. Joseph	8
-St. Joseph (unspecified)- 0 flood events	
-St. Joseph/Missouri River- 4 flood events	
-St. Joseph Industrial City/Missouri River- 4 flood events	

Source: National Centers for Environmental Information (NCEI), 3-31-21

Flash flooding occurs in SFHAs and those locations in the planning area that are low-lying. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. Review NCEI database to determine which jurisdictions are most prone to flash flooding during a 20-year time period and list them. **Table 3.27** shows the number of flash flood events by location recorded in NCEI for the 20-year period. NCEI Event narratives may show that a given stretch of road is repeatedly underwater during flash flood events, so include this information in the risk assessment.

Table 3.27. Buchanan County NCEI Flash Flood Events by Location, 2000-2020

Location	# of Events
Buchanan County	**18**
-Buchanan County (unspecified)- 2 flood events	
-Buchanan County (Missouri River/St. Joseph)-14 flood events	
-Buchanan County (Platte River/Agency)- 0	
-Buchanan County (DeKalb/Easton)- 2	
Agency	**0**
-Agency (unspecified)- 0 flood events	
-Agency/Platte River- 0 flood events	
DeKalb	1
-DeKalb (unspecified)- 1 flood events	
Easton	1
-Easton (unspecified)- 1 flood events	
Lewis and Clark Village	
-Lewis and Clark Village (unspecified)- 0 flood events	
Rushville	
-Rushville (unspecified)- 0 flood events	
St. Joseph	14
-St. Joseph (unspecified)- 0 flood events	
-St. Joseph/Missouri River- 13 flood events	
-St. Joseph Industrial City/Missouri River- 1 flood events	

Source: National Centers for Environmental Information (NCEI), 3-31-21

Strength/Magnitude/Extent

Missouri has a long and active history of flooding over the past century, according to the 2018 State Hazard Mitigation Plan. Flooding along Missouri's major rivers generally results in slow-moving disasters. River crest levels are forecast several days in advance, allowing communities downstream sufficient time to take protective measures, such as sandbagging and evacuations. Nevertheless, floods exact a heavy toll in terms of human suffering and losses to public and private property. By contrast, flash flood events in recent years have caused a higher number of deaths and major property damage in many areas of Missouri.

Flooding presents a danger to life and property, often resulting in injuries, and in some cases, fatalities. Floodwaters themselves can interact with hazardous materials. Hazardous materials stored in large containers could break loose or puncture as a result of flood activity. Examples are bulk propane tanks. When this happens, evacuation of citizens is necessary.

Public health concerns may result from flooding, requiring disease and injury surveillance. Community sanitation to evaluate flood-affected food supplies may also be necessary. Private water and sewage sanitation could be impacted, and vector control (for mosquitoes and other entomology concerns) may be necessary.

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Floodwaters can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

According to the U.S. Geological Survey, two critical factors affect flooding due to rainfall: rainfall duration and rainfall intensity – the rate at which it rains. These factors contribute to a

flood's height, water velocity and other properties that reveal its magnitude.

National Flood Insurance Program (NFIP) Participation

Table 3.28 lists NFIP participation for the communities in the planning area. **Table 3.29** lists the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction, where applicable. There are no sanctioned communities, meaning those communities that are not currently participating in the NFIP and where a Flood Hazard Boundary Map or Flood Insurance Rate Map has been issued, in the planning area.

Table 3.28. NFIP Participation in Buchanan County

Community ID #	Community Name	NFIP Participant (Y/N/Sanctioned)	Current Effective Map Date	Regular-Emergency Program Entry Date
290040	Buchanan County	Y	08/01/1983	08/01/1978
290041	Agency	Y	05/01/1980	05/01/1980
290481	Lewis and Clark Village	Y	09/29/1978	09/29/1978
290042	Rushville	Y	(NSFHA)	08/19/1986
290043	St. Joseph	Y	09/19/1984	09/30/1977
---	Easton	---	---	---

Source: NFIP Community Status Book, 3-31-21; BureauNet, http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book; M= No elevation determined – all Zone A, C, and X: NSFHA = No Special Flood Hazard Area; E=Emergency Program

Table 3.29. NFIP Policy and Claim Statistics as of April 2021

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Buchanan County	73	$15,268,800	200	$6,378,900.09
Agency	7	$1,111,600	9	$423,067.01
Lewis and Clark Village	32	$3,858,100	113	$5,829,141.28
Rushville	-	-	15	$268,568.56
St. Joseph	245	$51,353,100	196	$7,275,625.90
Totals	357	$71,591,600	533	$20,175,302.80

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data, accessed by SEMA, 4-7-21

The City of St. Joseph had the most insurance claim payments at $7,275,302.80, followed by Buchanan County, at $6,378,900.09, and Lewis and Clark Village at $5,829,141.28.

Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss Properties are those properties with at least two flood insurance payments of $1,000 or more in a 10-year period. According to National Flood Insurance Plan data, four in-county jurisdictions included in the planning area have a combined total of seven mitigated repetitive loss properties totaling $749,199.98 in payments, and two out-of-county jurisdictions have a combined total of seven mitigated repetitive loss properties totaling $624,516.73 in payments (see **Tables 3.30 and 3.31**). Due to Federal restrictions on data sharing, the state was unable to provide the Property Type for the Repetitive Loss or Severe Repetitive Loss properties.

Table 3.30. Buchanan County Mitigated Repetitive Loss Properties

As of Date	Community	Repetitive loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	BIG LAKE, VILLAGE OF (290886)	1	3	$69,876.73	$0.00	$69,876.73
1/27/2021	BUCHANAN COUNTY* (290040)	2	4	$77,001.66	$15,600.00	$92,601.66
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	2	6	$452,294.08	$18,897.72	$471,191.80
1/27/2021	PLATTE COUNTY* (290475)	6	15	$479,728.95	$74,911.45	$554,640.40
1/27/2021	RUSHVILLE, CITY OF (290042)	1	2	$84,625.62	$19,783.20	$104,408.82
1/27/2021	ST. JOSEPH, CITY OF (290043)	2	6	$76,687.69	$4,310.10	$80,997.79
1/27/2021	***Grand Total***	14	36	$1,240,214.73	$133,502.47	$1,373,717.20

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Table 3.31. Buchanan County Non-Mitigated Repetitive Loss Properties

As of Date	Community	Repetitive loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	AGENCY, TOWN OF (290041)	2	6	$308,733.83	$27,432.33	$336,166.16
1/27/2021	ANDREW COUNTY* (290004)	1	2	$66,243.89	$2,215.12	$68,459.01
1/27/2021	BUCHANAN COUNTY* (290040)	25	72	$2,699,800.87	$247,706.93	$2,947,507.80
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	24	69	$3,202,681.75	$148,440.24	$3,351,121.99
1/27/2021	ST. JOSEPH, CITY OF (290043)	17	38	$2,537,294.41	$2,177,040.72	$4,714,335.13
1/27/2021	***Grand Total***	69	187	$8,814,754.75	$2,602,835.34	$11,417,590.09

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Severe Repetitive Loss (SRL): A SRL property is defined it as a single family property (consisting of one-to-four residences) that is covered under flood insurance by the NFIP; and has (1) incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding $5,000

and with cumulative amounts of such claims payments exceeding $20,000; or (2) for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. **Tables 3.32 and 3.33** show severe repetitive loss data for the planning area. There are two mitigated SRL properties in Buchanan County, according to data provided by the National Flood Insurance Program (NFIP), with a total of six losses and with payments equaling $560,019.69. There are 13 non-mitigated SRL properties in the county claiming a total of 47 losses with payments equaling $3,150,418.66.

Table 3.32. Buchanan County Mitigated Severe Repetitive Loss

As of Date	Community	Repetitive loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	1	3	$329,569.96	$18,083.83	$347,653.79
1/27/2021	PLATTE COUNTY* (290475)	1	3	$189,148.89	$23,217.01	$212,365.90
1/27/2021	***Grand Total***	2	6	$518,718.85	$41,300.84	$560,019.69

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Table 3.33. Buchanan County Non-Mitigated Severe Repetitive Loss

As of Date	Community	Repetitive Loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	AGENCY, TOWN OF (290041)	1	4	$153,715.17	$19,427.15	$173,142.32
1/27/2021	BUCHANAN COUNTY* (290040)	6	23	$1,545,259.50	$199,265.57	$1,744,525.07
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	6	20	$1,129,600.24	$103,151.03	$1,232,751.27
1/27/2021	***Grand Total***	13	47	$2,828,574.91	$321,843.75	$3,150,418.66

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Previous Occurrences

Past Presidential Flooding Disaster Declarations and their impact are listed in **Table 3.34**.

Table 3.34. Presidential Declarations in Buchanan County for Floods, 2000-2020

Date	Declaration #	Disaster
August 17, 2010	DR-1934	Severe Storms, Flooding, and Tornadoes
August 12, 2011	DR-4012	Flooding
August 7, 2015	DR-4238	Severe Storm
May 20, 2019	DR-4435	Severe Storms, Straight-line Winds and Flooding
July 9, 2019	DR-4451	Severe Storms, Tornadoes and Flooding

Sources: 2018 MO Hazard Mitigation Plan; https://www.fema.gov/disasters/disaster-declarations

Tables 3.35 and 3.36 include NCEI information for the last 20 years for both flash and river flooding.

Table 3.35. NCEI Buchanan County Flash Flood Events Summary, 2000 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2004	1	0	0	0	0
2005	4	0	0	0	0
2007	1	0	0	0	0
2009	1	0	0	0	0
2014	2	0	0	0	0
2015	3	0	0	0	0
2016	4	0	0	0	0
2020	2	0	0	0	0
Totals	**18**	**0**	**0**	**0**	**0**

Source: NCEI, data accessed 3-31-21

Table 3.36. NCEI Buchanan County Riverine Flood Events Summary, 2000 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2000	1	0	0	0	0
2001	8	0	0	0	0
2002	1	0	0	0	0
2004	8	0	0	0	0
2005	5	0	0	0	0
2006	1	0	0	0	0
2007	8	0	0	$50,000	$500,000
2008	5	0	0	0	0
2016	2	0	0	0	0
2019	4	0	0	$100,000	$100,000
Totals	**43**	**0**	**0**	**$150,000**	**$600,000**

Source: NCEI, data accessed 3-31-21

Narrative from a flood event in May 2007 stated heavy rainfall amounts from five to nine inches were observed, and "caused many rivers to flood, with levels not observed since the great flood of 1993." According to the NCEI report, "the Platte River near Agency crested at 34.40 feet, or 14.40 feet above flood stage," although "damage was confined to agricultural interests (https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=69343)."

Another event narrative from March 2019 stated that snow melt from heavy snowfall over the northern plains created significant flooding in Nebraska and in many counties along the Missouri River. "Once the Missouri River started flooding on March 9, it remained in flood through the remainder of the month. The gauge in St. Joseph, Missouri reached 32.12 feet on March 22 (preliminarily a new record)... The Missouri River Basin across the Northern Plains flooded with catastrophic consequences as numerous dams and levees failed. As the water flowed into the Missouri River upstream of Buchanan County, the river swelled and ultimately overwhelmed the levees along the river. About 1,500 residents and 6,000 employees of neighboring businesses were ushered out of the southern end of town, a city official said. Most of the evacuated dwellings were trailer homes interspersed among factories, warehouses and stockyards along a stretch of the riverfront known as the Bottoms. Local fields were also submerged, which delayed the growing season in the region, but several roads were washed away across Atchison County,

and I-29 from St. Joseph northward to the Iowa/Missouri border was closed until mid May. Note: The dollar valued assigned to this event is likely inaccurate as a full tally of the extent of the physical damages is unknown. The Missouri River remained in flood through the rest of the month, into April (https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=813013)." See Appendix A for complete event narratives.

Probability of Future Occurrence

There were 18 flash flood events over a 20-year time frame (18 divided by 20 = .9), resulting in a 90% probability that a flash flood will occur somewhere in Buchanan County per year.

There were 43 riverine flood events over a 20-year time frame (43 divided by 20 = 2.15), resulting in a 215% probability that flooding will occur somewhere in Buchanan County per year.

Changing Future Conditions Considerations

According to the State Plan, if departure from normal with respect to increased precipitation intensity continues, frequency of floods in Missouri is likely to increase as well. Over the last half century, average annual precipitation in most of the Midwest has increased by 5 to 10 percent. But rainfall during the four wettest days of the year has increased about 35 percent, and the amount of water flowing in most streams during the worst flood of the year has increased by more than 20 percent. It is likely (66-100% probability) that the frequency of heavy precipitation or the proportion of total rainfall from heavy falls will increase in the 21st century across the globe. More specifically, it is "very likely" (90-100% probability) that most areas of the United States will exhibit an increase of at least 5 percent in the maximum 5-day precipitation by the late 21st century. As the number of heavy rain events increase, more flooding and pooling water can be expected.

Flooding occasionally threatens navigation and riverfront communities, and greater river flows could increase these threats. In April and May 2011, a combination of heavy rainfall and melting snow caused a flood that closed the Mississippi River to navigation, threatened Caruthersville, and prompted evacuation of Cairo, Illinois, due to concerns that its flood protection levees might fail. The expected increases in rainfall frequency and intensity are likely to put additional stress on natural hydrological systems and community stormwater systems. Heavier snowfalls in the winter will lead to intensified spring flooding, and groundwater levels will remain high even in non-floodplain areas. Such changes in climate patterns can lead to the development of compounding events that interact to create extreme conditions. Flooding caused by high groundwater levels typically recedes more slowly than riverine flooding, slowing the response and recovery process. Groundwater-fed rivers and streams are also likely to experience heightened flooding when groundwater levels are high. Jurisdictions updating or installing stormwater management systems should consider potentially larger future discharge amounts when sizing culverts and drainage ways; storage capacity can also be increased by building retention basins to hold excess stormwater.

Communities already prone to flooding should be prepared for a potential increase in facility closures and/or damages, as well as an increase in public demand for flood response and assistance. Natural features that experience repeated flooding may manifest changes in the form of stream bank instability and changing shoreline, floodplain, and wetland boundaries. Communities may also wish to plan for the potential loss of cropland and damage to both private property and public infrastructure such as bridges. The environmental impacts of flooding include erosion, surface and groundwater contamination, and reduced water quality.

The threat of more frequent flood events may thus be a concern particularly for communities who depend on lakes, rivers, or trout streams for tourism. Rural 3.30 communities may experience increases in well contamination and road washouts, while urban areas may be particularly vulnerable to flash flooding as heavy rain events quickly overwhelm the ability of a more impermeable environment to absorb excess stormwater.
Source: 2018 MO State Hazard Mitigation Plan, 3.1-3.2

Vulnerability

Vulnerability Overview

Since 1975, Buchanan County has been included in 13 Presidential Disaster Declarations for flooding. Riverine flooding occurs more frequently than flash flooding, and with 69 non-mitigated repetitive loss properties in the planning area, as well as 13 non-mitigated severe repetitive loss properties, damage is likely to continue. Flooding presents a danger to life and property, often resulting in injuries, and in some cases, fatalities.

Floodwaters themselves can interact with hazardous materials. Hazardous materials stored in large containers could break loose or puncture as a result of flood activity. Examples are bulk propane tanks. When this happens, evacuation of citizens is necessary.

Public health concerns may result from flooding, requiring disease and injury surveillance. Community sanitation to evaluate flood-affected food supplies may also be necessary. Private water and sewage sanitation could be impacted, and vector control (for mosquitoes and other entomology concerns) may be necessary.

Periods of heavy rain falling at the rate of one inch per hour floods low water crossings throughout the county making many roads impassable. Street flooding over roadways has been reported in all communities in the county. This creates a severe threat to motorists who attempt to drive through flood waters over the roadway.

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Section 3.2.2 in this plan contains information on scour critical bridges in the planning area.

Floodwaters can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

Areas in low lying areas outside of the floodplain are frequently flooded. Increases in development add to surface runoff and can exacerbate flash flooding in areas that previously have not experienced flooding.

The 2018 State Plan's section on State Vulnerability Overview and State Estimates of Potential Losses is the best and most recent data available. For Buchanan County, which doesn't have digital FIRMs available, Hazus software was utilized to generate the flood hazard boundary and associated depth of flooding, although it is less accurate than DFIRM data. The number of structures at risk was determined using Hazus analysis along with a structure inventory dataset developed by the University of Missouri GIS Department (MSDIS). **Table 3.37** below identifies the total potential direct building loss and income loss for Buchanan County.

Table 3.37. Potential Direct Building Loss and Income Loss for Buchanan County

Buchanan County	Potential Flood Building/Income Loss
Countywide Building Exposure	$10,579,076,000
Structural Damage	$107,272,000
Loss Ratio	1.01%
Contents Loss	$188,962,000
Inventory Loss	$18,751,000
Total Direct Loss	$314,985,000
Total Income Loss	$843,000
Total Direct and Income Loss	$315,828,000
# MSDIS Residential Structures Exposed	632
# Hazus Buildings Risk	333
# Substantially Damaged	153
# Displaced People	1,681
# Shelter Needs	856

Source: 2018 MO State Mitigation Plan, pg. 3.110

Potential Losses to Existing Development

Flood loss estimates by structure for Buchanan County were identified in the 2018 State Plan and are presented in **Table 3.38**. There are no school or special districts, or critical facilities directly located in Special Flood Hazard Areas (SFHA) in Buchanan County, but here are two residential buildings in St. Joseph that are located in an SFHA, according to MSDIS data.

Table 3.38. Potential Losses for Building Type in Buchanan County

Type of Structure	# of Structures	Total # of Losses
Residential	632	$141,681,847
Agriculture	639	$155,086,821
Commercial	69	$65,966,673
Education	6	$6,942,188
Government	113	$99,950,822
Industry	507	$659,519,721
Total Loss- HAZUS Layer		$1,129,148,073
Total # of People Affected	1,631	

Source: 2018 MO State Hazard Mitigation Plan, pg. 3113

Table 3.39 provides the total exposure count for structures in each jurisdiction. Losses were estimated by applying a 5 percent damage factor to total exposure.

Table 3.39. Total Exposure of Structures and Contents by Building Type

Jurisdiction	Residential	Commercial	Agriculture	Other	Estimated Exposure	Estimated Loss
Unincorp. Buchanan Co.	4,443	133	6,813	189	$1,373,112,000	$68,655,600
Agency	245	10	141	7	$76,441,000	$3,822,050
Easton	105	3	11	7	$32,750,000	$1,637,500
Lewis & Clark	61	0	9	2	$15,538,000	$776,900
Rushville	109	7	12	36	$55,026,000	$2,751,300

St. Joseph	25,425	1,496	298	1,267	$8,801,327,000	$440,066,350

Source: MSDIS Buchanan (https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM)

Impact of Previous and Future Development

Future development could impact flash and riverine flooding in the planning area. Development in low-lying areas near rivers and streams or where interior drainage systems are not adequate to provide drainage during heavy rainfall events can increase the risk of flood. Future development would also increase impervious surfaces causing additional water run-off and drainage problems during heavy rainfall events.

Hazard Summary by Jurisdiction

Agency, Lewis and Clark Village, St. Joseph and some unincorporated areas in the county are at risk to flood hazards. As demonstrated in **Table 3.39**, exposure of assets in SFHAs varies among jurisdictions. It should be noted that all communities in Buchanan County can be impacted by flooding of major roads and low water crossings. The greatest impact of flooding is in the unincorporated part of the county and St. Joseph. Several large employers are located near the Missouri River and flooded roads and facilities could cause significant disruptions for the employers and employees. Although Buchanan County is a participant in the NFIP and can substantially regulate development in the floodplain, many pre-FIRM structures remain. Due to the topography and many streams in the county, numerous low water crossings can be damaged and create a significant hazard to public safety during flood events. There are no school facilities in SFHAs and no previous damages were reported on the Data Collection Questionnaire for schools. Missouri Western State University has no facilities located in SFHAs.

Buchanan County – Flooding impacts several roadways in the unincorporated parts of the county. Of particular concern is a 1.5 mile stretch of Missouri State Highway 59, a major highway connecting Atchison to St. Joseph. During the floods of 2019, Highway 59 was closed for 115 days due to water on the roadway, and it was also previously closed for about 100 days in 2011. Efforts are ongoing to secure a grant to raise the road 18 inches and add a battery of culverts to mitigate flooding. While the roadway didn't suffer much damage due to the flooding, the economic impact and safety concerns presented by the extended road closure make mitigation of this critical infrastructure a necessity in the county. A contributing factor to the Highway 59 road closure in 2019 was the overtopping and breech of the Rushville-Sugar Lake Levee. A bid to fix the breech was awarded in early 2021 and work was expected to be complete within the year (https://www.newspressnow.com/news/local_news/flooding/rushville-sugar-lake-levee-bid-awarded/article_1d67722c-5fe5-11eb-81e4-5bab22015c0a.html). See Appendix A for full story. Approximately 75 homes were damaged during the 2019 floods, according to information provided by the county, along with several county roads and tubes (# FEMA–4435-DR and FEMA—4451-DR).

Agency – Due to part of the city being located in a floodplain and floodway, the city requires new residents to get a floodplain permit, and there are building restrictions in place, according to information provided by the city. There are two non-mitigated repetitive loss properties in the city, according to NFIP, with six losses reported as of January 2021, and one non-mitigated severe loss property with four losses reported as of January 2021.

Lewis and Clark Village – Residents self-evacuated in March 2019 due to rising flood waters,

and that flood caused property, infrastructure, and crop damage, as well as road closures, according to information provided in the questionnaire; however, specifics were not included as to the extent of those damages. There are six severe, non-mitigated repetitive loss properties in Lewis and Clark, according to NFIP, as well as 24 non-mitigated repetitive loss properties.

Rushville – There is one, mitigated repetitive loss property in Rushville with two losses reported as of January 2021.

St. Joseph- In March 2019, when the Missouri River rose more than 15 feet above flood stage, cresting at 32.07 feet (second highest crest recorded) on March 22, 2019, about 1,500 residents and 6,000 employees from the Bottoms in south St. Joseph were forced to evacuate. Of those evacuated were employees of the South St. Joseph Industrial Sewer District (SSJISD), where the flood caused an estimated $1.3 million in damages, according to information provided by SSJISD. Although SSJISD and many other employers and residents are located in an area protected by federal levee L-455, the levee, in the middle of upgrades, was overwhelmed by the flood waters. The City of St. Joseph reported property damages to some of its facilities, including the St. Joe Port Authority and the public works building on Third Street. A call for volunteers was made to the public to make sandbags to protect properties and infrastructure. River levels stayed persistently high, resulting in two Presidential Disasters declared for flooding during 2019.

Following on the heels of the 2019 flooding, the south end of St. Joseph, including dozens of residences, flooded when debris clogged up nearby Contrary Creek during heavy rains in July 2020. Rescue boats were deployed to the area, where about 300 people live, and 50 water rescues took place (https://www.kq2.com/content/news/Southside--571839481.html). The area does not typically experience flooding and few impacted homeowners had flood insurance. The Civic Arena was used as a shelter for over 20 residents (https://www.kq2.com/content/news/Southside--571839481.html). Since the flooding was localized, FEMA assistance was not available.

With 17 non-mitigated repetitive loss properties in the city and 38 losses reported as of January 2021 and more frequent heavy rains happening in the area, it isn't a matter of if another flood will occur, but when and how bad.

Problem Statement

Major flooding near the Missouri River continues to be a concern in Buchanan County, as five out of 13 Presidential Disaster Declarations in the last 20 years have been for flooding and have included the county. As projects underway to strengthen local levees are completed, the level of protection should improve for those levee-protected areas; however, the record-setting flooding the area has experienced lately can diminish the integrity of levees in the planning area. Because of this, it is imperative that county and local officials prioritize mitigation efforts to protect the lives and property of those in the most flood-prone areas, such as Agency, south St. Joseph, and Lewis and Clark Village.

That work should include efforts to mitigate the 13 non-mitigated, severe repetitive loss properties in the county, through relocation, buyouts, and/or greater floodproofing efforts. All communities in the county, except DeKalb and Easton, participate in the NFIP. These communities have passed floodplain management ordinances and have the ability to substantially regulate development in the floodplain. Their participation in the NFIP enables residents to purchase flood insurance, but repetitive claims on non-mitigated properties doesn't

prevent flooding, it only insures rising premiums.

3.4.6 Land Subsidence/Sinkholes

Hazard Profile

Hazard Description

According to the U.S. Geological Survey's (USGS) "Sinkholes" Fact Sheet 2007-3060 by James Kauffman (July 2007), natural sinkholes are common in what geologists call "karst terrain," where bedrock below land surface, such as limestone, limestone, carbonate rock, salt beds, can be dissolved by ground water that has become acidic due to absorption of CO_2 from the air and soil. As the rock dissolves, spaces and caverns develop underground. The collapse of the land surface above them can be dramatic and range in size from broad, regional lowering of the land surface to localized collapse.

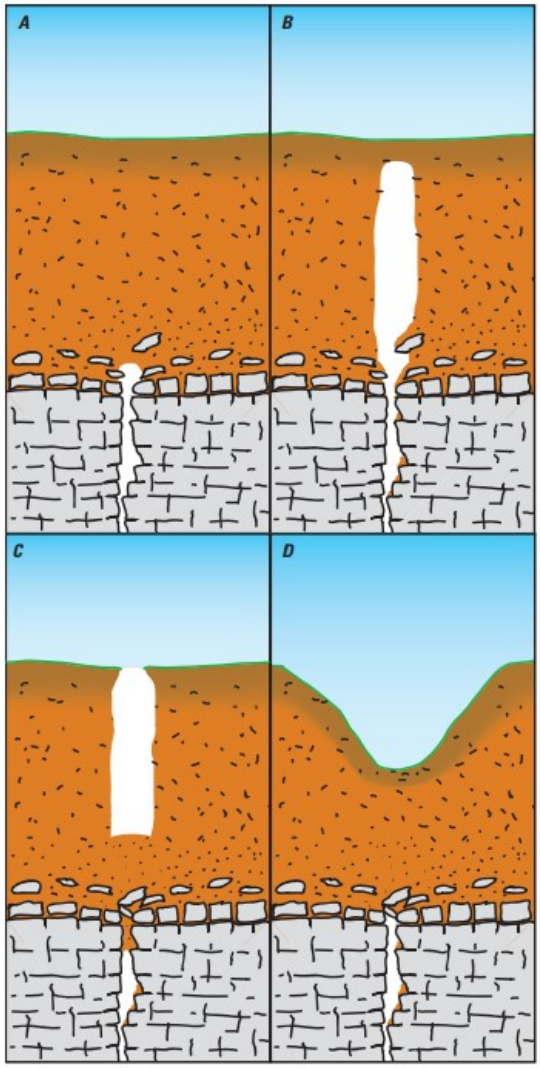
Naturally occurring sinkholes, as shown in the figure below, can develop via land cover subsidence & cover collapse. Land cover subsidence can occur slowly as the overlying earth above an underground void slowly settles and fills the void. According to the 2018 Missouri Hazard Mitigation Plan, cover collapse occurs much more rapidly when the earth above a void cannot support itself any longer and collapses into the void. Sudden collapse (Figure 3.29) can occur when a conduit fracture develops in bedrock deep below the surface, and although soil on the surface does not slump, it will maintain a bridge of loose soil across the surface. As the bedrock fracture fills with soil from above, the void will creep upwards and the loose bridge of surface earth will suddenly collapse in.

As a general rule, land subsidence occurs slowly and continuously over time. On occasion, it can occur abruptly, as in the sudden formation of sinkholes. Sinkhole formation can be aggravated by flooding.

Figure 3.28. Sinkhole Development

Source: https://dnr.mo.gov/geology/geostrat.htm

Figure 3.29. Collapse Formation



Formation of collapse—Soil bridges gap where sediment has been washing into a solution enlarged fracture, *A*. Over time, the void migrates upward through the soil, *B*. After the bridge thins, a sudden collapse, *C*, often plugs the drain and erosion will, after many years, transform the collapse into a more bowl-shaped sinkhole, *D*.

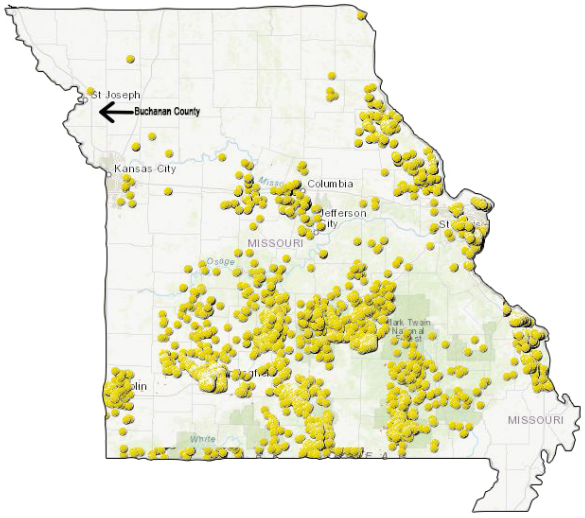
Source: https://pubs.usgs.gov/fs/2007/3060/

However, the primary causes of most subsidence are human activities: underground mining of coal, groundwater or petroleum withdrawal, and drainage of organic soils. Water main breaks can often lead to the sudden development of sinkholes in urban areas, leading to an immediate need to evacuate housing facilities or relocate vehicles. Sinkholes can also present a flooding hazard during periods of high precipitation. If the throat of a sinkhole becomes plugged, runoff may not be able to drain off, or if the fracture below the surface of a sinkhole is too narrow, then groundwater may become backed up. Nearby sinkholes can also back water up through connecting fractures, and floodwater in general can flow back up through sinkholes if there is a connecting flow under the surface a to a water source. Lastly, pollution capture in sinkholes can become a risk due to their deep-rooted connections to groundwater.

Geographic Location

According to the USGS, the most damage from sinkholes tends to occur in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Fifty-nine percent of Missouri is underlain by thick, carbonate rock that makes it vulnerable to sinkholes. Sinkholes occur in Missouri on a fairly frequent basis. They are a common geologic hazard in southern Missouri, but also occur in the central and northeastern parts of the state. Missouri sinkholes have varied from a few feet to hundreds of acres and from less than one to more than 100 feet deep. Artificial sinkholes may not be limited in geographic location though, as runoff from manmade construction, such as in urban areas, can quickly lead to a sudden sinkhole collapse.

Figure 3.30. Missouri Sinkhole Map



Source: GeoSTRAT, Missouri Geological Survey

Strength/Magnitude/Extent

Sinkholes vary in size and location, and these variances will determine the impact of the hazard. A sinkhole could result in the loss of a personal vehicle, a building collapse, or damage to infrastructure such as roads, water, or sewer lines.

Previous Occurrences

Buchanan County has no documented naturally occurring sinkholes but has experienced several man-made artificial sinkholes in recent years.

<u>2016</u>

January: According to an article by the *St. Joseph News Press*, "Woman Watches as Street Swallows Her Car," a 12-inch water main break occurred in near the 1500 block of North 3rd Street in St. Joseph, MO, causing a woman's car to sink and be swallowed whole.

<u>2017</u>

- *March*: According to an article by the *St. Joseph News Press*, "Crews Working to Fix Water Main Break," a sinkhole of significant size developed near Jackson & 35th streets in St. Joseph, MO.

<u>2018</u>

- *September:* According to an article by the *St. Joseph News Press*, "Sinkhole Displaces Residents at Apartment Complex," A sinkhole threatened a Corby Grove apartment building at 101 North 22nd Street in St. Joseph, MO. Property management evacuated residences temporarily relocated some to nearby America's Best Value Inn while the sinkhole was filled later in the week.

2019

- *March*: According to an article by *Water Technology* Online, “Solving a 600-Ton Problem,” historic water levels in the Missouri River contributed to high groundwater levels that lead to the failure of a gravity line on the north side of a parking lot at the South St. Joseph, MO Industrial Sewer, which caused a sinkhole to open. This collapse caused an 18-inch pipeline to fail, dumping 600 tons of sand into the plant’s system. The districted received both FEMA & EDA grants to repair this damage.

- *May:* According to an article by the *St. Joseph News Press*, “Sinkhole Forces Road Closure,” a sinkhole developed on West Pouline near the intersection of Prospect Ave. in St. Joseph, MO after a sewer main collapsed.

- *June:* According to According to an article by the *St. Joseph News Press*, “City’s Aging Water Mains, Hydrants Being Replaced,” sinkholes were discovered in alleys in several locations on the North End of St. Joseph, MO.

Probability of Future Occurrence

Due to a lack of a centralized database for recording sinkholes for Missouri, probability of a future occurrence is difficult to calculate, but the according to an article by the *St. Joseph News Press*, “State to Study Region’s Sinkholes,” State of Missouri began a project to GIS Map geotechnical assets, starting with the Northwest Missouri in 2020, that should lead to greater capabilities in the near future to view the frequency of sinkhole occurrence.

The 2018 Missouri Hazard Mitigation Plan rates the probability overall for the state to be 100-percent, using a measure of 12 events in 12 years, but rating sinkholes as low in severity.

Changing Future Conditions Considerations

Vulnerability

Sinkholes, whether natural or man-made, are impacted by the severity and rapid change in levels of precipitation. A dry spell followed by rain can cause fractures in man-made water main infrastructure, which in turn can lead to collapse and the development of sinkholes. The 2018 Missouri Hazard Mitigation Plan notes that significant precipitation with torrential downpours and flooding can increase the levels of natural groundwater, which can in turn cause natural sinkholes to form.

Vulnerability Overview

The 2018 Missouri Hazard Mitigation Plan shows Buchanan County as having 80 mines near where a Sinkhole could occur, but overall having a low vulnerability. Aging water and sewage infrastructure could open vulnerability to artificial sinkholes when exposed to rapid changes in precipitation.

Potential Losses to Existing Development

The 2018 Missouri Hazard Mitigation Plan rates the total value of Buchanan county’s structures affected by sinkholes as $0. This may only account for natural sinkholes, as artificial sinkholes have already been documented to have impacted property such as vehicles and apartment

complexes.

Impact of Previous and Future Development

Development around mines and in rural communities does not appear to have increased the risk of sinkhole development, but urban construction and development of water and sewage infrastructure could impact the development of sinkholes.

Hazard Summary by Jurisdiction

Buchanan County – Rural communities appear to be far less at risk compared to urban communities as the county is more at risk from artificial sinkholes than naturally occurring instances.

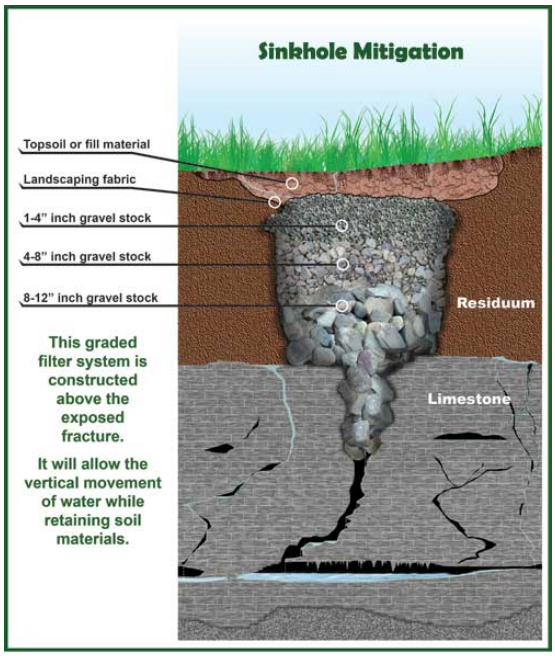
St. Joseph, MO – Aging Water & sewage infrastructure pose the greatest risk for artificial sinkholes developing and may put parts of the community with older water mains at greater risk.

St. Joseph School District – Like the City itself, any schools near older water & sewer infrastructure could be at greater risk for sinkholes developing. Water main breaks around high schools could pose a risk for parked vehicles.

Problem Statement

- Karst topography and numerous sinkholes were noted in the northern portion of Buchanan County along the Green River. Development within this area is also increasing. Possible solutions include updating the local ordinances/regulations to address the use of sinkholes for stormwater management.
- Maintaining a priority towards updating aging water & sewer infrastructure could mitigate urban occurrence of sinkholes if and when sewer main breaks can be prevented.
- The following diagram by the Missouri Department of Natural Resources outlines the process for filling and mitigating the risk of existing sinkholes:

Figure 3.31. Sinkhole Mitigation



Source:https://dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm

3.4.7 Levee Failure

Hazard Profile

Hazard Description

Levees are earth embankments constructed along rivers and coastlines to protect adjacent lands from flooding. Floodwalls are concrete structures, often components of levee systems, designed for urban areas where there is insufficient room for earthen levees. When levees and floodwalls and their appurtenant structures are stressed beyond their capabilities to withstand floods, levee failure can result in injuries and loss of life, as well as damages to property, the environment, and the economy.

Levees can be small agricultural levees that protect farmland from high-frequency flooding. Levees can also be larger, designed to protect people and property in larger urban areas from less frequent flooding events such as the 100-year and 500-year flood levels. For purposes of this discussion, levee failure will refer to both overtopping and breach as defined in FEMA's Publication "So You Live Behind a Levee" (http://mrcc.isws.illinois.edu/1913Flood/awareness/materials/SoYouLiveBehindLevee.pdf).

Following are the FEMA publication descriptions of different kinds of levee failure.

> **Overtopping: When a Flood Is Too Big**
>
> Overtopping occurs when floodwaters exceed the height of a levee and flow over its crown. As the water passes over the top, it may erode the levee, worsening the flooding and potentially causing an opening, or breach, in the levee.
>
> **Breaching: When a Levee Gives Way**
>
> A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning.

Earthen levees can be damaged in several ways. For instance, strong river currents and waves can erode the surface. Debris and ice carried by floodwaters—and even large objects such as boats or barges—can collide with and gouge the levee. Trees growing on a levee can blow over, leaving a hole where the root wad and soil used to be. Burrowing animals can create holes that enable water to pass through a levee. If severe enough, any of these situations can lead to a zone of weakness that could cause a levee breach. In seismically active areas, earthquakes and ground shaking can cause a loss of soil strength, weakening a levee and possibly resulting in failure. Seismic activity can also cause levees to slide or slump, both of which can lead to failure.

Geographic Location

Missouri is a state with many levees. Currently, there is no single comprehensive inventory of levee systems in the state. Levees have been constructed across the state by public entities and private entities with varying levels of protection, inspection oversight, and maintenance. The lack of a comprehensive levee inventory is not unique to Missouri.

There are two concurrent nation-wide levee inventory development efforts, one led by the United State Army Corps of Engineers (USACE) and one led by Federal Emergency

Management Agency (FEMA). The National Levee Database (NLD), developed by USACE, captures all USACE related levee projects, regardless of design levels of protection. The Midterm Levee Inventory (MLI), developed by FEMA, captures all levee data (USACE and non-USACE) but primarily focuses on levees that provide 1% annual-chance flood protection on FEMA Flood Insurance Rate Maps (FIRMs).

It is likely that agricultural levees and other non-regulated levees within the planning area exist that are not inventoried or inspected. These levees that are not designed to provide protection from the one percent annual chance flood would overtop or fail in the one percent annual chance flood scenario. Therefore, any associated losses would be taken into account in the loss estimates provided in the Flood Hazard Section.

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 like closure and drainage devices that are constructed and operated with sound engineering practices to protect a specified area. It is a manmade structure, generally earthen that is designed and constructed with sound engineering practices to contain, control, or divert the flow of water to provide temporary protection from flooding. FEMA states on its Levee Resource Library website that it does not build, own, or certify levees. The USACE is responsible for building and maintaining levee's in its inventory and for the inspection of its inventory. There may be states, communities and private levee owners that are responsible for maintaining and operating levees according to specific guidelines. The State of Missouri does not currently have a Levee Safety Program and does not currently own or operate any levees.

FEMA's role, and thus SEMA's role as the Cooperating Technical Partner (CTP) for the State is to "identify, analyze, and map the flood hazards associated with levees, and depict accreditation on Flood Insurance Rate Maps (FIRMs) for those levee systems for which the appropriate certification documentation has been submitted. For levees depicted on a FIRM showing protection for the base flood elevation, FEMA categorizes levees into one of 2 categories: 1) Accredited and 2) Non-Accredited. Accredited levees are ones in which the levee owner has provided data to FEMA demonstrating that the levee system is in compliance with Section 65.10. If a community is in the process of a mapping update and the levee accreditation process is underway, a special note can be placed on the FIRMs called a Provisionally Accredited Levee or PAL note which is a temporary designation denoting that the levee owners are undergoing the accreditation process and are expecting to reach accreditation within two years. If accreditation has not been reached during that timeframe, a mapping project to remove the note and depict the risk without the levee is initiated. (Source: 2018 State Plan).

Buchanan County's current levee system was constructed in the 1950s and 1960s and the series of levees on both the left and right side of the Missouri River were designed as a single system. The left bank levee (Unit L-455) is on the east side of the Missouri River, protecting St. Joseph and unincorporated parts of Buchanan County. The right bank levee (Unit R471-460) is the west side of the Missouri River, and protects Rosecrans Memorial Airport, the Missouri National Guard 139th Airlift Wing base and Elwood, KS. There are three levee districts that are responsible for operating and maintaining the levee system. The South St. Joseph Levee and Drainage District and Halls Levee District are responsible for the left bank system and St. Joseph Airport Levee District and Elwood-Gadden Drainage District (a Kansas entity) are each responsible for various sections of the right bank unit (Source: http://www.stjoemo.info/DocumentCenter/View/4412). **Table 3.40** lists the levee districts and relevant information. Buchanan County has preliminary FIRMs from 1983/84 with levees noted on them. The preliminary FIRMs are awaiting adoption. These can be found in Appendix E. Panels 20, 75 and 125 show levees along the left and right banks of the Missouri River.

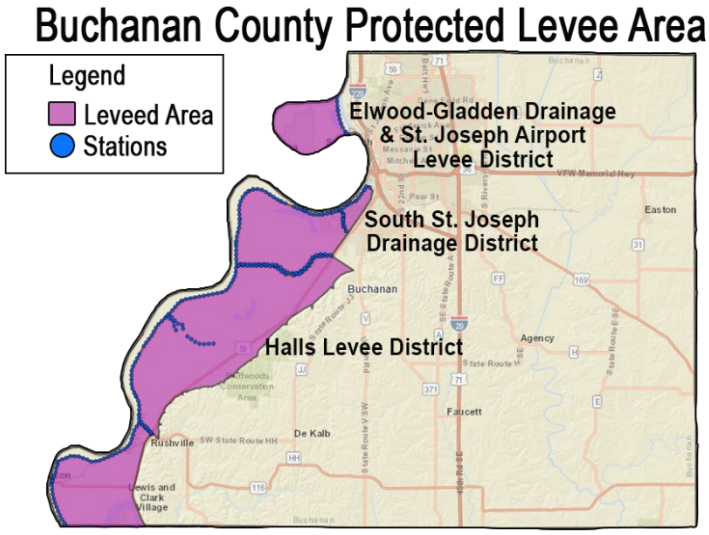
Table 3.40. Levees in Buchanan County

Designation	Primary Community Protected	Levee Owner	Corps Program Levee	Levee Status	Length (Miles)	Estimated Leveed Area Population	Estimated Property Value
MRLS 471-460-R	Elwood, Troy, and St. Joseph	Elwood-Gladden Drainage District and St. Joseph Airport Levee District	Yes	PAL	13.8	2,800	$746 million
MRLS 455-L	St. Joseph & Buchanan County Unincorporated Areas	South St. Joseph Drainage District	Yes	PAL	15.68	1,577	$2.6 billion
MRLS 448-443-L	Buchanan County Unincorporated Areas	Halls Levee District	Yes	PAL	17.45	290	$22.9 million
Platte County Drainage District No. 1 Section 1	Rushville	Platte County Drainage District and the Rushville-Sugar Lake Levee District	Yes	Non-Accredited	12	304	$45 million

Source: 2018 State Plan, https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Buchanan,%20Missouri&viewType=map&resultsType=systems&advanced=true&hideList=false&eventSystem=false

Figure 3.32 shows the levees, levee districts and the areas protected from the 1% annual chance flood on the preliminary FIRM. Lake Contrary Elementary School was located in the protected area but closed in 2018 due to reasons unrelated to flood concerns.

Figure 3.32. County Levees Shown on DFIRM as Providing Protection from the 1-Percent Annual Chance Flood



Map data source: https://levees.sec.usace.army.mil/

Strength/Magnitude/Extent

Levee failure is typically an additional or secondary impact of another disaster such as flooding or earthquake. The main difference between levee failure and losses associated with riverine flooding is magnitude. Levee failure often occurs during a flood event, causing destruction in addition to what would have been caused by flooding alone. In addition, there would be an increased potential for loss of life due to the speed of onset and greater depth, extent, and velocity of flooding due to levee breach.

As previously mentioned, agricultural levees and levees that are not designed to provide flood protection from at least the one percent annual chance flood likely do exist in the planning area. However, none of these levees are shown on the Preliminary DFIRM, nor are they enrolled in the USACE Levee Safety Program. As a result, an inventory of these types of levees is not available for analysis. Additionally, since these types of levees do not provide protection from the one percent annual chance flood, losses associated with overtopping or failure are captured in the Flood Section of this plan.

The USACE regularly inspects levees within its Levee Safety Program to monitor their overall condition, identify deficiencies, verify that maintenance is taking place, determine eligibility for federal rehabilitation assistance (in accordance with P.L. 84-99), and provide information about the levees on which the public relies. Inspection information also contributes to effective risk assessments and supports levee accreditation decisions for the National Flood Insurance Program (NFIP) administered by FEMA.

The USACE now conducts two types of levee inspections. The first is routine inspection, which is a visual inspection to verify and rate levee system operation and maintenance. It is typically conducted each year for all levees in the USACE Levee Safety Program. The second is a periodic inspection, which is a comprehensive inspection led by a professional engineer and conducted by a USACE multidisciplinary team that includes the levee sponsor. The USACE typically conducts this inspection every five years on the federally authorized levees in the USACE Levee Safety Program.

Both routine and periodic inspections result in a rating for operation and maintenance. Each levee segment receives an overall segment inspection rating of acceptable, minimally acceptable, or unacceptable. **Table 3.41** below defines the three ratings.

Table 3.41. Definitions of the Three Levee System Ratings

Levee System Inspection Ratings	
Acceptable	All inspection items are rated as Acceptable.
Minimally Acceptable	One or more levee segment inspection items are rated as minimally acceptable, or one or more items are rated as unacceptable and an engineering determination concludes that the unacceptable inspection items would not prevent the segment/system from performing as intended during the next flood event.
Unacceptable	One or more levee segment inspection items are rated as unacceptable and would prevent the segment/system from performing as intended, or a serious deficiency noted in past inspections (previous unacceptable items in a minimally acceptable overall rating) has not been corrected within the established timeframe, not to exceed two years.

None of the levees in the planning area are currently rated unacceptable (Source: 2018 State Plan 3.126-127). However, in 1999, FEMA formally decertified R-471-460, finding that it was unable to provide the designed level of protection. FEMA aims to see that levees capable of protecting property up to the 1% annual flood – the so called 100-year flood. Decertification of the R-471-460 levee unit resulted in a FEMA rezoning process whereby the area behind the levee could reportedly undergo increasingly severe flood insurance restrictions and economic hardship. Fortunately, the left bank levee is not presently at risk of decertification. (Source: https://www.stjoemo.info/DocumentCenter/View/4412/)

Previous Occurrences

The Rosecrans Memorial Airport, Missouri National Guard 139th Airlift Wing base, industrial areas and a significant part of Elwood, KS flooded in 1993 after the right bank of the MRLS 471-460-R levee overtopped and breached. The left bank levee held but preventative measures, including sandbagging, at several points occurred. The damages were estimated at $98 million. The levees were repaired and protected the area during the Missouri River floods in 2007, 2008, 2010 and 2011. In 2007 the flood was predicted to overtop the levee but did not. In 2011 the water level was 18 inches for approximately 120 days. The levee was 75% loaded and repairs were made afterward, but aging and deteriorating pipes and relief wells are still a concern.

The MRLS 455-L levee was loaded to almost three-fourths its height for several months in 2011. The distress was repaired by the U.S. Army Corps of Engineers under the PL 84-99 program. The levee was loaded to within a few feet of the top in 2019 and performed as designed.

MRLS 448-443-L was loaded in 1993 and 2019 to within 4 feet of the top of the levee. The levee performed as designed in 2019 with no serious performance concerns.

The Platte County Drainage District levee system overtopped in 1993, 2011, and 2019. In these floods water flowing over the top of the levee eroded the slope and led to a breach of the levee. The levee overtopped in 2007 and 2010 without breaching. Although screening found overtopping to be the highest risk driver, it also noted that the condition of drainage pipes in the levee is unknown.

Probability of Future Occurrence

Flooding of the MRLS 471-460-R leveed area could lead to flood depths of at least 7 feet in populated areas and up to 20 feet in undeveloped areas. The likelihood of flood overtopping this levee in the next year has been estimated at 0.5 percent which equals a 14 percent likelihood of water overtopping the levee over the life of a typical 30-year mortgage.

The likelihood of MRLS 455-L overtopping in any given year has been estimated at approximately 0.2 percent. Flooding of the leveed area could lead to water depths of at least 10 feet in developed areas which could result in loss of life and severe economic consequences.

The 2010 levee screening risk assessment estimated the likelihood of a flood overtopping MRLS 448-443-L at 0.1 percent in any given year. This equals a three percent likelihood of water overtopping the levee over the life of a typical 30-year mortgage. Flooding of the levee could lead to flood depths up to 18 feet which could result in loss of life and economic consequences. Recommended risk management activities include continuing effective operations and maintenance practices, ensuring pipes through the levee are inspected as

required and replaced as needed, and maintaining channel capacity in Contrary Creek and Rushville Drain channels. Levee sponsors are encouraged to work with local emergency management personnel to review and update emergency planning efforts on a regular basis. Efforts should be made to inform those that live or work behind the levee of their flood risk.

The 2014 U.S. Army Corps of Engineers screening level risk assessment estimated the likelihood of a flood overtopping the Platte County Drainage District levee system in any given year at approximately 5 percent. Flooding of the leveed area could lead to flood depths up to 9 feet which could result in life loss and economic consequences. (https://levees.sec.usace.army.mil)

Changing Future Conditions Considerations

The impact of changing future conditions on levee failure will most likely be related to changes in precipitation and flood likelihood. Climate change projections suggest that precipitation may increase and occur in more extreme events, which may increase risk of flooding, putting stress on levees and increasing likelihood of levee failure. Furthermore, aging levee infrastructure and a lack of regular maintenance (including checking for seepage and removing trees, roots and other vegetation that can weaken a levee) coupled with more extreme weather events may increase the risk of future levee failure.

Vulnerability

Vulnerability Overview

The 2018 State Plan determines the population and building count vulnerable to damage if levee segments were to fail. The “Area Protected by Levees” feature class from the FEMA Midterm Levee Inventory was overlaid on census block – level buildings and population data from US Census 2010. As the vulnerability analysis of levee failure in this plan is limited to levees indicated as providing protection from 100-year or higher base flood level, protected area polygons were extracted for levees with a stated level of protection for the 100-year flood or greater. The overlay was performed using proportional division (so that if the levee protected area covers a fraction of a census block, that fraction of the building or population data is counted in the exposure), the building and contents value, building count and population exposure was calculated. In the event of a levee failure 2,117 people and 1,034 buildings would be at risk.

Potential Losses to Existing Development

MRLS 471-460-R has a moderate risk level with a population of 2,773 behind it. There are 797 structures and an estimated property value of $746 million. MRLS 455-L has a population of 1,577 behind it with 1,463 structures and property value of $2.6 billion. MRLS 448-443-L has a population of 290 behind it with 143 structures and an estimated $22.9 million in property value. Platte County Drainage District No. 1 Section 1 has a population of 304 with 425 structures and an estimated property value of $45 million between the two counties of Buchanan and Platte.

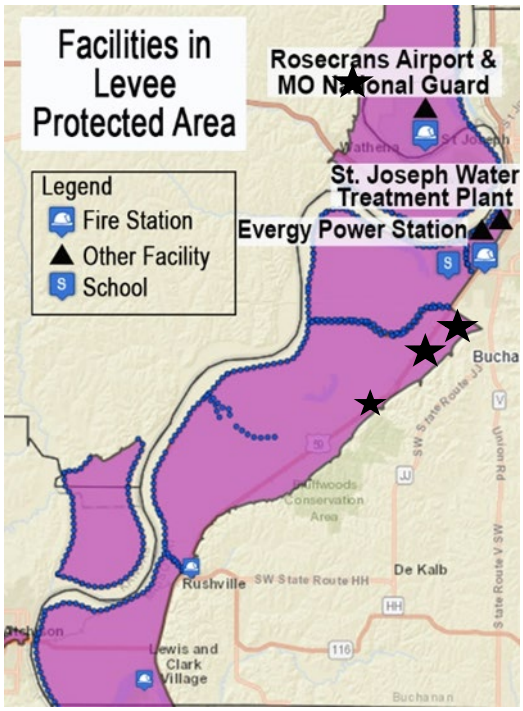
Impact of Previous and Future Development

Additional development would result in the exposure of more households and businesses vulnerable to damages from levee failure.

Hazard Summary by Jurisdiction

The area impacted by a levee failure would be St. Joseph and the unincorporated areas along the Missouri River. The Kansas communities of Elwood and Troy would also be impacted. Facilties located in protected areas include Rosecrans Memorial Airport, the Missouri National Guard 139th Airlift Wing base, St. Joseph's wastewater treatment plant, KCP&L power generation station and Lake Contrary Elementary School, as shown in **Figure 3.33**. St. Joseph has a significant amount of industry also located in the levee protected area.

Figure 3.33. Facilities in the Levee Protected Area



Source: Buchanan County GIS

Problem Statement

A levee failure would be a devastating event for the impacted areas. After several instances of levee overtopping nearly occurring and the decertification of the right levee, Buchanan County voters passed a four-year, quarter cent, sales tax levy in August 2016 to pay for a portion of the Missouri River levee repairs. The levy passed with 77% voting in favor of the sales tax. The $70.7 million project cost will be shared by the federal government, State of Missouri, USACE, local levee districts, St. Joseph, Buchanan County, and the funds generated from sales tax. This is a significant mitigation measure that supports the plan's first goal to protect the lives, property and livelihood of all citizens. However, as **Figure 3.33** shows, there are other areas along the Missouri River in Buchanan County not protected by levees. This may be a topic to explore by the MPC at the next plan update.

3.4.8 Public Health Emergencies/Environmental Issues

Hazard Profile

Hazard Description

Public health emergencies can take many forms—pandemics, large-scale incidents of food or water contamination, or extended periods without adequate water and sewer services. There can also be harmful exposure to chemical, radiological, or biological agents, and largescale infestations of disease-carrying insects or rodents. The first part of this section focuses on emerging public health concerns and pandemics, while the second part addresses natural and human-caused air and water pollution.

Public health emergencies can occur as primary events by themselves, or they may be secondary to another disaster or emergency, such as tornado, flood, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact or have the potential to adversely impact a large number of people. Public health emergencies can be worldwide or localized in scope and magnitude.

In particular, two public health hazards have recently emerged as issues of great concern, with far reaching consequences. One pertains to the intentional release of a radiological, chemical, or biological agent, as a terrorist act of sabotage to adversely impact a large number of people. The second hazard concerns a deadly outbreak (other than one caused by an act of terrorism) that could kill or sicken thousands of people across the county or around the globe. The primary communicable or infectious diseases addressed within this plan are influenza and COVID-19.

Influenza- Whether natural or manmade, health officials say the threat of a dangerous new strain of influenza (flu) virus in pandemic proportions is a very real possibility in the years ahead. Unlike most illnesses, the flu is especially dangerous because it is spread through the air. A classic definition of influenza is a respiratory infection with fever. Each year, flu infects humans and spreads around the globe. There are three types of influenza virus: Types A, B, and C. Type A is the most common, most severe, and the primary cause of flu epidemics. Type B cases occur sporadically and sometimes as regional or widespread epidemics. Type C cases are quite rare and hence sporadic, but localized outbreaks have occurred. Seasonal influenza usually is treatable, and the mortality rate remains low. Each year, scientists estimate which particular strain of flu is likely to spread, and they create a vaccine to combat it. A flu pandemic occurs when the virus suddenly changes or mutates and undergoes an —antigenic shift, permitting it to attach to a person's respiratory system and leave the body's immune system defenseless against the invader.

- **COVID-19-** According to the Centers for Disease Control and Prevention (CDC), COVID-19 is a respiratory virus that is transmitted through respiratory droplets when people with the virus cough, sneeze, sing, talk or breathe while in close contact with others. These droplets and particles can linger in the air for minutes to hours, making the virus spread through airborne transmission. Appearing two-14 days after exposure, symptoms may include fever chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting and/or diarrhea. While influenza (flu), and COVID-19 are both

contagious respiratory illnesses, COVID-19 is caused by infection with a new coronavirus (called SARS-CoV-2), and appears to spread more easily than flu and cause more serious illness in more vulnerable populations, such as older populations and those with pre-existing conditions. In severe cases, intubation is required and, if unsuccessful in managing respiratory symptoms, may result in death. Since being identified by the World Health Organization as a potential global health concern in January 2020 and then as a pandemic in March 2020, the virus has spread globally, with more than 27.7 million cases in the United States, including 486,000 deaths, as of February 15, 2021. As with other flu-like viruses, COVID-19 has mutated since its unknown etiologic origination in Wuhan City, China, according to the U.S. Food and Drug Administration, thus resulting in genetic variation in the population of circulating viral strains, such as the B.1.1.7 variant discovered in England in September 2020 and now in the U.S.

Additional diseases of public health concern include tuberculosis, Smallpox, St. Louis Encephalitis, Meningitis, Lyme disease, West Nile, SARS, Zika, and Ebola; however, these diseases will not be profiled for this plan.

Additional environmental concerns addressed in this hazard profile focus on air and water pollution, because if people breathe contaminated air and/or drink contaminated water, the potential implications on public health can be devastating and widespread.

Air Pollution

While much more of a concern in metropolitan areas, high amounts of ozone, carbon dioxide, nitrogen compounds, and other vehicular pollutants, can impact air quality and pose a health risk. For more information on Missouri's Air Pollution Control Program, contact the Missouri Department of Natural Resources at http://dnr.mo.gov/env/apcp. Buchanan has one air monitoring station, located in south St. Joseph, to help determine the exposure of a segment of residents in the area to ground-level ozone and to monitor attainment of the ambient air quality standards. According to the Department of Natural Resources, air quality monitoring began here in 1980. The facility is in the parking lot of a pump station affiliated with St. Joseph Water Treatment Plant. Other businesses with nearby facilities include Holliday Sand and Gravel Co., which has a storage area north of the monitor, as well as St. Joe Petroleum Co., Missouri Gas Energy, MHC Kenworth, American Walnut Co. and Nor-Am Cold Storage. To the west, lay railroad tracks and the Missouri River, which divides Kansas and Missouri. For more information on this station, visit https://dnr.mo.gov/env/esp/aqm/st-joe-pump.htm.

National Beef Leathers LLC in St. Joseph made the state's top ten list of facilities releasing the most toxic chemicals, as reported in the State Plan, for air pollutant releases. See detailed EPA report information for the facility in Appendix E.

Water Pollution

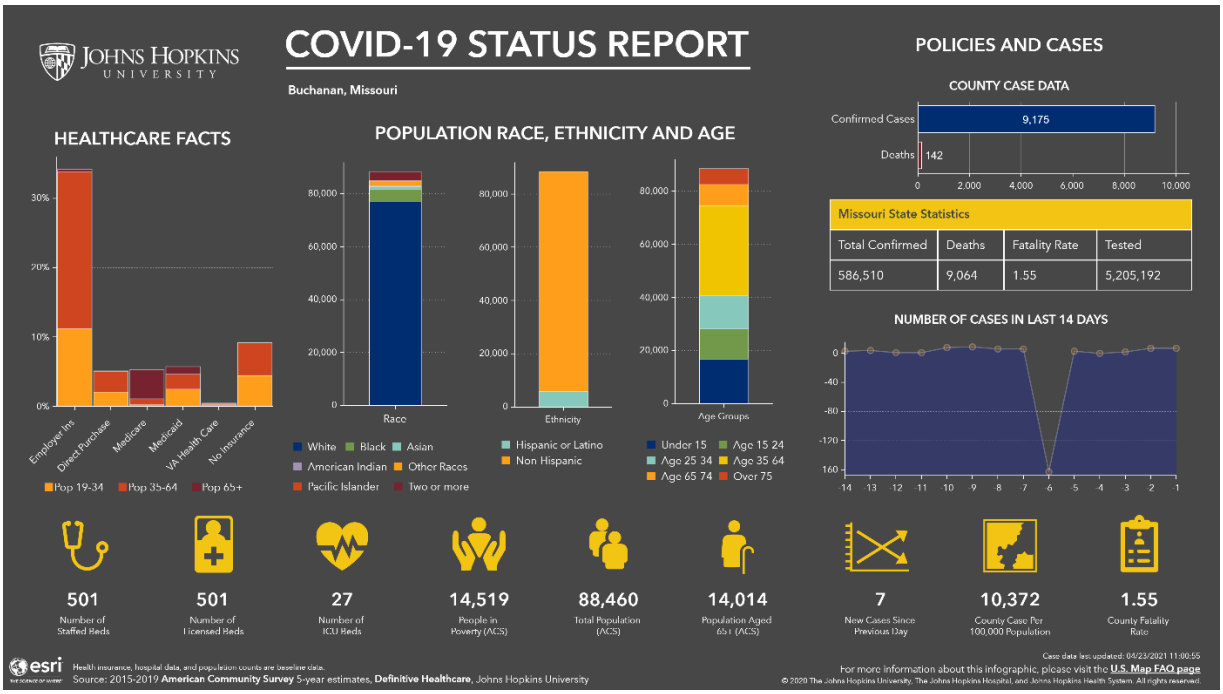
According to the State Plan, there are currently 115,772 miles of classified streams in Missouri and 142,666 miles of unclassified streams. There are 363,653 acres of classified lakes and 68,302 acres of unclassified lakes. In Buchanan County, Belcher Branch Lake is classified as impaired for mercury contamination in fish according to DNR's MO 2020 Section 303(d) listed waters.

The Environmental Protection Agency (EPA) also maintains the National Pollutant Discharge Elimination System (NPDES). Authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discreet conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. In most cases, the NPDES permit program is administered by authorized states. Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to our Nation's water quality.

Geographic Location

All communities in Buchanan County are at risk to public health emergencies. The Missouri Department of Health and Senior Services tracks the spread of influenza and other communicable diseases within the State through reporting from hospitals, laboratories, and healthcare providers. **Figure 3.34**, from Johns Hopkins University, shows COVID 19 data in Buchanan County as of April 23, 2021.

Figure 3.34. COVID-19 Status Report, Buchanan County



Source: https://bao.arcgis.com/covid-19/jhu/county/29021.html, accessed 4-23-21

Strength/Magnitude/Extent

The State Hazard Mitigation Plan, which was last updated in 2018, cited the probability of a pandemic at less than one percent. However, the COVID-19 outbreak has become a significant public health emergency. COVID-19 made landfall on the west coast of the United States in late January 2020.

Missouri reported its first corona virus-related death on March 18, 2020, just five days after a state of emergency was declared. By March 21, Governor Mike Parson would announce a ban on gatherings of 10 or more people. A stay at home order was issued for Missouri residents and

the Missouri National Guard was activated by April 2. Executive Order 20-12, issued on April 24, 2020, extended the state emergency through December 30, 2020, Executive Order 20-19 once again extended the state emergency and Air Guard activation until March 31, 2021 (https://www.sos.mo.gov/library/reference/orders/2020). The order wasn't extended beyond March 2021.

On June 11, 2020, Parson announced the state had met the four pillars for his reopening plan, including expanded testing capacity, expanded reserves of personal protective equipment (PPE), successful monitoring of hospital and health care system capacity, and improved ability to track potential outbreaks with public health data (https://governor.mo.gov/press-releases/archive/governor-parson-announces-missouri-will-fully-reopen-enter-phase-2-recovery). A state COVID-19 dashboard, https://showmestrong.mo.gov/data/public-health/, continues tracking the number of tests administered, active cases, deaths and vaccinations for specific dates (**Figure 3.35**).

Figure 3.35. COVID-19 Public Health Dashboard

Last updated on **4/23/2021**. The 7-day range reflects 4/14/2021 through 4/20/2021. A delay allows daily data to be accurate and complete. See FAQ for details.

Vaccinations	Vaccine Doses Administered in the Past 7 Days **270,022**	Average of **38,575** per day	The number of vaccine doses administered in the past week. The Pfizer and Moderna vaccines both require two doses per person. See our new vaccine dashboard and the new vaccine website for more information **(links below)**.
Confirmed Cases	New PCR Cases in the Past 7 Days **2,102**	Average of **300** per day **34** PCR cases per 100K residents	The number of total people with a positive PCR COVID-19 test in the past week. If a person has both a postive PCR and Antigen test, they are only counted as a confirmed case.
Probable Cases	New Antigen Cases in the Past 7 Days **1,400**	Average of **200** per day **23** Antigen cases per 100K residents	The number of total people with a positive Antigen COVID-19 test in the past week. If a person has both a postive PCR and Antigen test, they are only counted as a confirmed case.
Deaths	New Deaths in the Past 7 Days **7** (see note)	Average of **1** per day (see note) **0.1** deaths per 100K residents	The number of Missourians who died from COVID-19 in the past week. Note: Deaths are often reported with a delay. We encourage you to look at historical 7-day averages on our Statewide and County dashboards **(links below)**.
PCR Tests	New PCR Tests in the Past 7 Days **48,704**	Average of **6,958** per day **793.6** PCR tests per 100K residents	The number of total PCR tests in the past week. Testing helps identify new cases so we can take actions to slow the spread of the virus.
Antigen Tests	New Antigen Tests in the Past 7 Days **32,559**	Average of **4,651** per day **530** Antigen tests per 100K residents	The number of total Antigen tests in the past week. Testing helps identify new cases so we can take actions to slow the spread of the virus.
PCR Positivity Rate	Positivity Rate over the Past 7 Days (CDC method) **4.8%**		Positivity rate can be calculated multiple ways. The CDC method uses the number of positive PCR tests divided by the total number of PCR tests. **See FAQ for more details (link below).**
Antigen Positivity Rate	Positivity Rate over the Past 7 Days (Antigen Only) **4.9%**		Positivity rate can be calculated multiple ways. Our method uses the number of positive Antigen tests divided by the total number of Antigen tests. **See FAQ for more details (link below).**
Hospitali-zations	COVID-19 Patients in the Hospital **760** (as of 4/20/2021)	**132** in the ICU **82** on ventilators	The number of Missourians in the hospital who are confirmed or suspected to have COVID-19. This number is important for assessing the overall strain on the Missouri health care system. **See note below for more context.**

Source: https://showmestrong.mo.gov/data/public-health/

Similarly, many counties and cities erected their own public health dashboards. The St. Joseph Public Health Department hosts a COVID-19 dashboard on its website, https://www.stjoemo.info/959/COVID-19-Dashboard, and listed total confirmed COVID-19 cases in the county at 7,237 and probable cases at 3,089 as of April 22, 2021, with 180 confirmed COVID-19 deaths. The percentage of the population that had received at least one round of the two-shot vaccination as of April 22, 2021 was 18.4 percent, or 27,709 administered doses. Nearby Platte County had 3,282 confirmed and 1,009 probable cases with 47 deaths as of April 23, 2021. The vaccination percentage in Platte County was 31.2 percent, or 20,669 total doses administered. In comparison with Platte County, Buchanan County showed a higher COVID-19 infection and mortality rate and lower vaccination rate. Initially, due to limited testing capacity, eligibility criteria had to be met in order for people to receive a test. As more tests became available and in an effort to confirm/track cases, tests were scheduled and administered either through free community testing sites, with Buchanan County hosting one such site in September 2020, and through public and private health care providers. A list of testing sites was made available at https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/mobile-testing.php. Because of the airborne and close contact nature of COVID-19 transmissions, all people, including Buchanan County residents, are at risk of contracting the virus but can help in the prevention of its spread through simple measures like wearing a mask, frequent hand washing, avoiding close contact with others and those who are sick, disinfecting objects and surfaces, covering the mouth and nose with a tissue to cough or sneeze, and staying home away from others if sick (https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/prevention.php).

Previous Occurrences

Since the early 1900s, five lethal pandemics have swept the globe: Spanish Flu of 1918-1919; Asian Flu of 1957-1958; Hong Kong Flu of 1968-1969; Swine Flu of 2009-2010; and COVID-19 of 2019-present. The Spanish Flu was the most severe pandemic in recent history. The number of deaths was estimated to be 50-100 million worldwide and 675,000 in the United States. Its primary victims were mostly young, healthy adults. COVID-19 ranks second deadliest in the United States with a reported 487,109 deaths as of February 16, according to Johns Hopkins University of Medicine (https://coronavirus.jhu.edu/) with a higher mortality rate among older populations, those with pre-existing conditions, and disadvantaged populations. The 1957 Asian Flu pandemic killed about 70,000 people in the United States, mostly the elderly and chronically ill. The 1968 Hong Kong Flu pandemic killed 34,000 Americans. The 2009 Swine Flu caused 12,469 deaths in the United States.

Environmental Issues

The EPA maintains a list of facilities that release the most toxic chemicals each year. The most current report, from 2019, shows no known toxics release inventory (TRI) sites in Andrew County; two sites in Holt County to the west; three sites in Nodaway County to the north; one site in Gentry County to the east; and 23 sites in Buchanan County to the south (https://gispub.epa.gov/trina2019/).

Probability of Future Hazard Events

It is impossible to predict when the next pandemic will occur or its impact, thus noted as less than one percent. The CDC continually monitors and assesses pandemic threats and prepares

for an influenza pandemic. Novel influenza A viruses with pandemic potential include Asian lineage avian influenza A (H5N1) and (H7N9) viruses. These viruses have all been evaluated using the Influenza Risk Assessment Tool (IRAT) to assess their potential pandemic risk. Because the CDC cannot predict how severe a future pandemic will be, advance planning is needed at the national, state and local level. The Missouri Department of Health and Senior Service maintains a Pandemic Influenza Plan for the State.

Today, a much larger percentage of the world's population is clustered in cities, making them ideal breeding grounds for epidemics. Additionally, the explosive growth in air travel means the virus could literally be spread around the globe within hours. Under such conditions, there may be very little warning time. Outbreaks are expected to occur simultaneously throughout much of the nation, preventing shifts in human and material resources that normally occur with other natural disasters. These and many other aspects make influenza pandemic unlike any other public health emergency or community disaster.

Environmental concerns are also on the rise, with recent scientific data emphasizing the long-term impacts that air and water pollution can have on the ecology of affected areas. With continued enforcement of regulatory standards for airborne releases and discharges to waterways, routine emissions by industrial facilities are relatively easy to monitor and control. However, the potential always remains for unauthorized 3.511 3 Risk Assessment dumping and releases and for failure of systems to control industrial discharges, resulting in potential environmental emergencies (2018 Mo State Hazard Mitigation Plan, pp. 3.510-3.511).

Changing Future Conditions Considerations

According to the U.S. Global Change Research Program, the influences of climate change on public health is significant and varied. The influences range from the clear threats of temperature extremes and severe storms to less obvious connections related to insects. Climate and weather can also affect water and food quality in particular areas, with implications for public health.

Hot days can be unhealthy—even dangerous. High air temperatures can cause heat stroke and dehydration, and affect people's cardiovascular and nervous systems. Midwestern cities like St. Louis are vulnerable to heat waves, because many houses and apartments lack air conditioning, and urban areas are typically warmer than their rural surroundings. In recent decades, severe heat waves have killed hundreds of people across the Midwest. Heat stress is expected to increase as climate change brings hotter summer temperatures and more humidity. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor.

Higher temperatures and wetter conditions tend to increase mosquito and tick activity, leading to an increased risk of zoonotic diseases. Mosquitos are known to carry diseases such as West Nile virus (WNV), La Crosse/California encephalitis, Jamestown Canyon virus, St. Louis encephalitis, and Eastern equine encephalitis. The two major concerns associated with warmer and wetter conditions are that the mosquito species already found in Missouri and the diseases that they carry will become more prevalent, and that new species carrying unfamiliar diseases will start to appear for the first time.

Warmer winters with fewer hard freezes in areas that already see WNV-carrying mosquitos are likely to observe both a higher incidence of WNV and a longer WNV season, ultimately leading to an increase in human cases. Non-native mosquito species may move into Missouri if the climate becomes more suitable for them, bringing with them diseases such as Jamestown

Canyon virus, Chikungunya, and Dengue Fever.

Ticks are also well-known disease vectors in Missouri, carrying pathogens such as Lyme disease, anaplasmosis, Ehrlichiosis, Powassan virus, and Babesiosis. Warmer, wetter weather can lead to an increase in algal blooms and declining beach health. An increase in flood events may also be associated with an increased incidence of mold problems in homes and businesses, as well as contamination of wells and surface waters due to sewer overflows and private septic system failures.

If these predictions come true, communities must contend with the human health impacts related to the increased prevalence of infectious diseases, heat waves, and changes in air and water quality. Public health officials will need to focus on spreading information and enacting pest and disease reduction. Flood prone communities will need to focus on continuously improving flood controls and mitigation strategies, including restricting building and chemical storage in floodplains, upgrading well and septic requirements, and providing water testing kits to residents (2018 Mo State Hazard Mitigation Plan, p. 3.511).

Vulnerability

Vulnerability Overview

Public Health Emergencies

For planning purposes, it is reasonable to assume a rapid movement of a pandemic flu virus from major metropolitan areas to rural areas of Missouri. The 2018 Missouri Hazard Mitigation Plan accurately stated that the effect of a pandemic on individual communities would be relatively prolonged – weeks to months – and could have a devastating effect on the health and well-being of Missouri citizens and the American public. CDC estimates of such an outbreak, as reported in the 2018 State Plan, included these estimates, most of which have been met and exceeded by COVID-19:

- Up to 200 million persons will be infected
- Between 40 and 100 million persons will become clinically ill
- Between 18 and 45 million persons will require outpatient care
- Between 300,000 and 800,000 persons will be hospitalized
- Between 88,000 and 300,000 people will die nationwide
- Effective preventative and therapeutic measures, including vaccines and antiviral agents, likely will be in short supply, as well as some antibiotics to treat secondary infections
- Economic losses from the next pandemic may range from $71 to 166 billion, depending on the attach rate.

Compared to public health emergencies, as previously described, environmental incidents involving air and water pollution would likely impact a more localized area; however, long-term effects on the environment in the impacted area could linger for many years.
As previously noted, all of Missouri and Buchanan County is at risk to public health emergencies, while some special populations are at increased risk for infectious diseases (2018 Mo Hazard Mitigation Plan, 3.512), including the institutionalized elderly, prison populations and children, particularly un-immunized children.

Environmental Issues

Although Missouri has never had an environmental disaster of large proportions, there are many instances where hazardous substances can impact the environment with considerable consequences to either air or water. Floods often temporarily interrupt community water supplies, creating the need for emergency potable water for thousands of people, as was the case in July 1993 when St. Joseph's municipal water plant was forced to shut down for an extended period when contaminated floodwater threatened to enter the system. Floodwaters also disrupt wastewater treatment facilities, resulting in the discharge of raw or improperly treated sewage. Amazonia's wastewater treatment process was compromised by flood waters during a flood event in July 2019, resulting in the town paying thousands of dollars to pump excess water out of the system to keep it running. Periodically, water pollutants cause fish kills in Missouri streams, and excessive air pollutants associated with smog in large metropolitan areas create public health problems.

Potential Losses to Existing Development

Public Health Emergencies

According to the State Plan, buildings, infrastructure, and critical facilities are not vulnerable to this hazard. It affects only persons susceptible to the illness. The lasting impacts and potential losses are largely social/economic and are dependent on the type, extent, and duration of the illness. A 2007 study prepared by the Trust for America's Health, a nonprofit organization dedicated to making disease prevention a national priority, developed a model to assess the potential impact of a pandemic flu on each state's workforce and how 20 key industry sectors and trade would be affected. Economic impact to Missouri was estimated to include the following:

- Projected GDP Loss from Pandemic: $12.4 billion
- Projected GDP Percentage Loss from Pandemic: 5.74%
- Ranking of Percentage Losses Out of 50 States (Highest = 1): 14
- Projected Impact on the Workforce: $5.5 billion in losses
- Projected Impact on Industries: $4.7 billion in losses
- Projected Trade Impact: $2.2 billion in losses
- Projected Number of Lives Lost: 47,000
- Projected Number of Sick Workers (assuming 3 weeks of work lost (with 50 weeks of work per year) from those who are either ill, fear the risk of infection at work, or need to take care of sick family members): 1,717,000

Source: Mo State Hazard Mitigation Plan, p.3.513

For this plan update, pandemic influenza was used as the worst-case scenario for estimating potential losses. The Missouri Department of Health and Senior Service's Pandemic Influenza Plan assumes the clinical disease attack rate would be 30 percent in the overall population. Combining this assumption with an estimate of age distribution for influenza cases and the estimated direct and indirect health care costs, the economic impact of pandemic influenza can be calculated for each county within Missouri. The table below presents the estimates for age distribution and disease outcome.

Table 3.42. Potential Vulnerability of Buchanan County for Pandemic Influenza

Population	*Potential Population Affected*	*Total Hospitalizations per Age Group (#)* *1) 0-19* *2) 20-64* *3) 65+*			*Economic Impact per Age Group ($)* *1) 0-19* *2) 20-64* *3) 65+*			*Total Economic Impact*	*Vulnerability*
89,100	***26,730***	1) 0-19 57.44	2) 20-64 196.54	3)65+ 70.97	1) 0-19 $296,275.25	2) 20-64 $1,859,678.57	3) 65+ $765,274.70	***$2,890,228.52***	***Mediu m***

Source: 2018 Mo Hazard Mitigation Plan, p. 3515

Impact of Previous and Future Development

Public Health Emergencies

As populations increase and the cost of healthcare climbs, potential losses can be expected to rise.

Environmental Issues

Throughout the State, continuing suburban development impacts streams in several ways. Shortening and culverting of channels leads to the direct loss of streams and riparian areas. The increase in impervious surface area in the surrounding watershed leads to unnatural hydrograph patterns, with lower baseflow and higher stormflow. The altered channel and higher peak flows can increase erosion, while the runoff from the impervious surface carries increased levels of sediment and various chemicals from the urban environment. Elevated nutrient levels or bacterial contamination is also likely if individual or community domestic sewage systems are not well maintained.

Hazard Summary by Jurisdiction

Buchanan County is susceptible to public health emergencies, including pandemics. Some counties and regions are tracking COVID-19 by zip code, including Andrew County, but this information is not readily available for the communities in Buchanan County.

Problem Statement

Preparing for, responding to and recovering from public health emergencies like COVID-19 will require a strategy with many similarities to other disease outbreaks, be they naturally occurring or resulting from terrorist action. The time-honored public health activities to lessen the impact on morbidity and mortality such as education, vaccination, prophylaxis, isolation/quarantine and the closure of public facilities are common to all, despite the particular disease of concern. In addition, clear, concise communication with the public, within the Missouri Department of Health and Senior Services (DHSS), and with other agencies remains a critical component, as does the ability of the involved agencies to achieve collaboration and coordination. By its very nature, an

influenza pandemic, once started, will not be stopped until it has run its course. This course can be shortened and weakened by many things, with vaccination being the gold standard for protecting the population. Pandemic plans describe strategies of preparedness, response and recovery to attempt to decrease illnesses and deaths during the pandemic period to manageable levels (i.e., that do not overwhelm the critical infrastructures of the State), and to promote community resiliency and rapid recovery.

3.4.9 Severe Thunderstorms Including High Winds, Hail, and Lightning

Profile

Hazard Description

Thunderstorms

By definition, a thunderstorm is a type of storm that contains lightning and thunder which is caused by unstable atmospheric conditions. These conditions occur when cold upper air sinks and warm moist air rises, creating storm clouds or 'thunderheads' that result in thunderstorms. This can be an isolated occurrence, as well as in clusters or lines. To be considered "severe," as defined by the National Weather Service, a thunderstorm includes hail that is one inch or more, or wind gusts that are at 58 miles per hour or higher. There are about 1,800 thunderstorms occurring at any given moment across the world. Severe thunderstorms most often occur in Missouri in the spring and summer, during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms are heavy rains resulting in flooding (discussed separately in **Section 3.4.1**) and tornadoes (discussed separately in **Section 3.4.10**).

High Winds

When severe, a thunderstorm can produce winds causing as much damage as a weak tornado. The different types of damaging winds of thunderstorms include downbursts, microbursts, and straight-line winds. Localized currents of air blasting down from a thunderstorm are downbursts, which induce an outward burst of damaging wind on or near the ground. Minimized downbursts covering an area of less than 2.5 miles across are considered microbursts; they include a strong wind shear (a rapid change in the direction of wind over a short distance) near the surface. Microbursts can produce winds at speeds of more than 150 miles per hour and may or may not include precipitation. Reaching speeds of 140 miles per hour, damaging straight-line winds are high winds across a wide area. Straight-line winds are defined as any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 miles per hour, which represent the most common type of severe weather. They are responsible for most wind damage related to thunderstorms. Since thunderstorms do not have narrow tracks like tornadoes, the associated wind damage can be extensive and affect entire (and multiple) counties. Objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase.

Lightning

All thunderstorms produce lightning which can strike outside of the area where it is raining and has been known to fall more than 10 miles away from the rainfall area. Lightning is an immense discharge of electricity shooting through the air, which causes vibrations and creates the sound of thunder. Simply put, the sound lightning makes is thunder.

Hail

According to the National Oceanic and Atmospheric Administration (NOAA), hail is a type of precipitation formed when thunderstorm updrafts carry raindrops upward into an extremely cold

atmosphere causing them to freeze. The raindrops form into small frozen droplets. They continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet and form hail. Hail can continue to grow before it hits the earth as long as the updraft forces can support or suspend the weight of the hailstone.

Once the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 miles per hour, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 miles per hour. According to the NOAA, the largest hailstone in diameter recorded in the United States was found in Vivian, South Dakota on July 23, 2010. It was eight inches in diameter, almost the size of a soccer ball. Although soccer-ball-sized hail is the exception, even small pea-sized hail can do damage.

Geographic Location

Thunderstorms/high winds/hail/lightning events are an area-wide hazard in Buchanan County. While thunderstorms can happen anywhere in the planning area, they are more frequently reported in more urbanized areas, as damages are more likely to occur in more densely developed urban areas.

Strength/Magnitude/Extent

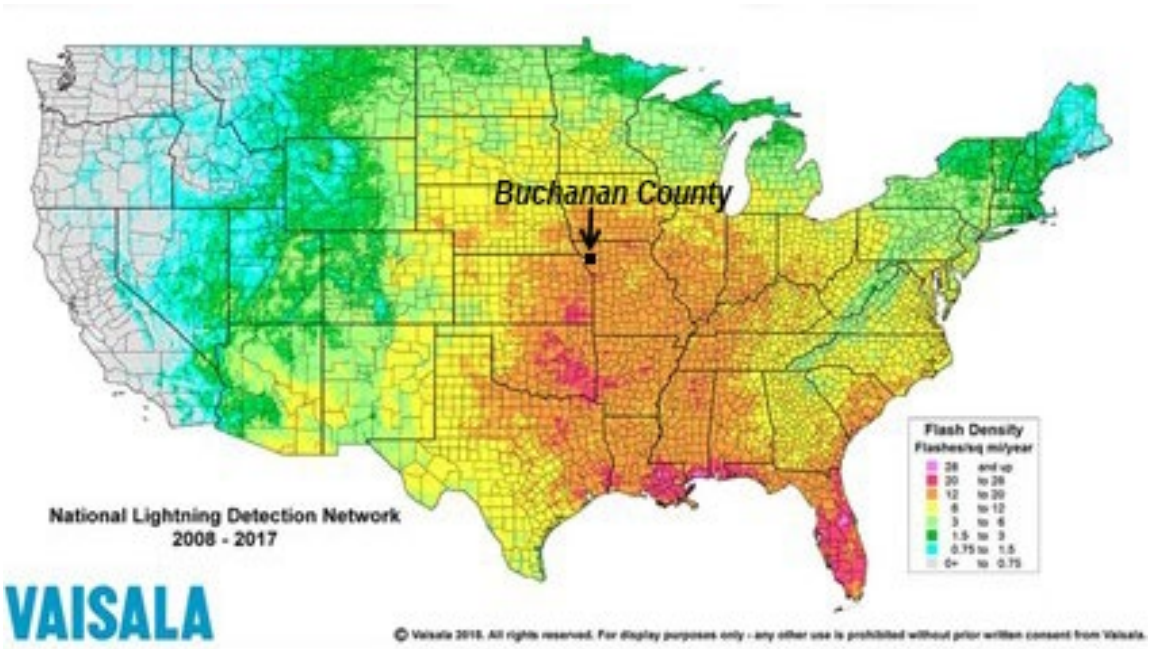
Severe thunderstorm losses are usually attributed to the associated hazards of hail, winds, lightning and heavy rains. Losses due to hail and high wind are typically insured losses that are localized and do not result in presidential disaster declarations. However, in some cases, impacts are severe and widespread making federal assistance necessary. Hail and wind have devastating impacts on crops. Severe thunderstorms/heavy rains that lead to flooding are discussed in the flooding hazard profile. Hailstorms cause damage to property, crops, and the environment, and can injure and even kill livestock. In the United States, hail causes more than $1 billion in damage to property and crops each year. Even relatively small hail can destroy plants in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are also commonly damaged by hail. Hail has been known to cause injury, occasionally fatal, to humans.

In general, assets in Buchanan County vulnerable to thunderstorms with lightning, high winds, and hail include people, crops, vehicles, and structures. Although this hazard results in high annual losses, private property insurance and crop insurance usually cover the majority of losses. Considering insurance coverage as a recovery capability, the overall financial impact on jurisdictions is reduced.

Most lightning damages occur to electronic equipment located inside buildings. Structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops if fields or forested lands are set on fire. Communications equipment and warning transmitters and receivers can also be rendered useless by lightning strikes.

Figure 3.36 shows lightning frequency in the U.S. Buchanan County is identified with an arrow. It is located in the orange zone on the map, indicating on average 12 to 20 lightning flashes per square mile per year. Much of the state is in the same zone.

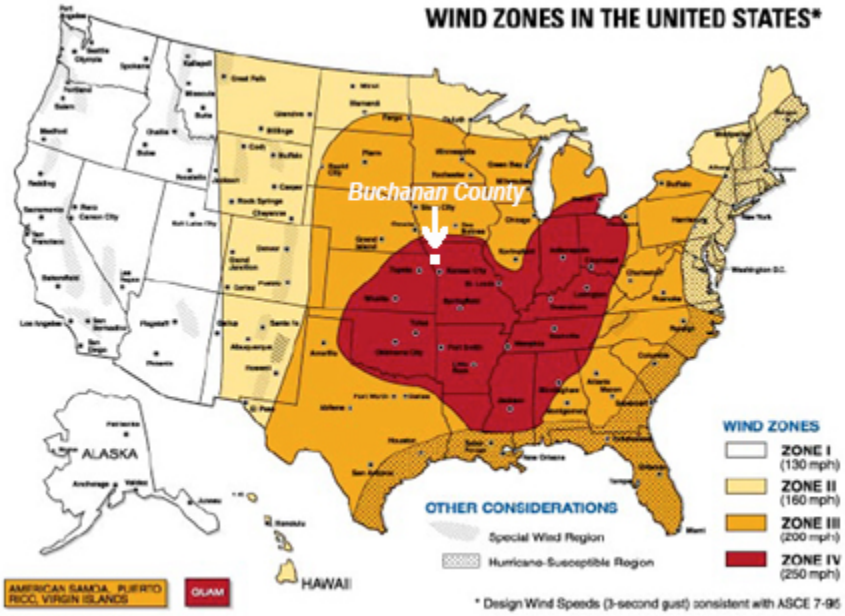
Figure 3.36. Location and Frequency of Lightning in U.S.



Source:https://www.vaisala.com/sites/default/files/documents/Vaisala%202017%20Annual%20Lightning%20Report.pdf.

Figure 3.37 shows wind zones in the United States, and Buchanan County is located in the red zone as indicated on the map. In the red zone, Zone IV, winds can reach 250 miles per hour.

Figure 3.37. Wind Zones in the United States



Source: FEMA 320, Taking Shelter from the Storm, 3rd edition, https://www.fema.gov/pdf/library/ism2_s1.pdf

According to the Tornado and Storm Research Organization (TORRO), the intensity of a hailstorm, in terms of damages, increases relative to the size of hail, as indicated in **Table 3.43** below.

Table 3.43. Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76-90	3.0-3.5	Large orange > Soft ball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity. http://www.torro.org.uk/site/hscale.php

The onset of thunderstorms with lightning, high wind, and hail is generally rapid. Duration is less than six hours and warning time is generally six to twelve hours. Nationwide, lightning kills 75 to 100 people each year. Lightning strikes can also start structural and wildland fires, as well as damage electrical systems and equipment.

Previous Occurrences

The tables below include NCDC reported events and damages for the past 10 years for thunderstorms, wind, and hail. There were no NCDC reported events during the past 10 years for lightning. One limitation of NCDC reported lightning events is the fact that only those that result in fatality, injury, and/or property and crop damage are reported. There were 57 recorded thunderstorm wind events in Buchanan County, causing $96,000 in property damages but no reported injuries. The storm events reported in Lake Contrary on June 19, 2010, caused the roofs of several trailers to be blown off resulting in $60,000 in damages. **Table 3.44** lists only thunderstorm wind events resulting in injuries or property damage. Not included in this list but of note was a strong Quasi-Linear Convective System (QLCS) reported at St. Joseph Memorial Airport on June 5, 2020 that produced scattered wind damage. QLCS's, also called bow echoes, are most common in the spring and summer and usually are associated with an axis of enhanced winds that create straight-line wind damage at the surface. According to the National Weather Service, bow echo-induced winds/downbursts account for a large majority of the

structural damage resulting from convective non-tornadic winds. The Buchanan County Region H HazMat building, pole barn and other property suffered $400,000 in damages in the June 5 storms, according to Bill Brinton, the county's emergency management director.

Table 3.44. NCDC Thunderstorm Wind Events in Buchanan County, 2010-2020

Jurisdiction	*Date*	*Wind Speed (in knots)*	*Injuries*	*Property Damage*
Lake Contrary	6/19/2010	70 kts	0	$20,000
Lake Contrary	6/19/2010	77 kts	0	$40,000
South St. Joseph	7/16/2010	52 kts	0	$1,000
Saxton	8/13/2010	52 kts	0	$1,000
Industrial City	8/18/2011	61 kts	0	$15,000
Hurlingen	5/19/2013	61 kts	0	$2,000
St. Joseph	9/1/2013	52 kts	0	$7,000
Lake Contrary	11/16/2013	61 kts	0	$10,000
Total				***$96,000***

Source: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

There were 55 recorded hail events in Buchanan County, with no injuries or property damage reported. **Table 3.45** lists only the hail events with hail over one inch in diameter.

Table 3.45. NCDC Hail Events in Buchanan County, 2010-2020

Jurisdiction	*Date*	*Size (in inches)*	*Injuries*	*Property Damage*
South St. Joseph	5/7/2010	1.75 in	0	$0
South St. Joseph	5/7/2010	1.25 in	0	$0
Halls	4/3/2011	1.25 in	0	$0
Hurlingen	5/21/2011	1.75 in	0	$0
St. Joseph	6/30/2012	1.25 in	0	$0
Saxton	11/16/2013	1.25 in	0	$0
De Kalb	6/21/2015	2.75 in	0	$0
Faucett Farris Airport	4/27/2016	1.5 in	0	$0
Rushville	5/26/2018	1.25 in	0	$0
Rushville	5/26/2018	1.5 in	0	$0
Willow Brook	4/17/2019	1.25 in	0	$0
Agency	4/17/2019	1.25 in	0	$0
De Kalb	5/14/2019	1.25 in	0	$0
Halls	5/14/2019	1.75 in	0	$0
Halls	5/14/2019	1.25 in	0	$0
Total			***0***	***$0***

Source: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

Table 3.46. NCDC High Wind Events in Buchanan County, 2010-2020

Jurisdiction	*Date*	*Wind Speed (in knots)*	*Injuries*	*Property Damage*
Buchanan County	11/11/2015	52 kts	0	$0

Buchanan County	5/17/2017	55 kts	0	$0
Buchanan County	5/17/2017	52 kts	0	$0
Buchanan County	1/28/2019	52 kts	0	$0

Source: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=29%2CMISSOURI

Table 3.47 below summarizes past crop damages as indicated by crop insurance claims. The tables illustrate the magnitude of the impact on the planning area's agricultural economy.

Thunderstorms, high winds and lightning were not listed as the cause of loss for any insurance claims in Buchanan County from 2016 – 2020.

Table 3.47. Crop Insurance Claims Paid in Buchanan County from Hail, 2016-2020.

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid
2016	Soybeans	Hail	$2,853
2016	Corn	Hail	$7,521
2017	Soybeans	Hail	$15,724.40
2017	Soybeans	Hail	$654.55
2018	Soybeans	Hail	$6,797
2018	Soybeans	Hail	$1,571
2018	Soybeans	Hail	$2,649
Total			$37,769.95

Source: USDA Risk Management Agency, Insurance Claims, https://www.rma.usda.gov/data/cause

Probability of Future Occurrence

Thunderstorm Wind

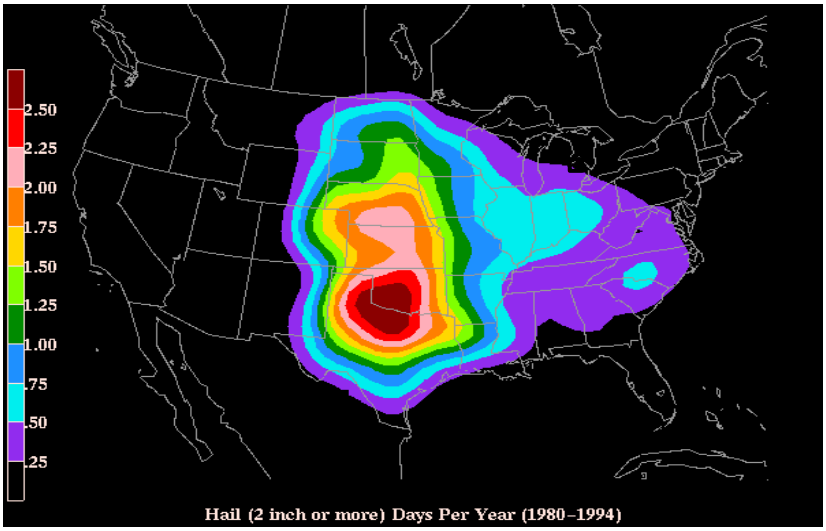
There have been 57 recorded thunderstorm wind events in Buchanan County over a 10-year period from 2010 to 2020. This equates to six thunderstorm wind events in any given year with a 100% probability of occurrence. There were eight events that resulted in $96,000 in property damages but no reported injuries. This equates to .7 damaging events per year with annualized losses of $9,600.

Hail

There have been 55 recorded hail events over a 10-year period from 2010 to 2020. This equates to 5.5 hail events in any given year with a 100% probability of occurrence. There were no reports of damage or injuries from the NCDC database so there are no annualized losses.

Figure 3.38 is based on hailstorm data from 1980-1994. It shows the probability of hailstorm occurrence (2" diameter or larger) based on number of days per year. Buchanan County is located in the light green zone, indicating the county's probability of hailstorm with 2" diameter or larger hail is 1.25 to 1.50 days per year.

Figure 3.38. Annual Hailstorm Probability (2" diameter or larger), 1980- 1994



Source: NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif
Note:

High Wind
There have been four high wind events reported over a 10-year period from 2010 –2020. This equates to .4 events per year or a four percent probability of occurrence annually. Since there were no reported property losses, there were no annualized losses.

Changing Future Conditions Considerations
According to the 2018 State Hazard Mitigation Plan, NASA's Earth Observatory provides an analysis on how climate change could, theoretically, increase potential storm energy by warming the surface and putting more moisture in the air through evaporation. The presence of warm, moist air near the surface is a key ingredient for summer storms that meteorologists have termed "convective available potential energy," or CAPE. With an increase in CAPE, there is greater potential for cumulus clouds to form. The study also counters this theory with the theory that warming in the Arctic could lead to less wind shear in the mid-latitude areas prone to summer storms, making the storms less likely.

Predicted increases in temperature could help create atmospheric conditions that are fertile breeding grounds for severe thunderstorms and tornadoes in Missouri and Buchanan County. Possible impacts include an increased risk to life and property in both the public and private sectors. Public utilities and manufactured housing developments will be especially prone to damages. Jurisdictions already affected should be prepared for more of these events, and should thus prioritize mitigation actions such as construction of safe rooms for vulnerable populations, retrofitting and/or hardening existing structures, improving warning systems and public education, and reinforcing utilities and additional critical infrastructure. Source: MO Hazard Mitigation Plan, pp. 3.293-3.294

Vulnerability

Vulnerability Overview

Severe thunderstorm losses are usually attributed to the associated hazards of hail,

downburst winds, lightning and heavy rains. Losses due to hail and high wind are typically insured losses that are localized and do not result in presidential disaster declarations. However, in some cases, impacts are severe and widespread and assistance outside state capabilities is necessary. Hail and wind also can have devastating impacts on crops. Severe thunderstorms/heavy rains that lead to flooding are discussed in the flooding hazard profile. Hailstorms cause damage to property, crops, and the environment, and can injure and even kill livestock. In the United States, 3.75 hail causes more than $1 billion in damage to property and crops each year. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are also commonly damaged by hail. Hail has been known to cause injury to humans, occasionally fatal injury.

In general, assets in Buchanan County vulnerable to thunderstorms with lightning, high winds, and hail include people, crops, vehicles, and built structures. Although this hazard results in high annual losses, private property insurance and crop insurance usually cover the majority of losses. Considering insurance coverage as a recovery capability, the overall impact on jurisdictions is reduced. Most lightning damages occur to electronic equipment located inside buildings, but structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops, if fields or forested lands are set on fire. Communications equipment and warning transmitters and receivers can also be knocked out by lightning strikes. Source: http://www.vaisala.com/en/ products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx and http://www.lightningsafety.noaa.gov/)

The method used to determine vulnerability to severe thunderstorms across Missouri, including in Buchanan County, was statistical analysis of data from several sources: National Centers for Environmental Information (NCEI) storm events data (1996 to December 31, 2016), HAZUS Building Exposure Value data, housing density and mobile home data from the U.S. Census (2015 ACS), and the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina. From the statistical data collected, six factors were considered in determining overall vulnerability to lightning as follows: housing density, building exposure, percentage of mobile homes, social vulnerability, likelihood of occurrence, and average annual property loss. Based on natural breaks in the statistical data, a rating value of 1 through 5 was assigned to each factor. These rating values correspond to the following descriptive terms: 1) Low 2) Low-medium 3) Medium 4) Medium-high 5) High

According to this method, Buchanan County has a medium vulnerability rating for thunderstorms, including high wind, hail, and lightning as detailed in **Tables 3.48 and 3.49** below.

Table 3.48. Housing Density, Building Exposure, SOVI, and Mobile Home Data by County

County	*Total Building Exposure (Hazus)*	*Building Exposure Rating*	*Housing Density*	*Housing Density Rating*	*SOVI Ranking*	*SOVI Ranking Rating Percent*	*Mobile Homes Percent*	*Mobile Home Ranking*
Buchanan	$10,579,076,000	3	94.32	2	Medium	3	4.5	1

Source: 2018 Mo State Hazard Mitigation Plan, p. 3.296

Table 3.49. Number of High Wind, Hail, and Lightning Events, Likelihood of Occurrence, and Associated Ratings

County	HIGH WIND			HAIL			LIGHTNING		
	Total # of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total # of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total # of Events	Likelihood of Occurrence	Likelihood of Occurrence Rating
Buchanan	87	4.143	2	112	5.333	3	0	0.000	1

Source: 2018 Mo State Hazard Mitigation Plan, p. 3.299

Potential Losses to Existing Development

The average annual loss determined from historical losses for high wind and hail are indicators of the potential losses to existing development. While a limited number of high wind events have been recorded in Buchanan County, they have the potential to damage private property and commercial buildings. Based on the $96,000.00 in losses from thunderstorm wind damage recorded in the NCEI database from 2010-2020, potential losses for future events is annualized at $4,150.00. In looking at the historical property losses from thunderstorm wind damage over the 20-year period from 2000-2020, the annualized losses are $60,600, in large part due to a thunderstorm event report in 2000 of more than $1.2 million in property damages to an industrial building under construction.

Previous and Future Development

Additional development would result in the exposure of more households and businesses vulnerable to damages from severe thunderstorms/high winds/lightning/hail.

Hazard Summary by Jurisdiction

Although thunderstorms/high winds/lightning/hail events are area-wide, there may be demographics indicating higher losses in one jurisdiction as compared to another. Structures built before 1939 are considered to be more vulnerable to the impact of high wind and hail damage. Please see Table 3.21 for ages of structures in jurisdictions in Buchanan County. Risk to new development is somewhat mitigated by IBC 2012 building codes.

Problem Statement

The NCEI Storm Events Database notes close to 100 thunderstorm wind events over the last 20 years in Buchanan County with over $1.212 million dollars in damages.

Poorly built structures, barns, outbuildings are more vulnerable to the impact of high winds during thunderstorms. High winds can topple utility poles and lead to power outages. Both high winds and hail can damage roofs. Hail can also damage crops and dent cars and trucks. People are also at risk of injury and death during high wind events. Crop insurance mitigates the risk to farmers and the agriculture sector within the county.

The risk of injury and death in the county can be mitigated by identifying safe refuge areas in public buildings, nursing homes and other facilities that house vulnerable populations that do not have a saferoom. Retrofitting school district facilities to better withstand high winds will provide more protection for students and staff. Additional warnings and alerts will also provide the public

and schools more time to take cover during high wind events. Education and hazard awareness programs would also increase public safety in the event of severe thunderstorm events.

3.4.10 Severe Winter Weather

Hazard Profile

Hazard Description

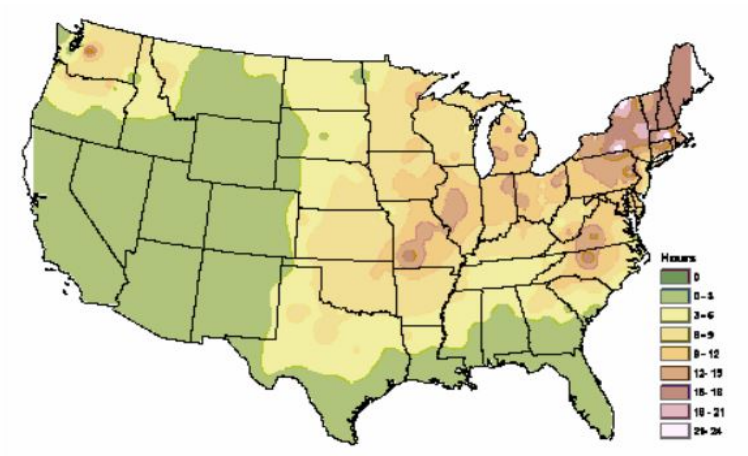
A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The National Weather Service describes different types of winter storm events as follows.

- **Blizzard**—Winds of 35 miles per hour or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers**—Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Freezing Rain**—Measurable rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Most freezing-rain events are short lived and occur near sunrise between the months of December and March.
- **Sleet**—Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

Geographic Location

The entire county is vulnerable to heavy snow, ice, extreme cold temperatures, and freezing rain. **Figure 3.39** shows the zones of average number of hours of freezing rain per year. Buchanan County is located in the light-yellow zone, indicating it receives three to six hours of freezing rain per year.

Figure 3.39. NWS Statewide Average Number of Hours per Year with Freezing Rain



Source: American Meteorological Society. "Freezing Rain Events in the United States." http://ams.confex.com/ams/pdfpapers/71872.pdf

Strength/Magnitude/Extent

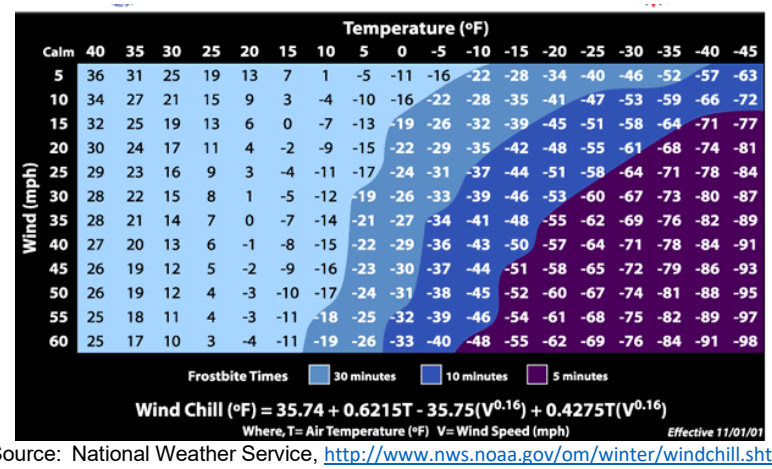
Severe winter storms include heavy snowfall, ice, and strong winds which can push the wind chill well below zero degrees in the planning area.

For severe weather conditions, the National Weather Service issues some or all of the following warnings as conditions warrant across the State of Missouri. NWS local offices in Missouri may collaborate with local partners to determine when an alert should be issued for a local area.

- Winter Weather Advisory — Winter weather conditions are expected to cause significant inconveniences and may be hazardous. If caution is exercised, these situations should not become life threatening. Often the greatest hazard is to motorists.
- Winter Storm Watch — Severe winter conditions, such as heavy snow and/or ice are possible within the next day or two.
- Winter Storm Warning — Severe winter conditions have begun or are about to begin.
- Blizzard Warning — Snow and strong winds will combine to produce a blinding snow (near zero visibility), deep drifts, and life-threatening wind chill.
- Ice Storm Warning -- Dangerous accumulations of ice are expected with generally over one quarter inch of ice on exposed surfaces. Travel is impacted, and widespread downed trees and power lines often result.
- Wind Chill Advisory -- Combination of low temperatures and strong winds will result in wind chill readings of -20 degrees F or lower.
- Wind Chill Warning -- Wind chill temperatures of -35 degrees F or lower are expected. This is a life-threatening situation.

Wind can greatly amplify the impact of cold ambient air temperatures. This is illustrated by **Figure 3.40**, which shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 3.40. Wind Chill Chart



Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) Effective 11/01/01

(Source: National Weather Service, http://www.nws.noaa.gov/om/winter/windchill.shtml)

Previous Occurrences

Table 3.1850 includes NCEI reported events and damages for the past 25 years. No crop or property damage was reported in the county in the last decade and there was only a $25,000 property damage claim in the last 25 years.

Table 3.50. NCEI Buchanan County Winter Weather Events Summary, 1995-2020

Type of Event	Inclusive Dates	Magnitude	# of Injuries	Property Damage	Crop Damages
Cold/Wind Chill	01/10/1997	Very cold arctic air, -30 degrees	0	$0	$0
Winter Storm	02/21/1997	2-4” of snow less than 24 hrs	0	$0	$0
Ice Storm	12/21/1997	Icy roads, rain, sub-freezing temperatures	0	$0	$0
Ice Storm	01/05/1998	¼” ice accumulation on roads	0	$0	$0
Heavy Snow	12/05/1999	6-11” of snow	0	$0	$0
Cold/Wind Chill	10/06/2000	Record low temperatures, 20 degrees	0	$0	$0
Cold/Wind Chill	12/10/2000	Arctic air, -9 degrees	1 (death)	$0	$0
Winter Storm	12/11/2000	7” of snow, freezing drizzle	0	$0	$0
Winter Storm	01/28/2001	4-6” of snow, Ice and snow mix	0	$0	$0
Winter Storm	02/09/2001	6-8” of snow, school closings	0	$0	$0
Heavy Snow	02/27/2001	6-9” of snow, school closings	0	$0	$0
Heavy Snow	01/30/2002	8-14” if snow, Ice over an inch	0	$0	$0
Winter Storm	12/09/2003	2-4” of snow, school closings	0	$0	$0
Winter Storm	01/25/2004	Freezing rain, ice accumulation ¼”	0	$0	$0
Winter Storm	02/05/2004	6-8” of snow	0	$0	$0
Ice Storm	01/04/2005	¼-¾” ice mixes with sleet	0	$0	$0
Winter Weather	01/20/2006	Sleet, freezing rain, snow 2-4” of snow	0	$0	$0
Ice Storm	11/29/2006	¼-½” ice, freezing rain/sleet	0	$0	$0
Frost/Freeze	04/04/2007	Low temps in April, damage to crops	0	$0	$0
Ice Storm	12/10/2007	Freezing rain, power loss	0	$25,000	$0
Winter Storm	12/22/2007	9″ of snow, road closures, accidents	0	$0	$0
Heavy Snow	02/05/2008	6-10″ of snow, snow drifts 3 ft.	0	$0	$0
Blizzard	12/07/2009	14″ of snow, 45 mph winds	0	$0	$0
Blizzard	12/24/2009	11-14″ of snow, strong winds	0	$0	$0
Winter Storm	02/21/2010	6-8” of snow, hazardous driving conditions	0	$0	$0
Winter Weather	01/10/2011	Up to 8.3” of snow	0	$0	$0
Winter Storm	01/19/2011	5-6” of snow, accident on I-29	4	$0	$0

Winter Storm	01/22/2011	6.5” of snow	0	$0	$0
Blizzard	02/01/2011	45 mph wind gusts, up to 7.5” of snow, visibility less than ¼ of a mile	0	$0	$0
Winter Storm	02/24/2011	Up to 5” of snow, blowing and drifting led to hazardous driving conditions	0	$0	$0
Winter Weather	11/09/2011	Up to 1” of snow	0	$0	$0
Winter Weather	02/13/2012	1.3” of snow	0	$0	$0
Blizzard	12/20/2012	High winds and 1-2” of snow fall	0	$0	$0
Winter Weather	01/29/2013	2.5” of snow	0	$0	$0
Winter Storm	02/21/2013	4-7” of snow	0	$0	$0
Heavy Snow	12/21/2013	6-9” of snow accumulation	0	$0	$0
Cold/Wind Chill	01/05/2014	Temperature of 30 degrees below zero due to a polar plunge	0	$0	$0
Winter Weather	01/06/2014	Several inches of snow fall and a fatal car crash	3 (1 death)	$0	$0
Heavy Snow	02/04/2014	Around 1’ of snow	0	$0	$0
Heavy Snow	01/31/2015	6-8” with numerous vehicle accidents and poor driving conditions, but no serious injuries were reported	0	$0	$0
Heavy Snow	02/01/2015	6-8” with numerous vehicle accidents and poor driving conditions, but no serious injuries were reported	0	$0	$0
Winter Storm	12/27/2015	Sleet and 3-4” of snow fall	0	$0	$0
Blizzard	11/25/2018	6-8” of snow fall and 41 mph gusts of wind for nearly 4 hours	0	$0	$0
Winter Storm	01/11/2019	7-9” of snow fall over first 12 hours light snow the next day resulted in an additional 1-2”	0	$0	$0
Winter Storm	12/15/2019	Light to moderate snow fall accumulating 6-8”	0	$0	$0
Winter Storm	01/10/2020	Freezing rain prior to 2-3” of snow fall	0	$0	$0
Totals			**8 (2 deaths)**	**$25,000**	**$0**

Source: NCEI, data accessed 04/15/2021
https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=ALL&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2010&endDate_mm=12&endDate_dd=30&endDate_yyyy=2020&county=BUCHANAN%3A21&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=29%2CMISSOURI

Winter storms, cold, frost and freezing take a toll on crop production in the planning area. **Table 3.51** shows the USDA’s Risk Management Agency payments for insured crop losses in the planning area as a result of cold conditions and snow for the past 10 years.

Table 3.51. Crop Insurance Claims Paid in Buchanan County as a Result of Cold Conditions and Snow 2010-2020

Crop Year	Crop Name	Cause of Loss Description	Insurance Paid ($)
2020	Corn	Cold Wet Weather	$9,794.50
2020	Soybeans	Cold Wet Weather	$2,951.50
2018	Wheat	Freeze	$1,033
2018	Wheat	Freeze	$11,639.03

2017	Soybeans	Cold Wet Weather	$3,610.00
2017	Soybeans	Cold Wet Weather	$764.00
2015	Corn	Cold Wet Weather	$6,451.00
2014	Corn	Cold Wet Weather	$8,222.00
2014	Soybeans	Cold Wet Weather	$55,901.00
2014	Soybeans	Other (Snow-Lighting)	$10,814.80
2014	Wheat	Cold Winter	$23,942.00
2014	Wheat	Cold Wet Weather	$5,464.00
2014	Wheat	Frost	$1,239.00
2013	Corn	Cold Wet Weather	$10,609.00
2013	Corn	Other (Snow-Lighting)	$374.00
2013	Soybeans	Cold Wet Weather	$618.00
2013	Wheat	Cold Wet Weather	$15,417.00
2013	Wheat	Frost	$7,921.00
2012	Wheat	Cold Wet Weather	$6,008.00
2012	Wheat	Frost	$2,575.00
2011	Corn	Cold Wet Weather	$7,016.00
2011	Corn	Cold Winter	$976.00
2011	Soybeans	Cold Wet Weather	$7,195.00
2011	Soybeans	Other (Snow-Lighting)	-$4,518.00
2010	Corn	Cold Wet Weather	$315.00
2010	Wheat	Cold Wet Weather	$1,224.00
2010	Wheat	Cold Winter	$1,167.00
Total			**$205,917.83**

Source: USDA Risk Management Agency, https://www.rma.usda.gov/data/cause

Probability of Future Occurrence

There were 46 severe winter weather events in Buchanan County from 1995-2020 (25 years). This equates to a 100% probability of occurrence in any given year with approximately 1.84 events in any given year.

Changing Future Conditions Considerations

A shorter overall winter season and fewer days of extreme cold may have both positive and negative indirect impacts. Warmer winter temperatures may result in changing distributions of native plant and animal species and/or an increase in pests and non-native species.

Warmer winter temperatures will result in a reduction of lake ice cover. Reduced lake ice cover impacts aquatic ecosystems by raising water temperatures. Water temperature is linked to dissolved oxygen levels and many other environmental parameters that affect fish, plant, and other animal populations. A lack of ice cover also leaves lakes exposed to wind and evaporation

during a time of year when they are normally protected.

As both temperature and precipitation increase during the winter months, freezing rain will be more likely. Additional wintertime precipitation in any form will contribute to saturation and increase the risk and/or severity of spring flooding. A greater proportion of wintertime precipitation may fall as rain rather than snow. (Source: https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf)

Vulnerability

Vulnerability Overview

Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. Ice can also become a problem on roadways if the air temperature is high enough that precipitation falls as freezing rain rather than snow.

Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. Extreme cold also increases the likelihood for ice jams on flat rivers or streams. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is hazardous to health and safety.

The National Institute on Aging estimates that more than 2.5 million Americans are elderly and especially vulnerable to hypothermia, with the isolated elders being most at risk. About 10 percent of people over the age of 65 have some kind of bodily temperature-regulating defect, and 3-4 percent of all hospital patients over 65 are hypothermic.

Also at risk are those without shelter, those who are stranded, or who live in a home that is poorly insulated or without heat. Other impacts of extreme cold include asphyxiation (unconsciousness or death from a lack of oxygen) from toxic fumes from emergency heaters; household fires, which can be caused by fireplaces and emergency heaters; and frozen/burst pipes.

Buildings with overhanging tree limbs are more vulnerable to damage during winter storms when limbs fall. In general heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to determine. Businesses can experience loss of income as a result of closure during winter storms.

Overhead power lines and infrastructure are also vulnerable to damages from winter storms. In particular ice accumulation during winter storm events damage to power lines due to the ice weight on the lines and equipment. Damages also occur to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses could include cost of repair or replacement of damaged facilities, and lost economic opportunities for businesses.

Secondary effects from loss of power could include burst water pipes in homes without electricity during winter storms. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard. Standard values for loss of

service for utilities reported in FEMA's 2009 BCA Reference Guide, the economic impact as a result of loss of power is $126 per person per day of lost service. In February 2021 the region experienced rolling black outs due to a three-week long cold wave across the Midwest which resulted in a system failure of the Texas power grid. The potential of such an outage highlights the region's reliability on out-of-state infrastructure. The impact of the power outages is still being determined at the time of drafting the 2022 Buchanan County Hazard Mitigation Plan.

According to the 2018 Mo Hazard Mitigation Plan, for areas north of the Missouri River, like Buchanan County, the probability of a snowstorm, ice storm, or extreme cold should be considered high due to historically higher average snowfall and lower average temperatures. However, the SRMT has the rated the severity as moderate due to local knowledge of the overall level of preparedness in this area. For example, homes and businesses may be better insulated due to the higher probability of severe cold relative to other areas. Also, people living in this area may be more likely to use snow tires or purchase four-wheel-drive vehicles. People living in this area may be more likely to maintain adequate supplies of home heating fuels and consider other preparedness measures. Local and state governments may have access to more snow clearing equipment and maintain adequate supplies of materials needed for snow or ice removal. School districts and businesses may be more likely to develop and use snow routes or establish closing procedures.

In the 2018 State Plan, the method used to determine vulnerability to severe winter weather across Missouri was statistical analysis of data from several sources: National Centers for Environmental Information (NCEI) storm events data (1996 to December 31, 2016), HAZUS Building Exposure Value data, housing density data from the U.S. Census (2015 ACS), and the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina. From the statistical data collected, five factors were considered in determining overall vulnerability to severe winter weather as follows: housing density, building exposure, social vulnerability, likelihood of occurrence, and average annual property loss. Based on natural breaks in the statistical data, a rating value of 1 through 5 was assigned to each factor. These rating values correspond to the following descriptive terms: 1) Low 2) Low-medium 3) Medium 4) Medium-high 5) High. **Table 3.52** lists exposure and loss amounts, as well as the medium low vulnerability rating for Buchanan County based on the abovementioned vulnerability criteria.

Table 3.52. Housing Density, Building Exposure, and SOVI Data by County

County	Total Building Exposure (Hazus)	Building Exposure Rating	Housing Density	Housing Density Rating	SOVI Ranking	SOVI Ranking Rating
Buchanan	$10,579,076,000	3	94.32	2	Medium	3

Potential Losses to Existing Development

During the 20-year period from 1995 to 2015, a total of $25,000 in property losses equates to $1,190.48 in average annual losses countywide. No additional property losses were recorded between 2015-2020, resulting in an annual average of $1,000.00 in property losses in Buchanan County for the last 25 years.

Previous and Future Development

Future commercial development can expect functional downtime and decreased revenues during periods of severe winter weather. Road construction in the county will increase the need for snow removal and salt to keep transportation lifelines open during periods of severe winter weather.

Hazard Summary by Jurisdiction

Severe winter weather can cause power outages and put structures at risk to fires when individuals in homes resort to using portable fuel heaters. The risk of extreme cold deaths and frostbite varies among segments of the populations. People over 65 and those living below the poverty level have an increased vulnerability to severe winter weather. **Table 3.53** includes information on populations over 65 and the percent living below the poverty level by jurisdiction.

Table 3.53. Population over 65 and Population Living Below the Poverty Level

Jurisdiction	% of Families Living Below Povery Level	% of Population Over 65
Buchanan County	12.3%	15.8%
Agency	6.5%	12.2%
Easton	14.3%	25%
Lewis & Clark Village	0%	16.9%
Rushville	11.6%	10.2%
St. Joseph	13.7%	15.5%

Source: American Community Survey, 2015-2019

Easton, St. Joseph, and Rushville have the largest percent of families living below the poverty level, while St. Joseph and Lewis and Clark Village have the highest percentages of residents over 65. Of Buchanan County's 33,501 occupied housing units, 31,152 are multi-units (92.9%) and 1,372 are mobile homes (4%) (Source: American Community Survey, 2015-2019).

According to the 2019 Missouri Statewide Homelessness Study, 204 homeless people make use of emergency shelters, transitional housing, safe haven housing or are literally unsheltered in the St. Joseph/Andrew, Buchanan, DeKalb Continuum of Care. In addition to the Salvation Army shelter, the Community Mission's Cold Weather Shelter is open from mid-December to the end of March, to shelter the homeless population from severe winter weather. (Source: https://www.mhdc.com/ci/Missouri%20Homelessness%20Study_Final_11.18.19.pdf)

Problem Statement

Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. People over 65 and those living in poverty and the homeless have an increased risk of hypothermia and frostbite due to extreme cold and wind chill.

Public works departments and road districts can develop snow removal plans and maintain adequate snow removal equipment and salt to quickly open roads after periods of heavy snow and freezing rain. The County and cities can work with local electric coops and utility companies

to develop vegetation management programs in rights of way to minimize damage to falling tree limbs laden with ice resulting from ice storms to minimize power outages throughout the county. In the event of a power outage, entities with space for emergency shelters, such as churches and schools, can shelter people if equipped with independent power supplies like generators.

3.4.11 Tornado

Hazard Profile

Hazard Description

National Weather Service (NWS) defines a tornado as “a violently rotating column of air extending from a thunderstorm to the ground.” It is usually spawned by a thunderstorm and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Often, vortices remain suspended in the atmosphere as funnel clouds. When the lower tip of a vortex touches the ground, it becomes a tornado. High winds not associated with tornadoes are profiled separately in this document in **Section 3.4.8**, Thunderstorm/High Wind/Hail/Lightning.

Essentially, tornadoes are a vortex storm with two components of winds. The first is the rotational winds that can measure up to 500 miles per hour, and the second is an uplifting current of great strength. The dynamic strength of both these currents can cause vacuums that can overpressure structures from the inside.

Although tornadoes have been documented in all 50 states, most of them occur in the central United States. The unique geography of the central United States allows for the development of thunderstorms that spawn tornadoes. The jet stream, which is a high-velocity stream of air, determines which area of the central United States will be prone to tornado development. The jet stream normally separates the cold air of the north from the warm air of the south. During the winter, the jet stream flows west to east from Texas to the Carolina coast. As the sun “moves” north, so does the jet stream, which at summer solstice flows from Canada across Lake Superior to Maine. During its move northward in the spring and its recession south during the fall, the jet stream crosses Missouri, causing the large thunderstorms that breed tornadoes.

Tornadoes spawn from the largest thunderstorms. The associated cumulonimbus clouds can reach heights of up to 55,000 feet above ground level and are commonly formed when Gulf air is warmed by solar heating. The moist, warm air is overridden by the dry cool air provided by the jet stream. This cold air presses down on the warm air, preventing it from rising, but only temporarily. Soon, the warm air forces its way through the cool air and the cool air moves downward past the rising warm air. This air movement, along with the deflection of the earth’s surface, can cause the air masses to start rotating. This rotational movement around the location of the breakthrough forms a vortex, or funnel. If the newly created funnel stays in the sky, it is referred to as a funnel cloud. However, if it touches the ground, the funnel officially becomes a tornado.

A typical tornado can be described as a funnel-shaped cloud that is “anchored” to a cloud, usually a cumulonimbus that is also in contact with the earth’s surface. This contact on average lasts 30 minutes and covers an average distance of 15 miles. The width of the tornado (and its path of destruction) is usually about 300 yards. However, tornadoes can stay on the ground for upward of 300 miles and can be up to a mile wide. The National Weather Service, in reviewing tornadoes occurring in Missouri between 1950 and 1996, calculated the mean path length at 2.27 miles and the mean path area at 0.14 square mile.

The average forward speed of a tornado is 30 miles per hour but may vary from nearly stationary to 70 miles per hour. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Tornadoes are most likely to occur in the afternoon and evening but have been known to occur at all hours of the day and night.

Geographic Location

In contrast to thunderstorms, which can cause widespread damage, tornadoes represent a hazard that is a more defined area. With this tradeoff of a smaller impact area, the damage will be much more catastrophic. The geographic location in which these tornadoes have occurred in the past will be discussed in previous occurrences. The numbers on the markers correspond with the class of tornado.

Due to the nature of tornadoes, they can occur anywhere in Buchanan County.

Strength/Magnitude/Extent

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour and damage paths can be more than one mile wide and 50 miles long. Tornadoes have been known to lift and move objects weighing more than 300 tons a distance of 30 feet, toss homes more than 300 feet from their foundations, and siphon millions of tons of water from water bodies. Tornadoes also can generate a tremendous amount of flying debris or "missiles," which often become airborne shrapnel that causes additional damage. If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, roofs, and walls. However, the less spectacular damage is much more common.

Tornado magnitude is classified according to the EF- Scale (or the Enhance Fujita Scale, based on the original Fujita Scale developed by Dr. Theodore Fujita, a renowned severe storm researcher). The EF- Scale (see **Table 3.54**) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F Scale was implemented in the U.S. on February 1, 2007.

Table 3.54. Enhanced F Scale for Tornado Damage

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest ¼-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Source: The National Weather Service, www.spc.noaa.gov/faq/tornado/ef-scale.html

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3.55**. The damage descriptions are summaries. For the actual EF scale, it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator. Information on the Enhanced Fujita Scale's damage indicators and degrees or damage is located online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 3.55. Enhanced Fujita Scale with Potential Damage

Enhanced Fujita Scale			
Scale	Wind Speed (mph)	Relative Frequency	Potential Damage
EF0	65-85	53.5%	Light. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are always rated EF0).
EF1	86-110	31.6%	Moderate. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	10.7%	Considerable. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes complete destroyed; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	136-165	3.4%	Severe. Entire stores of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some
EF4	166-200	0.7%	Devastating. Well-constructed houses and whole frame houses completely levelled; cars thrown and small missiles generated.
EF5	>200	<0.1%	Explosive. Strong frame houses levelled off foundations and swept away; automobile-sized missiles fly through the air in excess of 300 ft.; steel reinforced concrete structure badly damaged; high rise buildings have significant structural deformation; incredible phenomena will occur.

Source: NOAA Storm Prediction Center, http://www.spc.noaa.gov/efscale/ef-scale.html

Enhanced weather forecasting has provided the ability to predict severe weather likely to produce tornadoes days in advance. Tornado watches can be delivered to those in the path of these storms several hours in advance. Lead time for actual tornado warnings is about 30 minutes. Tornadoes have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornadoes may not be visible on the ground if they occur after sundown or due to blowing dust or driving rain and hail.

Previous Occurrences

Table 3.56 includes NCEI reported tornado events and damage since 1993 in the planning area. Prior to that date, only destructive tornadoes were recorded. It is necessary to go back as far as possible because of the random and intermittent nature of tornado events.

There are limitations to the use of NCEI tornado data that must be noted. For example, one tornado may contain multiple segments as it moves geographically. A tornado that crosses a county line or state line is considered a separate segment for the purposes of reporting to the NCEI. Also, a tornado that lifts off the ground for less than 5 minutes or 2.5 miles is considered a separate segment. If the tornado lifts off the ground for greater than 5 minutes or 2.5 miles, it is considered a separate tornado. Tornadoes reported in Storm Data and the Storm Events Database are in segments.

Table 3.56. Recorded Tornadoes in Buchanan County, 1993 – 2020

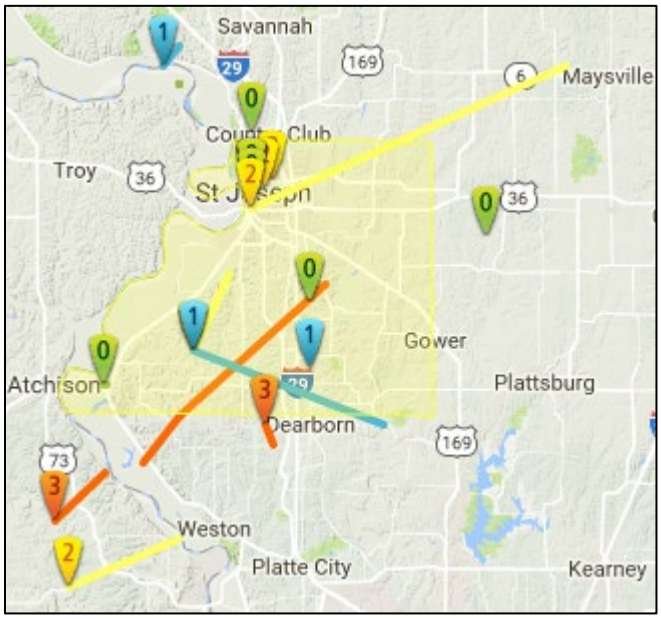
Date	Beginning Location	Ending Location	Length (miles)	Width (yards)	F/EF Rating	Death	Injury	Property Damage	Crop Damages
7/4/1995	N St. Joseph	---	0.1	10	----	0	0	$12,000	0
9/20/2001	St. Joseph	St. Joseph	0.1	0.2	EF0	0	0	0	0
9/20/2001	St. Joseph	St. Joseph	0.1	0.2	EF0	0	0	0	0
9/20/2001	St. Joseph	St. Joseph	0.1	0.2	EF0	0	0	0	0
9/20/2001	Easton	Easton	0.1	0.2	EF0	0	0	0	0
5/29/2004	DeKalb	DeKalb	5	400	EF3	0	0	0	0
5/29/2004	Agency	Agency	0.2	50	EF0	0	0	0	0
6/4/2005	St. Joseph	St. Joseph	7.5	50	EF0	0	0	$300,000	0
4/10/2008	St. Joseph	St. Joseph	0.33	30	EF0	0	0	$70,000	0
6/29/2014	Armour	Armour	.25	25	EF0	0	0	0	0
5/25/2020	Halls	Halls	.01	20	EF0	0	0	0	0
	Total							$382,000	

Source: National Centers for Environmental Information, http://www.NCEI.noaa.gov/stormevents/

There were 11 tornado events recorded in the NCEI database from 1993-2020 for Buchanan County. No damages reported from these events resulted in no deaths, injuries, or crop damage. There was $382,000 in property damage.

Figure 3.41 shows historic tornado paths in the planning area.

Figure 3.41. Buchanan County Map of Historic Tornado Events



Source: Missouri Tornado History Project, http://www.tornadohistoryproject.com/tornado/Missouri

The USDA Risk Management Agency has no insurance payments in Buchanan County for crop

damages as a result of tornadoes from 2012-2020.

Probability of Future Occurrence

According to NCEI data, 14 tornadoes have occurred during the 27-year period from 1995 to 2020, resulting in a probability percentage of 52% chance of a tornado of any magnitude event in the planning area in any given year.

Changing Future Conditions Considerations

According to the State Plan, scientists do not know how the frequency and severity of tornadoes will change. Research published in 2015 suggests that changes in heat and moisture content in the atmosphere, brought on by a warming world, could be playing a role in making tornado outbreaks more common and severe in the U.S. The research concluded that the number of days with large outbreaks has been increasing since the 1950s and that densely concentrated tornado outbreaks are on the rise. It is notable that the research shows that the area of tornado activity is not expanding, but rather the areas already subject to tornado activity are seeing the more densely packed tornadoes. Because Missouri experiences, on average, around 39.6 tornadoes a year, such research is closely followed by meteorologists in the state.

Vulnerability

Vulnerability Overview

Buchanan County is in Northwest Missouri, where the high frequency of dangerous and destructive tornadoes has led to the region being referred to as "Tornado Alley." The map below (**Figure 3.42**) illustrates areas where dangerous tornadoes have historically occurred.

Figure 3.42. Tornado Alley in the U.S.

Source: http://www.tornadochaser.net/tornalley.html

The method used in the 2018 State Plan to determine vulnerability to tornadoes across Missouri included statistical analysis of data from several sources: HAZUS building exposure value data, population density and mobile home data from the U.S. Census (2015 ACS), the calculated Social Vulnerability Index for Missouri Counties from the Hazards and Vulnerability Research

Institute in the Department of Geography at the University of South Carolina, and storm events data (1950 to December 31, 2016) from the National Centers for Environmental Information (NCEI). It is important to realize that one limitation to the NCEI data is that many tornadoes that might have occurred in uninhabited areas, as well as some in inhabited areas, may not have been reported. The incompleteness of the data suggests that it is not appropriate for use in parametric modeling. In addition, NOAA data cannot show a realistic frequency distribution of different Fujita scale tornado events, except for recent years. Thus a parametric model based on a combination of many physical aspects of the tornado to predict future expected losses was not used. The statistical model used for this analysis was probabilistic based purely on tornado frequency and historic losses. It is based on past experience and forecasts the expected results for the immediate or extended future. From the statistical data collected, six factors were considered in determining overall vulnerability to tornadoes as follows: building exposure, population density, social vulnerability, percentage of mobile homes, likelihood of occurrence, and annual property loss. Based on natural breaks in the statistical data, a rating value of 1 through 5 was assigned to each factor. These rating values correspond to the following descriptive terms:

1) Low
2) Low-medium
3) Medium
4) Medium-high
5) High

Additional details on the methodology can be found in the 2018 State Plan, starting on page 3.337.

Table 3.57 below provides the building exposure, population density, SOVI index ranking and percentage of mobile homes by county and the associated vulnerability rating. Based on this data, Buchanan County has a medium vulnerability to tornadoes.

Table 3.57. Building Exposure, Population Density, SOVI, and Mobile Home Data in Buchanan County

County	Total Building Exposure (Hazus)	Exposure Rating	Population Density	Population Rating	SOVI Index Ranking	SOVI Rating	Percent Mobile Homes	Mobile Home Rating
Buchanan	$10,579,076,000	3	218.37	2	Medium	3	4.5	1

Source: Missouri State Plan 2018, pg. 3.377

Potential Losses to Existing Development

Based on NCEI historical damage data from the years 1993-2020, property damages totaled $382,000, which equates to an average annual loss of $14,148.15. **Table 3.58** below, taken from the 2018 State Plan, shows the overall vulnerability analysis and the total overall vulnerability rating for tornadoes, including a likelihood of occurrence rating and an annualized property loss total.

Table 3.58. Likelihood of Occurrence, Annual Property Loss, and Overall Vulnerability Rating for Tornadoes

County	Total Number of Tornadoes	Likelihood of Occurrence	Likelihood of Occurrence Rating	Total Annualized Property Loss	Total Annualized Property Loss Rating	Overall Vulnerability Rating	Overall Vulnerability Rating Description

Buchanan	24	.358	3	$65,153	1	13	Medium

Source: Missouri State Plan 2018, pg. 3.382

The most important loss is that of human life, and while there are no recorded deaths attributed to tornadoes in the planning area, reports of injuries from tornadoes occurred in Buchanan County in 1965 (two injuries); 1971 (two injuries); 1973 (14 injuries); and 1985 (three injuries) from tornado events.

Previous and Future Development

Since the population in Buchanan County is only slightly declining, the exposure to property damage and loss of life or injury, remains the same as in recent years. Residential development in the unincorporated areas of the county could impact early warning systems, such as sirens, from reaching those populations in more rural locations.

Hazard Summary by Jurisdiction

In Buchanan County, a tornado could occur due to its location in Tornado Alley and historical precedence. The county also has an at-risk population of homes that are valued below $50,000 (2,111) and mobile homes (1,656) that are at a higher risk yet (Source: ACS 5-year 2015-2019). These homes are at risk because they could have weak structural protection from high winds associated with tornadoes due to their low value, disrepair, or possible lack of a foundation.

Homes that are over 25 years old also face the risk of older building codes and deteriorating structure. A tornado, of any magnitude, could have a large, adverse impact on these homes. Because a significant number of homes in Buchanan County are over 25 years old, the impact of a tornado would be substantial. Please see **Table 3.21** for the ages of homes of jurisdictions in Buchanan County.

A tornado event could occur anywhere in the planning area, but some jurisdictions, such as St. Joseph, would suffer heavier damages because of the age of the housing, concentration of buildings and higher number of mobile homes (Source: www.factfinder.census.gov).

The county has 17 warning sirens to provide early warning to people who may be outdoors during the onset of severe weather, and all but one is activated by the St. Joseph Police/Fire Communications Center. The siren at Lewis & Clark Village is activated by the Atchsion, Kansas Communications Center because of its close proximity to Atchison, Kansas. Some of the sirens are owned by individual cities and some are owned by Buchanan County but all are maintained by the county and have regular service.

The county and City of St. Joseph share Nixle, a mass texting alert system, as another tool to provide emergency warnings to the public.

School districts in the planning area all conduct tornado drills per state statute, all have public address intercoms, and have NOAA weather radios. Buchanan R-IV built a new vocation-agriculture building in 2014 that doubles as a safe room. Mid-Buchanan School District has a safe room constructed to FEMA standards, according to district officials, and an indoor public address system with tones for fire and tornado. St. Joseph School District has district-wide alert systems in place and utilizes social media and a district application as part of its emergency warning preparedness. SJSD does not have any safe rooms.

Problem Statement

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour and damage paths can be more than one-mile wide and 50 miles long. According to the NCEI, over the past 27 years there were 14 tornado events in Andrew County, resulting in $385,000 in property damage. Information in the State Plan indicates that Buchanan County has a low vulnerability to tornadoes based on frequency of occurrence and previous damages. However, the Risk Assessment survey taken by county residents noted tornadoes as a top concern.

The risk of property damage, injury, and death in the county can be mitigated by constructing FEMA safe rooms in facilities that house vulnerable populations such as nursing homes, government buildings, and schools. In addition, identifying safe refuge areas in public buildings, nursing homes and other facilities that house vulnerable populations that do not have a safe room could reduce risk. Retrofitting school district facilities with protective filming of windows and installation of blast proof doors will provide more protection for students and staff at school facilities. Additional warnings and alerts will also provide the public and schools more time to take cover during a tornado. In addition, public safety fairs provide an opportunity to disseminate information to homeowners about individual safe room construction in homes. Cities can adopt or update and enforce IBC 2012 building codes that include construction techniques such as roof tie down straps for mobile homes to mitigate damage to future development.

The unincorporated area of Halls doesn’t have a tornado siren and could benefit from the addition of one. The county can promote the use of NOAA weather radios and conduct public education and outreach activities to increase awareness of tornado risk. A campaign to increase those signed up to receive text alerts through the Nixle system could also mitigate the risk of people being unaware of impending severe weather.

3.4.12 (Urban/Structural and Wild) Fires

Hazard Profile

Hazard Description

The incident types considered for urban/structural fire include all fires in the following categories: 1) general fires, 2) structure fire, 3) fire in mobile property used as a fixed structure, and 4) mobile property (vehicle) fire. The fire incident types for wildfires include: 1) natural vegetation fire, 2) outside rubbish fire, 3) special outside fire, and 4) cultivated vegetation, crop fire.

The Forestry Division of the Missouri Department of Conservation (MDC) is responsible for protecting privately owned and state-owned forests and grasslands from wildfires. To accomplish this task, eight forestry regions have been established in Missouri for fire suppression. The Forestry Division works closely with volunteer fire departments and federal partners to assist with fire suppression activities. Currently, more than 900 rural fire departments in Missouri have mutual aid agreements with the Forestry Division to obtain assistance in wildfire protection if needed.

Presently, the Missouri Division of Fire Safety (MDFS) investigative staff includes one law enforcement manager, two fire investigator supervisors, and multiple field investigators. This staff must cover all 114 counties and is dedicated to assisting any local or state agency and conducting quality investigations. The investigators are trained in several fields of expertise, including arson for fraud, explosives recognition, and post-blast training.

Most of Missouri fires occur during the spring season between February and May. The length and severity of wildland fires depend largely on weather conditions. Spring in Missouri is usually characterized by low humidity and high winds. These conditions result in higher fire danger. In addition, due to the recent lack of moisture throughout many areas of the state, conditions are likely to increase the risk of wildfires. Drought conditions can also hamper firefighting efforts, as decreasing water supplies may not prove adequate for firefighting. It is common for rural residents burn their garden spots, brush piles, and other areas in the spring. Some landowners also believe it is necessary to burn their forests in the spring to promote grass growth, kill ticks, and reduce brush. Therefore, spring months are the most dangerous for wildfires. The second most critical period of the year is fall. Depending on the weather conditions, a sizeable number of fires may occur between mid-October and late November.

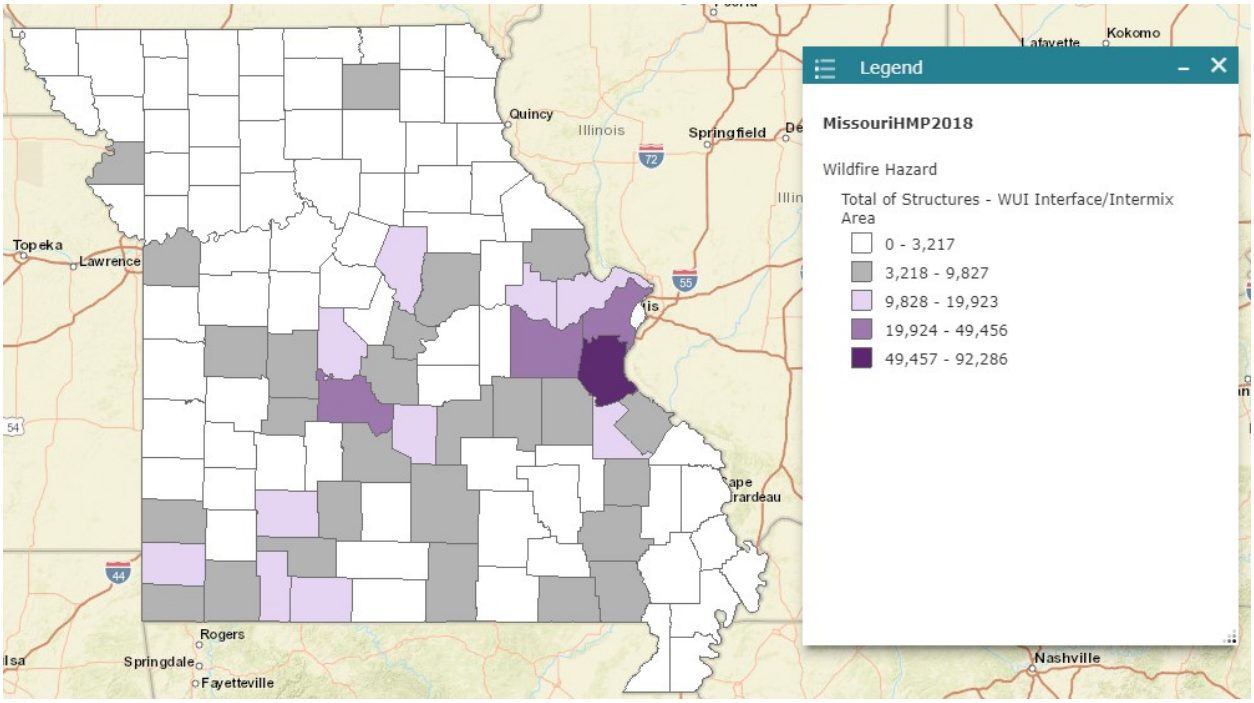
Geographic Location

Wildlife Urban Interface (WUI) refers to the zone of transition between unoccupied land and human development and needs to be defined in the plan. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas. **Figure 3.43** demonstrates growth in WUI over a 20-year period in Buchanan County, with considerable intermix growth (orange) two kilometers northeast of Kenmoor, MO and interface growth (yellow) east of Richie, MO towards State Route V SW covering State Route 371. **Figure 3.44** shows the number of structures Buchanan County has present in WUI regions in comparison to other counties.

Figure 3.43. Wildlife Urban Interface Changes in Buchanan County 1990-2010

Source: http://silvis.forest.wisc.edu/data/wui-change/

Figure 3.44. Structures in WUI Interface/Intermix Areas by County



Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=d97d80d5cff04996bff54b2250e47d83

Strength/Magnitude/Extent

Wildfires damage the environment, killing some plants and occasionally animals. Firefighters have been injured or killed, and structures can be damaged or destroyed. The loss of plants

can heighten the risk of soil erosion and landslides. Although Missouri wildfires are not the size and intensity of those in the Western United States, they could impact recreation and tourism in and near the fires.

Wildland fires in Missouri have been mostly a result of human activity rather than lightning or some other natural event. Wildfires in Missouri are usually surface fires, burning the dead leaves on the ground or dried grasses. They do sometimes “torch” or “crown” out in certain dense evergreen stands like eastern red cedar and shortleaf pine. However, Missouri does not have the extensive stands of evergreens found in the Western US that fuel the large fire storms seen on television news stories.

While very unusual, crown fires can and do occur in Missouri native hardwood forests during prolonged periods of drought combined with extreme heat, low relative humidity, and high wind. Tornadoes, high winds, wet snow and ice storms in recent years have placed a large amount of woody material on the forest floor that causes wildfires to burn hotter and longer. These conditions also make it more difficult for fire fighters suppress fires safely.

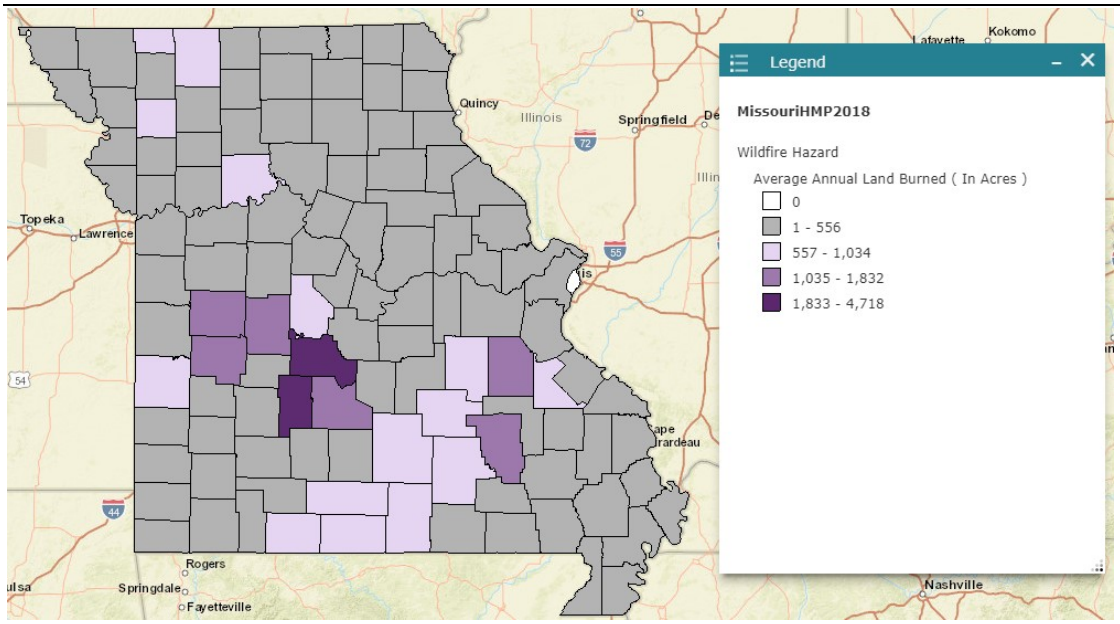
As defined by the National Fire Protection Agency (NFPA), a structure fire is defined as “any fire inside, on, under, or touching a structure.” Factors that can influence the extent and damage of a structural fire include:

- Structure type and age
- Building codes addressing fire prevention, detection, and extinguishments
- Density of development
- Presence of flammable substances
- Fire department response speed
- Firefighting technology
- Training of local fire management officials and firefighters
- Public information about common fire hazards and use of smoke alarms
- Notification techniques and procedures
- Water Pressure & Availability

There are additional economic consequences related to this hazard. Urban fires and explosions may result in lost wages due to temporarily or permanently closed businesses, destruction and damage involving business and personal assets, loss of tax base, recovery costs, and lost investments in destroyed property. In addition to this are of course the immediate need that victims of structural fires may face beyond medical attention, including addressing concerns over food, shelter, and healthcare. As non-profits are almost always seen as the source of response to these concerns, their capacity to absorb this burden is of a critical concern.

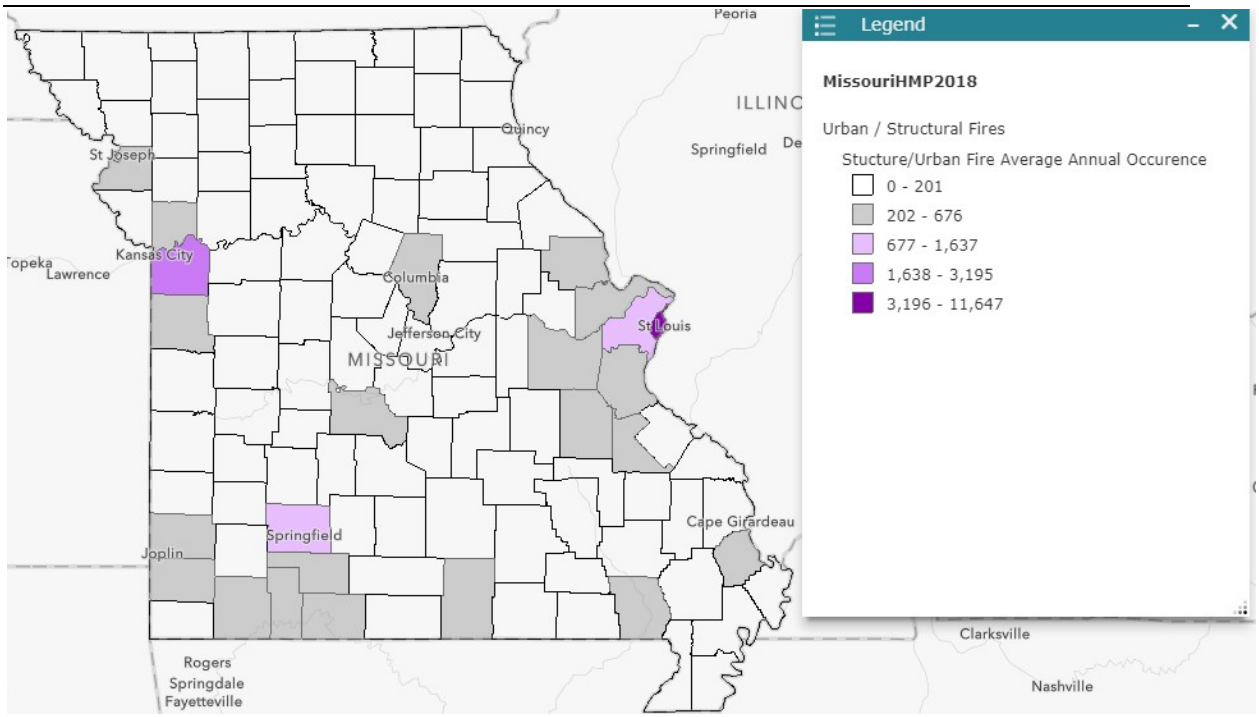
For some context on the danger these hazards present, **Figure 3.45** shows the average number of acres burned per year in each county in Missouri and **Figure 3.46** shows the average number of structure/urban fires per year in each Missouri county.

Figure 3.45. Average Acres Burned Per Year in Missouri Counties



Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=d97d80d5cff04996bff54b2250e47d83

Figure 3.46. Average Annual Structure/Urban Fires in Missouri Counties



Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=d97d80d5cff04996bff54b2250e47d83

Previous Occurrences

Table 3.59 records the average number of wildfire incidents recorded by the MDC that occurred over the last decade from 2010-2019 and the average number of acres burned each year.

Table 3.59. Wildfire Incidents and Avg. Acres Burned in Buchanan County (2010-2019)

Year	Total Incidents	Total Acres Burned	Avg. Acres Burned
2010	45	28	.62
2011	43	107	2.48
2012	65	482	7.42
2013	19	221	11.63
2014	39	307	7.87
2015	30	180	6
2016	14	164	11.71
2017	19	73.5	3.87
2018	23	155.1	6.74
2019	3	8.74	2.91

Source: https://mdc12.mdc.mo.gov/Applications/MDCFireReporting/Home/FireReportSearch

The largest wildfire of the last decade occurred November 29, 2013 near Dekalb, MO at SW 41st at SW Crockett Rd where approximately 80-85 acres of unharvested corn were burned. The fire burned for over 12 hours and the cause was unknown.

Two of the largest structural/urban fires in Buchanan County both happened in the fall of 2016 in St. Joseph. According to a *St. Joseph News-Press* article titled, “Cleanup Continues After Night of Fires,” the first of the two large fires occurred on the night of October 21, 2016 in the downtown area near 310 Sylvanie Street. The fire engulfed and caused the collapse of a five-story structure and a smaller building next to it. Smoke damage occurred to a neighboring furniture warehouse and nearby vehicles and the on and off-ramps to I-229 were closed until the next morning. Embers caught in the wind also led to mobilized efforts to watch the roofs of nearby large structures, including the evacuation of the Radisson Hotel for an hour that evening. Power outages were also reported in the area. Overall, the fire was contained within two hours and no injuries were reported.

The second incident occurred on November 21, 2016 according to a *St. Joseph News-Press* article titled “Blaze Destroys Downtown Building with History.” During this incident, the historic Pioneer Building in Downtown St. Joseph caught fire in the morning and firefighters from the Savannah Fire Department and Rosecrans Memorial Airport were deployed to assist local efforts. Ultimately a smaller building behind the Pioneer Building caught fire, but no extensive damage was reported beyond this and the initial structure fire. The cause of this fire was unknown.

Probability of Future Occurrence

Using data from **Table 3.59** and dividing the 300 fires over 10 years from 2010-2019, there is 30% chance of a wildfire happening in any given year in Buchanan County. Stretching across the same period of time if a wildfire does occur it will likely burn 6.13 acres on average. Evens are more likely to occur in wildfire-prone areas experiencing new or additional development.

The Missouri Hazard Mitigation Viewer lists the average number of urban/structural fires occurring annually in Buchanan County as 453. The most determining factor in the future rate of urban/structural fires is the amount of aging structures in the county which may not be up to modern fire code standards. Referring to **Figure 3.20** under **Extreme Temperatures (3.4.1**), one can see there are approximately 1,200 structures in St. Joseph that are over 80 years old and could be potential fire risks.

Changing Future Conditions Considerations

The 2018 Missouri Hazard Mitigation Plan describes the future of wildfire activity as being tied to the relationship between prescribed seasonal burning and forest understory growth. As temperatures increase, the prescribed burning season will shorten and this will lead to a growth in understory vegetation that could fuel future wildfires. Increased droughts will also dry out vegetation, further fueling future wildfires.

The 2018 plan indicates that changes in the climate should not impact the propensity for urban/structural fires greatly as these hazards are more tied to human activity than climate.

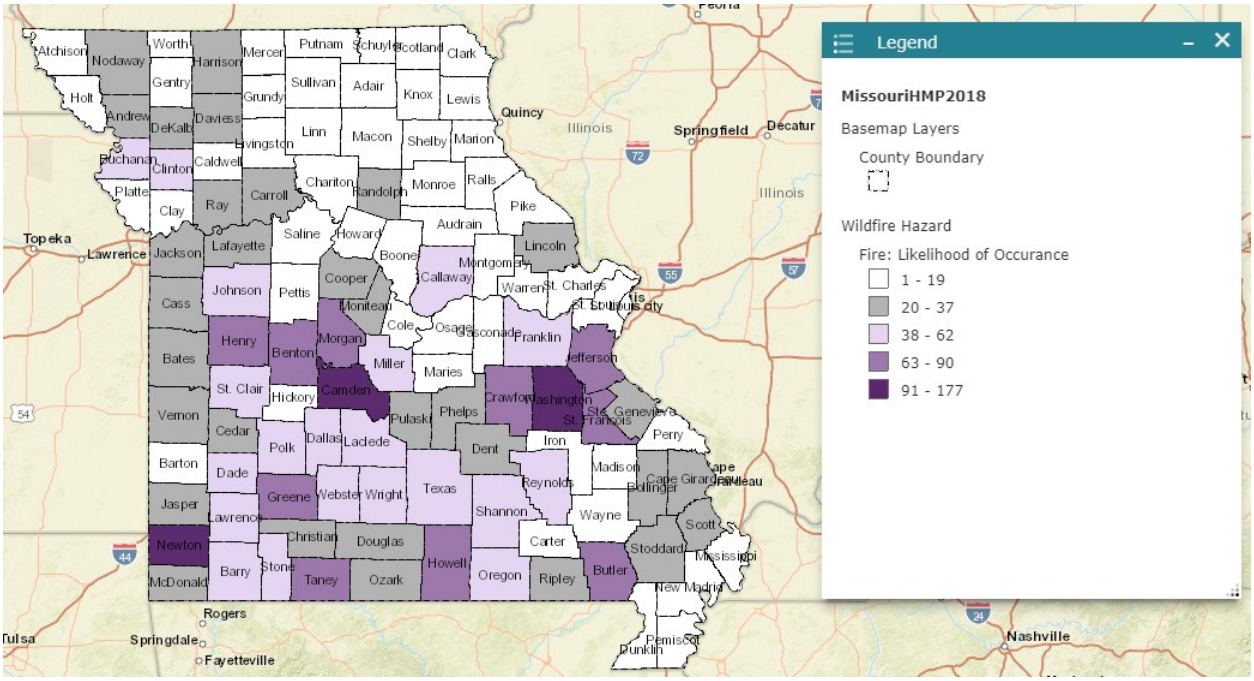
Vulnerability

Vulnerability Overview

Using the data reported by the MDC's Wildfire Reporting in **Table 3.59**, there were 300 reported wildfires in Buchanan County from the decade of 2010-2019. Using the methodology from the 2018 MO Hazard Mitigation Plan uses for estimating likelihood of occurrence (# of occurrences/# of years), Buchanan County is likely to have 30 wildfire incidents in a given year. **Figure 3.47** from the 2018 State Plan demonstrates that in comparison to the other counties in Northwest region, Buchanan County is at a greater risk for wildfire occurrence.

Due to lack of publicly available data on structure fires in Buchanan County, the main point of reference will be the 2018 State Plan, using data from 2002-2012. This plan rated planning areas across six categories, each on a 5-point scale. Overall, Buchanan County scored 19-points, putting it at a Medium-High vulnerability (See **Table 3.60**). Due to the amount of fire departments in Missouri that are staffed mostly with volunteers, roughly 80 percent, the impact of a fire to a single-story building in a small community may be as great as that of a larger fire to a multi-story building in a large city.

Figure 3.47. Likelihood of Wildfire Occurrence



Source: https://amecei.maps.arcgis.com/apps/webappviewer/index.html?id=d97d80d5cff04996bff54b2250e47d83

Table 3.60. Buchanan County Urban/Structural Fire Vulnerability 2002-2012

Factor Considered	Vulnerability Measure	Vulnerability Rating
Building Exposure ($)	$10,579,076,000	3/5
Housing Density (# per sq. mile)	94.32	2/5
Social Vulnerability Index Rating	Medium	3/5
Likelihood of Occurrence (# / 11 years)	453	4/5
Total Annualized Property Loss	$4,742,961	2/5
# of Deaths Injuries	90	5/5
	Overall Vulnerability Rating:	19 (Medium-High)

Source: 2018 Missouri State Hazard Mitigation Plan

Potential Losses to Existing Development

As seen in **Table 3.59**, Buchanan County has experienced an average of 30 acres of wildfire destruction per year over the last decade. As indicated in **Figure 3.45**, while the county may not experience any greater amount of acreage burned compared to surrounding counties in Northwest Missouri, the county is still at a higher risk of seeing wildfires occur each year compared to surrounding counties.

Buchanan County is at an increased risk of seeing urban/structural fires occur compared to surrounding counties (See **Figure 3.46**). When they do occur, the county is inclined to see higher losses of property and potentially life due to fact that there is a more urban environment present and therefore a greater housing density. Historic properties may be especially at risk due to their age, potential to be behind on modern fire codes, and their proximity to other such structures.

Impact of Previous and Future Development

WUI interface grew significantly in Buchanan County over the 20-year period from 1990-2010 (See **Figure 3.43**). As WUI interface regions grow, so will the chances of a wildfire occurring in these regions, which will also increase the risk for larger wildfires.

Structural fires are impacted solely by human development. While the climate may change, the only impact this can have on the propensity for urban/structural fires will be how human behavior is impacted. An example of this would be if there is an increased strain on the electrical grid which leads to a greater chance for electrical fires, or if individuals seeking shelter from the cold are more likely to start indoor fires. The main cause for concern and risk assessment should be focused on older, larger structures, as they may be more likely to catch fire and impact surrounding structures of a similar nature, and areas with a generally higher housing density, such as St. Joseph.

Hazard Summary by Jurisdiction

Table 3.61 summarizes wildfire and structural fire occurrence rates for 2020 as reported by multiple fire departments throughout the county and their individual response capabilities.

Table 3.61. 2020 Fire Protection District Incident Response Rates and Staffing

District Name	Total Staff	Reports to NFIRS?	General Fire	Structural Fire	Mobile Property Fixed Structure	Vehicle Fire
South Central Buchanan	23 (Volunteer)	Yes	4	3	-	4
St. Joseph	130 (Paid)	Yes	753	147	-	83
Dearborn Area	15 (Volunteer)	Yes	27	5	1	9
Southwest Buchanan	18 (Volunteer)	Yes	116 (Mostly Wildland)	-	-	-
			Natural Vegetation Fire	**Cultivated Vegetation Fire**	**Outside Rubbish Fire**	**Special Outside Fire**
South Central Buchanan	-	-	9	1	7	-
St. Joseph	-	-	46	-	432	9
Dearborn Area	-	-	2	9	2	-

Source: Buchanan County Fire District Survey, 2021

Table 3.62 summarizes the structure exposure for the county and its jurisdictions for wildfires. Communities with more WUI area will be at a greater risk of wildland fires. The structure counts and values were derived by overlaying Buchanan County Assessor parcels with the WUI census block data. The exposure amount indicates the dollar amount of assets at risk and the variability of vulnerability from place to place.

Table 3.62. Wildfire Structure Exposure by Jurisdiction

Jurisdiction	Acres	Residential	Commercial	Agriculture	Total Exposure
Buchanan County	19,774	$312,638,790	$99,910,270	$10,655,150	$423,204,210
Agency	261	$315,940	$0	$45,500	$361,440
DeKalb	88	$1,136,820	$20,000	$22,950	$1,179,770
Easton	12	$123,440	$0	$6,780	$130,220
Lewis and Clark Village	0	$0	$0	$0	$0
Rushville	183	$174,800	$0	$11,180	$185,980
St. Joseph	6,614	$230,984,210	$74,694,760.00	$897,250	$306,576,220

Source: http://silvis.forest.wisc.edu/maps/wui_main

Table 3.63 lists the seven schools located in WUI zones with enrollment. The Noyes Elementary School facility in St. Joseph, as of 2020, has closed except for administrative purposes since the last plan update. The St. Joseph School District has four schools located in interface area. The risk of wildfire for these school facilities is mitigated by fire breaks created by roads, parking lots, and landscaping.

Table 3.63. Schools Located in the Wildland—Urban Interface and Intermix Areas

School Name	School District	Location	Student Enrollment
Lindbergh Elementary	St. Joseph School District	2812 St. Joseph Avenue, St. Joseph	515
St. Joseph Cathedral	Private	518 N. 11th Street, St. Joseph	282
DeKalb, Jr-Sr High	Buchanan R-IV School District	702 Main Street, DeKalb	120
Benton High	St. Joseph School District	5655 S. 4th Street, St. Joseph	702
Hyde Elementary	St. Joseph School District	509 Thompson, St. Joseph	342
Hosea Elementary	St. Joseph School District	6401 Gordon Street, St. Joseph	489

Source: https://apps.dese.mo.gov/MCDS/home.aspx?categoryid=2&view=2

Overall, according to 2010 county numbers from the University of Wisconsin SILVIS Lab, Buchanan County has the following exposure from wildfires:

- 76.2 km (7.1%) of land in Buchanan county exists in a WUI zone
- 7,502 units (19.5%) of housing exists in a WUI zone
- 16,463 people (18.5% of population) live in a WUI zone

Problem Statement

Wildfire occurrence is frequent within Buchanan County. These events can destroy, damage, and threaten structures in hazard prone areas. Populations and structures in WUI areas of the county have an increased risk to wildfires due to the level of fuel mixed with structures. St. Joseph and DeKalb have the highest exposure of risk to wildfire in Buchanan County. Cities that have adopted landscape ordinances can include fire safe landscape design requirements in these areas. The school districts that have facilities located in WUI areas have a slightly elevated risk of wildfire due to the proximate amount of fuel present.

Surveys from county fire districts yielded insights into ongoing programs and desired improvements in fire education and safety. The St. Joseph Fire District engages in a number of civic education programs including fire extinguisher training, smoke detector installation, and even the use of a “Patches and Pumper” robotic dog puppet to educate children. The Dearborn district teaches courses in Fire I and Fire II and conducts a cover fire class every March.

In terms of improvements, increasing outreach to community groups is a desire across every district, particularly to community churches and organizations. Technical training is also desired including using burn trailers, towers, practice with simulated car fires, propane fires, basic hazmat, and education in DOT highway safety. The most pressing risks acknowledged by the districts are a need for improved education on electrical fire safety, heating source use and awareness, and best burning practices.

Possible solutions for the county and its communities could include review of the land use code and/or local ordinance to address density and quantity of development within the WUI area, as well as emergency access, landscaping and water supply. Another possible solution could include promotion of fire-resistant construction materials and landscape design techniques to mitigate the risk to wildfire in future development. Information about these materials and techniques are included in the MDC publication, “Living with Wildfire.” Including this information to education and awareness programs for the public may potentially mitigate wildfire damage in the county. The City of St. Joseph has the highest risk and exposure to structural fire.

4 MITIGATION STRATEGY 4.1
4.1 Goals 4.1
4.2 Identification and Analysis of Mitigation Actions 4.2
4.3 Implementation of Mitigation Actions 4.6

44 CFR Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section presents the mitigation strategy updated by the Mitigation Planning Committee (MPC) based on the [updated] risk assessment. The mitigation strategy was developed through a collaborative group process. The process included review of general goal statements to guide the jurisdictions in lessening disaster impacts as well as specific mitigation actions to directly reduce vulnerability to hazards and losses. The following definitions are taken from FEMA's *Local Hazard Mitigation Review Guide (October 1, 2012)*.

- **Mitigation Goals** are general guidelines that explain what you want to achieve. Goals are long-term policy statements and global visions that support the mitigation strategy. The goals address the risk of hazards identified in the plan.

- **Mitigation Actions** are specific actions, projects, activities, or processes taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan's mission and goals.

4.1 Goals

44 CFR Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

This planning effort is an update to Buchanan County's existing hazard mitigation plan approved by FEMA on May 12, 2017. Therefore, the goals from the 2018 Buchanan County Hazard Mitigation Plan were reviewed to see if they were still valid, feasible, practical, and applicable to the defined hazard impacts. The MPC conducted a discussion session during their second meeting to review and update the plan goals. To ensure that the goals developed for this update were comprehensive and supported State goals, the 2018 State Hazard Mitigation Plan goals were also reviewed. The MPC agreed to keep the goals the same as the 2018 plan:

Goal 1: Protect the Lives, Property and Livelihoods of All Citizens.
1. Objective: Protect citizens' lives and property.
2. Objective: Provide sufficient warning of impending disasters.
3. Objective: Identify the citizens most vulnerable to disasters and plan accordingly.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas.

1. Objective: Lessen the impact of certain disasters and reduce the damage of disasters.
2. Objective: Decrease the cost of the next disaster.
3. Objective: Increase our economic resilience to disasters.

Goal 3: Increase Resources Available to Citizens via Education and Preparedness Information.
1. Objective: Increase knowledge among citizens about disaster safety and preparedness.

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster.
1. Objective: Increase disaster mitigation management capability in local governments.

Goal 5: Identify Critical Infrastructure Components.
1. Objective: Increase mitigation strategies to support those infrastructures.

4.2 Identification and Analysis of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Jurisdictions were mailed copies of previous actions from the last plan update prior to the first MPC meeting. Action review discussion took place at the second MPC meeting, and jurisdictions were asked to bring completed action review assessments to the third MPC meeting. Actions from the previous plan included completed actions, on-going actions, and actions upon which no progress had been made. Each jurisdiction was instructed to provide information regarding the "Action Status" with one of the following status choices:

- Completed, with a description of progress;
- In Progress/Continue in Plan Update, with a description of the progress;
- Deleted, with a discussion of the reasons for deletion

For meeting #3, which was held as a workshop session, individual jurisdictions, including school and special districts, developed final mitigation strategies for submission to the MPC. They were also offered FEMA's publication, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013)* as a reference. This document was developed by FEMA as a resource for the identification of a range of potential mitigation actions for reducing risk to natural hazards and disasters.

In total, participating jurisdictions turned in nine completed actions, 24 deleted actions, and 61 continuing actions. Actions that were not evaluated were not brought into the updated plan. Completed evaluations are included in Appendix C. Table 4.1 provides a summary of the action statuses for each participating jurisdiction.

Table 4.1. Action Status Summary

Jurisdiction	Completed Actions	Deleted Actions	Continuing Actions
Buchanan County	4.1.8, 2.3.5 Total: 2	2.1.1, 2.1.4, 2.1.7, 2.2.1, 2.3.8, 3.1.8, Total: 6	1.1.1, 1.1.3, 1.1.8, 1.1.11, 1.1.18, 1.2.3, 1.2.4, 1.2.7, 1.3.1, 1.3.3, 2.1.4, 2.3.3, 2.3.5, 3.1.1, 3.1.3, 4.1.1, 4.1.3, 4.1.12, 4.1.8, 4.1.9, 4.1.13. 5.1.1 Total: 21
Agency	-- Total:0	1.2.5, 2.3.4, 3.1.4 Total: 3	1.1.12, 2.1.2, 2.1.5, 2.1.8, 2.1.9, 2.1.12, 4.1.4 Total: 7
Easton	-- Total: 0	1.1.5, 1.1.9, 2.3.2, 2.3.9, 3.1.5, 2.1.13 Total: 6	1.1.24, 1.3.4, 4.1.6, 3.1.6 Total: 4
Lewis and Clark Village	4.1.7 Total: 1	4.1.7, 2.1.10, 4.1.10 Total: 3	1.1.20, 2.1.3, 2.1.6, 2.1.14, 3.1.7 Total: 5
Rushville	--	--	--
St. Joseph	2.1.16, 2.3.10 Total: 2	1.1.14, 2.3.10, 4.1.11, 1.2.2, 1.2.6, 2.1.16 Total: 6	1.1.2, 1.1.4, 1.1.7, 1.1.13, 1.1.16, 1.1.21, 1.1.22, 1.3.2, 2.1.11, 2.1.15, 2.1.16, 2.3.1, 2.3.6, 5.1.2, 5.1.4 Total: 15
Buchanan County R-IV School District	-- Total: 0	-- Total: 0	1.2.8, 3.1.9 Total: 2
East Buchanan School District	--	--	--
Mid-Buchanan School District	-- Total: 0	-- Total: 0	1.2.9, 3.1.10 Total: 2
Missouri Western State University	1.1.10, 1.1.15, 1.2.1, 2.3.7, 5.1.3 Total: 5	-- Total: 0	1.1.6, 1.1.10, 1.1.15, 1.1.17, 1.2.1, 1.3.6, 2.3.7, 5.1.3 Total: 8
St. Joseph School District	-- Total: 0	-- Total: 0	3.1.2 Total: 1
	Total Completed Actions: 9	Total Deleted Actions: 25	Total Continuing Actions: 61

Table 4.2 provides a summary of the completed, deleted and continuing actions from the previous plan.

Table 4.2. Summary of Completed and Deleted Actions from the Previous Plan

Completed Actions	Completion Details
1.1.10- MWSU- Maintain up-to-date list of addresses of shelters to assist fire departments	Department chairperson keeps personal list and schedule for all faculty/staff employees.

and emergency services agencies to locate survivors after a disaster.	
1.1.15- MWSU- Implement snow day policies for employees to reduce the number of people on the roadway during severe winter weather.	Administration declares snow days based on weather reports. All employees are notified through Griffon Alert phone system or by local TV stations.
1.2.1- MWSU- NOAA weather radio on continuous operation in university facilities.	Location of units: University Police Office, Physical Plant office
2.1.16- St. Joseph- Amend municipal ordinances to include a section mandating the building of a storm shelter with a capacity to handle the expected population in any new mobile home park or park undergoing renovation or expansion	Updated building codes now include this language for new construction.
2.3.5- Buchanan County- Maintain and updated list of names, phone numbers and duties for all employees during regular operation and off hours.	New HR system has updated employee information and can provide hard copies of information.
2.3.7-MWSU- Maintain and update list of names, phone numbers and duties for all employees during regular operation and off hours.	The University Human Resource office and the individual academic departments keep a current list of employees, home addresses and contact numbers.
2.3.10- St. Joseph- Follow guidelines as suggested in the Missouri 2002 Drought Plan, developed by MDNR.	
4.1.7- Lewis and Clark Village- Execute mutual aid agreements with all relevant agencies	Council signed a mutual aid agreement with Buchanan County
4.1.8- Buchanan County- Make GIS hazard information available online to county and permitting departments	Our GIS records are online.
5.1.3- MWSU- Assess critical facilities and infrastructure for needed upgrades and retrofits	The Physical Plant Maintenance Department assesses the campus facilities for operational and safety concerns, repairs, upgrades and remodels monthly.
Deleted Actions	**Reason for Deleted Actions**
1.1.5- Easton- Assess critical facilities and infrastructure for needed upgrades and retrofits	No construction of this type
1.1.9- Easton- Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.	No emergency shelters
1.1.14- St. Joseph- Implement snow day policies for employees to reduce the number of people on the roadway during severe winter weather.	
1.2.2- St. Joseph- NOAA weather radio on continuous operation in all facilities offering public accommodations.	Addressed in new action
1.2.5- Agency- Use electronic methods, including the Internet, social media, Twitter, texting and call systems to notify public of a hazard.	
1.2.6- St. Joseph- Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.	Addressed in new action

2.1.1- Buchanan County- Build a marketing program to inform property owners on the benefits of the buy-out program.	Neither Buchanan County, nor Lewis & Clark Village nor Agency participated in buyouts.
2.1.4- Buchanan County- Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)	The Buchanan County Planning and Zoning Department monitors this.
2.1.7- Buchanan County- Adopt the most current edition of a model building code to address structural and architectural issues related to hazard mitigation.	Buchanan County does not have a Building Inspector.
2.1.10- Lewis and Clark- Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.	No city property is subjected to a higher risk more than the community as a whole.
2.1.13-Easton- Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.	
2.2.1- Buchanan County- Update comprehensive land use plan to specifically address development in hazard-prone areas and outline strategies to decrease vulnerability	We do not have a land use plan.
2.3.2- Easton- Enact ordinances prohibiting residential and commercial development in all high-hazard prone areas.	Not applicable
2.3.4- Agency- Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents	
2.3.5- Buchanan County- Maintain and updated list of names, phone numbers and duties for all employees during regular operation and off hours.	New HR System has updated employee information and can provide hard copies of information.
2.3.8- Buchanan County- Follow guidelines as suggested in the Missouri 2002 Drought Plan, developed by MDNR.	Unknown
2.3.9- Easton- Follow guidelines as suggested in the Missouri 2002 Drought Plan, developed by MoDNR.	This action is followed
2.3.10- St. Joseph- Follow guidelines as suggested in the Missouri 2002 Drought Plan, developed by MoDNR.	
3.1.4- Agency- Conduct a public education campaign to inform citizen across the region of the benefits of constructing a tornado safe room in their homes	
3.1.5- Easton- Conduct a public education campaign to inform citizen across the region of the benefits of constructing a tornado safe room in their homes	Hard for most homes to construct safe room in/on their property
3.1.8- Buchanan County- Public information campaign to remove reduce the threat of fire (remove vegetation, yard debris and other combustible materials) in urban interface/intermix areas	None
4.1.7- Lewis and Clark Village- Execute mutual aid agreements with all relevant agencies	Council signed a mutual aid agreement with Buchanan County

4.1.9- Buchanan County- Schools and emergency responders to participate in Electronic Response Information Portal (ERIP)	
4.1.10- Lewis and Clark Village- Schools and emergency responders to participate in Electronic Response Information Portal (ERIP)	Fire department and schools are their own entity and have measures in place
4.1.11- St. Joseph- Schools and emergency responders to participate in Electronic Response Information Portal (ERIP)	Not adopted

Source: Previously approved County Hazard Mitigation Plan; Data Collection Questionnaires.

4.3 Implementation of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(2)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefits review of the proposed projects and their associated costs.

Jurisdictional MPC members were encouraged to meet with others in their community to finalize the actions to be submitted for the updated mitigation strategy. Throughout the MPC consideration and discussion, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. The Disaster Mitigation Act requires benefit-cost review as the primary method by which mitigation projects should be prioritized. The MPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the 2018 Missouri State Hazard Mitigation Plan. The benefit/cost review at the planning stage primarily consisted of a qualitative analysis and was not the detailed process required grant funding application. For each action, the plan sets forth a narrative describing the types of benefits that could be realized from action implementation. The cost was estimated as closely as possible, with further refinement to be supplied as project development occurs.

The jurisdictions independently prioritized their actions. The methodology from the 2018 plan was used, in which jurisdictions self-determined which actions were high, medium and low priorities. Consideration included the action's potential to save lives and protect property, cost and local capacity to implement/pursue. STAPLEE methodology was not used but available to jurisdictions if they wanted to use it. Actions followed the SMART criteria of being Specific, Measurable, Action oriented, Relevant and Time-bound. The goals and actions were consistent with the hazards identified in the plan and reflected the local priorities and vulnerability to hazards. The actions for the 2022 plan are listed below, followed by a summary table (Table 4.3) that lists the actions in the categories of prevention, structure and infrastructure projects, emergency services and education/outreach.

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.1:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Public not informed of severe weather
Hazard(s) Addressed:	Flood, heat wave, severe winter weather, tornado, etc.
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Weather Radios
Action or Project Description:	Public education outreach to inform residents to purchase weather radios to ensure they have sufficient access to information in times of disasters.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$0
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Proceed based on priority

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.2:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Public not informed of severe weather
Hazard(s) Addressed:	Flood, heat wave, severe winter weather, tornado, etc.
Action or Project	
Action/Project Number:	1.1.2

Name of Action or Project:	Public notification
Action or Project Description:	Increase public notification through use of Nixle alerts
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens.
Estimated Cost:	$0
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Communications Center
Action/Project Priority:	High
Timeline for Completion:	Active Now
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue but modify
Report of Progress	Use has increased yearly

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.3:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Public not having a storm shelter in severe weather
Hazard(s) Addressed:	Thunderstorm, tornado
Action or Project	
Action/Project Number:	1.1.3
Name of Action or Project:	Shelters
Action or Project Description:	Adding shelters in the construction of new public facilities like libraries, community centers, etc.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies depending on project
Benefits:	Protected public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Planning and Zoning
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Private, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	

Action Status	Continued
Report of Progress	There was a shelter built at Mid-Buchanan School District

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.4:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Public not having a storm shelter in severe weather
Hazard(s) Addressed:	Thunderstorm, tornado
Action or Project	
Action/Project Number:	1.1.4
Name of Action or Project:	Shelters
Action or Project Description:	Adding shelters in the construction of new public facilitates like libraries, community centers, etc.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies depending on project
Benefits:	Protected public
Plan for Implementation	
Responsible Organization/Department:	St. Joseph City Council
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Internal, Private
Local Planning Mechanisms to be Used in Implementation, if any:	Code of Ordinances
Progress Report	
Action Status	Continued
Report of Progress	Building code includes this terminology

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.5:

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable students, staff and faculty
Hazard(s) Addressed:	Thunderstorm, tornado

Action or Project	
Action/Project Number:	1.1.5
Name of Action or Project:	Safe rooms for MWSU
Action or Project Description:	Submit NOI for construction of safe rooms across the University campus.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Unknown
Benefits:	Safety of campus community during a tornado event
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Director of Facilities (Physical Plant) and Supervisor of Buildings and Grounds
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	"Shelter in Place Plan," Internal Use of Altertus system for emergency campus notifications, Griffon alert
Progress Report	
Action Status	Modified and continued
Report of Progress	Funding allocation has not been approved

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.6:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Excess water
Hazard(s) Addressed:	Flood, dam failure, levee failure, etc.
Action or Project	
Action/Project Number:	1.1.6
Name of Action or Project:	Buffer zones
Action or Project Description:	Incorporate hazard buffer zones into subdivision platting regulations
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens.
Estimated Cost:	Varies by project
Benefits:	Protection of property
Plan for Implementation	
Responsible Organization/Department:	St. Joseph City Council
Action/Project Priority:	Medium
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal, private

Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Buffer zones have been incorporated into some platting regulations.

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.7:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Inability to locate people after a disaster.
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, tornado, etc.
Action or Project	
Action/Project Number:	1.1.7
Name of Action or Project:	List of shelters
Action or Project Description:	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens.
Estimated Cost:	$0
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	Medium
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Work with American Red Cross for sheltering needs

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.8:

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	

Problem being Mitigated:	Inability to locate people after a disaster.
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, tornado, etc.
Action or Project	
Action/Project Number:	1.1.8
Name of Action or Project:	List of shelters
Action or Project Description:	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens.
Estimated Cost:	$0
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Risk Manager
Action/Project Priority:	Medium
Timeline for Completion:	2 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Department chairperson keeps personal list and schedule for all faculty/staff employees

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.9:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Public not having a storm shelter nearby.
Hazard(s) Addressed:	Tornadoes, thunderstorm
Action or Project	
Action/Project Number:	1.1.9
Name of Action or Project:	Tornado Shelters
Action or Project Description:	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies depending on project
Benefits:	Protected public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Planning and Zoning

Action/Project Priority:	Medium
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, internal, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Still working to identify locations and participants to implement

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.10:

Action Worksheet	
Name of Jurisdiction:	Agency
Risk / Vulnerability	
Problem being Mitigated:	Public not having a storm shelter nearby
Hazard(s) Addressed:	Tornadoes, thunderstorm
Action or Project	
Action/Project Number:	1.1.10
Name of Action or Project:	Tornado Shelters
Action or Project Description:	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies depending on project
Benefits:	Protected public
Plan for Implementation	
Responsible Organization/Department:	Agency City Council
Action/Project Priority:	Medium
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, internal, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	Completed and continue to expand

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.11:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Public not having a storm shelter nearby
Hazard(s) Addressed:	Tornadoes, thunderstorm
Action or Project	
Action/Project Number:	1.1.11
Name of Action or Project:	Tornado Shelters
Action or Project Description:	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens.
Estimated Cost:	Varies depending on project.
Benefits:	Protected public
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Planning and Zoning
Action/Project Priority:	Medium
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, internal, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Planning to implement a public relations program

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.12:

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Problem being Mitigated:	Decrease number of people on roads in inclement weather
Hazard(s) Addressed:	Severe winter weather
Action or Project	
Action/Project Number:	1.1.12

Name of Action or Project:	Snow day policies
Action or Project Description:	Implement snow day policies for employees to reduce the number of people on the roadway during severe winter weather.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$0
Benefits:	Decrease roadway traffic during severe winter weather
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Risk Manager
Action/Project Priority:	Medium
Timeline for Completion:	3 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Admin declares snow days; all employees notified through Griffon Alert phone system or by local TV stations

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.13:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Decrease number of people on roads in inclement weather
Hazard(s) Addressed:	Severe winter weather
Action or Project	
Action/Project Number:	1.1.13
Name of Action or Project:	Marked safe areas
Action or Project Description:	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Cost of signage
Benefits:	Quicker identification of safe areas
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	Low
Timeline for Completion:	3 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A

Progress Report	
Action Status	Continued
Report of Progress	Continue with PR program

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.14:

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Problem being Mitigated:	Decrease number of people on roads in inclement weather
Hazard(s) Addressed:	Severe winter weather
Action or Project	
Action/Project Number:	1.1.14
Name of Action or Project:	Marked safe areas
Action or Project Description:	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Cost of signage
Benefits:	Quicker identification of safe areas
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Risk Manager
Action/Project Priority:	Low
Timeline for Completion:	3 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Marking and labeling of safe rooms is an on-going process under review. Additional signs will be put up once the review is finished.

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.15:

Action Worksheet	
Name of Jurisdiction:	Village of Lewis & Clark
Risk / Vulnerability	
Problem being Mitigated:	Impassible roads

Hazard(s) Addressed:	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.
Action or Project	
Action/Project Number:	1.1.15
Name of Action or Project:	Emergency Routes
Action or Project Description:	Review emergency access routes and evacuation routes and mitigate any problem areas.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$0
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	Lewis & Clark Village Council
Action/Project Priority:	Medium
Timeline for Completion:	5 Years
Potential Fund Sources:	None
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Looking at MoDOT resources for improving ingress and egress and water flow under the main road

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.16

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Impassible roads
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.
Action or Project	
Action/Project Number:	1.1.16
Name of Action or Project:	Emergency Routes
Action or Project Description:	Review emergency access routes and evacuation routes and mitigate any problem areas.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$0
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	Medium
Timeline for Completion:	5 Years

Potential Fund Sources:	None
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Considering expanding current snow route map for this

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.17

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	The lack of trained local personnel
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.
Action or Project	
Action/Project Number:	1.1.22
Name of Action or Project:	Community Emergency Response Team (CERT)
Action or Project Description:	Form and train Community Response Teams in cities and neighborhood associations.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Unsure
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Continue to develop viable roster of CERT members

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.1.18

Action Worksheet	
Name of Jurisdiction:	Village of Rushville
Risk / Vulnerability	
Problem being Mitigated:	Public not having a storm shelter nearby
Hazard(s) Addressed:	Tornadoes, thunderstorm
Action or Project	
Action/Project Number:	1.1.18
Name of Action or Project:	Tornado Shelters
Action or Project Description:	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens.
Estimated Cost:	Varies depending on project.
Benefits:	Protected public
Plan for Implementation	
Responsible Organization/Department:	Village of Rushville Trustees
Action/Project Priority:	Low
Timeline for Completion:	5 years
Potential Fund Sources:	Grants, internal, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	New
Report of Progress	

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.2.1

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Problem being Mitigated:	Insufficient warning of hazard
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.
Action or Project	
Action/Project Number:	1.2.1

Name of Action or Project:	Weather radio in facilities
Action or Project Description:	NOAA weather radio on continuous operation in university facilities.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$30-$40 per radio
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Risk Manager
Action/Project Priority:	Medium
Timeline for Completion:	5 Years
Potential Fund Sources:	Private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Completed and continued
Report of Progress	Units in physical plant office and university police office

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.2.2:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Insufficient warning of hazard
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.
Action or Project	
Action/Project Number:	1.2.2
Name of Action or Project:	Storm warning sirens
Action or Project Description:	Improve storm siren alert coverage for underserviced areas
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$60,000
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A

Progress Report	
Action Status	Modified and continued
Report of Progress	Two new sirens placed and operational

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.2.3:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of warning systems
Hazard(s) Addressed:	Flood, thunderstorm, tornado, etc.
Action or Project	
Action/Project Number:	1.2.3
Name of Action or Project:	Purchasing warning systems
Action or Project Description:	Communities that do not have warning systems should purchase them.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$5,000 per used sirens
Benefits:	Notification of severe weather
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	All communities except one that is unincorporated have storm sirens- hope to have one in the next couple of years. We have a location and just need the siren.

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.2.4:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Insufficient warning of hazard

Hazard(s) Addressed:	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.
Action or Project	
Action/Project Number:	1.2.4
Name of Action or Project:	Electronic notifications
Action or Project Description:	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies
Benefits:	Notified public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	Police/Fire Communications Center uses Nixle Information System

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.2.5:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of warning sirens
Hazard(s) Addressed:	Flood, thunderstorm, tornado, etc.
Action or Project	
Action/Project Number:	1.2.5
Name of Action or Project:	Warning sirens in unincorporated areas
Action or Project Description:	Place warning sirens in densely populated unincorporated areas
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Approximately $5,000 per siren
Benefits:	Notified public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Internal

Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	All communities except one that is unincorporated have storm sirens- hope to have one in the next couple of years. We have a location and just need the siren.

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.2.6:

Action Worksheet	
Name of Jurisdiction:	Buchanan County School District
Risk / Vulnerability	
Problem being Mitigated:	Insufficient warning of hazard
Hazard(s) Addressed:	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.
Action or Project	
Action/Project Number:	1.2.6
Name of Action or Project:	Electronic notifications
Action or Project Description:	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$600
Benefits:	Notified public
Plan for Implementation	
Responsible Organization/Department:	Buchanan School District Superintendent
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	In progress – Thrillshare public address notification

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.2.7:

Action Worksheet

Name of Jurisdiction:	Mid-Buchanan School District
Risk / Vulnerability	
Problem being Mitigated:	Insufficient warning of hazard
Hazard(s) Addressed:	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.
Action or Project	
Action/Project Number:	1.2.7
Name of Action or Project:	Electronic notifications
Action or Project Description:	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$0
Benefits:	Notified public
Plan for Implementation	
Responsible Organization/Department:	Mid-Buchanan School District Superintendent
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Have improved communication since last plan. Seeking a way to combine different types of events into one notification system.

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.3.1:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable citizens
Hazard(s) Addressed:	Flood, severe winter weather, heat wave, thunderstorm, tornado, etc.
Action or Project	
Action/Project Number:	1.3.1
Name of Action or Project:	Help elderly and disabled
Action or Project Description:	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$0

Benefits:	Vulnerable citizens receive help
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	In progress – COAD group meets monthly and helps coordinate public outreach and response

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.3.2:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable citizens
Hazard(s) Addressed:	Flood, severe winter weather, heat wave, thunderstorm, tornado, etc.
Action or Project	
Action/Project Number:	1.3.2
Name of Action or Project:	Help elderly and disabled
Action or Project Description:	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	$0
Benefits:	Vulnerable citizens receive help
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Information is in place to aid the public on this action.

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.3.3:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable citizens
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, heat wave, etc.
Action or Project	
Action/Project Number:	1.3.3
Name of Action or Project:	ADA compliance
Action or Project Description:	Accommodate individuals with special/functional needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies depending on projects
Benefits:	Special needs individuals can access shelters
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	In progress – Emergency management directors collaborate with American Red Cross to make accommodations as necessary

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action: 1.3.4:

Action Worksheet	
Name of Jurisdiction:	Easton
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable citizens
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, heat wave, etc.
Action or Project	
Action/Project Number:	1.3.4

Name of Action or Project:	ADA compliance
Action or Project Description:	Accommodate individuals with special needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies depending on projects
Benefits:	Special needs individuals can access shelters
Plan for Implementation	
Responsible Organization/Department:	Easton City Council
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continued
Report of Progress	No emergency shelters

Goal 1: Protect the Lives, Property and Livelihood of All Citizens

Action 1.3.5:

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Problem being Mitigated:	Lack of power
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, heat wave, etc.
Action or Project	
Action/Project Number:	1.3.6
Name of Action or Project:	Inventory of facilities with generators
Action or Project Description:	Update inventory of facilities with generators and emergency power than can be used as shelters in the event of a disaster. Retrofit shelters to be equipped to connect with generators.
Applicable Goal Statement:	Protect the lives, property and livelihood of all citizens
Estimated Cost:	Varies depending on facility
Benefits:	Current information
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Risk Manager
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A

Progress Report	
Action Status	Continue
Report of Progress	No progress due to lack of funding

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.1:

Action Worksheet	
Name of Jurisdiction:	Agency
Risk / Vulnerability	
Problem being Mitigated:	Flooding in high-risk areas
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.1
Name of Action or Project:	Buyout program
Action or Project Description:	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	25% of property value
Benefits:	Reduce repetitive property loss
Plan for Implementation	
Responsible Organization/Department:	Agency City Council
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, state, federal, match, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No progress but still active in plan.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.2:

Action Worksheet	
Name of Jurisdiction:	Lewis and Clark Village
Risk / Vulnerability	
Problem being Mitigated:	Flooding in high-risk areas

Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.2
Name of Action or Project:	Buyout program
Action or Project Description:	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	25% of property value
Benefits:	No repeat loss of property
Plan for Implementation	
Responsible Organization/Department:	Lewis & Clark Village Council
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, state, federal, match, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	Community is in/near floodplain so there is a need for continued participation.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.3:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Flooding
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.3
Name of Action or Project:	Floodplain management
Action or Project Description:	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0

Benefits:	Regulated construction in floodplain
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No progress but still applicable

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.4:

Action Worksheet	
Name of Jurisdiction:	Agency
Risk / Vulnerability	
Problem being Mitigated:	Flooding
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.4
Name of Action or Project:	Floodplain management
Action or Project Description:	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0
Benefits:	Regulated construction in floodplain
Plan for Implementation	
Responsible Organization/Department:	Agency City Council
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No progress but still applicable

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.5:

Action Worksheet	
Name of Jurisdiction:	Lewis & Clark Village
Risk / Vulnerability	
Problem being Mitigated:	Flooding
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.5
Name of Action or Project:	Floodplain management
Action or Project Description:	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0
Benefits:	Regulated construction in floodplain
Plan for Implementation	
Responsible Organization/Department:	Lewis and Clark Village Council
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No progress but still applicable

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.6:

Action Worksheet	
Name of Jurisdiction:	Agency
Risk / Vulnerability	
Problem being Mitigated:	Excess water
Hazard(s) Addressed:	Flooding
Action or Project	
Action/Project Number:	2.1.6
Name of Action or Project:	Storm water management
Action or Project Description:	Construction of detention basin, small lakes, and greenways or riparian corridors to channel and catch storm water, thereby reducing the likelihood of flooding as part of a countywide storm water management plan.

Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	Varies on project
Benefits:	Storm water management
Plan for Implementation	
Responsible Organization/Department:	Agency City Council
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress - Currently in appeals court since the land is being annexed

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.7:

Action Worksheet	
Name of Jurisdiction:	Agency
Risk / Vulnerability	
Problem being Mitigated:	Unused flood plain land
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.7
Name of Action or Project:	Uses for flood-prone areas
Action or Project Description:	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	Varies depending on project
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	Agency City Council
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, state, federal, match, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No progress was made due to the lack of funding, but will seek alternative uses for flood-prone areas.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.8:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Unused flood plain land
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.8
Name of Action or Project:	Uses for flood-prone areas
Action or Project Description:	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	Varies depending on project
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	St. Joseph City Council
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, state, federal, match, private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – The city has done this with Heritage Park ballparks and soccer fields and will consider for other flood-prone areas.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.9:

Action Worksheet	
Name of Jurisdiction:	Agency
Risk / Vulnerability	
Problem being Mitigated:	Excess water
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.9

Name of Action or Project:	Comprehensive storm water management plan
Action or Project Description:	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	Varies depending on project
Benefits:	Storm water management
Plan for Implementation	
Responsible Organization/Department:	Agency City Council
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, federal, state
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No progress due to limited resources but will renew efforts to implement.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.10:

Action Worksheet	
Name of Jurisdiction:	Lewis & Clark Village
Risk / Vulnerability	
Problem being Mitigated:	Excess water
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.10
Name of Action or Project:	Comprehensive storm water management plan
Action or Project Description:	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	Varies depending on project
Benefits:	Storm water management
Plan for Implementation	
Responsible Organization/Department:	Lewis & Clark Village Council
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, federal, state
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	

Action Status	Continue
Report of Progress	No progress due to lack of staff

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.3.1:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	2.3.1
Name of Action or Project:	Commercial and industrial disaster plans
Action or Project Description:	Encourage up-to-date commercial and industrial disaster plans that are coordinated with community disaster plans.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0
Benefits:	Relevant disaster plan
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	Medium
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	Community disaster plans
Progress Report	
Action Status	Continue
Report of Progress	In progress – Currently working with several factories and industrial businesses about this action.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.3.2:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Outdated information
Hazard(s) Addressed:	Flood

Action or Project	
Action/Project Number:	2.3.3
Name of Action or Project:	Flood insurance rate maps
Action or Project Description:	Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0
Benefits:	Accurate information
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Buchanan County has a GIS Department

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.3.3:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Outdated information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	2.3.3
Name of Action or Project:	Updated list
Action or Project Description:	Maintain and update list of names, phone numbers and duties for all employees during regular operation and off hours.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0
Benefits:	Current information
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	High
Timeline for Completion:	1 Year
Potential Fund Sources:	

Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – City directors and supervisors have city cell phones and can be contacted anytime during a disaster. Will continue the action and update information.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.3.4:

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Problem being Mitigated:	Outdated information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	2.3.4
Name of Action or Project:	Updated list
Action or Project Description:	Maintain and update list of names, phone numbers and duties for all employees during regular operation and off hours.
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0
Benefits:	Current information
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Risk Manager
Action/Project Priority:	High
Timeline for Completion:	1 Year
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – the University Human Resource office and the individual academic departments keep a current list of employees, home addresses and contact numbers.

Goal 3: Increase Resources Available to Citizens via Education and Preparedness

Action 3.1.1:

Action Worksheet

Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	3.1.1
Name of Action or Project:	Seasonal campaigns
Action or Project Description:	Develop an ongoing campaign to educate the community about seasonal hazards and coordinate the campaign with a variety of promotional resources
Applicable Goal Statement:	Increase resources available to citizens via education and preparedness
Estimated Cost:	$0
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Educational materials are provided at meetings and other outreach presentations, as well as posted on informational boards at the courthouse

Goal 3: Increase Resources Available to Citizens via Education and Preparedness

Action 3.1.2:

Action Worksheet	
Name of Jurisdiction:	St. Joseph School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	3.1.2
Name of Action or Project:	Educate children
Action or Project Description:	Educate children in disaster preparedness and how to survive disasters
Applicable Goal Statement:	Increase resources available to citizens via education and preparedness
Estimated Cost:	$0
Benefits:	Informed public

Plan for Implementation	
Responsible Organization/Department:	St. Joseph School District Superintendent
Action/Project Priority:	High
Timeline for Completion:	1 Year
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Each year one earthquake, two tornado, two intruder, two bus evacuations and five fire drills are completed. Will continue to implement action.

Goal 3: Increase Resources Available to Citizens via Education and Preparedness

Action 3.1.3:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	Thunderstorm wind, tornado
Action or Project	
Action/Project Number:	3.1.3
Name of Action or Project:	Public education campaign
Action or Project Description:	Conduct a public education campaign to inform citizens across the region of the benefits of constructing a tornado safe room in their homes
Applicable Goal Statement:	Increase resources available to citizens via education and preparedness
Estimated Cost:	$0 for campaign materials/ Safe room costs vary by project
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Educational materials are provided through planning/zoning department when building permits are issued

Goal 3: Increase Resources Available to Citizens via Education and Preparedness

Action 3.1.4:

Action Worksheet	
Name of Jurisdiction:	Easton
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	3.1.4
Name of Action or Project:	Public education campaign
Action or Project Description:	Promote Ready-In-Three Campaign
Applicable Goal Statement:	Increase resources available to citizens via education and preparedness
Estimated Cost:	$0 for campaign materials
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Easton City Council
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No progress toward implementation but will try to develop a plan

Goal 3: Increase Resources Available to Citizens via Education and Preparedness

Action 3.1.5:

Action Worksheet	
Name of Jurisdiction:	Lewis & Clark Village
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	3.1.5

Name of Action or Project:	Public education campaign
Action or Project Description:	Promote Ready-In-Three Campaign
Applicable Goal Statement:	Increase resources available to citizens via education and preparedness
Estimated Cost:	$0 for campaign materials
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Lewis & Clark Village Council
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	Created a social media page for the city and will develop an informational packet for new and existing residents

Goal 3: Increase Resources Available to Citizens via Education and Preparedness

Action 3.1.6:

Action Worksheet	
Name of Jurisdiction:	Buchanan County School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	3.1.6
Name of Action or Project:	Educate children
Action or Project Description:	Educate children in disaster preparedness and how to survive disasters
Applicable Goal Statement:	Increase resources available to citizens via education and preparedness
Estimated Cost:	$0
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Buchanan School District Superintendent
Action/Project Priority:	High
Timeline for Completion:	1 Year
Potential Fund Sources:	

Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – We train our staff and students on our emergency disaster plans which are on file with the Buchanan County Sheriff's Dept, follow state guidelines for fire, tornado, and earthquake drills. In addition we hold intruder training for our staff at least once a year.

Goal 3: Increase Resources Available to Citizens via Education and Preparedness

Action 3.1.7:

Action Worksheet	
Name of Jurisdiction:	Mid-Buchanan School District
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	3.1.7
Name of Action or Project:	Educate children
Action or Project Description:	Educate children in disaster preparedness and how to survive disasters
Applicable Goal Statement:	Increase resources available to citizens via education and preparedness
Estimated Cost:	$0
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Mid-Buchanan School District Superintendent
Action/Project Priority:	High
Timeline for Completion:	1 Year
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Numerous drills are conducted each year. Will continue to modify drills to address potential hazards.

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.1:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of public information
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	4.1.1
Name of Action or Project:	List of contacts
Action or Project Description:	Maintain a publicly accessible list of names, positions, contact information, roles and responsibilities for all public safety positions and departments
Applicable Goal Statement:	Ensure continued operation of government and emergency functions in a disaster
Estimated Cost:	$0
Benefits:	Informed public
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress but will modify and continue on county website

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.2:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources in an emergency
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	4.1.2

Name of Action or Project:	Mutual Aid
Action or Project Description:	Execute mutual aid agreements with all relevant agencies
Applicable Goal Statement:	Ensure continued operation of government and emergency functions in a disaster
Estimated Cost:	$0
Benefits:	Ample resources
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Mutual aid agreements in place with Platte County and the Regional Hazmat Team has agreements with all 15 counties in Region H

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.3:

Action Worksheet	
Name of Jurisdiction:	Agency
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources in an emergency
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	4.1.3
Name of Action or Project:	Mutual Aid
Action or Project Description:	Execute mutual aid agreements with all relevant agencies
Applicable Goal Statement:	Ensure continued operation of government and emergency functions in a disaster
Estimated Cost:	$0
Benefits:	Ample resources
Plan for Implementation	
Responsible Organization/Department:	Agency City Council
Action/Project Priority:	High

Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress – Will maintain and expand agreements

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.4:

Action Worksheet	
Name of Jurisdiction:	Easton
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources in an emergency
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	4.1.4
Name of Action or Project:	Mutual Aid
Action or Project Description:	Execute mutual aid agreements with all relevant agencies
Applicable Goal Statement:	Ensure continued operation of government and emergency functions in a disaster
Estimated Cost:	$0
Benefits:	Ample resources
Plan for Implementation	
Responsible Organization/Department:	Easton City Council
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	No new progress but want to continue

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.5:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of resources in an emergency
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	4.1.5
Name of Action or Project:	GIS information
Action or Project Description:	Make GIS hazard information available online to county and permitting departments
Applicable Goal Statement:	Ensure continued operation of government and emergency functions in a disaster
Estimated Cost:	Unsure
Benefits:	Ample resources
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	GIS records are now online

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.6:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Data vulnerability
Hazard(s) Addressed:	All

Action or Project	
Action/Project Number:	4.1.6
Name of Action or Project:	Data backup
Action or Project Description:	Maintain offsite data backup of county records and safeguard data that does not have backups.
Applicable Goal Statement:	Ensure continued operation of government and emergency functions in a disaster
Estimated Cost:	Unsure
Benefits:	Ability to access data
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Information Technology Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Complete and Continue
Report of Progress	Data backed up to server at the Drug Strike Task Force Building- that has a generator (active/active system)

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.7:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of communication
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	4.1.7
Name of Action or Project:	ERIP Usage
Action or Project Description:	Schools and emergency responders to participate in Electronic Response Information Portal (ERIP)
Applicable Goal Statement:	Ensure continued operation of government and emergency functions in a disaster
Estimated Cost:	$0
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High

Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	In progress- Continue to coordinate with school resource officer

Action 4.1.8:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of power
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, heat wave, etc.
Action or Project	
Action/Project Number:	4.1.8
Name of Action or Project:	Courthouse generator
Action or Project Description:	Acquire a generator and place at a critical facility (courthouse) to maintain essential county functions during prolonged power outages
Applicable Goal Statement:	Ensure Continued Operation of Government and Emergency Functions in a Disaster
Estimated Cost:	$550,000
Benefits:	Assures that county business and communication with public can continue without disruption.
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Commission
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, etc.
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continued
Report of Progress	Submitted NOI for federal assistance under HMGP program in September 2021

Goal 5: Identify Critical Infrastructure Components

Action 5.1.1:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable infrastructure
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	5.1.1
Name of Action or Project:	Critical infrastructure
Action or Project Description:	Assess critical facilities and infrastructure for needed upgrades and retrofits
Applicable Goal Statement:	Identify critical infrastructure components
Estimated Cost:	Inspection costs/ varies on building/infrastructure assessed
Benefits:	
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	Beginning to investigate purchasing a generator to power all of the Buchanan County Courthouse

Goal 5: Identify Critical Infrastructure Components

Action 5.1.2:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable infrastructure
Hazard(s) Addressed:	All
Action or Project	

Action/Project Number:	5.1.2
Name of Action or Project:	Critical infrastructure
Action or Project Description:	Assess critical facilities and infrastructure for needed upgrades and retrofits
Applicable Goal Statement:	Identify critical infrastructure components
Estimated Cost:	Inspection costs vary on building/infrastructure assessed
Benefits:	Updated infrastructure
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Building Development, Chief Building Official
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	Continue to identify sites

Goal 5: Identify Critical Infrastructure Components

Action 5.1.3:

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable infrastructure
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	5.1.3
Name of Action or Project:	Critical infrastructure
Action or Project Description:	Assess critical facilities and infrastructure for needed upgrades and retrofits
Applicable Goal Statement:	Identify critical infrastructure components
Estimated Cost:	Inspection costs vary on building/infrastructure assessed
Benefits:	Updated infrastructure
Plan for Implementation	
Responsible Organization/Department:	Missouri Western State University Risk Manager
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Internal
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	

Action Status	Complete and continue
Report of Progress	The Physical Plant Maintenance Department assesses monthly the campus facilities for operational and safety concerns, repairs, upgrades and remodels.

Goal 5: Identify Critical Infrastructure Components

Action 5.1.4:

Action Worksheet	
Name of Jurisdiction:	St. Joseph
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable infrastructure
Hazard(s) Addressed:	All
Action or Project	
Action/Project Number:	5.1.4
Name of Action or Project:	Utilities
Action or Project Description:	Work with utility providers to assess vulnerability to hazards and to implement needed upgrades and retrofits
Applicable Goal Statement:	Identify critical infrastructure components
Estimated Cost:	Inspection costs vary on building/infrastructure assessed
Benefits:	Updated infrastructure
Plan for Implementation	
Responsible Organization/Department:	St. Joseph Emergency Manager
Action/Project Priority:	Low
Timeline for Completion:	5 Years
Potential Fund Sources:	Private
Local Planning Mechanisms to be Used in Implementation, if any:	N/A
Progress Report	
Action Status	Continue
Report of Progress	Continue to identify sites

Table 4.3. Mitigation Action Matrix

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
	Prevention Public Education							
1.1.6	Incorporate hazard buffer zones into subdivision platting regulations.	St. Joseph	Medium	1	Flood, dam failure, levee failure, etc.	✓	✓	✓
1.1.12	Implement snow day policies for employees to reduce the number of people on the roadway during severe winter weather.	Missouri Western State University	Medium	1	Severe winter weather	n/a	n/a	n/a
1.1.13	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.	St. Joseph	Low	1	Severe winter weather	✓	✓	n/a
1.1.14	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.	Missouri Western State University	Low	1	Severe winter weather	✓	✓	n/a
1.1.15	Review emergency access routes and evacuation routes and mitigate any problem areas.	Lewis and Clark Village	Medium	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
1.1.16	Review emergency access routes and evacuation routes and mitigate any problem areas.	St. Joseph	Medium	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
4.1.1	Maintain a publicly accessible list of names, positions, contact information, roles and responsibilities for all public safety positions and departments	Buchanan County	Low	4	All	n/a	n/a	n/a
	Structure and Infrastructure Projects							

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.1.3	Adding shelters in the construction of new public facilities like libraries, community centers, etc.	Buchanan County	Low	1	Thunderstorm, tornado	x	✓	✓
1.1.4	Adding shelters in the construction of new public facilitates like libraries, community centers, etc.	St. Joseph	Low	1	Thunderstorm, tornado	x	✓	n/a
1.1.5	Submit NOI for construction of safe rooms across the University campus.	Missouri Western State University	Low	1	Thunderstorm, tornado	x	✓	n/a
1.1.9	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	Buchanan County	Medium	1	Tornadoes, thunderstorm	✓	✓	✓
1.1.10	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	Agency	Medium	1	Tornadoes, thunderstorm	✓	✓	✓
1.1.11	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	St. Joseph	Medium	1	Tornadoes, thunderstorm	✓	✓	✓
1.1.18	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.	Rushville	Low	1	Tornadoes, thunderstorm	✓	✓	✓
1.2.5	Place warning sirens in densely populated unincorporated areas	Buchanan County	High	1	Flood, thunderstorm, tornado, etc.	✓	✓	✓
1.3.3	Accommodate individuals with special/functional needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).	Buchanan County	High	1	Earthquake, flood, severe winter weather, heat wave, etc.	✓	✓	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.3.4	Accommodate individuals with special/functional needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).	Easton	High	1	Earthquake, flood, severe winter weather, heat wave, etc.	✓	✓	n/a
2.1.11	Amend municipal ordinances to include a section mandating the building of a storm shelter with a capacity to handle the expected population in any new mobile home park or park undergoing renovation or expansion.	St. Joseph	Low	2	Thunderstorm wind, tornado	✓	✓	n/a
	Natural Systems Protection							
2.1.1	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.	Agency	High	2	Flood	✓	✓	✓
2.1.2	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.	Lewis and Clark Village	High	2	Flood	✓	✓	✓
2.1.3	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)	Buchanan County	High	2	Flood	✓	✓	✓
2.1.4	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)	Agency	High	2	Flood	✓	✓	✓
2.1.5	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)	Lewis and Clark Village	High	2	Flood	✓	✓	✓
2.1.6	Construction of detention basin, small lakes, and greenways or riparian corridors to channel and catch storm water, thereby reducing the likelihood of flooding as part of a countywide storm water management plan.	Agency	High	2	Flood	✓	✓	✓

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
2.1.7	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.	Agency	Low	2	Flood	✓	✓	✓
2.1.8	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.	St. Joseph	Low	2	Flood	✓	✓	✓
2.1.9	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.	Agency	Low	2	Flood	✓	✓	✓
2.1.10	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.	Lewis and Clark Village	Low	2	Flood	✓	✓	✓
	Emergency Services							
1.1.7	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.	Buchanan County	Medium	1	Earthquake, flood, severe winter weather, tornado, etc.	n/a	n/a	n/a
1.1.8	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.	Missouri Western State University	Medium	1	Earthquake, flood, severe winter weather, tornado, etc.	n/a	n/a	n/a
1.2.1	NOAA weather radio on continuous operation in university facilities.	Missouri Western State University	Medium	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	n/a	n/a	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.2.2	Keep areas of the city covered with storm siren alerts	St. Joseph	High	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
1.2.3	Keep areas of the city covered with storm siren alerts	Buchanan County	High	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	✓	✓	✓
1.3.5	Update inventory of facilities with generators and emergency power than can be used as shelters in the event of a disaster. Retrofit shelters to be equipped to connect with generators.	Missouri Western State University	High	1	Earthquake, flood, severe winter weather, heat wave, etc.	✓	✓	n/a
2.3.1	Encourage up-to-date commercial and industrial disaster plans that are coordinated with community disaster plans.	St. Joseph	Medium	2	All	n/a	n/a	n/a
2.3.2	Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents	Buchanan County	High	2	Flood	✓	✓	✓
2.3.3	Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents	St. Joseph	High	2	Flood	✓	✓	✓
2.3.4	Maintain and update list of names, phone numbers and duties for all employees during regular operation and off hours.	Missouri Western State University	High	2	All	n/a	n/a	n/a
4.1.2	Execute mutual aid agreements with all relevant agencies	Buchanan County	High	4	All	n/a	n/a	n/a
4.1.3	Execute mutual aid agreements with all relevant agencies	Agency	High	4	All	n/a	n/a	n/a
4.1.4	Execute mutual aid agreements with all relevant agencies	Easton	High	4	All	n/a	n/a	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
4.1.6	Maintain offsite data backup of county records and safeguard data that does not have backups.	Buchanan County	High	4	All	✓	✓	✓
5.1.1	Assess critical facilities and infrastructure for needed upgrades and retrofits	Buchanan County	High	5	All	✓	✓	✓
5.1.2	Assess critical facilities and infrastructure for needed upgrades and retrofits	St. Joseph	High	5	All	✓	✓	✓
5.1.3	Assess critical facilities and infrastructure for needed upgrades and retrofits	Missouri Western State University	High	5	All	✓	✓	✓
4.1.4	Work with utility providers to assess vulnerability to hazards and to implement needed upgrades and retrofits	St. Joseph	Low	5	All	✓	✓	✓
	Education and Outreach							
1.1.1	Public education outreach to inform residents to purchase weather radios to ensure they have sufficient access to information in times of disasters.	Buchanan County	Low	1	Flood, heat wave, severe winter weather, tornado, etc.	✓	✓	n/a
1.1.2	Increase public notification through use of Nixle alerts	St. Joseph	High	1	Flood, heat wave, severe winter weather, tornado, etc.	✓	✓	n/a
1.1.17	Form and train Community Response Teams in cities and neighborhood associations.	St. Joseph	High	1	Earthquake, flood, severe winter weather, dam failure, levee failure, etc.	n/a	n/a	n/a
1.2.4	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.	Buchanan County	High	1	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.	n/a	n/a	✓

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
1.2.6	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.	Buchanan County School District	High	1	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.	n/a	n/a	n/a
1.2.7	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.	Mid-Buchanan School District	High	1	Dam failure, drought, earthquake, flood, heat wave, thunderstorm, etc.	n/a	n/a	n/a
1.3.1	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.	Buchanan County	High	1	Flood, severe winter weather, heat wave, thunderstorm, tornado, etc.	n/a	n/a	n/a
1.3.2	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.	St. Joseph	High	1	Flood, severe winter weather, heat wave, thunderstorm, tornado, etc.	n/a	n/a	n/a
3.1.1	Develop an ongoing campaign to educate the community about seasonal hazards and coordinate the campaign with a variety of promotional resources	Buchanan County	Low	3	All	n/a	n/a	n/a
3.1.2	Educate children in disaster preparedness and how to survive disasters	St. Joseph School District	High	3	All	n/a	n/a	n/a
3.1.3	Conduct a public education campaign to inform citizens across the region of the benefits of constructing a tornado safe room in their homes	St. Joseph School District	High	3	All	n/a	n/a	n/a
3.1.4	Promote Ready-In-Three Campaign	Easton	Low	3	All	n/a	n/a	n/a

#	Action	Jurisdiction	Priority	Goals Addressed	Hazards Addressed	Address Current Development	Address Future Development	Continued Compliance with NFIP
3.1.5	Promote Ready-In-Three Campaign	Lewis and Clark Village	Low	3	All	n/a	n/a	n/a
3.1.6	Educate children in disaster preparedness and how to survive disasters	Buchanan County School District	High	3	All	n/a	n/a	n/a
3.1.7	Educate children in disaster preparedness and how to survive disasters	Mid-Buchanan School District	High	3	All	n/a	n/a	n/a
4.1.5	Make GIS hazard information available online to county and permitting departments	Buchanan County	High	4	All	✓	✓	✓

5 PLAN MAINTENANCE PROCESS

5 PLAN MAINTENANCE PROCESS 5.1

5.1 Monitoring, Evaluating, and Updating the Plan 5.1

5.1.1 Responsibility for Plan Maintenance 5.1

5.1.2 Plan Maintenance Schedule 5.2

5.1.3 Plan Maintenance Process 5.2

5.2 Incorporation into Existing Planning Mechanisms 5.3

5.3 Continued Public Involvement 5.4

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

5.1 Monitoring, Evaluating, and Updating the Plan

44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

5.1.1 Responsibility for Plan Maintenance

The Mitigation Planning Committee (MPC) is not a standing committee. Responsibility for maintenance will reside with the individual jurisdictions for monitoring, evaluation and maintenance. Maintenance activities for the participating jurisdictions, including school and special districts, may involve:

- Meet annually, and after a disaster event, to monitor and evaluate the implementation of the plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low- or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Report on plan progress and recommended changes to the County Board of Supervisors and governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

It's the MPC representative's primary duty to see the plan successfully carried out and to report to the community's governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information in areas accessible to the public.

5.1.2 Plan Maintenance Schedule

The Buchanan County Emergency Management Director (EMD) will be responsible for initiating the plan review at the LEPC meeting every other year. The St. Joseph EMD will be responsible for initiating plan reviews for St. Joseph every other year. The LEPC and St. Joseph will coordinate so their reviews do not fall on the same year. For the other jurisdictions, their MPC representative will be responsible for initiating reviews.

In coordination with all participating jurisdictions, the Buchanan County EMD will be responsible for initiating a five-year written update of the plan to be submitted to the Missouri State Emergency Management Agency (SEMA) and FEMA Region VII per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. The MPC during the annual meeting should review changes in vulnerability identified as follows:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions,
- Increased vulnerability due to hazard events, and/or
- Increased vulnerability as a result of new development (and/or annexation).

Future 5-year updates to this plan will include the following activities:

- Consideration of changes in vulnerability due to action implementation,
- Documentation of success stories where mitigation efforts have proven effective,
- Documentation of unsuccessful mitigation actions and why the actions were not effective,
- Documentation of previously overlooked hazard events that may have occurred since the previous plan approval,
- Incorporation of new data or studies with information on hazard risks,
- Incorporation of new capabilities or changes in capabilities,
- Incorporation of growth data and changes to inventories, and
- Incorporation of ideas for new actions and changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will adopt the following process:

- Each proposed action in the plan identified an individual, office, or agency responsible for action implementation. This entity will track and report on an annual basis to the jurisdictional MPC member on action status. The entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in

reducing risk.

- If the action does not meet identified objectives, the jurisdictional MPC (or designated responsible entity) member will determine necessary remedial action, making any required modifications to the plan.

Changes will be made to the plan to remedy actions that have failed or are not considered feasible. Feasibility will be determined after a review of action consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring of this plan. Updating of the plan will be accomplished by written changes and submissions, as the MPC deems appropriate and necessary. Changes will be approved by the Buchanan County Commission and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Where possible, plan participants, including school and special districts, will use existing plans and/or programs to implement hazard mitigation actions. Those existing plans and programs were described in Chapter 2 of this plan. Based on the capability assessments of the participating jurisdictions, communities in Buchanan County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

- General or master plans of participating jurisdictions;
- Ordinances of participating jurisdictions;
- Buchanan County Emergency Operations Plan;
- Capital improvement plans and budgets; and
- School and Special District Plans and budgets

The MPC members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The MPC is also responsible for monitoring this integration and incorporation of the appropriate information into the five-year update of the multi-jurisdictional hazard mitigation plan.

Additionally, after the annual review of the Hazard Mitigation Plan, the Buchanan County EMD will provide the updated Mitigation Strategy with the current status of each mitigation action to the county commission, as well as all mayors, city clerks, and school district superintendents as appropriate. The EMD will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

Table 5.1 below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

Table 5.1. Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Buchanan County	Comprehensive Plan, Zoning Ordinance, Floodplain Ordinance, Site Plan Review Ordinance, Emergency Operating Plan	Comprehensive Plan, Zoning Ordinance, Floodplain Ordinance, Site Plan Review Ordinance, Emergency Operating Plan	Comprehensive Plan, Zoning Ordinance, Floodplain Ordinance, Site Plan Review Ordinance, Emergency Operating Plan
Agency	Comprehensive Plan, Zoning Ordinance Building Code, Subdivision Ordinance, Storm Water Ordinance	Comprehensive Plan, Zoning Ordinance, Building Code, Subdivision Ordinance, Storm Water Ordinance	Comprehensive Plan, Zoning Ordinance, Building Code, Subdivision Ordinance, Storm Water Ordinance
Easton	Zoning Ordinance, Subdivision Ordinance	Zoning Ordinance, Subdivision Ordinance	Zoning Ordinance, Subdivision Ordinance
Lewis & Clark Village	Zoning Ordinance, Floodplain Ordinance	Zoning Ordinance, Floodplain Ordinance	Zoning Ordinance, Floodplain Ordinance
Rushville	Zoning Ordinance	Zoning Ordinance	Zoning Ordinance
St. Joseph	Emergency Operations Plan, Zoning Ordinance, Floodplain Ordinance, Storm Water Ordinance, Landscape Ordinance, Site Plan Review Ordinance, Land Use Plan	Emergency Operations Plan, Zoning Ordinance, Floodplain Ordinance, Storm Water Ordinance, Landscape Ordinance, Site Plan Review Ordinance, Land Use Plan	Emergency Operations Plan, Zoning Ordinance, Floodplain Ordinance, Storm Water Ordinance, Landscape Ordinance, Site Plan Review Ordinance, Land Use Plan
Buchanan County R-IV School District	Emergency Plan	Emergency Plan	Emergency Plan
East Buchanan School District	Emergency Plan	Emergency Plan	Emergency Plan
St. Joseph School District	Emergency Plan	Emergency Plan	Emergency Plan
Missouri Western State University	Emergency Plan	Emergency Plan	Emergency Plan

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan's implementation and seek additional public comment. Information about the reviews will be posted in the local newspaper as well as on the Buchanan County website following each review of the mitigation plan. When the MPC reconvenes for the five-year update, it will coordinate with all stakeholders participating in the planning process. Included in this group will be those who joined the MPC after the initial effort, to update and revise the

plan. Public notice will be posted and public participation will be actively solicited, at a minimum, through available website postings and press releases to local media outlets, primarily newspapers.

Appendix A: References

3.111	American Meteorological Society Publication: "Freezing Rain Events in the U.S." http://ams.confex.com/ams/pdfpapers/71872.pdf
	Andrew County Hazard Mitigation Plan, 2021
3.125	Buchanan County Fire District Survey, 2021
3.63-3.66; 3.90	Buchanan County GIS: https://www.co.buchanan.mo.us/136/GIS
	Buchanan County Hazard Mitigation Plan, 2018
	Buchanan County R-IV School District: http://buchananrivmo.apptegy.us/o/district/browse/167143
3.91	Centers for Disease Control and Prevention (CDC)
3.21	City of St. Joseph Land Use Plan: http://www.stjoemo.info/index.aspx?nid=358
3.85; 3.88	City of St. Joseph: http://www.stjoemo.info/DocumentCenter/View/4412
3.95	City of St. Joseph: https://www.stjoemo.info/959/COVID-19-
2.14-2.43	Data Collection Questionnaires completed by each jurisdiction
3.95	Environmental Protection Agency (EPA): https://gispub.epa.gov/trina2019/
3.117	FEMA BCA Reference Guide, 2009: https://www.fema.gov/sites/default/files/2020-04/fema_bca_reference-guide.pdf
3.69	FEMA- National Flood Insurance Program (NFIP): http://www.fema.gov/national-flood-insurance-program /national- flood-insurance-program-community-status-book
2.8-2.13	FEMA, HMA Grants
3.3-3.4	FEMA: https://www.fema.gov/data-visualization-summary-disaster-declarations-and-grants
3.71	FEMA: https://www.fema.gov/disasters/disaster-declarations
3.84	FEMA Publication: *So You Live Behind a Levee:* http://mrcc.isws.illinois.edu/1913Flood/awareness/materials/SoYouLiveBehindLevee.pdf
3.103	FEMA Publication- Taking Shelter from the Storm: https://www.fema.gov/pdf/library/ism2_s1.pdf
2.5	Hazards & Vulnerabilities Research Institute: http://artsandsciences.sc.edu/geog/hvri/sites/sc.edu.geog.hvri/files /attachments/Missouri_0610.pdf
3.12-3.13	Hazus MH 4.2
3.93; 3.95	Johns Hopkins University Of Medicine: https://bao.arcgis.com/covid-19/jhu/county/29021.html AND https://coronavirus.jhu.edu/
3.77	KQTV: https://www.kq2.com/content/news/Southside--571839481.html AND https://www.kq2.com/content/news/ Southside--571839481.html
3.14-3.15	Missouri Deparment of Conservation: http://mdc7.mdc.mo.gov/applications/moatlas/AreaList.aspx?txtUserID=guest&txtAreaNm=s
3.132	Missouri Department of Conservation: https://mdc12.mdc.mo.gov/Applications/MDCFireReporting/Home/FireReportSearch
3.9	Missouri Department of Elementary and Secondary Education: https://apps.dese.mo.gov/mcds/home.aspx

3.9	Missouri Department of Elementary and Secondary Education: https://apps.dese.mo.gov/MCDS/Reports/SSRS_Print.aspx?Reportid =f04838c4-c116-4ee1-b9b2-8eb6c4cfab45
2.34	Missouri Department of Elementary and Secondary Education: https://mogov.maps.arcgis.com/apps/webappviewer/index.html?id= 42394a81012c4737a705d8e943b6fda5
3.136	Missouri Department of Elementary and Secondary Education: https://apps.dese.mo.gov/MCDS/home.aspx?categoryid=2&view=2
3.53	Missouri Department of Health and Senior Services: https://health.mo.gov/living/healthcondiseases/hypothermia/pdf/hypomap.pdf
3.54	Missouri Department of Health and Senior Services: https://health.mo.gov/living/healthcondiseases/hypothermia/pdf/hypomap.pdf
3.56-3.57	Missouri Department of Health and Senior Services: https://healthapps.dhss.mo.gov/MoPhims/ProfileBuilder?pc=14
3.95	Missouri Department of Health and Senior Services: https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/mobile-testing.php AND https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/prevention.php
3.27	Missouri Department of Natural Resources: http://dnr.mo.gov/env/wrc/docs/rules_reg_94.pdf
3.15-3.17	Missouri Department of Natural Resources: http://dnr.mo.gov/shpo/mnrlist.htm
3.28; 3.79; 3.81	Missouri Department of Natural Resources: https://dnr.mo.gov/geology/geostrat.htm
2.3	Missouri Department of Natural Resources: https://dnr.mo.gov/omw/OMWWatersheds.htm
3.29	Missouri Department of Natural Resources: https://dnr.mo.gov/geology/wrc/dam-safety/damsinmissouri.htm
3.83	Missouri Department of Natural Resources: https://dnr.mo.gov/geology/geosrv/envgeo/sinkholes.htm
3.92	Missouri Department of Natural Resources: http://dnr.mo.gov/env/apcp AND https://dnr.mo.gov/env/esp/aqm/st-joe-pump.htm
3.94	Missouri Governor's Office: https://governor.mo.gov/press-releases/archive/governor-parson-announces-missouri-will-fully-reopen-enter-phase-2-recovery).
3.94	Missouri Secretary of State: https://www.sos.mo.gov/library/reference/orders/2020
3.7; 3.75-3.76	Missouri Spatial Data Information Service (MSDIS): https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM
3.32	Missouri State Hazard Mitigation Plan, 2018 & 2013
3.33-3.34; 3.130-1.131; 3.134	Missouri State Hazard Mitigation Plan, 2018: https://amecei.maps.arcgis.com/apps/webappviewer /index.html?id=d97d80d5cff04996bff54b2250e47d83
3.4; 3.48	Missouri State Hazard Mitigation Plan, 2018: https://sema.dps.mo.gov/docs/programs/LRMF/mitigation/MO_Hazard_Mitigation_Plan2018.pdf
3.118	Missouri Statewide Homelessness Study, 2019: https://www.mhdc.com/ci/Missouri%20Homelessness%20Study_Final_11.18.19.pdf
3.123	Missouri Tornado History Project: http://www.tornadohistoryproject.com/tornado/Missouri
3.38-3.39; 3.67-3.68;	National Center for Environmental Information (NCEI), Storm Events

3.105; 3.114; 3.123	
3.55	National Center for Environmental Information (NCEI): https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=8b910d9c7b9744ea94e07d82f5420782
3.72	National Center for Environmental Information (NCEI): https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=69343
3.73	National Center for Environmental Information (NCEI): https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=813013
3.28	National Inventory of Dams: https://nid.sec.usace.army.mil OR http://nid.usace.army.mil/cm_apex/f?p=838:12
3.107	National Severe Storms Laboratory (NSSL): http://www.nssl.noaa.gov/users/brooks/public_html/bighail.gif
3.107	National Severe Storms Laboratory (NSSL): http://www.lightningsafety.noaa.gov
2.3	National Weather Service: http://w2.weather.gov/climate/ index.php?wfo=eax
3.5	National Weather Service: https://www.weather.gov/ama/heatindex
3.52; 3.112	National Weather Service: https://www.weather.gov/safety/cold-wind-chill-chart
3.6	National Weather Service: https://www.weather.gov/safety/heat-illness
3.51	National Weather Service: https://www.weather.gov/safety/heat-index
3.121-3.122	National Weather Service: https://www.spc.noaa.gov/faq/tornado/ef-scale.html
3.4	Natural Resources Defense Council: https://www.nrdc.org/issues/climate-change
3.94	Show-Me Strong COVID Dashboard: https://showmestrong.mo.gov/data/public-health/
3.18	St. Joseph Economic Development Partnership: https://choosesaintjoseph.com/site-selection/data/largest-employers/
3.31	St. Joseph News-Press: https://www.newspressnow.com/news/local_news/corps-looking-at-missouri-river-navigation/ article_d8db9fe4-60dd-11eb-8f46-171eae9c192f.html
3.23	St. Joseph News-Press: https://www.newspressnow.com/news/local_news/education/sjsd- voters-dont-care-much-for-care-bond-issue/article_ada0ea8e-9731-11eb-9388-bbcbd87fe5f1.html
3.76	St. Joseph News-Press: https://www.newspressnow.com/news/local_news/flooding/rushville-sugar-lake-levee-bid-awarded/article _1d67722c-5fe5-11eb-81e4-5bab22015c0a.html
3.81-3.82; 3.82; 31.132	St. Joseph News-Press articles: Woman Watches as Street Swallows Her Car; Crews Working to Fix Water Main Break; Sinkhole Displaces Residents at Apartment Complex; Sinkhole Forces Road Closure; City's Aging Water Mains, Hydrants Being Replaced; State to Study Region's Sinkholes; Blaze Destroys Downtown Building with History"
3.59	St. Joseph School District: https://www.sjsdfacilities.org/assessments

3.7-3.9	State of Missouri Geographic Information Systems (GIS) database: https://docs.google.com/spreadsheets/d/1fMhAlZERunnWCCZh7-FA4-gm9g8dHe5M/edit#gid=224301997
3.104	Tornado and Storm Research Organization (TORRO): http://www.torro.org.uk/site/hscale.php
3.124	Tornado Chaser: http://www.tornadochaser.net/tornalley.html
3.129; 3.136	University of Wisconsin-Madison Silvis Lab: http://silvis.forest.wisc.edu/data/wui-change/
3.3	U.S. Army Corps of Engineers: https://www.nwd.usace.army.mil/Media/News-Releases/Article/1785855/ gavins-point-releases-reach-90k/
3.86; 3.89	U.S. Army Corps of Engineers: https://levees.sec.usace.army.mil/#/levees/search/in=@ county%20state:Buchanan,%20Missouri&viewType=map&resultsType=systems&advanced =true&hideList=false&eventSystem=false
3.4	U.S. Climate Resilience Toolkit, Climate Explorer: https://crt-climate-explorer.nemac.org/cards-home/?county=Buchanan+County&city= Buchanan+County,%20MO&fips=29021&lat=39.6349791&lon=-94.81059549999999&zoom=7&nav=undefined
3.39	U.S. Drought Monitor: http://droughtmonitor.unl.edu/data/png/20180626/20180626_wfoeax_trd.png
3.37	U.S. Drought Monitor: https://droughtmonitor.unl.edu/Maps/MapArchive.aspx
3.14	U.S. Fish and Wildlife Service: http://www.fws.gov/midwest/Endangered/lists/missouri-cty.html OR https://ecos.fws.gov/
3.38	U.S. Geological Survey: http://maps.waterdata.usgs.gov/mapper/index.html
3.45; 3.47	U.S. Geological Survey: https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map
3.79-3.80	U.S. Geological Survey- Sinkholes Fact Sheet: https://pubs.usgs.gov/fs/2007/3060/
2.2; 3.49; 3.118	U.S. Census American Community Survey five-year estimate, 2015-2019 & one-year estimate, 2019
2.2	U.S. Census Bureau, Annual Population Estimates, 2019 (www.factfinder.census.gov)
2.7; 3.36	USDA Census on Agriculture, 2017: https://www.nass.usda.gov/Publications/AgCensus/2017/ Online_Resources/County_Profiles/Missouri/cp29021.pdf
3.4; 3.106; 3.114-3.115	USDA: http://www.rma.usda.gov/data/cause.html
3.38; 3.57	USDA: https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss
3.82	Water Technology Online: https://www.watertechonline.com/wastewater /article/14183856/solving-a-600ton-problem-print

Appendix B: Planning Process Documentation

Specialized meetings
• Schools • Fire Chiefs
• Levies •

4 meetings
7 pm

• unincorporated fall under county
• public health / fire could be own jurisdictions

• Halls Levy District

meeting 1st Monday of each mo @ Bill's house

Buchanan County Multi-Jurisdictional Hazard Mitigation Plan

What is a Hazard Mitigation Plan (HMP)? It is a plan that is focused on reducing the loss of life and property in the event of a natural disaster. Input from many people and organizations are needed to update the plan, including the county, communities, special districts, emergency management, schools, organizations, and other stakeholders.

What experience do I need to participate? No prior experience in planning or emergency management is necessary. Everyone is welcome to the planning meetings and to provide input.

What's the process for updating the plan? A committee of the various stakeholders listed above will be established and will meet four times. Jurisdictions will need to provide information/data about their jurisdiction, evaluate actions from the last plan and identify new actions. It can be a time consuming process so having several people participating from each jurisdiction makes it an easier process. The Emergency Management Director and County Commissioners take the lead to encourage participation and help gather information. Each jurisdiction will need to formally adopt the plan when it's complete. The completed plan will be sent to SEMA and then FEMA for review. There will also be public meetings and outreach. The public should have an opportunity to be involved.

1 intro!
2 Risk assess.
3 actions
4 adopt resolutions + plan to review

Why do we need to do update the HMP? Having a current HMP keeps the jurisdiction eligible for certain FEMA funding and grants, such as the tornado siren grant applications that Mo-Kan is currently assisting with in Andrew County.

When is the HMP due? HMPs are updated every five years. A draft with resolutions from all participating jurisdictions is due **December 10, 2021** and the final is due **May 12, 2022**.

Draft = Dec. 10, 21
Final = May 12, 22

How much does the update cost? Mo-Kan is paid directly from SEMA to write the plan but there needs to be $8,640 in documented local match (cash or in-kind). The volunteer rate for non-elected participants is $23.96 per hour and $.45 per mile. Donation of meeting space, printing and materials can count as in-kind. Elected officials' time doesn't count towards in-kind. **All in-kind must be properly documented in order to count as match.**

donation of meeting space, printing & in-kind

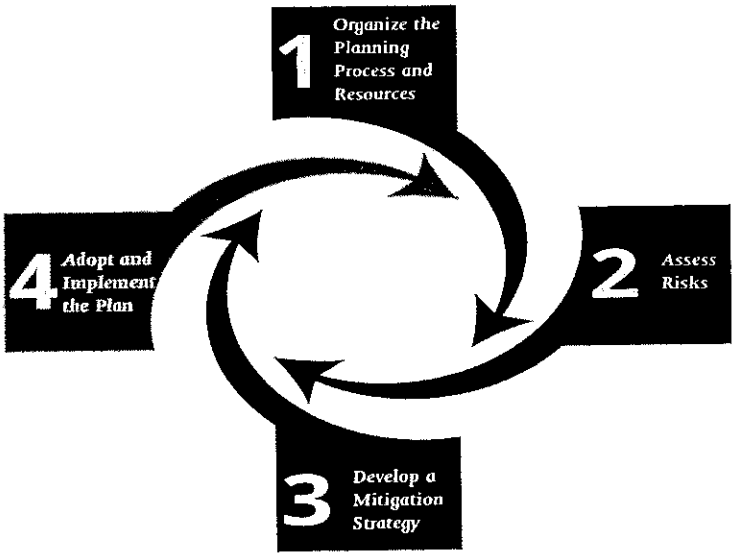
Ron Meals on Wheels ↓ deliver survey w/ that can count

Who do I contact with questions? Contact Mo-Kan at 816-233-3144. We will be the lead on updating the plan and arranging the meetings.

Fire Chiefs meeting Jan. 21

Talking Points for Commissioner's Meeting 11-9-20

The Planning Process



1. Organize the Planning Process and Resources – At the start, a state, tribe, or local government should focus on assembling the resources needed for a successful mitigation planning process. This includes securing technical expertise, defining the planning area, and identifying key individuals, agencies, neighboring jurisdictions, businesses, and/or other stakeholders to participate in the process. The planning process for local and tribal governments must include opportunities for the public to comment on the plan.

2. Assess Risks – Next, the state, tribe, or local government needs to identify the characteristics and potential consequences of hazards. It is important to understand what geographic areas each hazard might impact and what people, property, or other assets might be vulnerable.

3. Develop a Mitigation Strategy – The state, tribe, or local government then sets priorities and develops long-term strategies for avoiding or minimizing the undesired effects of disasters. The mitigation strategy addresses how the mitigation actions will be implemented and administered.

4. Adopt and Implement the Plan – Once FEMA has received the adoption from the governing body and approved the plan, the state, tribe, or local government can bring the mitigation plan to life in a variety of ways, ranging from implementing specific mitigation projects to changing aspects of day-to-day organizational operations. To ensure success, the plan must remain a relevant, living document through routine maintenance. Local government needs to conduct periodic evaluations to assess changing risks and priorities and make revisions as needed.

(https://www.fema.gov/hazard-mitigation-planning-process)

Levy Presidents !!!! ✓

✓ Add : Easton Schools - contact - Middle school ✓

✓ Lewis / Clark - Eric Wagner - # 294-6563

✓ Gary Black - Rushville Mayor # 688-7695

✓ Thomas Gillis - DeKalb - # 294-1974

DRAFT LIST OF PLANNING COMMITTEE MEMBERS

NAME	TITLE	ORGANIZATION	EMAIL
Adam Perry	**Chairperson**	**Buchanan County LEPC**	**Adam.M.Perry@leo.gov**
Jody Carlson		MO American Water	Bernie Meyer <Bernard.Meyer@amwater.com>,
Bill Brinton	Emergency Management Director	Buchanan County Courthouse	Bill Brinton <bbrinton@co.buchanan.mo.us>,
Lee Sawyer	Presiding Commissioner	Buchanan County Courthouse	Lee Sawyer <Lsawyer@co.buchanan.mo.us>,
Ron Hook	Commissioner	Buchanan County Courthouse	Ron Hook <RHook@co.buchanan.mo.us>,
Scott Burnham	Commissioner	Buchanan County Courthouse	Scott Burnham <SBurnham@co.buchanan.mo.us>,
Bill Lamar	~~Interim~~ Emergency Manager	904 S 10th St.	Bill Lamar <blamar@stjoemo.org>
Karla Duncan	Disaster Program Manager	American Red Cross	karla.duncan@redcross.org
Abby Pierce	Emergency Management Coordin	MO Air National Guard	abby.n.pierce.mil@mail.mil
Ralph Dishong	Disaster Program Specialists	American Red Cross	Ralph Dishong <Ralph.Dishong@redcross.org>,
Ron Barbosa	Senior Vice President	Security Bank	Ron Barbosa <rbarbosa@securitybankkc.com>
Ryan Pummell	Code Enforcement	Buchanan County	Ryan Pummell <RPummell@co.buchanan.mo.us>,
Steve Groshong	Paramedic	Buchanan County EMS	Steve Groshong <Steve.groshong@bc-ems.com>,
Travis Dittemore	Superintendent	Buchanan County R-IV School District	Travis Dittemore <dittemot@bcr4.k12.mo.us>
Jay Albright	Superintendent	Mid-Buchanan R-V School District	jalbright@midbuchanan.k12.mo.us
current officials:			
Sandy Wood	Chairman	Agency	agencyclerk@yahoo.com
Heather Marti	City Clerk	Agency	agencyclerk@yahoo.com
☐ Jerry Smith	Mayor	DeKalb	
Skylar Glaub	City Clerk	DeKalb	skyler8140@hotmail.com
Twila Ellington	Mayor	Easton	cityofeaston@centurytel.net
Sally McDowell	City Clerk	Easton	cityofeaston@centurytel.net
Jack Rodkey	**Chairman/Flood Plain Ma**	Lewis & Clark Village	jack.rodkey@att.net
☐	City Clerk	Rushville	
☐	Chairman	Rushville	
☐	City Clerk	Rushville	
Bill McMurray	Mayor	St. Joseph	bmcmurray@stjoemo.org
Zack Martin	City Planner	St. Joseph	zmartin@stjoemo.org
Paula Heyde	City Clerk	St. Joseph	pheyde@stjoemo.org
Gary Edwards	City Manager	* Starts in November	gedwards@stjoemo.org
Dr. Doug Van Zyl	Superintendent	St. Joseph School District	doug.vanzyl@sjsd.k12.mo.us

John Newell	Superintendent	East Buchanan C-1 School District	newell@ebs.k12.mo.us
Chris Connally	Chief of Police	St. Joseph Police Department	cconnally@stjoemo.org
Bill Puett	Sheriff	Buchanan County	bpuett@sher.co.buchanan.mo.us
	Fire Chief	City of DeKalb	
	Fire Chief	510 SE Kemmer Rd	
Robert Blair	Fire Chief	St. Joseph	
Andrew Johnson	**Fire Chief -- Southwest Buchanan County**	Rushville	**awjandy@hotmail.com**
Brian Christgen (not Mayor any more)		St. Joseph	
Mike Dalsing	Fire Chief	St. Joseph	mdalsing@stjoemo.org
Warren Nadler	**Fire Chief - San Antonio**	St. Joseph	warren.nadler@yahoo.com
Dennis Johnson	**Central Buchanan County**	Agency	**FireSCBC@gmail.com**
Mike Curren (Retired & does not do much with us any more)	Fire Chief	St. Joseph	
Mike Booth	Region H Coordinator		Michael.booth@sema.dps.mo.gov
Keven Schneider	Superintendent	St. Joseph Public Works	kschneider@stjoemo.org
Wally Patrick	Director	Buchanan County EMS	wally.patrick@bc-ems.com
Kevin Kelly	CEO	Lifeline Foods	
Sharon Smith	ER Nurse	Mosaic Life Care	sharon.smith@mymlc.com
Eric Protzman	Commander	St. Joseph Police Dept.	eprotzman@stjoemo.org
Warren Rogers	Nestle Purina PetCare	4502 Packers Ave	warren.rogers@purina.nestle.com
Tim Kissock	Risk Manager	MWSU	tkissock@missouriwestern.edu
Sheldon Lyon	Executive Director	St. Joseph Safety and Health Council	
Chris Redline	District Engineer	MoDOT	christopher.redline@modot.mo.gov

Tentative Timeline for Buchanan County Hazard Mitigation Plan (HMP) Update

TASKS	Sept 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	June 21	July 21	Aug 21	Sept 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22
Establish planning committee *																		
Kick-Off Meeting																		
Introduction Meeting I																		
Risk Assessment Meeting II																		
Other meetings																		
Survey Public outreach																		
Mitigation Strategy Meeting III																		
First Draft for SEMA Review																		
Posted for 2 week Committee Review																		
Posted for 30 day Public Review														Oct. 12*				
Jurisdictions adopt resolutions																		
Final Draft to SEMA																Dec. 10*		
Revisions																		
SEMA submits final draft to FEMA																		

***Oct. 12- Last day to ask for a written request of extension *Dec. 10- Due to the SEMA**

*All jurisdictions should have at least one representative attending the planning meetings and working on the forms required to update the plan. It's suggested that two or more people from each jurisdiction work together to divide the responsibilities. It's important that forms are submitted on time in order for the plan to be completed on time.

Buchanan County, MO
PRESS RELEASE

For Immediate Release

Contact: Rebecca Thacker
(816) 233-3144

BUCHANAN COUNTY HAZARD MITIGATION PLANNING COMMITTEE

Buchanan County, MO – Buchanan County is seeking public participation in updating the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan. The purpose of the plan is to mitigate the impact of natural hazards and to reduce the loss of life and property. The public can help by serving on the planning committee and/or by distributing information at public events.

The planning committee will be comprised of representatives from Buchanan County, the incorporated cities, public school districts, agencies, businesses and community volunteers. The first of four meetings will be held at 6:00 pm on Tuesday, December 8 at the Remington Nature Center located at 1502 McArthur Drive, St. Joseph, Missouri 64505. All participants will be required to wear a mask and maintain social distancing.

The plan update will address a comprehensive list of hazards – ranging from severe winter storms and floods to drought and tornadoes – and will assess the likely impacts of these hazards on communities and school districts in Buchanan County. The committee will also update mitigation strategies and identify additional activities to reduce the vulnerability of people and property from extreme weather events.

Feedback from the public will be incorporated into the plan, which will be available for public review and comment. Upon the formal adoption by each participating jurisdiction, the plan will be presented to Missouri State Emergency Management Agency (SEMA) and Federal State Emergency Management Agency (FEMA) for approval. Jurisdictions that participate in updating the plan will remain eligible for hazard mitigation assistance grants.

Mo-Kan Regional Planning Commission is partnering with Buchanan County to update the plan. For more information about participating and/or to RSVP to the upcoming meeting, contact Mo-Kan at (816) 233-3144. Please RSVP by December 3rd. If you cant participate in the meeting but would like to be involved in the future please contact us.

###

.

Buchanan County Hazard Mitigation Planning Meeting #1

Sign-in Sheet

Date: **Tuesday, December 8, 2020**
Time: **6:00 PM**
Location: **Remington Nature Center, 1502 McArthur Drive, Saint Joseph, MO 64505**

Name	Email Address
Adam Perry	adam.m.perry@leo.gov ✓
Lauren Caudle	lauren.williams.caudle@clarios.com ✓
Mindy Andrasevits	mandrasevita@stjoemo.org ✓
Jeff Wilson	jwilson@stjoemo.org ✓
Colleen Armstrong	carmstrong@stjoemo.org ✓

Buchanan County Hazard Mitigation Planning Meeting #1
Virtual Sign-in Sheet

Date: **Tuesday, December 8, 2020**
Time: **6:00 PM**
Location: **Remington Nature Center, 1502 McArthur Drive, Saint Joseph, MO 64505**

Name	Email Address/Phone #
Bill Brinton	BBrinton@co.buchanan.mo.us 816 383-0604 ✓
BILL LAMAR	BLAMAR@STJOEMO.ORG ✓
SALLY MCDOWELL	cityofeaston@unitedfiber.email 816-473-4571 ✓
Dennis Johnson	firesdbc@gmail.com ✓
John Hontz	John.Hontz@amwater.com ✓
JEFF ATKINS	JATKINS@STJOEMO.ORG
Robert Sigrist	robertsigrist@sjsd.k12.mo.us ✓
Mickey Gill	mickey.gill@stsd.k12.mo.us ✓
Ron Hook	RHOOK@Buchmo.com ✓

Buchanan County Hazard Mitigation Plan Update

Planning Meeting #1

Tuesday, December 8, 2020 @ 6pm
Remington Nature Center
St. Joseph, Missouri

Mo-Kan
An Economic and Community Development Organization

1

Meeting Agenda

- Welcome and Introductions
- What is the Hazard Mitigation Plan (HMP)? (Background & Purpose)
- Why do we need to Participate? (Grant Eligibility & Programs)
- What's the Process of Updating the Plan? (Planning Tasks)
- What are HMP participation requirements?
- Timeline
- Next Steps

Mo-Kan
An Economic and Community Development Organization

2

Welcome & Introductions

- Please tell us your name and the community/district you are representing

  Please sign-in **and fill out the volunteer form (elected officials' time doesn't count)*

Mo-Kan
An Economic and Community Development Organization

3

Mo-Kan's Role in HMP

- Who is Mo-Kan?
  - Mo-Kan is one of 19 regional planning commissions in Missouri
  - Mo-Kan serves six counties
    - Andrew, Buchanan, Clinton, and DeKalb in Missouri
    - Atchison and Doniphan in Kansas
  - Part of a larger, statewide organization, the Missouri Association of Council of Governments (MACOG)
  - Mo-Kan facilitates process in cooperation with the county/jurisdictions

Mo-Kan
An Economic and Community Development Organization

4

What is a Hazard Mitigation Plan?

- Sustained action taken to reduce or eliminate long-term risk to human life and property from hazardous events
- Mitigation planning is a process for communities to:
  - Identify the hazards to which they are at risk
  - Assess the potential impact of those hazards
  - Develop goals, objectives, and actions to reduce impacts
  - Prioritize and implement mitigation actions

Mo-Kan
An Economic and Community Development Organization

5

What is a Hazard Mitigation Plan?

- Chapter 1 – planning process
- Chapter 2 – community profiles and capabilities
- Chapter 3 – risk assessment
- Chapter 4 – mitigation strategy
- Chapter 5 – plan maintenance

(Buchanan's 2016 plan was 433 pages)

Mo-Kan
An Economic and Community Development Organization

6

Why Do We Need to Participate?

- Disaster Mitigation Act of 2000
- Requires local governments to adopt a natural hazard mitigation plan to maintain eligibility for FEMA mitigation funds
- Plan must be updated and approved by FEMA every 5 years
- Goal is to reduce loss of life and property in the event of a natural disaster
- Create more resilient communities.

Mo-Kan
An Economic and Community Development Organization

7

Approved HMP Establishes Eligibility for FEMA Grants To Participating Jurisdictions

- Hazard Mitigation Grant Program (HMGP)- available after a federally declared disaster
- Building Resilient Infrastructure and Communities (BRIC)-NEW
- Pre-Disaster Mitigation Program (PDM)
- Flood Mitigation Assistance Program
  - Repetitive Loss Program
  - Severe Repetitive Loss Program

Mo-Kan
An Economic and Community Development Organization

8

Hazard Mitigation Grant Program (HMGP)

- The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration.
- Eligible applicants are state agencies, local governments, private non-profit organizations, or Indian tribal governments.
- 75% federal & 25% non-federal match
- **An approved local mitigation plan is required.**

Mo-Kan
An Economic and Community Development Organization

9

Building Resilient Infrastructure & Communities (BRIC)

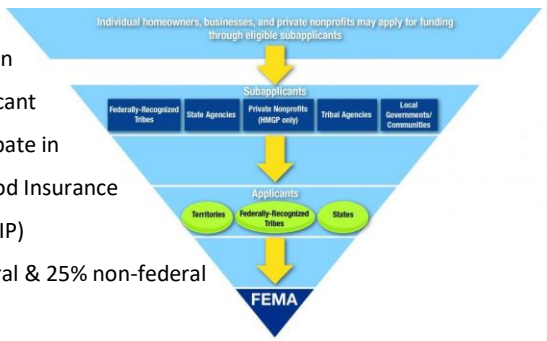
- Annual Appropriation
- Nationally competitive grant for up to $600,000 for individual projects that focus on pre-disaster mitigation activities that involve critical services/facilities, public infrastructure, public safety or public health
- 75% federal & 25% non-federal match; or 90% & 10% if meets criteria for a small, impoverished community
  - SEMA forwards selected applications to FEMA
  - **An approved local mitigation plan is required.**

Mo-Kan
An Economic and Community Development Organization

10

Flood Mitigation Assistance Program

- Annual Appropriation
- Sub-applicant must participate in National Flood Insurance Program (NFIP)
- 75% federal & 25% non-federal match



- **An approved local mitigation plan is required.**

Mo-Kan
An Economic and Community Development Organization

11

What's the Process to Update Buchanan County's Hazard Mitigation Plan?

Mo-Kan
An Economic and Community Development Organization

12

9 Tasks to Complete the Plan Update

- **Task 1: Determine the Planning Area**
- **Task 2: Build the Planning Team**
- **Task 3: Create an Outreach Strategy**
- **Task 4: Review Community Capabilities**
- Task 5: Conduct a Risk Assessment
- Task 6: Develop a Mitigation Strategy
- Task 7: Review and Adopt the Plan
- Task 8: Keep the Plan Current
- Task 9: Create a Safe and Resilient Community

Mo-Kan
An Economic and Community Development Organization

13

Multi-Jurisdictional Plan Approach
Task 1: Determine the Planning Area

- Buchanan County
- Lewis & Clark Village
- Agency
- DeKalb
- Easton
- Rushville
- St. Joseph
- St. Joseph School District
- Mid-Buchanan School District
- East Buchanan School District (Middle School)
- Rushville Elementary
- DeKalb High School
- Special Districts (fire, EMS)

Mo-Kan
An Economic and Community Development Organization

Who's missing?

14

Task 2: Build the Planning Team

Jurisdictions

- Emergency Responders
- County and City Clerks
- Elected Officials
- Public Works Directors
- Floodplain Managers
- Stormwater Managers
- School Principals & Superintendents

Stakeholders

- Business Partners
- Private-non-profits
- State & Federal Agencies
- Academia
- Healthcare Sector
- Senior Living Facilities
- Local/Regional Agencies

Who is missing?

Mo-Kan
An Economic and Community Development Organization

15

Public Involvement Requirement
Task 3: Creating an Outreach Strategy

- During Drafting Stage
  - Public Survey – please see handout
    - Survey Monkey
    - Hard Copies—City Halls/Libraries/Post Offices
    - Link on County Website/Other Websites
- Prior to approval
  - Draft Available via County Website
  - Hard Copies - at least two public locations
- Other Ideas/Events for Public Outreach? Ready-In-3?

Mo-Kan
An Economic and Community Development Organization

16

Data Collection Questionnaires
Task 4: Reviewing Community Capabilities

- Please see the questionnaire
- The questionnaire asks for information that's used for reviewing community capabilities
- It's common for several people to contribute information to complete the questionnaire
- Critical facilities information is required

Mo-Kan
An Economic and Community Development Organization

17

Critical Facilities Examples

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline
•Hospitals and other medical facilities •Police stations •Fire station •Emergency Operations Centers	•Power plants •Dams/levees •Military installations •Hazardous material sites •Schools •Shelters •Day care centers •Nursing homes •Main government buildings	•Highways, bridges, and tunnels •Railroads and facilities •Bus facilities •Airports •Water treatment facilities •Natural gas facilities and pipelines •Oil facilities and pipelines •Communications facilities

- Take a few minutes to review and ask questions
- Please submit **before** the next meeting (mail or e-mail)

Mo-Kan
An Economic and Community Development Organization

18

What are HMP Participation Requirements for each jurisdiction?

- Attend at least one HMP meeting
- Complete data questionnaire form and list of critical/essential facilities
- Complete updated risk assessment
- Evaluate past mitigation actions
- Develop new and update past mitigation actions (at least one)
- Provide comments on plan drafts as requested
- Inform the public and provide opportunities for comment on plan
- Adopt the plan (adoption resolution template)

Mo-Kan
An Economic and Community Development Organization

19

Buchanan County Plan Update Timeline

- Buchanan County's Current Hazard Mitigation Plan
  - First draft of update due to SEMA by **December 10, 2021**
  - Final draft of the update is due to FEMA by **May 12, 2022**
  - The public must have an opportunity to comment on the draft before adopted by the county
  - All jurisdictions must adopt the HMP **prior** to submitting the draft to SEMA

Mo-Kan
An Economic and Community Development Organization

20

Buchanan County Plan Update Timeline

- Planning Committee Meetings
  - Planning Meeting #1, **Today**
    - Data Collection Questionnaire & discuss hazards
  - Planning Meeting #2, **February 2021 (Exact Date TBD)**
    - Risk Assessment & update mitigation goals/actions from previous plan
  - Planning Meeting # 3, **May 2021 (Exact Date TBD)**
    - Develop new goals and actions & discuss plan maintenance
  - Planning Meeting #4 (if necessary)
    - Revise sections based on preliminary SEMA, FEMA review

Mo-Kan
An Economic and Community Development Organization

21

Timeline of HMP

TASKS	Sept 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	June 21	July 21	Aug 21	Sept 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22
Establish planning committee *																		
Kick-Off Meeting																		
Introduction Meeting I																		
Risk Assessment Meeting II																		
Other meetings																		
Public outreach																		
Mitigation Strategy Meeting III																		
First Draft for SEMA Review																		
Posted for 2-week Committee Review																		
Posted for 30-day Public Review														Oct. 12*				
Jurisdictions adopt resolutions																		
Final Draft to SEMA																Dec. 10*		
Revisions																		
SEMA submits final draft to FEMA																		

*Oct. 12- Last day to ask for a written request of extension *Dec. 10- Due to SEMA

*All jurisdictions should have at least one representative attending the planning meetings and working on the forms required to update the plan. It's suggested that two or more people from each jurisdiction work together to divide the responsibilities. It's important that forms are submitted on time in order for the plan to be completed on time.

Mo-Kan
An Economic and Community Development Organization

22

In-kind Match

- Buchanan County is responsible for $ **8,640** in-kind match
- In-kind activities include:
  - Planning Committee (unless elected or appointed)
  - Hosting public meetings and talking to community groups
  - Researching or compiling data related to the plan
  - Donation of supplies, labor or equipment for project in plan
  - Time spent driving to HMP activities

Buchanan County HMP In-Kind Contribution

Name: Joe Bob
Address: 500 Cool St.
Jurisdiction: St. Joseph

Date	Hours	Mileage (Round trip)	Activity
	X $23.96 =	X $.45 =	
12-6-20	2	15	HMP meeting 1

Hours $ Total:	Mileage $ Total:	Timesheet $ Total:
$47.92	$6.75	$54.67

Signature: Joe Bob

*All donated hours and labor must be documented on timesheet
* All donated supplies and equipment must be on an invoice

Mo-Kan
An Economic and Community Development Organization

23

The Next Steps

- Schedule additional public meetings and public outreach
- Encourage people to attend and provide feedback
- 2nd Planning Committee meeting
- 3rd Planning Committee meeting

Rebecca Thacker, Hayley Howard, Trevor Tutt
Community Development Planners
Mo-Kan Regional Council
224 N. 7th Street
St. Joseph, MO 64501
816-233-3144
rebecca@mo-kan.org
hayley@mo-kan.org
trevor@mo-kan.org

Mo-Kan
An Economic and Community Development Organization

24

Questions

Rebecca Thacker, Hayley Howard, Trevor Tutt
Community Development Planners
Mo-Kan Regional Council
224 N. 7th Street
St. Joseph, MO 64501
816-233-3144
rebecca@mo-kan.org
hayley@mo-kan.org
trevor@mo-kan.org

Mo-Kan
An Economic and Community Development Organization

25

Buchanan County Chiefs Association

Thursday Jan 27th 2021

Opening: Meeting was called to order at 1900 hours SCBC #2

Attendance: Dennis, Mike, Jess, Andrew, Brad, Joe, Bill B, Jon,

Absent Departments: Edgerton/Trimble, Easton, San Antonio

Guest: Tom Sontheimer Savannah Fire, Jacy Brooks Comm Center, Haylen Howard MOKAN, Rebecca Thacker MOKAN

Approval of Agenda:

Approval of minutes:

Motion: **Second:**

Financial report: See attached document for the breakdown of funds.

Easton and San Antonio are still on the VHF system and the cost for the insurance and tower combined with both departments is about $1,700. Andrew is going to reach out to them.

In the general fund we have $8,804.92

The question was brought up do we try and help San Antonio and Easton get on board with the 800 paging? Andrew was going to reach and see if they are wanting to change over.

Financial report approval

Motion: **Second:**

Business from the previous meeting: Covid-19

New Business: Free radios will be passed out to each department after the meeting. Need to thank the county commissioners for the radios.

Officer election: Will stay the same

BCEMS will be hosting COVID-19 shots for rural fire on Sunday Jan 24th from 2-

Additions to the agenda:

Training: Gower will be hosting Life Net training that is open to everyone May 22nd at 1400 hours

Savannah Fire is working on opening there station up for a regional training facility

State farm insurance will help out with training needs (help pay for some classes in needed)

MOKAN- Multi-Jurisdictional hazard Mitigation plan: handed out some information they are putting together at this time and will be emailing out a survey for each department. This will be sent out through Dennis.

Department news:

SCBC: End of yr calls: 378 on the ice storm day ran 16 calls in 24 hours

Reg H Hazmat: Air show April 30th Practice, May 1st-2nd

Gower: End of yr calls: 258 man hours: 840 received new pumper last May, about 25 staffing members

Southwest: Tanker not in service at this time working on getting a new one pretty quick

DeKalb: Board just approved a new pumper most of the calls are stolen car fires

Dearborn: end of yr calls: 255 had a lot on Chestnut road wanted to thank SCBC for helping run some of those. 2nd biggest calls vehicle accidents on i-29. The wedding venue caught fire and chief was very proud of his men and MA departments for saving it.

Eaton:

San Antonio:

Edgerton/Trimble

Communication Center: Do the chiefs want an email or active 911 for control burns? Most chiefs advised if Comm Centers knows then they are okay with that.

BCEMS: Air is coming up and might be looking a rural fire first responders for help with EMS

St Joe Fire:

Adjournment:

Next meeting: April 22nd Gower Fire Chili will be serviced at 1830 hours

Buchanan County, MO
PRESS RELEASE

For Immediate Release

Contact: Hayley Howard
(816) 233-3144

BUCHANAN COUNTY HAZARD MITIGATION PLANNING COMMITTEE

Buchanan County, MO – Buchanan County is seeking public participation in updating the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan. The purpose of the plan is to mitigate the impact of natural hazards and to reduce the loss of life and property. The public can help by serving on the planning committee and/or by distributing information at public events.

The planning committee is comprised of representatives from Buchanan County, the incorporated cities, public school districts, agencies, businesses, and community volunteers. The second of four meetings will be held at **6:00 pm on Tuesday, February 23 at the Remington Nature Center, located at 1502 McArthur Drive, St. Joseph, Missouri 64505**, as well as via Zoom for virtual viewing. All in-person participants will be required to wear a mask and maintain social distancing.

The plan update will address a comprehensive list of hazards – ranging from severe winter storms and floods to drought and tornadoes – and will assess the likely impacts of these hazards on communities and school districts in Buchanan County. The committee will also update mitigation strategies and identify additional activities to reduce the vulnerability of people and property from extreme weather events.

Feedback from the public will be incorporated into the plan, which will be available for public review and comment. Upon the formal adoption by each participating jurisdiction, the plan will be presented to Missouri State Emergency Management Agency (SEMA) and Federal State Emergency Management Agency (FEMA) for approval. Jurisdictions that participate in updating the plan will remain eligible for hazard mitigation assistance grants.

Mo-Kan Regional Planning Commission is partnering with Buchanan County to update the plan. For more information about participating and/or to RSVP to the upcoming meeting or to receive a Zoom link, contact Mo-Kan at (816) 233-3144. **Please RSVP by February 16**. If you cannot participate in the meeting, but would like to be involved in the future, please contact us.

###

.

Buchanan County Hazard Mitigation Planning Meeting #2

Sign-in Sheet

Date: **Tuesday, February 23, 2021**
Time: **6:00 PM**
Location: **Remington Nature Center, 1502 McArthur Drive, Saint Joseph, MO 64505**

Name	Email Address
Mike Sobetsko	msobetsko@lifeline-foods.com ✓
Bill Brinton	BBrinton@co.Buchanan.mo.us ✓
Ryan Pummell	RPummell,co Buchanan mo.us ✓
Jeff Atkins	JATKINS@STJOEMO.ORG ✓
John Hontz	John.Hontz@Amwater.com ✓
Mindy Andrasents	mandrasents@stjoemo.org ✓
Sally McDowell	cityofeaston@unitedfiber.email ✓
Adam Perry	adam.m.perry@leo.gov ✓
Lee Sawyer	Lsawyer@buchmo.org ✓
Katie Bruegge	Kbruegge@stjoe.org ✓
Colleen Armstrong	Colleen Armstrong ✓
Jeff Wilson	jwilson@stjoemo.org ✓

Planning Meeting #2

Buchanan County Multi-Jurisdictional Hazard Mitigation Plan Update

February 23, 2021
Remington Nature Center & Zoom
St. Joseph, Missouri

PUBLIC SURVEY QR CODE

PLEASE TAKE A MOMENT **NOW** TO TAKE THE BUCHANAN COUNTY HMP SURVEY* ONLINE VIA THE QR CODE OR BY GOING TO WWW.MO-KAN.ORG & CLICKING ON THE SURVEY UNDER "PUBLIC PARTICIPATION."

*PAPER COPIES ARE AVAILABLE UPON REQUEST

Public Participation

Complete the *Andrew County* Multi-Jurisdictional Hazard Mitigation Plan survey by clicking here.

Complete the *Buchanan County* Multi-Jurisdictional Hazard Mitigation Plan survey by clicking here

Mo-Kan
An Economic and Community Development Organization

Meeting Agenda

- Review
- Public Outreach
- Review Mitigation Goals
- Hazard Profile and Vulnerability Assessment
- Previous Occurrences
- In-Kind Match
- Next Steps

Mo-Kan
An Economic and Community Development Organization

Review

- **What?** Buchanan County Hazard Mitigation Plan
- **Who?** All jurisdictions
- **Why?** To reduce loss and life and property
  Also, to stay eligible for FEMA/SEMA funding
- **When?** Draft due in December 2021 (very soon!)

Mo-Kan
An Economic and Community Development Organization

9 Tasks to Complete the Plan Update

- **Task 1: Determine the Planning Area**
- **Task 2: Build the Planning Team**
- **Task 3: Create an Outreach Strategy**
- **Task 4: Review Community Capabilities and Plan Goals**
- **Task 5: Conduct a Risk Assessment**
- **Task 6: Develop a Mitigation Strategy**
- Task 7: Review and Adopt the Plan
- Task 8: Keep the Plan Current
- Task 9: Create a Safe and Resilient Community

Mo-Kan
An Economic and Community Development Organization

Task 3 – Create an Outreach Strategy

We must get creative during the pandemic!

- Ready-In-3 materials available for distribution
- Attended Fire Chiefs meeting at SCBC Station 2 on January 21
- Other ideas?
- Public survey – Survey Monkey

https://www.surveymonkey.com/r/BuchananHMP

Mo-Kan
An Economic and Community Development Organization

Task 4 – Review Community Capabilities & Data Questionnaire Forms

- **Must be submitted in order to be considered a participating jurisdiction!**
- **Data questionnaires already received from:**

Easton

Buchanan County

Buchanan County R-IV School District

Mo-Kan
An Economic and Community Development Organization

Common Categories of Mitigation Goals

- Reduce Risk to Life and Property
- Public Education
- Policies/Planning/Training/Communication
- Protection of Critical/Essential Facilities

Every $1 Invested in Disaster Mitigation Saves $6

(pewtrusts.org)

Review of Past Mitigation Goals

- Goals describe the overall direction of the plan
- Jurisdictions will create individual actions that align with goals and objectives

Mo-Kan
An Economic and Community Development Organization

2018 Buchanan County HMP Goals (pp. 4.2-4.3)

Goal 1: Protect the Lives, Property and Livelihoods of All Citizens.

Objective 1: Protect citizens' lives and property.

Objective 2: Provide sufficient warning of impending disasters.

Objective 3: Identify the citizens most vulnerable to disasters and plan accordingly.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas.

Objective 1: Lessen the impact of certain disasters and reduce the damage of disasters.

Objective 2: Decrease the cost of the next disaster.

Objective 3: Increase our economic resistance to disasters.

Goal 3: Increase Resources Available to Citizens via Education and Preparedness Information.

Objective 1: Increase knowledge among citizens about disaster safety and preparedness.

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster.

Objective 1: Increase disaster mitigation management capability in local governments.

Goal 5: Identify Critical Infrastructure Components.

Objective 1: Increase mitigation strategies to support those infrastructures.

Mo-Kan
An Economic and Community Development Organization

State 2018 HMP Goals

Goal 1: Implement mitigation actions that improve the protection of human life, health, and safety from the adverse effects of disasters

Goal 2: Implement mitigation actions that improve the continuity of government and essential services from the adverse effects of disasters

Goal 3: Implement mitigation actions that improve the protection of public and private property from the adverse effects of disasters

Goal 4: Implement mitigation actions that improve the protection of community tranquility from the adverse effects of disasters

(Objectives listed in the handout)

Mo-Kan
An Economic and Community Development Organization

Determine/Update Mitigation Goals

Does anything need changed?

Mo-Kan
An Economic and Community Development Organization

Task 5: Hazard Identification and Risk Assessment

- Hazard Profile
  - Geographic Location
  - Severity/Magnitude/Extent
  - Previous Occurrences
  - Probability of Future Occurrence
- Vulnerability Assessment
  - Vulnerability Overview
  - Potential Losses to Existing Development
  - Future Development
  - Hazard Summary by Jurisdiction
- Problem Statement

Based on existing plan, state plan, additional information from planning committee, additional research/ analysis

https://www.mo-kan.org/community/hazard-mitigation/

Mo-Kan
An Economic and Community Development Organization

Natural Hazards for Consideration

- Dam Failure
- Drought
- Earthquakes
- Extreme Heat
- Fires (Urban/Structural and Wild)
- **Flooding (Flash and River)**
- Land Subsidence/Sinkholes
- Levee Failure
- Thunderstorm/High Winds/Lightning/Hail
- Tornado
- **Winter Weather/Snow/Ice/Severe Cold**
- New: Pandemic & Community Rating System

Mo-Kan
An Economic and Community Development Organization

Previous Occurrences

Each participating jurisdiction needs to answer these questions:

1. What significant natural hazards have occurred in the past five years? What was the impact?

HISTORIC HAZARD EVENTS (continued)

Please fill out the sheet on the next page for each significant hazard event that affected Your Jurisdiction. Make as many copies as necessary to record all events and complete with as much detail as possible. This includes all events associated with the hazards listed below that have caused previous damage in your jurisdiction. It is especially important to capture events that either were not included in the previous Hazard Mitigation Plan or occurred since the plan was completed. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

Jurisdiction	
Type of event	
Nature and magnitude of event	
Location	
Date of event	
Injuries	
Deaths	

2. Have any mitigation actions been implemented in the past five years, such as outdoor warning sirens, tornado safe rooms, adoption of building codes, etc.

Mo-Kan
An Economic and Community Development Organization

Natural Hazards for Consideration

Table 3.2 Hazards Identified for Each Jurisdiction

New

	Dam Failure	Drought	Earthquake	Extreme Heat	Fires (Structural/Urban/Wild)	Flooding (River and Flash)	Land Subsidence/Sinkholes	Levee Failure	Severe Winter Weather	Thunderstorms/Lightning (Hail/High Wind)	Tornado	Public Health Emergencies/Environmental Issues
Buchanan County	x	x	x	x	x	x	x	x	x	x	x	
Agency	x	x	x	x	x	x	x	—	x	x	x	
DeKalb	—	x	x	x	x	x	x	—	x	x	x	
Easton	—	x	x	x	x	x	x	—	x	x	x	
Lewis & ClarkVillage	—	x	x	x	x	x	x	x	x	x	x	
St. Joseph	—	x	x	x	x	x	x	x	x	x	x	
Buchanan County School District	—	—	x	x	x	x	x	—	x	x	x	
Mid-Buchanan School District	—	—	x	x	x	x	x	x	x	x	x	
St. Joseph School District	—	—	x	x	x	x	x	x	x	x	x	
Missouri Western State University		x	x	x	x	x	x	x	x	x	x	

— Indicates this hazard wasn't a concern for a particular jurisdiction per the last update. Any changes to this chart?

Mo-Kan
An Economic and Community Development Organization

Inventory of Critical/Essential Facilities

Table 3.7 Inventory of Critical/Essential Facilities and Infrastructure by Jurisdiction

Jurisdiction	Airport Facility	Bus Facility	Childcare Facility	Communications Tower	Electric Power Facility	Emergency Operations	Fire Service	Government	Housing	Shelters	Highway Bridge **	Hospital/Health Care	Military	Natural Gas Facility	Nursing Homes	Police Station	Potable Water Facility	Rail	Sanitary Pump Stations	School Facilities	Stormwater Pump Stations	Tier II Chemical Facility	Wastewater Facility	Total
Unincorp	0	0	3	2	1	0	3	2	0	0	**	0	0	0	0	1	1	0	0	0	0	9	0	22
Agency	0	0	0	0	0	0	1	0	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0	1
DeKalb	0	0	0	1	0	0	1	0	0	0	**	0	0	0	0	0	0	0	0	1	0	0	0	2
Easton	0	0	0	0	0	0	1	1	0	0	**	0	0	0	0	0	0	0	0	1	0	1	0	4
Lewis & Clark	0	0	0	0	0	0	1*	0	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0	1
St. Joseph	1	2	51	1	0	1	9	18	0	4	**	1	2	0	16	1	1	1	0	33	1	162	0	304
Totals	1	2	54	4	1	1	16	21	0	4	**	1	2	0	16	2	1	1	0	35	1	172	0	328

*Fire station serves both Rushville and Lewis & Clark Village

** See Figure 3.8 on following page

(Source: Data Collection Questionnaires, HAZUS MH 3.2, MO Department of Health and Senior Services)

Please review this chart for any changes.

Mo-Kan
An Economic and Community Development Organization

Task 6: Develop Mitigation Strategy
What are Mitigation Actions?

- Actions are activities/programs/etc., that support the plan's goals and objectives
- Have long-term and cumulative benefits
- Some may be low-cost and easy to implement
- Others may be dependent on available funding
- Relevant to your jurisdiction
- Jurisdiction must have one action that is potentially funded by FEMA (**Not all actions will be eligible for FEMA grants)**

Mo-Kan
An Economic and Community Development Organization

https://www.fema.gov/grants/mitigation

Task 6: Develop Mitigation Strategy
What are Mitigation Actions?

Data questionnaire section: Assessment of Previously Proposed Actions

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.5	Add shelters in the construction of new public facilitates like libraries, community centers, etc.			✓	NO CONSTRUCTION OF THIS TYPE	X
1.1.9	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.			✓	NO EMERGENCY SHELTERS	X
1.1.24	Perform street improvements to further improve drainage throughout the community		✓		IN PROCESS OF STREET REPAIRS WHEN WILL TACKLE CRITICAL RUN OFF AREAS	✓

Mo-Kan
An Economic and Community Development Organization

Review Previous Actions

- Status updates required for ALL actions from previous plan (FEMA will not approve plan without this)
- Identified as completed, deleted or continuing
- **Must be received by April 20, 2021 or considered a non-participating jurisdiction. This will make pending FEMA grant applications ineligible.**
- Will have our next meeting March 23 to use as workshop time for reviewing action items/formulating mitigation strategies

Mo-Kan
An Economic and Community Development Organization

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas

Action 2.1.4:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Flooding
Hazard(s) Addressed:	Flood
Action or Project	
Action/Project Number:	2.1.4
Name of Action or Project:	Floodplain management
Action or Project Description:	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)
Applicable Goal Statement:	Provide mitigation to lessen the impact in hazard prone areas
Estimated Cost:	$0
Benefits:	Regulated construction in floodplain
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Emergency Management Director
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	Continue
Report of Progress	No progress but still applicable

Mo-Kan
An Economic and Community Development Organization

Create New Actions

- Should be SMART: specific, measurable, achievable, relevant and time-bound
- Complete form for new action
- Aim for a few meaningful actions
- Due by April 20
- **Set a date when your jurisdiction will review the HMP on an annual basis – default date will be January of each year**

Specific
Measurable
Achievable
Relevant
Time-bound

Mo-Kan
An Economic and Community Development Organization

In-Kind Match

- Buchanan County is responsible for **$8,640.00** of in-kind match
- At 11% of goal with **$963.75** of in-kind match (for meeting 1 & meeting space)
- In-kind match activities include:
  - Planning Committee (unless elected or appointed)
  - Public meeting attendees
  - Hosting public meetings and talking to community groups
  - Researching or compiling information related to the plan
  - Mileage for driving to HMP activities
  - Making copies of materials needed for the update and meetings

All in-kind hours and labor must be properly documented

Mo-Kan
An Economic and Community Development Organization

The Next Steps

- Schedule additional public meetings and public outreach!
- 3rd Planning Committee meeting
  - tentatively March 23, 6:30 pm
- Deadline for new actions is April 20, 2021
- Draft of plan will be posted in July 2021
- Available for public review/comment (30 days)
- Resolution adopting the plan due from jurisdictions by October 31, 2021

Mo-Kan
An Economic and Community Development Organization

Questions

Trevor Tutt trevor@mo-kan.org
Hayley Howard hayley@mo-kan.org
Nic Hutchison nic@mo-kan.org
Rebecca Thacker rebecca@mo-kan.org

Mo-Kan Regional Council
224 N. 7th Street
St. Joseph, MO 64501
816-233-3144

Mo-Kan
An Economic and Community Development Organization

State of Missouri Mitigation Goals and Objectives 2018 (pg. 671)

Goal 1: Implement mitigation actions that improve the protection of human life, health, and safety from the adverse effects of disasters

1.1. Maintain a robust mitigation program that addresses ways to mitigate the loss of life from disaster events. (This includes supporting the development and funding of mitigation plans and sensible mitigation projects to reduce the effects of natural hazards, future flooding, eliminate repetitive flood losses, improve safety and reduce losses during severe weather events, mitigate losses due to earthquakes, minimize losses due to terrorism, and reduce risk and losses due to high wind, tornadoes, winter storms, drought, high heat, and fire.)

1.2. Strengthen cooperation with SEMA's mitigation partners and help educate them about mitigation.

1.3. Support the development of sensible enabling legislation, programs, and capabilities of federal, state, and local governments and public-private partnerships engaged in mitigation activities.

1.4. Increase public awareness of disaster risks and effective mitigation measures that protect human life.

1.5. Maintain a high level of mitigation proficiency among SEMA staff.

Goal 2: Implement mitigation actions that improve the continuity of government and essential services from the adverse effects of disasters

2.1. Support the development of sensible mitigation projects to protect key and essential facilities and services.

2.2. Continue to educate federal, state, and local public officials; educational institutions; private associations; and private business entities that provide essential services about hazards and how mitigation can reduce losses and help maintain continuity.

2.3. Educate state and local officials concerning the need to use sensible mitigation techniques for new facility construction.

2.4. Encourage maximum participation in maintaining effective state and local mitigation plans, disaster plans, and business continuity plans.

2.5. Encourage federal, state, and local officials; educational institutions; private associations; and private business entities that provide essential services to incorporate mitigation into other plans.

Goal 3: Implement mitigation actions that improve the protection of public and private property from the adverse effects of disasters

3.1. Maintain an effective mitigation program that addresses ways to mitigate the loss of property rom disaster events. (This includes supporting the development and funding of mitigation plans and sensible mitigation projects to reduce the effects of natural hazards, future flooding, eliminate repetitive flood losses, improve safety and reduce losses during severe weather events, mitigate losses due to earthquakes, minimize losses due to terrorism, and reduce risk and losses due to high wind, tornadoes, winter storms, drought, high heat, and fire.)

3.2. Strengthen cooperation with SEMA's mitigation partners and help educate them about mitigating the loss of property.

3.3. Support organizations that work to help mitigate the adverse effects of disasters.

3.4. Increase public awareness of disaster risks and effective mitigation measures that protect property.

3.5. Support the National Flood Insurance Program, Community Rating System (CRS), earthquake insurance, and other programs that serve to reduce the impacts of disasters on properties.

Goal 4: Implement mitigation actions that improve the protection of community tranquility from the adverse effects of disasters

4.1. Develop, implement, and complete mitigation projects as expeditiously, effectively, efficiently, and unobtrusively as possible.

4.2. Consider sustainability issues (ecologically sound, economically viable, socially just, and humane) when developing or reviewing mitigation projects and plans.

4.3. Lead and support the work of mitigation partners to educate the general public about how mitigation can help protect communities and promote community tranquility.

4.4. Develop and provide periodic reports and success stories to federal, state, and local public officials, educational institutions, private associations, private business entities, and the public on the progress of hazard mitigation activities.

4.5. Encourage citizens and citizen organizations to support and use mitigation in plans, projects, and public outreach to increase a sense of community security and safety.

Tentative Timeline for Buchanan County Hazard Mitigation Plan (HMP) Update

TASKS	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	June 21	July 21	Aug 21	Sept 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	April 22	May 22
Establish planning committee *																				
Kick-Off Meeting																				
Introduction Meeting I																				
Risk Assessment Meeting II																				
Other meetings																				
Public outreach																				
Mitigation Strategy Meeting III																				
Post for 2-week Committee Review																				
Post for 30-day Public Review																				
First Draft for SEMA Review											Aug. 2									
Jurisdictions adopt resolutions													Oct. 12*							
Final Draft to SEMA															Dec. 10*					
Revisions																				
SEMA submits final draft to FEMA																				May 12

***Oct. 12- Last day to ask for a written request of extension *Dec. 10- Final Draft Due to the SEMA**

**All jurisdictions should have at least one representative attending the planning meetings and working on the forms required to update the plan. It's suggested that two or more people from each jurisdiction work together to divide the responsibilities. It's important that forms are submitted on time in order for the plan to be completed on time.*

Mo-Kan

Buchanan County HMP In-Kind Contribution

Name:
Address:
Jurisdiction:

Date	Hours	Mileage (Round trip)	Activity
	X $24.65 =	**X $.45 =**	

Hours $ Total:	**Mileage $ Total:**	**Timesheet $ Total:**

Signature: _____

Please return form to Trevor Tutt at Mo-Kan (trevor@mo-kan.org)

224 North 7th Street
Saint Joseph, Missouri 64501
www.mo-kan.org
Phone: (816) 233-3144
Fax: (816) 233-8498

Buchanan County Hazard Mitigation Planning Meeting #3

Sign-in Sheet

Date: **Tuesday, March 23, 2021**
Time: **6:00 PM**
Location: **Remington Nature Center, 1502 McArthur Drive, Saint Joseph, MO 64505**

Name	Email Address/Phone #
✓ Joshua Cobb	JCobb@StJoeMo.Com
✓ BILL LAMAR	BLAMAR@STJOEMO.ORG
☑ Mindy Andrasents	mandrasents@stjoemo.org
✓ John Hontz	John.Hontz@amwater.com
✓ Craig Darrough	MWSU Darrough@missouriwestern.edu
✓ John Newell	newell@ebs.h12.mo.us
✓ Eric Wagner	ewagner63@yahoo.com
elected ? Matt LARKIN	MattLarkin30@YAHOO.com
✓ Katie Bruegge	Kbruegge@stjoemo.org
elected ☐ Lee Sawyer	lSawyer@buchmo.org
☐ Ron Hook	RHOOK@Buchmo.com
✓ Thom Cates	tcates@buchmo.org
✓ Jeff Wilson	jwilson@stjoemo.org

Dear Planning Partners:

The third planning committee meeting for Buchanan County's HMP update will be held on **Tuesday, March 23 at 6:00 pm, at the Remington Nature Center, 1502 McArthur Dr, St. Joseph, MO 64505. This is an in-person meeting only**, as no Zoom option will be offered. All participants will be required to wear a mask and maintain social distancing.

During this workshop meeting, Mo-Kan staff will work with the planning committee and jurisdiction representatives to review past actions and create new actions. It would be helpful for two people to be present from each jurisdiction due to the collaborative nature of this workshop.

If you represent a jurisdiction or school district, please bring the following items: completed questionnaire pages including asset inventories (critical facilities and economic assets); historic hazard events; and previously proposed action assessment pages. It is important that these documents are submitted. If your jurisdiction has already submitted these documents, they will be available for review at the meeting. **New action worksheets will also be made available at this meeting and are due April 20, 2021**.

Jurisdictions must attend at least one planning meeting to meet participation requirements; however, attending more meetings is highly encouraged. If you are unable to take part, please help by having someone from your agency/sector attend the meeting. Please contact me if no one from your jurisdiction is able to attend so that we can make other arrangements to meet.

If a representative from your jurisdiction does not participate, future funding from FEMA for mitigation projects will be jeopardized. By participating in the planning process and formally adopting the completed plan, your jurisdiction/district will be eligible for federal funding to complete such projects as relocating properties out of a floodplain, construction of tornado saferooms, and many other preventative measures meant to protect lives and property.

Mo-Kan Regional Council is the contact for updating the plan and will be working closely with the county commissioners and the emergency management director during the update. Please contact me at 816-233-3144 or hayley@mo-kan.org to **RSVP for the meeting by Monday, March 22 (at the latest)** or if you have any questions.

Thank you,

Hayley Howard
Trevor Tutt
Community Development Planners

Buchanan County Hazard Mitigation Planning Meeting #3

Sign-in Sheet

Date: **Tuesday, March 23, 2021**
Time: **6:00 PM**
Location: **Remington Nature Center, 1502 McArthur Drive, Saint Joseph, MO 64505**

	Name	Email Address/Phone #
✓	Joshua Cobb	JCobb@StJoeMo.Com
✓	BILL LAMAR	BLAMAR@STJOEMO.ORG
☑	Mindy Andrasents	mandrasents@stjoemo.org
✓	John Hontz	John.Hontz@amwater.com
✓	Craig Darrough	MWSU Darrough@missouriwestern.edu
✓	John Newell	newell@ebs.k12.mo.us
✓	Eric Wagner	ewagner636yahoo.com
?	Matt LARKIN	MattLarkin30@YAHOO.com
✓	Katie Bruegge	Kbruegge@stjoemo.org
☐	Lee Sawyer	lSawyer@buchmo.org
☐	Ron Hook	RHOOK@Buchmo.com
✓	Thom Cates	tcates@buchmo.org
✓	Jeff Wilson	jwilson@stjoemo.org

Buchanan County Hazard Mitigation Plan Update

Planning Meeting #3

Tuesday, March 23 @ 6 pm
Remington Nature Center
St. Joseph, Missouri

1

Meeting Agenda

- Task 6: Develop a Mitigation Strategy
- New Actions – turn in by Tuesday, April 20

Mo-Kan
An Economic and Community Development Organization

2

Updating Mitigation Strategy

- Goals are general guidelines that explain what you want to achieve
- Mitigation Actions are specific actions that help you achieve goals

Mo-Kan
An Economic and Community Development Organization

3

Determine/Update Mitigation Goals

pg. 4.1 in 2017 HMP

- **Goal 1: Protect the Lives, Property and Livelihoods of All Citizens.**
- 1. Objective: Protect citizen's lives and property.
- 2. Objective: Provide sufficient warning of impending disasters.
- 3. Objective: Identify the citizens most vulnerable to disasters and plan accordingly.

Mo-Kan
An Economic and Community Development Organization

4

Determine/Update Mitigation Goals

pg. 4.2 in 2017 HMP

- **Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas.**
- 1. Objective: Lessen the impact of certain disasters and reduce the damage of disasters.
- 2. Objective: Decrease the cost of the next disaster.
- 3. Objective: Increase our economic resistance to disasters.

Mo-Kan

5

Determine/Update Mitigation Goals

pg. 4.2 in 2017 HMP

- **Goal 3: Increase Resources Available to Citizens via Education and Preparedness Information.**
- 1. Objective: Increase knowledge among citizens about disaster safety and preparedness.
- **Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster.**
- 1. Objective: Increase disaster mitigation management capability in local governments.
- **Goal 5: Identify Critical Infrastructure Components.**
- Objective: Increase mitigation strategies to support those infrastructures.

Mo-Kan

6

Updating Mitigation Strategy

- Previous Actions – status updates required for ALL actions from previous plan
- Some actions may be low-cost initiatives readily adopted
- Others may be dependent on available funding or outcome of a grant application

Mo-Kan

7

Updating Mitigation Strategy

- New Actions - add new actions, as appropriate:

  - FEMA's Mitigation Ideas Booklet
  - Review problems from recent hazards
  - Consider problems from a potential hazard
- Discuss new action ideas with others in your jurisdiction to assure community support of action
- Consider applying for mitigation grants

Mo-Kan

8

New Actions

- Actions should be SMART:
  - **S** pecific
  - **M** easurable
  - **A** chievable
  - **R** elevant
  - **T** ime-bound
- Actions need to show action. Do not use words such as encourage, explore, recommend.
- Jurisdictions are not penalized if an action is not accomplished. (Will need to explain why)

Mo-Kan
An Economic and Community Development Organization

9

Action Worksheet Example/STAPLEE Form

Action Worksheet

Name of Jurisdiction:	ST. JOSEPH
Risk / Vulnerability	
Problem being Mitigated:	PUBLIC DIDN'T HAVE INFORMATION DURING EMERGENCIES & DISASTERS
Hazard(s) Addressed:	DROUGHT, FLOOD, HEAT WAVE, SEVERE WINTER WEATHER, THUNDERSTORM, TORNADO
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	
Action or Project Description:	HAVE VIDEO & AUDIO PUBLIC SERVICE ANNOUNCEMENTS MADE, DELIVERED TO THE MEDIA & READY TO BE BROADCAST DURING EMERGENCIES & DISASTERS.
Applicable Goal Statement:	PROTECT THE LIVES, PROPERTY & LIVELIHOODS OF ALL CITIZENS
Estimated Cost:	
Benefits:	IMPORTANT INFORMATION CAN BE QUICKLY DISSEMINATED
Plan for Implementation	
Responsible Organization/Department:	EMERGENCY MANAGEMENT DIRECTOR
Action/Project Priority:	
Timeline for Completion:	
Potential Fund Sources:	
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	
Report of Progress	
Completed by:	

USE THIS SPACE IF NEEDED TO EXPLAIN WHAT WAS DONE ON THE ACTION -- PLEASE BE SPECIFIC AS POSSIBLE.

SHOW-ME COUNTY MULTI-JURISDICTIONAL LOCAL HAZARD MITIGATION PLAN

Action Title:	Jurisdiction:	
Action ID:		
STAPLEE Criteria	Evaluation Rating Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0	Score
S: Is it Socially acceptable?		
T: Is it Technically feasible and potentially successful?		
A: Does the jurisdiction have the administrative capacity to execute this action?		
P: Is it Politically acceptable?		
L: Is there Legal authority to implement?		
E: Is it Economically beneficial?		
E: Will the project have either a neutral or positive impact on the natural environment? (score a 3 if positive impact, 2 if neutral impact)		
Will historic structures be saved or protected?		
Could it be implemented quickly?		
STAPLEE Score		

Mitigation Effectiveness Criteria	Evaluation Rating	Score
Will the implemented action result in lives saved?	Assign from 5-10 points based on the likelihood that lives would be saved	
Will the implemented action result in a reduction of disaster damages?	Assign from 5-10 points based on the relative reduction of disaster damages.	
Mitigation Effectiveness Score		

Total Score (STAPLEE Score + Mitigation Effectiveness Score): _____

Priority Level: ☐High (30+ points) ☐Medium (25-29 points) ☐Low (less than 25 points)

Completed by (name/title/phone #): _____

10

In-Kind Match

- Buchanan County is responsible for $**8,640** in-kind match and the county has turned in **$1,458.85** so far **(17% of goal)**
- In-kind match activities include:
  - Planning Committee (unless elected or appointed)
  - Public meeting attendees
  - Hosting meetings and talking to community groups
  - Researching or compiling data related to the plan
  - Mileage for driving to HMP activities

All donated hours and labor must be documented

Mo-Kan
An Economic and Community Development Organization

11

Please turn in….

- Community Data Questionnaire forms
- Action evaluations
- Volunteer hours (time outside meetings spent on the HMP counts too)

Please turn action worksheets and STAPLEE criteria (if used) to Mo-Kan by Tuesday, April 20, 2021

Mo-Kan
An Economic and Community Development Organization

12

The Next Steps

- Schedule additional public meetings and public outreach
- 4th Planning Meeting –Tentatively set for Tuesday, April
- Draft of plan will be posted in July 2021
- Available for public review/comment (30 days)
- Resolution adopting the plan due from jurisdictions by October 31, 2021

Mo-Kan

13

Questions

Hayley Howard hayley@mo-kan.org

Trevor Tutt trevor@mo-kan.org

Houston Roberts houston@mo-kan.org

Nic Hutchison nic@mo-kan.org

Rebecca Thacker rebecca@mo-kan.org

Mo-Kan Regional Council
224 N. 7th Street
St. Joseph, MO 64501
816-233-3144

14

Buchanan County Hazard Mitigation Goals -2018 & 2022

Goal 1: Protect the Lives, Property and Livelihoods of All Citizens.

1. Objective: Protect citizen's lives and property.
2. Objective: Provide sufficient warning of impending disasters.
3. Objective: Identify the citizens most vulnerable to disasters and plan accordingly.

Goal 2: Provide Mitigation to Lessen the Impact in Hazard Prone Areas.

1. Objective: Lessen the impact of certain disasters and reduce the damage of disasters.
2. Objective: Decrease the cost of the next disaster.
3. Objective: Increase our economic resistance to disasters.

Goal 3: Increase Resources Available to Citizens via Education and Preparedness Information.

1. Objective: Increase knowledge among citizens about disaster safety and preparedness.

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster.

1. Objective: Increase disaster mitigation management capability in local governments.

Goal 5: Identify Critical Infrastructure Components.

1. Objective: Increase mitigation strategies to support those infrastructures.

ACTION WORKSHEET Guidance
***Highlighted items must be filled out by Jurisdiction**

Action Worksheet	
Name of Jurisdiction:	
Risk / Vulnerability	
Hazard(s) Addressed:	List the hazard or hazards that will be addressed by this action
Problem being Mitigated:	Provide a brief description of the problem that the action will address. Utilize the problem statement developed in the risk assessment.
Action or Project	
Applicable Goal Statement:	Choose the goal statement that applies to this action
Action/Project Number:	Insert a unique action number for this action for future tracking purposes. This can be a combination of the jurisdiction name, followed by the goal number and action number (i.e. Joplin1.1)
Name of Action or Project:	
Mitigation Category:	Prevention; Structure and Infrastructure Projects; Natural Systems Protection; Education and Outreach; Emergency Services
Action or Project Description:	Describe the action or project.
Estimated Cost:	Provide an estimate of the cost to implement this action. This can be accomplished with a range of estimated costs.
Benefits:	Provide a narrative describing the losses that will be avoided by implementing this action. If dollar amounts of avoided losses are known, include them as well.
Plan for Implementation	
Responsible Organization/Department:	Which organization will be responsible for tracking this action? Be specific to include the specific department or position within a department.
Supporting Organization/Department:	Which organization/department will assist in implementation of this action?
Action/Project Priority:	Include the STAPLEE score AND/OR Priority (H, M, L)
Timeline for Completion:	How many months/years to complete.
Potential Fund Sources:	List specific funding sources that may be used to pay for the implementation of the action such as grant, internal, state/federal/private
Local Planning Mechanisms to be Used in Implementation, if any:	Another plan/document already in place besides HMP that could help support implementation, i.e. comp plan, city ordinance, LEOP plan
Progress Report	
Action Status:	Indicate status as New, Continuing Not Started, or Continuing in Progress)
Report of Progress:	For Continuing actions only, indicate the report on progress. If the action is not started, indicate any barriers encountered to initiate the action. If the action is in progress, indicate the activity that has occurred to date.

Goal 1: Protect the Lives, Property and Livelihoods of All Citizens

Mitigation Action

2018 Action 1.1.1: (2013 Action 1.1.3)

Action Worksheet	
Name of Jurisdiction:	Lathrop School District
Risk / Vulnerability	
Problem being Mitigated:	Vulnerable students
Hazard(s) Addressed:	Thunderstorm, Tornado
Action or Project	
Action/Project Number:	1.1.1
Name of Action or Project:	Safe Room for Lathrop School District
Action or Project Description:	Submit notice of interest for a safe room
Applicable Goal Statement:	Protect the Lives, Property and Livelihoods of All Citizens
Estimated Cost:	$2,000,000
Benefits:	Protect lives of Clinton County residents
Plan for Implementation	
Responsible Organization/Department:	School Board
Action/Project Priority:	High
Timeline for Completion:	5 years
Potential Fund Sources:	Internal, PDM and HMPG safe room grants
Local Planning Mechanisms to be Used in Implementation, if any:	School Emergency Plan
Progress Report	
Action Status	Continuing In Progress
Report of Progress	No funds – at the discussion stage on progressing on notice of interest. Action modified from "Encourage the incorporation and design of safe rooms in the construction of new public facilities like libraries, community centers, etc." to current form.

Modified STAPLEE Process
For
Prioritization of Proposed
Mitigation Actions

SHOW-ME COUNTY MULTI-JURISDICTIONAL LOCAL HAZARD MITIGATION PLAN

The goal of each proposed mitigation action is life safety and/or reduction or prevention of damage from a hazard event. In order to determine the effectiveness in accomplishing this goal, evaluate each action using the criteria below which includes criteria utilizing the STAPLEE method. This method analyzes the Social, Technical, Administrative, Political, Legal, Economic and Environmental aspects of a project and is commonly used by public administration officials and planners for making planning decisions.

Ask the following STAPLEE criteria questions about each proposed mitigation action and strategies. Assign a score to each criterion as follows: (Definitely YES = 3, Maybe YES = 2, Probably NO = 1, Definitely NO = 0)

STAPLEE criteria:

- **Social**: Is the proposed strategy socially acceptable to the community?
- **Technical**: Will the proposed strategy work? Will it solve a problem independently?
- **Administrative**: Can the community implement the strategy? Is there someone to coordinate and lead the effort?
- **Political**: Is the strategy politically acceptable? Is there public support both to implement and to maintain the project?
- **Legal**: Is the community authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?
- **Economic**: What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits? After implementation, will the benefits over time be more than the cost of the project?
- **Environmental**: Will the project have a positive impact on the environment?

- Will historic structures be saved or protected?
- Could it be implemented quickly?

Mitigation Effectiveness:

Ask the following questions about each proposed mitigation action as it relates to life/safety and/or reduction or prevention of damages. Assign 5-10 additional points.

Will the implemented action result in lives saved?

Will the implemented action result in a reduction of disaster damages?

SHOW-ME COUNTY
MULTI-JURISDICTIONAL
LOCAL HAZARD MITIGATION PLAN

Action Title:	**Jurisdiction:**
Action ID:	

STAPLEE Criteria	Evaluation Rating Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0	Score
S: Is it Socially acceptable?		
T: Is it Technically feasible and potentially successful?		
A: Does the jurisdiction have the administrative capacity to execute this action?		
P: Is it Politically acceptable?		
L: Is there Legal authority to implement?		
E: Is it Economically beneficial?		
E: Will the project have either a neutral or positive impact on the natural environment? (score a 3 if positive impact, 2 if neutral impact)		
Will historic structures be saved or protected?		
Could it be implemented quickly?		
STAPLEE Score		

Mitigation Effectiveness Criteria	**Evaluation Rating**	**Score**
Will the implemented action result in lives saved?	Assign from 5-10 points based on the likelihood that lives would be saved.	
Will the implemented action result in a reduction of disaster damages?	Assign from 5-10 points based on the relative reduction of disaster damages.	
Mitigation Effectiveness Score		

Total Score (STAPLEE Score + Mitigation Effectiveness Score): _____

Priority Level: ☐High (30+ points) ☐Medium (25-29 points) ☐Low (less than 25 points)

Completed by (name/title/phone #): _____

Dear Planning Partners:

The fourth planning committee meeting for Buchanan County's HMP update will be held on **Tuesday, May 4 at 6:00 pm, at the Remington Nature Center, 1502 McArthur Dr, St. Joseph, MO 64505. This is an in-person meeting only**, as no Zoom option will be offered. All participants will be required to wear a mask and maintain social distancing.

During this workshop meeting, Mo-Kan staff will present information on the plan update, as well as ask for feedback from participants on draft parts of the plan. Mo-Kan staff will also be available to draft/review mitigation actions proposed by jurisdictions.

If you represent a jurisdiction or school district, please bring the following items: **New action worksheets which were due April 20, 2021 (if they have not already been turned in)**.

Jurisdictions must attend at least one planning meeting to meet participation requirements; however, attending more meetings is highly encouraged. If you are unable to take part, please help by having someone from your agency/sector attend the meeting. Please contact us if no one from your jurisdiction is able to attend so that we can make other arrangements to meet.

If a representative from your jurisdiction does not participate, future funding from FEMA for mitigation projects will be jeopardized. By participating in the planning process and formally adopting the completed plan, your jurisdiction/district will be eligible for federal funding to complete such projects as relocating properties out of a floodplain, construction of tornado saferooms, and many other preventative measures meant to protect lives and property.

Mo-Kan Regional Council is the contact for updating the plan and will be working closely with the county commissioners and the emergency management director during the update. Please contact Hayley at 816-233-3144 or hayley@mo-kan.org to **RSVP for the meeting by Monday, May 3 (at the latest)** or if you have any questions.

Thank you,

Hayley Howard
Trevor Tutt
Community Development Planners

Buchanan County Hazard Mitigation Planning Meeting #4
Sign-in Sheet

Date: **Tuesday, May 4, 2021**
Time: **6:00 PM**
Location: **Remington Nature Center, 1502 McArthur Drive, Saint Joseph, MO 64505**

Name	Email Address/Phone #
Dennis Johnson	firescbc@gmail.com 390-4981
Bill Brinton	BBRINTON@co.buchanan.mo.us 383-0604 ~~390-5158~~
Mindy Andrasents	mandrasents@stjoemo.org
Adam Perry	adam.m.perry@leo.gov 816-261-3852
John Hontz	John.Hontz@cmwater.com 785-550-1655
Hattie Matz	agencyclerk@yahoo.com 816-724-6668
Robert Sigrist	robertsigrist@sjsd.k12.mo.us 816-671-4006
Kelley McDowell	cityofeaston@unitedfiber.email

Buchanan County Hazard Mitigation Plan Update

Planning Meeting #4

Tuesday, May 4 @ 6 pm
Remington Nature Center
St. Joseph, Missouri

1

Meeting Agenda

- Review
- Public Outreach Update
- Plan Maintenance/Implementation
- Draft
- Public Comment
- Adopt the Plan
- In-Kind Match
- Next Steps

Mo-Kan

2

Review

- **What?** Buchanan County Hazard Mitigation Plan
- **Who?** All participating jurisdictions
- **Why?** To reduce loss of life and property & to stay eligible for FEMA/SEMA funding
- **When?** Draft due in December 2021
- **What's in-kind?** Documented local effort of volunteer hours and/or cash

Mo-Kan

3

9 Tasks to Complete the Plan Update

- Task 1: Determine the Planning Area
- Task 2: Build the Planning Team
- **Task 3: Create an Outreach Strategy**
- Task 4: Review Community Capabilities and Plan Goals
- Task 5: Conduct a Risk Assessment
- **Task 6: Develop a Mitigation Strategy** (See Jurisdiction Participation handout)
- **Task 7: Review and Adopt the Plan**
- **Task 8: Keep the Plan Current**
- **Task 9: Create a Safe and Resilient Community**

Mo-Kan

4

Public Outreach Update

- Update on possible commercial on Ch. 19 proposed by city
- Buchanan County LEPC- 3 forms turned in
- 1 request for Ready in 3 materials- no in-kind recorded for those
- Any other efforts in the works?

Mo-Kan

5

Plan Maintenance

- FEMA regulations require complete plan update every 5 years
- FEMA requires a formal plan maintenance process to ensure that the HMP is an active and relevant document (see Plan Maintenance Process handout)

Mo-Kan

6

Plan Maintenance

- Who, how and when will the plan be monitored, evaluated and updated?
  - Annual review? After hazard events?
  - Who will organize the review? Who will participate?
  - Update status of mitigation actions?
- How will the public be involved in plan maintenance?

Mo-Kan

7

Plan Implementation

- How will the mitigation strategy be incorporated into other planning mechanisms?
  - Review HMP during planning process to update other plans?
    - comprehensive plans
    - capital improvement plans
    - school infrastructure or emergency plans
    - other ideas?

Mo-Kan

8

Draft

- When a draft of the plan is near completion, Mo-Kan will coordinate the adoption of the plan with the various jurisdictions
- Draft will be provided to jurisdiction through Mo-Kan website
- Notice should be given to the public that the plan is available for review
- See Draft handout

Mo-Kan

9

Plan Adoption

- Jurisdictions must formally adopt the HMP at a council or board meeting
- Jurisdictions will turn in adoption resolution to Mo-Kan
- Once all resolutions are received, they will be sent to the state along with the draft, which is due to SEMA by December 10, 2021

Mo-Kan

10

In-Kind Match

- Buchanan County is responsible for $**8,640** in-kind match and the county has turned in **$2,054.90** so far **(24% of goal)**
- In-kind match activities include:
  - Planning Committee (unless elected or appointed)
  - Public meeting attendees
  - Hosting meetings and talking to community groups
  - Researching or compiling data related to the plan
  - Mileage for driving to HMP activities

All donated hours and labor must be documented

Mo-Kan

11

The Next Steps

- Schedule additional public meetings and public outreach
- Draft of plan will be posted in **July 2021**
- Available for public review/comment (30 days)
- Resolution adopting the plan due from jurisdictions by **October 31, 2021**

Mo-Kan

12

Before you leave, Please turn in….

- Action worksheets
- Completed In-Kind sheets (time outside meetings spent on the HMP counts too)

Mo-Kan

13

Questions

Hayley Howard hayley@mo-kan.org

Trevor Tutt trevor@mo-kan.org

Houston Roberts houston@mo-kan.org

Rebecca Thacker rebecca@mo-kan.org

Mo-Kan Regional Council
224 N. 7th Street
St. Joseph, MO 64501
816-233-3144

14

BC HMP
2018

5 PLAN MAINTENANCE PROCESS

5 PLAN MAINTENANCE PROCESS 5.1

5.1 Monitoring, Evaluating, and Updating the Plan *5.1*

5.1.1 Responsibility for Plan Maintenance 5.1

5.1.2 Plan Maintenance Schedule 5.2

5.1.3 Plan Maintenance Process 5.2

5.2 Incorporation Into Existing Planning Mechanisms *5.3*

5.3 Continued Public Involvement *5.4*

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

5.1 Monitoring, Evaluating, and Updating the Plan

44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

5.1.1 Responsibility for Plan Maintenance

The Mitigation Planning Committee (MPC) is not a standing committee. Responsibility for maintenance will reside with the individual jurisdictions for monitoring, evaluation and maintenance. Maintenance activities for the participating jurisdictions, including school and special districts, may involve:

- Meet annually, and after a disaster event, to monitor and evaluate the implementation of the plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low- or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;

- Report on plan progress and recommended changes to the County Commissioners and governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

It's the MPC representative's primary duty to see the plan successfully carried out and to report to the community's governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information in areas accessible to the public.

5.1.2 Plan Maintenance Schedule

The Buchanan County Emergency Management Director (EMD) will be responsible for initiating the plan review at the LEPC meeting every other year. The St. Joseph EMD will be responsible for initiating plan reviews for St. Joseph every other year. The LEPC and St. Joseph will coordinate so their reviews do not fall on the same year. For the other jurisdictions, their MPC representative will be responsible for initiating reviews.

In coordination with all participating jurisdictions, a five year written update of the plan will be submitted to the Missouri State Emergency Management Agency (SEMA) and FEMA Region VII per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

5.1.3 Plan Maintenance Process

Progress on the proposed actions can be monitored by evaluating changes in vulnerabilities identified in the plan. During the review, changes in vulnerability were identified as follows:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions,
- Increased vulnerability due to hazard events, and/or
- Increased vulnerability as a result of new development (and/or annexation).

Future five year updates to this plan will include the following activities:

- Consideration of changes in vulnerability due to action implementation,
- Documentation of success stories where mitigation efforts have proven effective,
- Documentation of unsuccessful mitigation actions and why the actions were not effective,
- Documentation of previously overlooked hazard events that may have occurred since the previous plan approval,
- Incorporation of new data or studies with information on hazard risks,
- Incorporation of new capabilities or changes in capabilities,
- Incorporation of growth data and changes to inventories, and
- Incorporation of ideas for new actions and changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the participating jurisdictions will:

V]

- Identify an individual, office, or agency responsible for action implementation. This entity will track and report on action status. The entity will provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing risk.
- If the action does not meet identified objectives, the jurisdiction will make required modifications to the plan.

Changes will be made to the plan to remedy actions that have failed or are not considered feasible. Feasibility will be determined after a review of action consistency with established criteria, time frame, community priorities, and/or funding resources. Updating of the plan will be accomplished by written changes and submissions, as the jurisdictions deem appropriate and necessary. Changes will be approved by the Buchanan County Commissioners and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Where possible, plan participants, including schools, will use existing plans and/or programs to implement hazard mitigation actions. Those existing plans and programs were described in Chapter 2 of this plan. Based on the capability assessments of the participating jurisdictions, communities in Buchanan County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans:

- Comprehensive plans of participating jurisdictions;
- Ordinances of participating jurisdictions;
- Local Emergency Operations Plan;
- Capital improvement plans and budgets;
- Other community plans within the County, such as water conservation plans, storm water management plans, and parks and recreation plans; and
- School District Emergency Plans

The MPC (or designated responsible entity) members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The MPC (or designated responsible entity) is also responsible for monitoring this integration and incorporation of the appropriate information into the five year update of the multi-jurisdictional hazard mitigation plan.

Additionally, the Buchanan County EMD will provide the updated mitigation strategy with current status of each mitigation action to the county commission as well as all mayors, city clerks, and school district superintendents as appropriate. The EMD will request that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

Table 1.1 below lists the planning mechanisms by jurisdiction into which the Hazard Mitigation Plan will be integrated.

Table 1.1. Planning Mechanisms Identified for Integration of Hazard Mitigation Plan

Jurisdiction	Planning Mechanisms	Integration Process for Previous Plan	Integration Process for Current Plan
Buchanan County	Comprehensive Plan Zoning Ordinance, Floodplain Ordinance, Site Plan Review Ordinance, Emergency Operating Plan	Comprehensive Plan, Emergency Operating Plan	Comprehensive Plan Zoning Ordinance, Floodplain Ordinance, Site Plan Review Ordinance, Emergency Operating Plan
Agency	Comprehensive Plan, Zoning Ordinance Building Code, Subdivision Ordinance, Storm Water Ordinance	Unknown	Comprehensive Plan, Zoning Ordinance, Building Code, Subdivision Ordinance, Storm Water Ordinance
Easton	Zoning Ordinance, Subdivision Ordinance	Unknown	Zoning Ordinance, Subdivision Ordinance
DeKalb	None	Unknown	-
Lewis & Clark Village	Zoning Ordinance, Flood Plain Ordinance	Unknown	Zoning Ordinance, Flood Plain Ordinance
St. Joseph	Emergency Operations Plan, Zoning Ordinance, Flood Plain Ordinance, Storm Water Ordinance, Landscape Ordinance, Site Plan Review Ordinance , Land Use Plan	Zoning Ordinance	Emergency Operations Plan, Zoning Ordinance, Flood Plain Ordinance, Storm Water Ordinance, Landscape Ordinance, Site Plan Review Ordinance, Land Use Plan
Buchanan County R-IV School District	Emergency Plan	Emergency Plan	Emergency Plan
Mid-Buchanan School District	Emergency Plan	Emergency Plan	Emergency Plan
St. Joseph School District	Emergency Plan	Emergency Plan	Emergency Plan
Missouri Western State University	Emergency Plan	Emergency Plan	Emergency Plan

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The hazard mitigation plan update process provides an opportunity to publicize success stories resulting from the plan's implementation and seek additional public comment. Information about the reviews will be posted in the local newspaper as well as on the Buchanan County website following each review of the mitigation plan. When the MPC reconvenes for the five-year update, it will coordinate with all stakeholders participating in the planning process. Included in this group will be those who joined the MPC after the initial effort, to update and revise the plan. Public notices will be posted and public participation will be actively solicited, at a minimum, through available website postings and press releases to local media outlets, primarily newspapers.

Buchanan County HMP Update as of 4-5-21 Y= yes N= no Incomplete= not enough information provided

Jurisdiction:	Meeting 1 Attendance December 8, 2020	Meeting 2 Attendance February 23, 2021	Meeting 3 Attendance March 23, 2021	Meeting 4 Attendance May 4, 2021	Data Questionnaire pp. 1-7 Received Due 2-23-21	Risk Assessment Received Due 3-23-21	Review Actions Sheet Received and Complete Due 3-23-21	New Actions Received Due 4-20-21	Adoption Date Due 10-31- 21	Submit Adoption Resolution Due 12-10-21
Buchanan County	Y	Y	Y		Y	Y	Incomplete	N		
Agency	N	N	N		Y	Y	Incomplete	N		
Buchanan County R I-V	Y	N	N		Y	Y	Y	N		
Dekalb	N	N	N		N	N	N	N		
Easton	Y	Y	N		Y	Y	Y	N		
Lewis & Clark Village	N	N	Y		Y	Y	Y	N		
Rushville	N	N	N		Y	Y	NA	N		
St. Joseph	Y	Y	Y		Incomplete	Y	Y	Y		
East Buchanan SD (Easton)	N	N	Y		Y	Y	Y	Y		
Mid-Buchanan SD (Agency)	N	N	N		Y	Y	Incomplete	N		
St. Joseph SD	Y	Y	N		Y	Y	Y	N		
MWSU	Y	Y	Y		Y	Y	Y	Y		

3.4.1 Flooding (Riverine and Flash)

Hazard Profile

Hazard Description

A flood is partial or complete inundation of normally dry land areas. Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt, or ice. There are several types of riverine floods, including headwater, backwater, interior drainage, and flash flooding. Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt or ice melt. The areas adjacent to rivers and stream banks that carry excess floodwater during rapid runoff are called floodplains. A floodplain is defined as the lowland and relatively flat area adjoining a river or stream. The terms "base flood" and "100- year flood" refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Floodplains are part of a larger entity called a basin, which is defined as all the land drained by a river and its branches.

Flooding caused by dam and levee failure is discussed in Section 3.___ and Section 3.___ respectively. It will not be addressed in this section.

A flash flood occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Flash flooding can happen in Special Flood Hazard Areas (SFHAs) as delineated by the National Flood Insurance Program (NFIP) and can also happen in areas not associated with floodplains.

Ice jam flooding is a form of flash flooding that occurs when ice breaks up in moving waterways, and then stacks on itself where channels narrow. This creates a natural dam, often causing flooding within minutes of the dam formation.

In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding is a dangerous form of flooding which can reach full peak in only a few minutes. Rapid onset allows little or no time for protective measures. Flash flood waters move at very fast speeds and can move boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding can result in higher loss of life, both human and animal, than slower developing river and stream flooding.

In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with rainfall trends and rainfall extremes all demonstrate the high probability, yet generally unpredictable nature of flash flooding in the planning area.

Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of the watershed characteristics, modeling techniques, monitoring, and advanced warning systems has increased the warning time for flash floods.

Geographic Location

Riverine flooding is most likely to occur in SFHAs. Maps in Figures 3. to 3. show SFHA's for Buchanan County and jurisdictions that have a 100-year floodplain in their city limits. The 100-year floodplain boundaries information is from the county's GIS website, which is based on preliminary FIRMS from 1983/84 that are awaiting adoption. According to these maps, no schools or critical facilities are locked in SFHAs.

Figure 3.1. Buchanan County 100-Year Floodplain

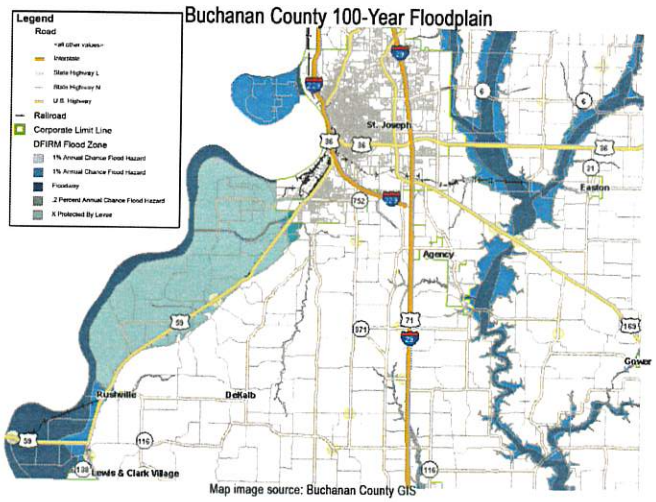
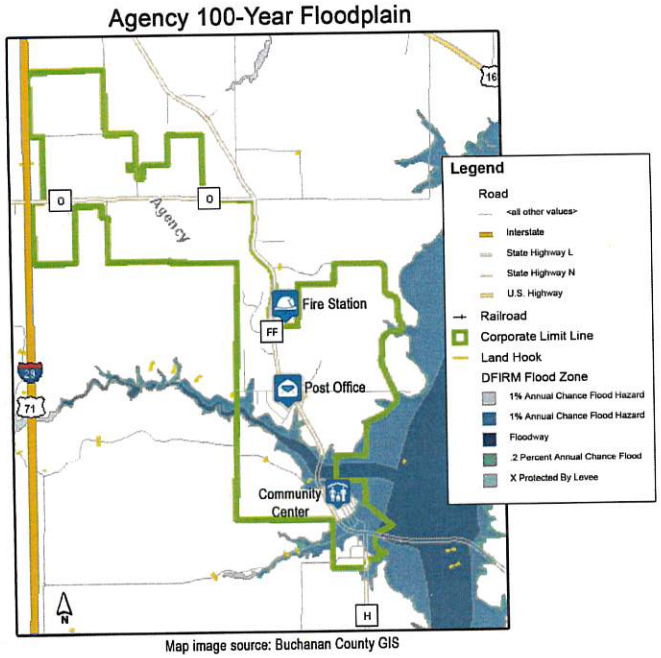
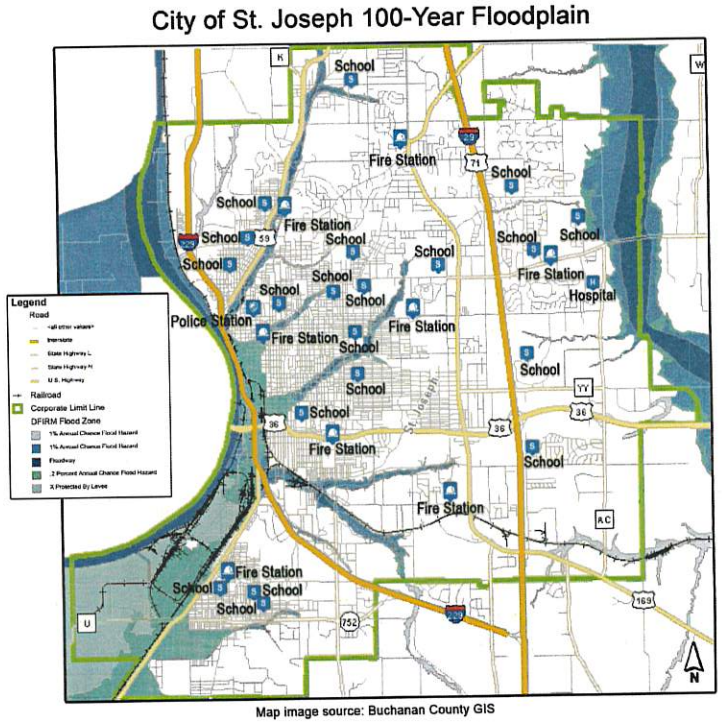


Figure 3.2. Agency 100-Year Floodplain with Critical Facilities



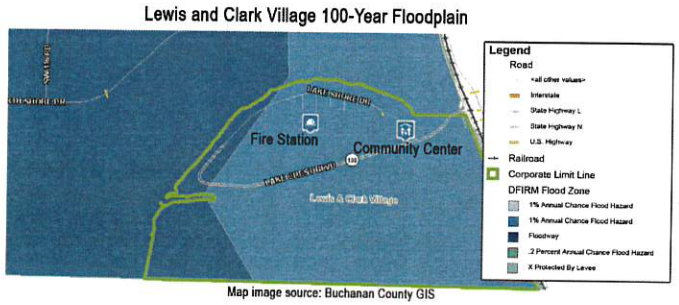
Map image source: Buchanan County GIS

Figure 3.3. City of St. Joseph's 100-Year Floodplain with Critical Facilities



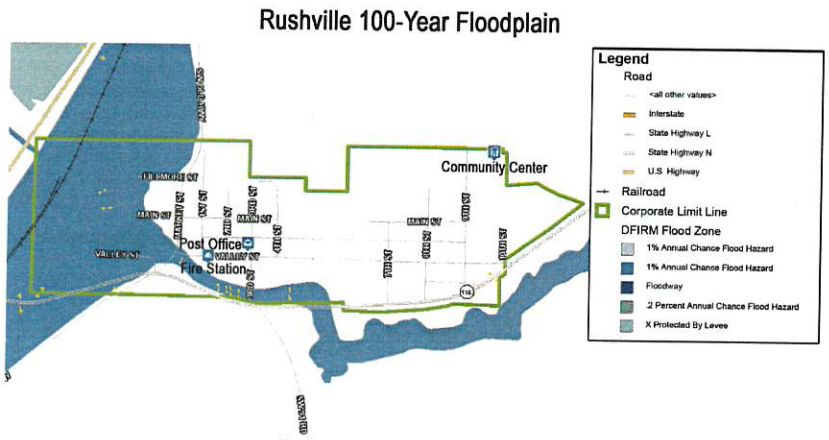
Map image source: Buchanan County GIS

Figure 3.4. **Lewis and Clark Village's 100-Year Floodplain with Critical Facilities**



Map image source: Buchanan County GIS

Figure 3.5. **Rushville's 100-Year Floodplain with Critical Facilities**



Map image source: Buchanan County GIS

Full size 100-year floodplain maps are located in Appendix B.

Flash flooding events pose the most pervasive hazard of the two flood types in the county due to permeability of soils, slopes, increasing urban development and the extensive network of streams and rivers. Sustained rainfall or downpours at the rate of one inch per hour have caused street flooding in incorporated areas and made a significant number of low water crossings impassible. In the instances of low water crossings, flash flooding occurs in the floodplain while low-lying areas in all jurisdictions are susceptible to flash floods outside the 100-year floodplain. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. A review of the NCDC storm event database determined which jurisdictions are most prone to flash flooding from 2000 to August 2020 are listed in Table 3.42.

Table 3.1. **Buchanan County NCEI Flood Events by Location, 2000-2020**

Location	# of Events
Buchanan County	43
-Buchanan County (unspecified)- 31 flood events	
-Buchanan County (Missouri River/St. Joseph)-8 flood events	
-Buchanan County (Platte River/Agency)- 4	
-Buchanan County (DeKalb/Easton)- 0	
Agency	4
-Agency (unspecified)- 0 flood events	
-Agency/Platte River- 4 flood events	
DeKalb	
-DeKalb (unspecified)- 0 flood events	
Easton	
-Easton (unspecified)- 0 flood events	
Lewis and Clark Village	
-Lewis and Clark Village (unspecified)- 0 flood events	
Rushville	
-Rushville (unspecified)- 0 flood events	
St. Joseph	8
-St. Joseph (unspecified)- 0 flood events	
-St. Joseph/Missouri River- 4 flood events	
-St. Joseph Industrial City/Missouri River- 4 flood events	

Source: National Centers for Environmental Information (NCEI), 3-31-21

Flash flooding occurs in SFHAs and those locations in the planning area that are low-lying. They also occur in areas without adequate drainage to carry away the amount of water that falls during intense rainfall events. Review NCEI database to determine which jurisdictions are most prone to flash flooding during a 20-year time period and list them. Table 3. shows the number of flash flood events by location recorded in NCEI for the 20-year period. NCEI Event narratives may show that a given stretch of road is repeatedly underwater during flash flood events, so include this information in the risk assessment.

Table 3.2. Buchanan County NCEI Flash Flood Events by Location, 2000-2020

Location	# of Events
Buchanan County	18
-Buchanan County (unspecified)- 2 flood events	
-Buchanan County (Missouri River/St. Joseph)-14 flood events	
-Buchanan County (Platte River/Agency)- 0	
-Buchanan County (DeKalb/Easton)- 2	
Agency	0
-Agency (unspecified)- 0 flood events	
-Agency/Platte River- 0 flood events	
DeKalb	1
-DeKalb (unspecified)- 1 flood events	
Easton	1
-Easton (unspecified)- 1 flood events	
Lewis and Clark Village	
-Lewis and Clark Village (unspecified)- 0 flood events	
Rushville	
-Rushville (unspecified)- 0 flood events	
St. Joseph	14
-St. Joseph (unspecified)- 0 flood events	
-St. Joseph/Missouri River- 13 flood events	
-St. Joseph Industrial City/Missouri River- 1 flood events	

Source: National Centers for Environmental Information (NCEI), 3-31-21

Strength/Magnitude/Extent

Missouri has a long and active history of flooding over the past century, according to the 2018 State Hazard Mitigation Plan. Flooding along Missouri's major rivers generally results in slow-moving disasters. River crest levels are forecast several days in advance, allowing communities downstream sufficient time to take protective measures, such as sandbagging and evacuations. Nevertheless, floods exact a heavy toll in terms of human suffering and losses to public and private property. By contrast, flash flood events in recent years have caused a higher number of deaths and major property damage in many areas of Missouri.

Flooding presents a danger to life and property, often resulting in injuries, and in some cases, fatalities. Floodwaters themselves can interact with hazardous materials. Hazardous materials stored in large containers could break loose or puncture as a result of flood activity. Examples are bulk propane tanks. When this happens, evacuation of citizens is necessary.

Public health concerns may result from flooding, requiring disease and injury surveillance. Community sanitation to evaluate flood-affected food supplies may also be necessary. Private water and sewage sanitation could be impacted, and vector control (for mosquitoes and other entomology concerns) may be necessary.

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Floodwaters can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

According to the U.S. Geological Survey, two critical factors affect flooding due to rainfall: rainfall duration and rainfall intensity – the rate at which it rains. These factors contribute to a flood's height, water velocity and other properties that reveal its magnitude.

National Flood Insurance Program (NFIP) Participation[5(c)]

Table 3. lists NFIP participation for the communities in the planning area. Table 3. lists the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction, where applicable. There are no sanctioned communities, meaning those communities that are not currently participating in the NFIP and where a Flood Hazard Boundary Map or Flood Insurance Rate Map has been issued, in the planning area.

Table 3.3. NFIP Participation in Buchanan County

Community ID #	Community Name	NFIP Participant (Y/N/Sanctioned)	Current Effective Map Date	Regular-Emergency Program Entry Date
290040	Buchanan County	Y	08/01/1983	08/01/1978
290041	Agency	Y	05/01/1980	05/01/1980
290481	Lewis and Clark Village	Y	09/29/1978	09/29/1978
290042	Rushville	Y	(NSFHA)	08/19/1986
290043	St. Joseph	Y	09/19/1984	09/30/1977
---	Dekalb	---	---	---
---	Easton	---	---	---

Source: NFIP Community Status Book, 3-31-21; BureauNet, http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book; M= No elevation determined – all Zone A, C, and X: NSFHA = No Special Flood Hazard Area; E=Emergency Program

Table 3.4. NFIP Policy and Claim Statistics as of April 2021

Community Name	Policies in Force	Insurance in Force	Closed Losses	Total Payments
Buchanan County	73	$15,268,800	200	$6,378,900.09
Agency	7	$1,111,600	9	$423,067.01
Lewis and Clark Village	32	$3,858,100	113	$5,829,141.28
Rushville	-	-	15	$268,568.56
St. Joseph	245	$51,353,100	196	$7,275,625.90
Totals	357	$71,591,600	533	$20,175,302.80

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data, accessed by SEMA, 4-7-21

The City of St. Joseph had the most insurance claim payments at $7,275,302.80, followed by Buchanan County, at $6,378,900.09, and Lewis and Clark Village at $5,829,141.28.

Repetitive Loss/Severe Repetitive Loss Properties[5(c)]

Repetitive Loss Properties are those properties with at least two flood insurance payments of $1,000 or more in a 10-year period. According to National Flood Insurance Plan data, four in-county jurisdictions included in the planning area have a combined total of seven mitigated repetitive loss properties totaling $749,199.98 in payments, and two out-of-county jurisdictions have a combined total of seven mitigated repetitive loss properties totaling $624,516.73 in payments (see Tables 3. and 3.). Due to Federal restrictions on data sharing, the state was unable to provide the Property Type for the Repetitive Loss or Severe Repetitive Loss properties.

Table 3.1. Buchanan County Mitigated Repetitive Loss Properties

As of Date	Community	Repetitive loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	BIG LAKE, VILLAGE OF (290886)	1	3	$69,876.73	$0.00	$69,876.73
1/27/2021	BUCHANAN COUNTY* (290040)	2	4	$77,001.66	$15,600.00	$92,601.66
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	2	6	$452,294.08	$18,897.72	$471,191.80
1/27/2021	PLATTE COUNTY* (290475)	6	15	$479,728.95	$74,911.45	$554,640.40
1/27/2021	RUSHVILLE, CITY OF (290042)	1	2	$84,625.62	$19,783.20	$104,408.82
1/27/2021	ST. JOSEPH, CITY OF (290043)	2	6	$76,687.69	$4,310.10	$80,997.79
1/27/2021	***Grand Total***	14	36	$1,240,214.73	$133,502.47	$1,373,717.20

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Table 3.5. Buchanan County Non-Mitigated Repetitive Loss Properties

As of Date	Community	Repetitive loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	AGENCY, TOWN OF (290041)	2	6	$308,733.83	$27,432.33	$336,166.16
1/27/2021	ANDREW COUNTY* (290004)	1	2	$66,243.89	$2,215.12	$68,459.01
1/27/2021	BUCHANAN COUNTY* (290040)	25	72	$2,699,800.87	$247,706.93	$2,947,507.80
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	24	69	$3,202,681.75	$148,440.24	$3,351,121.99
1/27/2021	ST. JOSEPH, CITY OF (290043)	17	38	$2,537,294.41	$2,177,040.72	$4,714,335.13
1/27/2021	***Grand Total***	69	187	$8,814,754.75	$2,602,835.34	$11,417,590.09

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Severe Repetitive Loss (SRL): A SRL property is defined it as a single family property (consisting of one-to-four residences) that is covered under flood insurance by the NFIP; and has (1) incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding $5,000 and with cumulative amounts of such claims payments exceeding $20,000; or (2) for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. **Tables 3. and 3.** show severe repetitive loss data for the planning area. There are two mitigated SRL properties in Buchanan County, according to data provided by the National Flood Insurance Program (NFIP), with a total of six losses and with payments equaling $560,019.69. There are 13 non-mitigated SRL properties in the county claiming a total of 47 losses with payments equaling $3,150,418.66.

Table 3. Buchanan County Mitigated Severe Repetitive Loss

As of Date	Community	Repetitive loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	1	3	$329,569.96	$18,083.83	$347,653.79
1/27/2021	PLATTE COUNTY* (290475)	1	3	$189,148.89	$23,217.01	$212,365.90
1/27/2021	***Grand Total***	2	6	$518,718.85	$41,300.84	$560,019.69

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Table 3.6. Buchanan County Non-Mitigated Severe Repetitive Loss

As of Date	Community	Repetitive Loss Properties	Total Losses	Total Building Payments	Total Contents Payments	Total Payments
1/27/2021	AGENCY, TOWN OF (290041)	1	4	$153,715.17	$19,427.15	$173,142.32
1/27/2021	BUCHANAN COUNTY* (290040)	6	23	$1,545,259.50	$199,265.57	$1,744,525.07
1/27/2021	LEWIS AND CLARK, VILLAGE OF (290481)	6	20	$1,129,600.24	$103,151.03	$1,232,751.27
1/27/2021	***Grand Total***	13	47	$2,828,574.91	$321,843.75	$3,150,418.66

Source: https://nfipservices.floodsmart.gov/reports-flood-insurance-data accessed by SEMA, 4-7-21

Previous Occurrences

Past Presidential Flooding Disaster Declarations and their impact are listed in Table 3.47.

Table 3.7. Presidential Declarations in Buchanan County for Floods, 2000-2020

Date	Declaration #	Disaster
August 17, 2010	DR-1934	Severe Storms, Flooding, and Tornadoes
August 12, 2011	DR-4012	Flooding
August 7, 2015	DR-4238	Severe Storm
May 20, 2019	DR-4435	Severe Storms, Straight-line Winds and Flooding
July 9, 2019	DR-4451	Severe Storms, Tornadoes and Flooding

Sources: 2018 MO Hazard Mitigation Plan; https://www.fema.gov/disasters/disaster-declarations

Tables 3.48 and 3.49 include NCEI information for the last 20 years for both flash and river flooding.

Table 3.8. NCEI Buchanan County Flash Flood Events Summary, 2000 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2004	1	0	0	0	0
2005	4	0	0	0	0
2007	1	0	0	0	0
2009	1	0	0	0	0
2014	2	0	0	0	0
2015	3	0	0	0	0
2016	4	0	0	0	0
2020	2	0	0	0	0
Totals	18	0	0	0	0

Source: NCEI, data accessed 3-31-21

Table 3.9. NCEI Buchanan County Riverine Flood Events Summary, 2000 to 2020

Year	# of Events	# of Deaths	# of Injuries	Property Damages	Crop Damages
2000	1	0	0	0	0
2001	8	0	0	0	0
2002	1	0	0	0	0
2004	8	0	0	0	0
2005	5	0	0	0	0
2006	1	0	0	0	0
2007	8	0	0	$50,000	$500,000
2008	5	0	0	0	0
2016	2	0	0	0	0
2019	4	0	0	$100,000	$100,000
Totals	43	0	0	$150,000	$600,000

Source: NCEI, data accessed 3-31-21

Narrative from a flood event in May 2007 stated heavy rainfall amounts from five to nine inches were observed, and "caused many rivers to flood, with levels not observed since the great flood of 1993." According to the NCEI report, "the Platte River near Agency crested at 34.40 feet, or 14.40 feet above flood stage," although "damage was confined to agricultural interests (https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=69343)."

Another event narrative from March 2019 stated that snow melt from heavy snowfall over the northern plains created significant flooding in Nebraska and in many counties along the Missouri River. "Once the Missouri River started flooding on March 9, it remained in flood through the remainder of the month. The gauge in St. Joseph, Missouri reached 32.12 feet on March 22 (preliminarily a new record)... The Missouri River Basin across the Northern Plains flooded with catastrophic consequences as numerous dams and levees failed. As the water flowed into the Missouri River upstream of Buchanan County, the river swelled and ultimately overwhelmed the levees along the river. About 1,500 residents and 6,000 employees of neighboring businesses were ushered out of the southern end of town, a city official said. Most of the evacuated dwellings were trailer homes interspersed among factories, warehouses and stockyards along a stretch of the riverfront known as the Bottoms. Local fields were also submerged, which delayed the growing season in the region, but several roads were washed away across Atchison County, and I-29 from St. Joseph northward to the Iowa/Missouri border was closed until mid May. Note: The dollar valued assigned to this event is likely inaccurate as a full tally of the extent of the physical damages is unknown. The Missouri River remained in flood through the rest of the month, into April (https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=813013)." See Appendix A for complete event narratives.

Probability of Future Occurrence

There were 18 flash flood events over a 20-year time frame (18 divided by 20 = .9), resulting in a 90% probability that a flash flood will occur somewhere in Buchanan County per year.

There were 43 riverine flood events over a 20-year time frame (43 divided by 20 = 2.15), resulting in a 215% probability that flooding will occur somewhere in Buchanan County per year.

Changing Future Conditions Considerations

According to the State Plan, if departure from normal with respect to increased precipitation intensity continues, frequency of floods in Missouri is likely to increase as well. Over the last half century, average annual precipitation in most of the Midwest has increased by 5 to 10 percent. But rainfall during the four wettest days of the year has increased about 35 percent, and the amount of water flowing in most streams during the worst flood of the year has increased by more than 20 percent. It is likely (66-100% probability) that the frequency of heavy precipitation or the proportion of total rainfall from heavy falls will increase in the 21st century across the globe. More specifically, it is "very likely" (90-100% probability) that most areas of the United States will exhibit an increase of at least 5 percent in the maximum 5-day precipitation by the late 21st century. As the number of heavy rain events increase, more flooding and pooling water can be expected.

Flooding occasionally threatens navigation and riverfront communities, and greater river flows could increase these threats. In April and May 2011, a combination of heavy rainfall and melting snow caused a flood that closed the Mississippi River to navigation, threatened Caruthersville, and prompted evacuation of Cairo, Illinois, due to concerns that its flood protection levees might fail. The expected increases in rainfall frequency and intensity are likely to put additional stress on natural hydrological systems and community stormwater systems. Heavier snowfalls in the winter will lead to intensified spring flooding, and groundwater levels will remain high even in non-floodplain areas. Such changes in climate patterns can lead to the development of compounding events that interact to create extreme conditions. Flooding caused by high groundwater levels typically recedes more slowly than riverine flooding, slowing the response and recovery process. Groundwater-fed rivers and streams are also likely to experience heightened flooding when groundwater levels are high. Jurisdictions updating or installing stormwater management systems should consider potentially larger future discharge amounts when sizing culverts and drainage ways; storage capacity can also be increased by building retention basins to hold excess stormwater.

Communities already prone to flooding should be prepared for a potential increase in facility closures and/or damages, as well as an increase in public demand for flood response and assistance. Natural features that experience repeated flooding may manifest changes in the form of stream bank instability and changing shoreline, floodplain, and wetland boundaries. Communities may also wish to plan for the potential loss of cropland and damage to both

private property and public infrastructure such as bridges. The environmental impacts of flooding include erosion, surface and groundwater contamination, and reduced water quality. The threat of more frequent flood events may thus be a concern particularly for communities who depend on lakes, rivers, or trout streams for tourism. Rural 3.30 communities may experience increases in well contamination and road washouts, while urban areas may be particularly vulnerable to flash flooding as heavy rain events quickly overwhelm the ability of a more impermeable environment to absorb excess stormwater.
Source: 2018 MO State Hazard Mitigation Plan, 3.1-3.2

Vulnerability

Vulnerability Overview

Since 1975, Buchanan County has been included in 13 Presidential Disaster Declarations for flooding. Riverine flooding occurs more frequently than flash flooding, and with 69 non-mitigated repetitive loss properties in the planning area, as well as 13 non-mitigated severe repetitive loss properties, damage is likely to continue. Flooding presents a danger to life and property, often resulting in injuries, and in some cases, fatalities.

Floodwaters themselves can interact with hazardous materials. Hazardous materials stored in large containers could break loose or puncture as a result of flood activity. Examples are bulk propane tanks. When this happens, evacuation of citizens is necessary.

Public health concerns may result from flooding, requiring disease and injury surveillance. Community sanitation to evaluate flood-affected food supplies may also be necessary. Private water and sewage sanitation could be impacted, and vector control (for mosquitoes and other entomology concerns) may be necessary.

Periods of heavy rain falling at the rate of one inch per hour floods low water crossings throughout the county making many roads impassable. Street flooding over roadways has been reported in all communities in the county. This creates a severe threat to motorists who attempt to drive through flood waters over the roadway.

When roads and bridges are inundated by water, damage can occur as the water scours materials around bridge abutments and gravel roads. Section 3.2.2 in this plan contains information on scour critical bridges in the planning area.

Floodwaters can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county, and city road and bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

Areas in low lying areas outside of the floodplain are frequently flooded. Increases in development add to surface runoff and can exacerbate flash flooding in areas that previously have not experienced flooding.

The 2018 State Plan's section on State Vulnerability Overview and State Estimates of Potential Losses is the best and most recent data available. For Buchanan County, which doesn't have digital FIRMs available, Hazus software was utilized to generate the flood hazard boundary and associated depth of flooding, although it is less accurate than DFIRM data. The number of structures at risk was determined using Hazus analysis along with a structure inventory dataset developed by the University of Missouri GIS Department (MSDIS). **Table 3.** below identifies the total potential direct building loss and income loss for Buchanan County.

Table 3.10. Potential Direct Building Loss and Income Loss for Buchanan County

Buchanan County	Potential Flood Building/Income Loss
Countywide Building Exposure	$10,579,076,000
Structural Damage	$107,272,000
Loss Ratio	1.01%
Contents Loss	$188,962,000
Inventory Loss	$18,751,000
Total Direct Loss	$314,985,000
Total Income Loss	$843,000
Total Direct and Income Loss	$315,828,000
# MSDIS Residential Structures Exposed	632
# Hazus Buildings Risk	333
# Substantially Damaged	153
# Displaced People	1,681
# Shelter Needs	856

Source: 2018 MO State Mitigation Plan, pg. 3.110

Potential Losses to Existing Development

Flood loss estimates by structure for Buchanan County were identified in the 2018 State Plan and are presented in **Table 3.29**. There are no school or special districts, or critical facilities directly located in Special Flood Hazard Areas (SFHA) in Buchanan County, but here are two residential buildings in St. Joseph that are located in an SFHA, according to MSDIS data.

Table 3.11. Potential Losses for Building Type in Buchanan County

Type of Structure	# of Structures	Total # of Losses
Residential	632	$141,681,847
Agriculture	639	$155,086,821
Commercial	69	$65,966,673
Education	6	$6,942,188
Government	113	$99,950,822
Industry	507	$659,519,721
Total Loss- HAZUS Layer		$1,129,148,073
Total # of People Affected	1,631	

Source: 2018 MO State Hazard Mitigation Plan, pg. 3113

Table 3.30 provides the total exposure count for structures in each jurisdiction. Losses were estimated by applying a 5 percent damage factor to total exposure.

Table 3.12. Total Exposure of Structures and Contents by Building Type

Jurisdiction	Residential	Commercial	Agriculture	Other	Estimated Exposure	Estimated Loss
Unincorp. Buchanan Co.	4,443	133	6,813	189	$1,373,112,000	$68,655,600
Agency	245	10	141	7	$76,441,000	$3,822,050
DeKalb	91	2	18	6	$27,661,000	$1,383,050
Easton	105	3	11	7	$32,750,000	$1,637,500
Lewis & Clark	61	0	9	2	$15,538,000	$776,900
Rushville	109	7	12	36	$55,026,000	$2,751,300
St. Joseph	25,425	1,496	298	1,267	$8,801,327,000	$440,066,350

Source: MSDIS Buchanan (https://drive.google.com/drive/folders/0Bzg99s866kWocFB5Y3hCRlRuWWM)

Impact of Previous and Future Development

Future development could impact flash and riverine flooding in the planning area. Development in low-lying areas near rivers and streams or where interior drainage systems are not adequate to provide drainage during heavy rainfall events can increase the risk of flood. Future development would also increase impervious surfaces causing additional water run-off and drainage problems during heavy rainfall events.

Hazard Summary by Jurisdiction

Agency, Lewis and Clark Village, St. Joseph and some unincorporated areas in the county are at risk to flood hazards. As demonstrated in Table 3.51 exposure of assets in SFHAs varies among jurisdictions. It should be noted that all communities in Buchanan County can be impacted by flooding of major roads and low water crossings. The greatest impact of flooding is in the unincorporated part of the county and St. Joseph. Several large employers are located near the Missouri River and flooded roads and facilities could cause significant disruptions for the employers and employees. Although Buchanan County is a participant in the NFIP and can substantially regulate development in the floodplain, many pre-FIRM structures remain. Due to the topography and many streams in the county, numerous low water crossings can be damaged and create a significant hazard to public safety during flood events. There are no school facilities in SFHAs and no previous damages were reported on the Data Collection Questionnaire for schools. Missouri Western State University has no facilities located in SFHAs.

Buchanan County – Flooding impacts several roadways in the unincorporated parts of the county. Of particular concern is a 1.5 mile stretch of Missouri State Highway 59, a major highway connecting Atchison to St. Joseph. During the floods of 2019, Highway 59 was closed for 115 days due to water on the roadway, and it was also previously closed for about 100 days in 2011. Efforts are ongoing to secure a grant to raise the road 18 inches and add a battery of culverts to mitigate flooding. While the roadway didn't suffer much damage due to the flooding, the economic impact and safety concerns presented by the extended road closure make mitigation of this critical infrastructure a necessity in the county. A contributing factor to the Highway 59 road closure in 2019 was the overtopping and breech of the Rushville-Sugar Lake Levee. A bid to fix the breech was awarded in early 2021 and work was expected to be complete within the year (https://www.newspressnow.com/news/local_news/flooding/rushville-sugar-lake-levee-bid-awarded/article_1d67722c-5fe5-11eb-81e4-5bab22015c0a.html). See Appendix A for full story. Approximately 75 homes were damaged during the 2019 floods, according to information provided by the county, along with several county roads and tubes, with _____ in insured losses for the county stemming from two federal disaster declarations (# FEMA–4435-DR and FEMA—4451-DR).

Agency – Due to part of the city being located in a floodplain and floodway, the city requires new residents to get a floodplain permit, and there are building restrictions in place, according to information provided by the city. There are two non-mitigated repetitive loss properties in the city, according to NFIP, with six losses reported as of January 2021, and one non-mitigated severe loss property with four losses reported as of January 2021.

Dekalb-

Lewis and Clark Village – Residents self-evacuated in March 2019 due to rising flood waters, and that flood caused property, infrastructure, and crop damage, as well as road closures, according to information provided in the questionnaire; however, specifics were not included as to the extent of those damages. There are six severe, non-mitigated repetitive loss properties in Lewis and Clark, according to NFIP, as well as 24 non-mitigated repetitive loss properties.

Rushville – There is one, mitigated repetitive loss property in Rushville with two losses reported as of January 2021.

St. Joseph- In March 2019, when the Missouri River rose more than 15 feet above flood stage, cresting at 32.07 feet (second highest crest recorded) on March 22, 2019, about 1,500 residents and 6,000 employees from the Bottoms in south St. Joseph were forced to evacuate. Of those evacuated were employees of the South St. Joseph Industrial Sewer District (SSJISD), where the flood caused an estimated $1.3 million in damages, according to information provided by SSJISD. Although SSJISD and many other employers and residents are located in an area protected by federal levee L-455, the levee, in the middle of upgrades, was overwhelmed by the flood waters. The City of St. Joseph reported $ in property damages to some of its facilities, including the St. Joe Port Authority and the public works building on Third Street. A call for volunteers was made to the public to make sandbags to protect properties and infrastructure. River levels stayed persistently high, resulting in two Presidential Disasters declared for flooding during 2019.

Following on the heels of the 2019 flooding, the south end of St. Joseph, including dozens of residences, flooded when debris clogged up nearby Contrary Creek during heavy rains in July 2020. Rescue boats were deployed to the area, where about 300 people live, and 50 water rescues took place (https://www.kq2.com/content/news/Southside--571839481.html). The area does not typically experience flooding and few impacted homeowners had flood insurance. The Civic Arena was used as a shelter for over 20 residents (https://www.kq2.com/content/news/Southside--571839481.html). Since the flooding was localized, FEMA assistance was not available.

With 17 non-mitigated repetitive loss properties in the city and 38 losses reported as of January 2021 and more frequent heavy rains happening in the area, it isn't a matter of if another flood will occur, but when and how bad.

Problem Statement

Major flooding near the Missouri River continues to be a concern in Buchanan County, as five out of 13 Presidential Disaster Declarations in the last 20 years have been for flooding and have included the county. As projects underway to strengthen local levees are completed, the level of protection should improve for those levee-protected areas; however, the record-setting flooding the area has experienced lately can diminish the integrity of levees in the planning area. Because of this, it is imperative that county and local officials prioritize mitigation efforts to protect the lives and property of those in the most flood-prone areas, such as Agency, south St. Joseph, and Lewis and Clark Village.

That work should include efforts to mitigate the 13 non-mitigated, severe repetitive loss properties in the county, through relocation, buyouts, and/or greater floodproofing efforts. All communities in the county, except DeKalb and Easton, participate in the NFIP. These communities have passed floodplain management ordinances and have the ability to substantially regulate development in the floodplain. Their participation in the NFIP enables residents to purchase flood insurance, but repetitive claims on non-mitigated properties doesn't prevent flooding, it only insures rising premiums.

BUCHANAN SCHOOL DISTRICT Missouri RESOLUTION NO. __

A RESOLUTION OF BUCHANAN SCHOOL DISTRICT ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS Buchanan County School District recognizes the threat that natural hazards pose to people and property within Buchanan County School District and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Buchanan County School District from the impacts of future hazards and disasters; and

WHEREAS Buchanan County School District recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, Buchanan County School District will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by Buchanan County School District demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY Buchanan County School District in the State of Missouri, THAT:

In accordance with (***local rule for adopting resolutions***), Buchanan County School District adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of_____in favor and__against, and__abstaining, this_____day of _____,_____.

By (Sig): _____
Print name: _____

ATTEST:
By (Sig.): _____
Print name: _____

APPROVED AS TO FORM:
By (Sig.): _____
Print name: _____

Buchanan County
Local Emergency Planning Committee
Region H Hazmat Building
Minutes of the Meeting of April 22, 2021

It should be noted that our April Meeting was held in person and via Zoom. We will continue to meet in person and via Zoom. A special thanks to JoAnn Woody of the American Red Cross for hosting our Zoom Meeting

Officers:

Chairperson	**Adam Perry**
Vice-Chairperson	**Kathie Metzinger (Absent)**
Treasurer	**Vacant**
Secretary	**Bill Brinton**
Standing Rules Chairperson	**Bill Caldwell**
MERC Director	**Mike Harris (Absent)**
SEMA	**Mike Boothe (Absent)**
Guests:	

Members:

Elected Officials	**None**
Law Enforcement	**None**
Fire	**Adam Perry & Bill Couldry HHazmat;**
Emergency Management	**Bill Brinton, BCEMA; Bill Lamar, STEMD**
Environmental	**Craig Darrough, MWSU**
Education	**Neil Hook, St. Joseph Christian**
Health	**Kendra Bundy, SJHD**
Hospital/Health Care	**Lindsey Kroenke, SJCOPS**
Transportation	**None**
Industry	**Ty Williams & Valerie Murawski & Russell Epperson, Albaugh; Jesse England, Fire EX/HS/HBS; Dallas Palmer, Daily's Premium Meats; Tim Talbot, Hillyard's Chemical**
Community/Volunteers	**JoAnn Woody & Ralph Dishong & Bill Caldwell; ARC; Hayley Howard & Houston Roberts, MOKAN, Cindy Wells & Gina Lucas, MUExtension; Kylee Strough, United Way; Jada McClintick & Hannah Williams, YWCA**
Public Works/Government	**None**
News Media/PIO	**None**

A quorum was present.

Approval of emailed minutes:

Bill Brinton emailed the corrected minutes of our February 27, 2020 meeting. Ty Williams made a motion to accept Ruben Bulgin seconded the motion and it passed. It should be noted that we have not met since February 27, 2020 due to COVID-19 City of St. Joseph Protocols.

Reading/Approval of Financial Report:
Secretary Bill Brinton reported that Treasurer Jimalee O'Connor's role has changed @ Catholic Charites and she will not longer be able to be our Treasurer.

Bill Brinton reported that we received $11,974.89 in MERC CEPF Funds in 2020; the Buchanan County Auditor's Officer reports that our 4/5/21 balance is $20,108.77.

Bill Couldry made a motion to accept the Treasurer's Report as emailed and presented; Ty Williams seconded the motion and it passed.

Bill Brinton presented the CEPF Budget from May 1, 2021 to March 30, 2022. Bill Couldry made a motion to accept the budget and Ty Williams seconded it and it passed.

Exercise Committee Report:
1/21/21 Air Show Tabletop Exercise
3/5/21 Air Show Mare Full Scale Exercise
4/7/21 Cooper Nuclear Dress Rehearsal
4/26 Cybersecurity Overview Seminar
5/12/21 Mass Mortality Table Top Exercise
5/26 & 5/26/21 Cooper Nuclear Graded Exercise

The Region H Hazmat Team's graded exercise will be October, in the event of a release at the Cooper Nuclear Reactor – the people from Rockport – travel to NWMSU to be decontaminated by the Region H Hazmat Team.
Here are the dates:

- **October 18 Walkthrough @ NWMSU**
- **October 19 Training Region H HSRT**
- **October 20 Dress Rehearsal @**
- **October 21 Graded Exercise @ NWMSU**

Needs Committee:
Bill Brinton made a motion for a Zoom Account for the Buchanan County LEPC; Ty Williams seconded the motion and it passed.

- **There will be no SEMA Conference in 2021.**
- **Not sure about the 2021 EPA LEPC Conference**

TIER II Reports: 57 Tier II's were due by March 1, 2021.

Region H Hazmat Update:
Bill Brinton reported:
Hazmat Calls:

- **Braymer**

Meetings 2021:

- **1/28 MERC**
- **2/10 Drug Strike Task Force Annual Meeting**
- **3/16 Hillyard's Technical Center Fire & EMS Board Meeting**
- **3/18 County Commissioner's Meeting and Presentation – Worth County**
- **4/6 Caldwell County Fire Chief's Meeting & Presentation**
- **Region H EMS Advisory Committee**

2021 LEPC Meetings: (Via Zoom or in person)

- ***Andrew County LEPC**
- ***Clinton County LEPC**
- ***Daviess County LEPC**
- **Holt County LEPC**

  ***Multiple meetings**

<u>COAD/Long Term Recovery Committee:</u>

In May of 2020, a portion of the South Side of St. Joseph was flooded by a 7 ½' rain over a very short period of time. Approx. 350 homes were damaged. It did not qualify for a FEMA Flood Declaration. Bill Brinton and Bill Lamar were able to put together the paperwork for a Small Business Association Disaster Declaration for low interest loans. The COAD/LTRC responded to the needs of the people and we supported them in their recovery efforts. We distributed more than $950,000 of home goods, building supplies. There were several challenges related to COVID-19 and the City of St. Joseph's quarantines, etc.

<u>Old Business:</u>

None

<u>Training Committee Reports:</u>

- **4/10 I attended Hazmat Size Up Class – Andrew County LEPC**
- **4/26 I attended**

Future Classes:

- **5/8 Hazmat Basic Life Saving – Andrew County LEPC**
- **7/7-7/9 G300 Intermediate IC – St. Joseph**
- **7/20-7/22 OSHA Hazmat Tech 24 Hour – Chillicothe Fire**
- **9/29-9/30 G400 Advanced ICS**

<u>Emergency Management:</u>

<u>Bill Lamar:</u>

- **has been hosting weekly COVID-19 Emergency Management Meetings.**
- **has been assisting with the COVID-19 Clinics.**
- **mentioned that the St. Joseph Fire Department is building a new Fire Station #8, near Missouri Western State University. It will include a City Emergency Operations Center.**
- **has been assisting with the City of St. Joseph's COVID-19 response.**

Bill Brinton:

- **represents Region H EMD's in the Non-Urban MO Healthcare Coalition Meetings.**
- **represents Region H EMD's for the NW Region of the Healthcare Coalition Meetings**
- **SEMA Community Organizations Active in Disasters weekly conference call. (COAD)**
- **Region H Mass Mortality Committee**
- **Represents Region H in the Missouri Emergency Management Association (MOEMA)**
- **Bill Brinton has been assisting with the recovery efforts from the South Saint Joseph May 2020 Flood.**

We both have been involved in the 2021 Sound of Speed Air Show.

New Business/Round Table:

Standing Rules Chairperson Bill Caldwell led our Election of officers:

- **Chairperson: Adam Perry was nominated and re-elected to the position of Chairperson.**
- **Secretary: Bill Brinton was nominated and re-elected to the position of Secretary.**
- **Interim Treasurer: Bill Couldry was nominated and elected to the position of Interim Secretary until our 12/2/21 Meeting.**

Roundtable: Note we did have several people that this was their first time at our meeting:

- **Adam Perry reported that the 2021 Household Hazardous Program at the Western District Barn in Faucett would begin May 1, 2021.**
- **Bill Caldwell reported that the American Red Cross had some issues related to a large apartment fire in Kansas City over Easter Weekend.**
- **Ralph Dishong reported that the St. Joseph American Red Cross office was still closed; they are still actively seeking volunteers to help with smoke alarm installations – the Sound the Alarm Program. He is available if needed.**
- **Kylee Strough updated everyone on the South St. Joseph Flood. Bill Brinton thanked her for her leadership during the flood event. She**
- **Hayley Howard and Houston Roberts updated everyone on Buchanan County's Hazard Mitigation Plan update. We have had several meetings with different organizations in Buchanan County. Both Bill Brinton and Bill Lamar are assisting in this process. Our next meeting will be May 4 @ the Remington Nature Center @ 7:00 PM. More information to follow**

Our next meeting will be Thursday May 27, 2021 @ the Region H hazmat Building 312 West Colorado and via Zoom.

Respectfully submitted by:

Bill Brinton

Secretary

Buchanan County
Local Emergency Planning Committee
Region H Hazmat Building
Minutes of the Meeting of May 27, 2021

It should be noted that our April Meeting was held in person and via Zoom. We will continue to meet in person and via Zoom. A special thanks to Debi Meeds of the American Red Cross for hosting our Zoom Meeting. A special thanks to Mike Sobetski for being our Acting Secretary.

Officers:

Chairperson	**Adam Perry**
Vice-Chairperson	**Kathie Metzinger**
Treasurer	**Bill Couldry (Absent)**
Secretary	**Bill Brinton (Absent)**
Standing Rules Chairperson	**Bill Caldwell**
MERC Director	**Mike Harris (Absent)**
SEMA	**Mike Boothe (Absent)**
Guests:	**`Chiquita Small, SEMA**

Members:

Elected Officials	**Heather Marti, Clerk-Agency**
Law Enforcement	**Jennifer Protzman & Mike Wilson, SJPD; Trenny Wilson, MWSUPD**
Fire	**Adam Perry, HHazmat;**
Emergency Management	**Bill Lamar, STEMD**
Environmental	**None**
Education	**Neil Hook, St. Joseph Christian**
Health	**None**
Hospital/Health Care	**Lindsey Kroenke, SJCOPS**
Transportation	**Adam Wood, MODOT; Michele Schultz CSJT**
Industry	**Ty Williams & Valerie Murawski, Albaugh; Jesse England, Fire EX/HS/HBS; Mike Sobetski & Ruben Bulgin & Doug Baggett, Lifeline Foods; Chris Ridpath, ICM BIOFuels; Deb Meyers, Ventura Foods**
Community/Volunteers	**Debi Meeds & Deb Consolver & Bill Caldwell; ARC; Hayley Howard, MOKAN; Gina Lucas, MUExtension; Kylee Strough, United Way**
Public Works/Government	**None**
News Media/PIO	**None**

A quorum was present.

Approval of emailed minutes:
Bill Brinton emailed the minutes of our April 22, 2021 meeting. Ty Williams made a motion to accept Ruben Bulgin seconded the motion and it passed.

Reading/Approval of Financial Report:
Mike Sobetski reported for Bill Couldry that our balance on May 24, 2021 was $20,108.77.

Bill Lamar made a motion to accept the Treasurer's Report as emailed and presented; Ty Williams seconded the motion and it passed.

Exercise Committee Report:
The Region H Hazmat Team's graded exercise will be October, in the event of a release at the Cooper Nuclear Reactor – the people from Rockport – travel to NWMSU to be decontaminated by the Region H Hazmat Team.

Here are the dates:
- **10/18/21 Walkthrough @ NWMSU**
- **10/19/21 Training Region H HSRT**
- **10/20/21 Dress Rehearsal @**
- **10/21/21 Graded Exercise @ NWMSU**

Needs Committee:
- **7/24/21 MERC Sponsored Anhydrous Ammonia Class: $350.00 for lunch & snacks. Rubin Bulgin made a motion to accept Bill Lamar seconded the motion and it passed.**
- **9/18/21 MERC sponsored *Chemical Suicide Class: $350.00 for lunch & snacks. Ty Williams made a motion to accept Ruben Bulgin seconded the motion and it passed.**

***POST Approved.**

Both classes will be at the Region H Hazmat Building.

TIER II Reports: 138 Tier II's

Region H Hazmat Update:
- **5/4/21 MERC Hazmat Team Advisory Committee Meeting – Jefferson City**
- **5/19/21 Region H EMS Advisory Committee Meeting**
- **5/25/21 Cooper Nuclear Graded Exercise – Tarkio**
- **5/27/21 MERC Meeting Jefferson City**

LEPC's:
- **5/13/21 Livingstons County**
- **5/17/21 Caldwell County**
- **5/18/21 Clinton County**

COAD/Long Term Recovery Committee:
No report, the Committee will meet June 24, 2021 in person and via Zoom

Old Business:
It should be noted that we have acquired our own BCLEPC ZOOM account and beginning with our next meeting, we will be using our own Zoom.

Training Committee Reports:
- **7/7-7/9 G300 Intermediate IC – St. Joseph**
- **7/20-7/22 OSHA Hazmat Tech 24 Hour – Chillicothe Fire**
- **7/24/21 MERC Sponsored Anhydrous Ammonia Class**
- **9/18/21 MERC sponsored Chemical Suicide Class**
- **9/29-9/30 G400 Advanced ICS**

Emergency Management:
Bill Lamar:
- **South St. Joseph Flood follow-up activities; ditch clean out, etc.**
- **Received several pallets of SEMA PPE N-95 masks, Tyvek suits, etc. See Bill if you need any things**

Bill Brinton:
- **4/30 & 5/1 & 5/2/21 Sound of Speed Air Show**
- **5/6 Sound of Speed Air Show After Action Review**
- **5/12/21 Mass Mortality Exercise @ Mosaic Emergency Management**

New Business/Round Table:
Hayley Howard updated us on the Buchanan County Hazard Mitigation Plan. We have held Community Meetings. You may visit the MO-KAN Website for public comment. Due to the State by end of December 2021

Our next meeting will be Thursday June 24, 2021 @ the Region H hazmat Building 312 West Colorado and via Zoom.

Respectfully submitted by:

Mike Sobetski

Acting Secretary

Buchanan County
Local Emergency Planning Committee
Region H Hazmat Building
Minutes of the Meeting of June 24, 2021

It should be noted that our June Meeting was held in person and via Zoom. We will continue to meet in person and via Zoom.

Officers:

Chairperson	**Adam Perry**
Vice-Chairperson	**Kathie Metzinger**
Treasurer	**Bill Couldry**
Secretary	**Bill Brinton**
Standing Rules Chairperson	**Bill Caldwell**
MERC Director	**Mike Harris**
SEMA	**Mike Boothe (Absent)**
Guests:	**`Chiquita Small, SEMA**

Members:

Elected Officials	**Brenda Shields, MOHREP**
Law Enforcement	**Jennifer Protzman & Jeff Wilson, SJPD; Jeremy Funk, 139thAWS**
Fire	**Adam Perry, HHazmat; Dennis Johnson, SCBDFPD; Mindy Andrasevitz, SJFD**
Emergency Management	**Bill Lamar, STEMD; Bill Brinton, BCEMD; Allison Behymer, MOSIAC**
Environmental	**Rodney Lockett, Homeland**
Education	**None**
Health	**None**
Hospital/Health Care	**Kathie Metzinger, Derek Conz, MOSIAC, Peggy Hardy, Freudenthal Home Health**
Transportation	**None**
Industry	**Ty Williams & Valerie Murawski & Russell Epperson, Albaugh; Mike Sobetski & Ruben Bulgin & Doug Baggett, Lifeline Foods; Joe Garcia, ICM BIOFuels; Dallas Palmer, Dailey's Meats, Paul Gomes, Triumph Foods**
Community/Volunteers	**Bill Caldwell; ARC; Hayley Howard, MOKAN; Bill Couldry, COAD; Bob Vey, Community; Ethel Catron, Community**
Public Works/Government	**None**
News Media/PIO	**None**

A quorum was present.

Approval of emailed minutes:
Bill Brinton emailed the minutes of our May 27, 2021 meeting. Dallas Palmer made a motion to accept. Bill Couldry seconded the motion and it passed.

Reading/Approval of Financial Report:
Treasurer Bill Couldry reported:

5/27/2021	Beginning Balance	$20,108.77
2/19/21	St. Joseph News Press	-$148.75
2/26/21	Claudia's – 2021 Sound of Speed Airshow Tabletop Exercise	-$816.27
5/21/2021	Claudia's – May Meeting	-$293.48
6/24/2021	Ending Balance	$18,850.27

Ty Williams made a motion to accept the Treasurer's Report as presented: Rubin Bulgin seconded the motion and it passed.

In connection with the filing of our CEPF Application, we worked with the Buchanan County Auditor's Office to re-check and balance our account.

Exercise Committee Report:
Planning is ongoing for the Region H Hazmat Team's Cooper Nuclear graded exercise that will be October, in the event of a release at the Cooper Nuclear Reactor – the people from Rockport – travel to NWMSU to be decontaminated by the Region H Hazmat Team.

Here are the dates:
- **10/18/21 Walkthrough @ NWMSU**
- **10/19/21 Training Region H HSRT**
- **10/20/21 Dress Rehearsal @**
- **10/21/21 Graded Exercise @ NWMSU**

Needs Committee:
No new needs have been presented

TIER II Reports: 138 Tier II's

Region H Hazmat Update:
- **6/8 Hazmat Call Atchsion County – I-29**
- **6/11 to 6/13 Equipment Support to Bethany**
- **6/14 Hazmat Meeting**
- **6/17 NWMO Commissioners Meeting**
- **Submitted CEPF Application**

LEPC's:
- **6/9 Nodaway County LEPC Meeting**

COAD/Long Term Recovery Committee:

The COAD/LTRC did meet before our meeting but only three people attended: Bill Brinton, Penny Adams and Representative Brenda Shields attended the meeting in person or via ZOOM. Bill Brinton will be following up with the COAD/LTRC members.

Old Business:

The LEPC voted to purchase a BCLEPC ZOOM account and we used it for the first time for our June 24, meeting. Bill Brinton reported that the ZOOM Account was paid for by Buchanan County Emergency Management & the Region H Hazmat Team.

Training Committee Reports:

- **7/7-7/9 G300 Intermediate IC – St. Joseph**
- **7/20-7/22 OSHA Hazmat Tech 24 Hour – Chillicothe Fire**
- **7/24/21 MERC Sponsored Anhydrous Ammonia Class**
- **9/18/21 MERC sponsored Chemical Suicide Class**
- **9/27-9/28 Pediatric Disaster Response and Emergency Preparedness -- Trenton**
- **9/29-9/30 G400 Advanced ICS**

Emergency Management:

Bill Lamar:

- **They have received several pallets of SEMA PPE N-95 masks, Tyvek suits, etc. and we will be working on distributing them to the different Counties in Region H the week of July 6-9, 2021**

Bill Brinton:

- **Floodplain Meeting**
- **6/16 Healthcare Coalition Zoom Meeting**

New Business/Round Table:

- **Hayley Howard updated us on the Buchanan County Hazard Mitigation Plan. We have held Community Meetings. You may visit the MO-KAN Website for public comment. Due to the State by end of December 2021.**

ZOOM:

- **Chiquita Small with SEMA reported that the Statewide COAD Conference Calls was still being held, she also reported the 2021 National CERT Conference will be held July 12-14, 2021 in Springfield.**
- **Derek Conz reported that hospitalizations related to COVID Delta Virus was on the rise and that MOSIAC was gearing up to assist people in our region.**
- **Mike Harris reported that the MERC was reviewing some legislative changes and would be restart hosting MERC Conferences beginning in 2022.**
- **Rodney Lockett, Chief of Regulatory Compliance, Region VII**
  U.S. Department of Homeland Security, Chemical Facility Anti-Terrorism Standards (CFATS) introduced himself and will be making a presentation at one of our meetings in the future.

In Person:

- **Dennis Johnson reported that SEMA was storing a new DEMAT/DEMORT Trailer at SCBCFD Station in Faucett, they are working with Mid-Buchanan School District on their Fire Station becoming an evacuation point; they will be doing a drill later this year.**
- **Dallas Palmer reported that Dailey's would be hosting a Hazwhopper class later this year and the Region H Team would be participating in an exercise.**
- **Mike Sobetski & Ruben Bulgin reported that Lifeline Foods would be conducting Crisis Management Training and Exercise June 30, 2021 and Bill Brinton will be assisting in the training.**
- **Adam Perry reported that the next Household Hazardous Waste Drop-off would be July 3, 2021 at the Western District Barn in Faucett.**

Bill Brinton explained that the next MERC Meeting would be July 22, 2021, the date of our next meeting. He made a motion not to Meet on July 22, 2021 but to meet August 26, 2021. Bill Couldry seconded the motion and it passed.

Our next meeting will be Thursday August 26, 2021 in person 7@ the Region H hazmat Building 312 West Colorado and via Zoom.

Respectfully submitted by:

Bill Brinton

Secretary

BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHAT IS A HAZARD MITIGATION PLAN?

A hazard mitigation plan (HMP) is "the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards" (44 CFR§ 201.6). HMPs are necessary to establish and maintain eligibility for grant funds. The planning process is as important as the plan itself because it creates a framework for governments to reduce the negative impacts from future diasters on lives, property, and the economy.

Hazard mitigation planning can significantly reduce the physical, financial, and emotional losses caused by disasters. The Disaster Mitigation Act of 2000 is federal legislation that established a pre-disaster hazard mitigation program and requirements for the national BRIC (Building Resilient Infrastructure and Communities) program. It encourages and rewards state and local pre-disaster planning and promotes sustainability. Completion of an HMP will result in more effective risk reduction projects and in a faster and more efficient allocation of funding.

PURPOSE

The Buchanan County Emergency Management Agency is leading the update of the countywide HMP, in cooperation with our region's planning council (Mo-Kan). This plan is an opportunity to detail a variety of potential hazards that affect some or all of our residents and will also allow the county and participating municipalities to be eligible for future mitigation funding from the Federal Emergency Management Agency (FEMA).

The goal of the plan is to identify projects that can reduce damages from future hazards. The plan includes a risk assessment and a hazard mitigation strategy. The primary natural hazards of concern in Buchanan County include: Drought, Severe Weather, Severe Winter Storm, Flood, Dam Failure, and Extreme Temperature. In addition, the County is evaluating the pandemic.

The plan will focus on existing buildings and potential future development, infrastructure, critical infrastructure, and critical facilities such as water utilities, roadways, and municipal buildings, that might be impacted.

What are the benefits of participating in the Hazard Mitigation Plan?

There are numerous benefits to participating in the HMP including:

- Awareness of risk and vulnerabilities
- Identification of implementable strategies and funding sources
- Reduction of hazard impact (save lives, property, and the local economy)
- Creation of partnerships and develop comprehensive approaches that enhance project grant funding opportunities.
- Pooling of resources and reducing the level of effort while avoiding duplication of effort.
- Creation of more resilient communities; bounce-back from disasters faster!

FAQS ABOUT THE PLAN

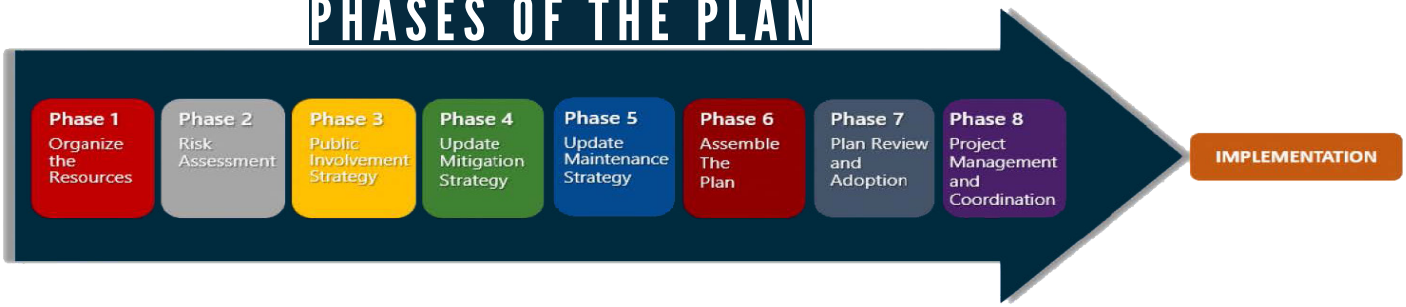
How can you reduce/eliminate risk? Identify mitigation actions/projects/activities or processes that can include **1)** Local plans and regulations; **2)** Structure and infrastructure projects; **3)** Natural systems protection; **4)** Education and awareness programs.

What grant funding is available? FEMA Hazard Mitigation Assistance grant funding is available with a FEMA-approved Hazard Mitigation Plan (annual and post-disaster grant funding opportunities).

How can I support the plan? Take the citizen survey! This will help us obtain input and get a better understanding of citizen preparedness for hazard events.

Where can I see the 2022 plan? Sections of the draft plan will be available in Fall 2021 for download, review and comment at:
https://www.mo-kan.org/community/hazard-mitigation/

PHASES OF THE PLAN



SUPPORT THE PLAN

Public input on the mitigation planning process is very important. Here are a few ways to get involved:

1. Review the existing plan and reach out with comments on the update.
2. Take the citizen survey!

Rebecca Thacker
Community Planner,
Mo-Kan Regional Council
rebecca@mo-kan.org
816-233-3144

Bill Brinton
Buchanan County
Emergency Management
bbrinton@co.buchanan.mo.us

Take the citizen survey!

Buchanan County residents can help with the plan by taking a short survey.

To complete the survey, go to:
https://www.surveymonkey.com/r/BuchananHMP
OR
Scan the QR code

HAZARD MITIGATION GRANTS

BUILDING RESILIENT INFRASTRUCTURE & COMMUNITIES (BRIC)

Support for states, local communities, tribes & territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards.

ELIGIBLE ENTITIES: state, local, tribal & territorial governments

ELIGIBLE PROJECTS:

- Pre-disaster activities that reduce risks to natural hazards, with a focus on critical services & facilities, public infrastructure, public safety & public health
- Using aquifer storage and recovery, floodplain & stream restoration, flood diversion and storage, or green infrastructure methods that may reduce the impacts of flood & drought.

FUNDING TYPE: Cost share: 75 Fed/25 Local OR 90 Fed/10 Local for small, impoverished communities

AMOUNT OF ASSISTANCE: Up to $600,000

ELIGIBILITY REQUIREMENTS:

1. Your community must have an approved hazard mitigation plan and be a member of the National Flood Insurance Program in good standing (not on probation, suspended, or withdrawn).
2. Benefit-Cost Analysis required to validate cost effectiveness

APPLICATION PERIOD: Annually, September-December

FLOOD MITIGATION ASSISTANCE (FMA) PROGRAM

Provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured annually under the National Flood Insurance Program.

ELIGIBLE ENTITIES: local governments, including cities, townships, counties, special district governments, & Indian tribal governments

ELIGIBLE PROJECTS:

- Project scoping to develop community/individual flood mitigation projects that reduce flood claims against NFIP.
- Community flood mitigation projects that address community flood risk with the goal of reducing NFIP claim payments (Aquifer Storage & Recovery, Floodwater Diversion & Storage, Floodplain & Stream Restoration, & Low Impact Development/Green Infrastructure).
- Technical assistance to maintain a viable FMA program over time.
- Projects that mitigate risk of flooding to individual NFIP insured structures.

FUNDING TYPE: Cost share: 75 Fed/25 Local (Federal cost share of up to 100% for Severe Repetitive Loss (SRL) properties & up to 90% for Repetitive Loss properties)

AMOUNT OF ASSISTANCE: Up to $600,000 for flood projects; $50,000 for tech assistance; $25,000 for local flood hazard mitigation planning

ELIGIBILITY REQUIREMENTS:

1. Your community must have an approved hazard mitigation plan and be a member of the National Flood Insurance Program in good standing (not on probation, suspended, or withdrawn).
2. Benefit-Cost Analysis to validate cost effectiveness for flood mitigation projects (not required for project scoping & technical assistance)

APPLICATION PERIOD: Annually, September-December

HAZARD MITIGATION GRANT PROGRAM (HMGP)

Assists in implementing long-term hazard mitigation planning & projects following a Presidential major disaster declaration.

ELIGIBLE ENTITIES: state, local, tribal and territorial governments (individuals can apply through local govt)

ELIGIBLE PROJECTS:

- Sirens & safe rooms
- Protecting or purchasing public or private property that experienced, or is in danger of experiencing, repetitive damage.
- Purchasing & removing a flood-prone property from an individual.
- Developing/adopting hazard mitigation plans- required for state, local, tribal & territorial governments to receive funding for HMP projects.
- Using aquifer storage & recovery, floodplain & stream restoration, flood diversion & storage, or green infrastructure methods to reduce flood & drough impacts.

FUNDING TYPE: Cost share: 75 Fed/25 Local

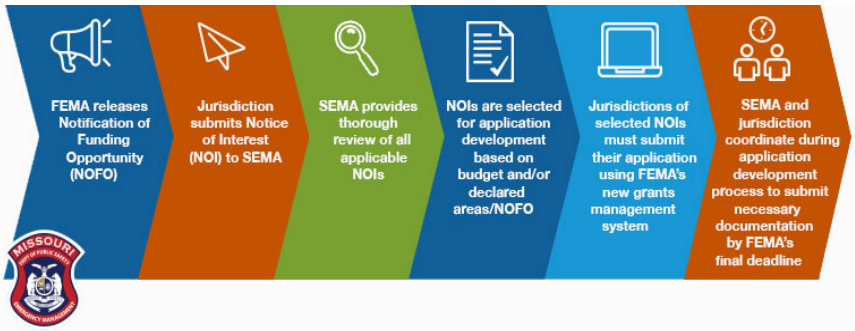
AMOUNT OF ASSISTANCE: Based on total cost of disaster

ELIGIBILITY REQUIREMENTS:

1. Your home must be located in the state that received a presidential major disaster declaration.
2. Your community must have an approved hazard mitigation plan & be a member of the National Flood Insurance Program in good standing (not on probation, suspended, or withdrawn).
3. Your home rebuilding project must be cost-effective, technically feasible, environmentally sound & FEMA approved.

APPLICATION PERIOD: Within 60 days after presidential declaration

HAZARD MITIGATION GRANT PROCESS (FMA/BRIC)



FEMA GO

https://go.fema.gov

APPLY FOR ALL GRANTS ONLINE

For more grant info, visit: https://sema.dps.mo.gov/programs/mitigation_management.php | Questions? Call Mo-Kan Regional Council at (816) 233-3144.

Buchanan County Resident Survey

1. Public Survey: Buchanan County Multi-Jurisdictional Hazard Mitigation Plan

Buchanan County is updating its Multi-Jurisdictional Hazard Mitigation Plan (HMP). The goal of the HMP is to reduce the impacts of natural hazards by identifying potential hazards and developing mitigation strategies. This important planning process makes our communities more resilient and better prepared before a disaster happens.

Public opinion is important to the planning process. Your comments will help inform your community's representatives who are on the HMP planning committee. By participating in this five-year update of the plan, your community will also remain eligible for mitigation funding programs from the Federal Emergency Management Agency (FEMA). Please take a few minutes to answer the following questions.

We appreciate you taking the time to share your opinions.
Thank you.

1. Where in the county do you live? Please select your community from the list:

- ☐ Unincorporated County
- ☐ Village of Agency
- ☐ Village of Easton
- ☐ Village of Rushville
- ☐ Lewis and Clark Village
- ☐ Village of DeKalb
- ☐ City of St. Joseph

2. Please indicate your opinion on the *likelihood* for each natural/manmade hazard to impact *your community* using the following rating system.
Please rate EACH hazard 1 through 4 as follows:
1=Unlikely, 2=Occasional, 3=Likely, 4=Highly Likely

	1	2	3	4
Dam Failure	☐	☐	☐	☐
Drought	☐	☐	☐	☐
Earthquake	☐	☐	☐	☐
Extreme Heat	☐	☐	☐	☐
Fire	☐	☐	☐	☐
Flooding (Flash and River)	☐	☐	☐	☐
Land Subsidence/Sinkhole	☐	☐	☐	☐
Levee Failure	☐	☐	☐	☐
Public Health Outbreaks	☐	☐	☐	☐
Thunderstorm/High Winds/Lightning/Hail	☐	☐	☐	☐
Tornado	☐	☐	☐	☐
Winter Weather/Snow/Ice/Severe Cold	☐	☐	☐	☐

3. Please indicate your opinion on the *potential magnitude* of each hazard's impact on your community using the following rating system:
1=Negligible, 2=Limited, 3=Critical, 4=Catastrophic

	1	2	3	4
Dam Failure	☐	☐	☐	☐
Drought	☐	☐	☐	☐
Earthquake	☐	☐	☐	☐
Extreme Heat	☐	☐	☐	☐
Fire	☐	☐	☐	☐
Flooding (Flash and River)	☐	☐	☐	☐
Land Subsidence/Sinkhole	☐	☐	☐	☐
Levee Failure	☐	☐	☐	☐
Public Health Outbreak	☐	☐	☐	☐
Thunderstorm/High Winds/Lightning/Hail	☐	☐	☐	☐
Tornado	☐	☐	☐	☐
Winter Weather/Snow/Ice/Severe Cold	☐	☐	☐	☐

4. In your opinion, which of the following strategies are the most effective investments to reduce the risk of future hazard damage? Please check all that apply.

- ☐ Upgrade infrastructure
- ☐ Avoid new construction in areas prone to damage
- ☐ Work more closely with private property owners
- ☐ Invest more resources in preventative maintenance
- ☐ Conduct education and awareness programs
- ☐ Invest in more monitoring and planning for protection of community assets
- ☐ Other (please specify)

5. FEMA Hazard Mitigation Assistance Grants are administered by the State Emergency Management Agency. Listed below are some types of projects considered.

Please indicate your opinion as to which projects could benefit your community. Check all that you think would be beneficial.

- ☐ Flood-prone Property Acquisition & Structure Demolition /Relocation
- ☐ Flood-Prone Structure Elevation
- ☐ Structural Retrofitting of Existing Buildings to Add a Tornado Safe Room
- ☐ Wildfire Mitigation
- ☐ Minor Localized Flood Reduction Projects (storm water management or localized flood control projects)
- ☐ Retrofitting of Existing Buildings, and Facilities from Wind Damage.
- ☐ New Tornado Safe Room Construction
- ☐ Electrical Utilities Infrastructure Retrofit
- ☐ Soil Erosion Stabilization
- ☐ Other (please specify)

6. Please comment on any other issues that the Buchanan County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by natural/man-made disasters.

Name: _____

Fire Protection District Name: _____

How many staff members are there in your fire protection district?

How many are paid?

How many are volunteers?

Does your fire district report to the National Fire Incident Reporting System (NFIRS)?

How many fires did you respond to last year in the following categories:

Urban/Structural fires:

1) general fires
2) structure fire
30 fire in mobile property used as a fixed structure
4) mobile property (vehicle) fire
4) cultivated vegetation, crop fire

Wildlife fires:

1) natural vegetation fire
2) outside rubbish fire
3) special outside fire
4) cultivate vegetation, crop fire

What issues/changes have you seen that contribute to an increase of any type of fire (example: change in burning restrictions, high grass near homes, etc.)? Please give details.

What resources/actions/changes would help decrease the number of fires?

What fire education outreach do you conduct or involved with?

What additional fire education outreach would your department like to conduct or be involved with but lack the resources to do so?

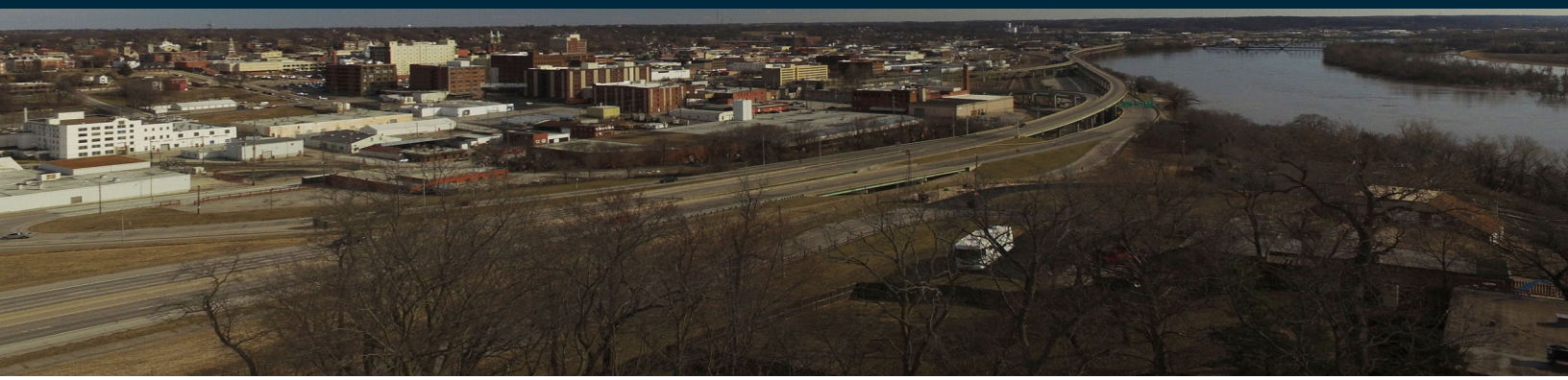
(please use back of paper if needed)

LET YOUR VOICE BE HEARD!

THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN'S

PUBLIC COMMENT PERIOD IS OPEN!

JULY 1- JULY 30



TO REVIEW THE DRAFT PLAN AND MAKE COMMENTS, GO TO:

1. Go to https://www.mo-kan.org/community/hazard-mitigation/
2. Download & Review the Buchanan County HMP Draft under "Links to HMPs"
3. Click on the Link & Make Comments
4. Click "Submit Response" Once Complete

THANK YOU FOR YOUR PARTICIPATION!!

QUESTIONS? CALL MO-KAN REGIONAL COUNCIL AT 816-233-3144 OR EMAIL INFO@MO-KAN.ORG

Appendix C: Completed/Deleted Mitigation Actions

Goal 4: Ensure Continued Operation of Government and Emergency Functions in a Disaster

Action 4.1.13:

Action Worksheet	
Name of Jurisdiction:	Buchanan County
Risk / Vulnerability	
Problem being Mitigated:	Lack of power
Hazard(s) Addressed:	Earthquake, flood, severe winter weather, heat wave, etc.
Action or Project	
Action/Project Number:	4.1.13
Name of Action or Project:	Courthouse generator
Action or Project Description:	Acquire a generator and place at a critical facility (courthouse) to maintain essential county functions during prolonged power outages
Applicable Goal Statement:	Ensure Continued Operation of Government and Emergency Functions in a Disaster
Estimated Cost:	$550,000
Benefits:	Assures that county business and communication with public can continue without disruption.
Plan for Implementation	
Responsible Organization/Department:	Buchanan County Commission
Action/Project Priority:	High
Timeline for Completion:	5 Years
Potential Fund Sources:	Grants, internal, etc.
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status	New
Report of Progress	

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: Buchanan County

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.1	Public education outreach to inform residents to purchase weather radios to ensure they have sufficient access to information in times of disasters.		Ongoing		Newspaper & TV Reports	Keep
1.1.3	Adding shelters in the construction of new public facilitates like libraries, community centers, etc.		Ongoing		There was a shelter built at Mid-Buchanan School District	Keep
1.1.8	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.		Ongoing		The American Red Cross is in charge of Sheltering in the US.	Keep

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.11	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.		Ongoing		needs to be proactive not reactive When contacted.	Keep
1.1.18	Review emergency access routes and evacuation routes and mitigate any problem areas.		Ongoing		Buchanan County EMA worked with the Halls Levee District on an evacuation plan	Keep
1.2.3	Communities that do not have warning systems should purchase them.		Ongoing		All Communities except one that is unincorporated have storm sirens – hope to have one in the next couple of years. We have a location just need the siren	Keep
1.2.4	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.		Ongoing		Police/Fire Communications Center uses Nixel	Keep
1.2.7	Place warning sirens in densely populated unincorporated areas.		Ongoing		All Communities except one that is unincorporated have storm sirens – hope to have one in the next couple of years. We have a location just need the siren	Keep
1.3.1	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.		Ongoing		COAD group meets monthly & coordinates When contacted	Keep
1.3.3	Accommodate individuals with special/functional needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).		Ongoing		EM collaborate w/ ARC to make accommodations as necessary When contacted	Keep
2.1.1	Build a marketing program to inform property owners on the benefits of the buy-out program.			No Progress	Neither Buchanan County, nor Lewis & Clark Village nor Agency participated in buy-outs.	Delete
2.1.4	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)		Ongoing		The Buchanan County Planning and Zoning Department Monitors this	Keep

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
4.1.8	Make GIS hazard information available online to county and permitting departments	X	Ongoing		Our GIS records are on line	Keep X
4.1.9	Schools and emergency responders to participate in Electronic Response Information Portal (ERIP)		Unknown		Each school has a resource ~~officer~~ deputy to assist in school safety	~~X~~
4.1.12	Maintain offsite data backup of county records and safeguard data that does not have backups.		Ongoing		We backup our data at a server at the Drug Strike Task Force Building – that has a generator. (Active/Active System)	Keep
5.1.1	Assess critical facilities and infrastructure for needed upgrades and retrofits		~~Unknown~~ Ongoing		We are beginning to investigate purchasing a generator to power all of the Buchanan County Courthouse.	Keep ~~X~~

create wkst for this

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
2.1.7	Adopt the most current edition of a model building code to address structural and architectural issues related to hazard mitigation.			No Progress	Buchanan County does not have a Building Inspector	Delete
2.2.1	Update comprehensive land use plan to specifically address development in hazard-prone areas and outline strategies to decrease vulnerability.				We do not have a land use plan.	Delete
2.3.3	Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents.		Ongoing		Buchanan County has a GIS Department	Keep
2.3.5	Maintain and updated list of names, phone numbers and duties for all employees during regular operation and off hours.		X		New HR System has updated employee information and can provide hard copies of information.	✓
2.3.8	Follow guidelines as suggested in the Missouri 2002 Drought Plan, developed by MDNR	X			Unknown	X
3.1.1	Develop an ongoing campaign to educate the community about seasonal hazards and coordinate the campaign with a variety of promotional resources		Ongoing		When contacted When Educational materials printed via meetings & info boards	Keep
3.1.3	Conduct a public education campaign to inform citizen across the region of the benefits of constructing a tornado safe room in their homes		Ongoing		Planning/ zoning permits When contacted	Keep
3.1.8	Public information campaign to remove reduce the threat of fire (remove vegetation, yard debris and other combustible materials) in urban interface/intermix areas				None	X
4.1.1	Maintain a publicly accessible list of names, positions, contact information, roles and responsibilities for all public safety positions and departments				Should be able to update on our Buchanan County Website.	K
4.1.3	Execute mutual aid agreements with all relevant agencies		Ongoing		We have Mutual Aid Agreements with Platte County and the Regional Hazmat Team has agreements with all 15 counties in Region H	Keep

updated!

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: Agency

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.1 2	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.					
1.2.5.	Use electronic methods, including the Internet, social media, Twitter, texting and call systems to notify public of a hazard.					X

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
2.1.2	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.		✓			
2.1.5	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs).		✓			
2.1.8	Construction of detention basin, small lakes, and greenways or riparian corridors to channel and catch storm water, thereby reducing the likelihood of flooding as part of a countywide storm water management plan.			✓		
2.1.9	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.			✓		
2.1.12	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.			✓		
2.3.4	Ensure all local governments have the latest copies of flood insurance rate maps, flood plain maps and similar documents.					X
3.1.4	Conduct a public education campaign to inform citizen across the region of the benefits of constructing a tornado safe room in their homes.					X

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
4.1.4	Execute mutual aid agreements with all relevant agencies.			✓		

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: East Buchanan School District - listed as Mid Buchanan on plan

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.2.9	Use electronic methods, including the Internet, Twitter, texting and call system to notify public of a hazard.		X		We use BlackBoard communication, which allows us to simoustaneously issue messages via phone, email, app, Twitter, Text, and Facebook. We plan to continue w/ this platform.	✓
3.1.10	Educate children in disaster preparedness and how to survive disasters.		X		Regular drills for earthquake, fire, and tornado. Plan to continue and improve through practice and reflection	✓

Jurisdiction name wrong on pg. 4.48 - Should be East (NOT MID) Buchanan

Same issue as above

ACTION WORKSHEET
***Highlighted items must be filled out by Jurisdiction**

Action Worksheet	
Name of Jurisdiction:	East Buchanan C-1 School District
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado
Problem being Mitigated:	Lack of adequate sheltering areas for students and staff during tornadic activity.
Action or Project	
Applicable Goal Statement:	
Action/Project Number:	
Name of Action or Project:	
Mitigation Category:	
Action or Project Description:	Create Storm Safe Area(s) through either: 1. storm safe dedicated shelter 2. New building structures built to tornado standards
Estimated Cost:	Varies by option from $200,000 - $4,000,000
Benefits:	Create safe areas from tornados to shelter students, staff, and community members during tornadic storms
Plan for Implementation	
Responsible Organization/Department:	East Buchanan C-1 School District
Supporting Organization/Department:	
Action/Project Priority:	High
Timeline for Completion:	1-3 Years
Potential Fund Sources:	Local tax funds from capital levy / Lease funds / Grant funds
Local Planning Mechanisms to be Used in Implementation, if any:	Engage East Buchanan School Board in coordination with City of Gower.
Progress Report	
Action Status:	
Report of Progress:	

ACTION WORKSHEET
***Highlighted items must be filled out by Jurisdiction**

Action Worksheet	
Name of Jurisdiction:	East Buchanan C-1 School District
Risk / Vulnerability	
Hazard(s) Addressed:	Communicable Disease
Problem being Mitigated:	Lack of proper ventilation in indoor spaces.
Action or Project	
Applicable Goal Statement:	
Action/Project Number:	
Name of Action or Project:	
Mitigation Category:	
Action or Project Description:	Replace HVAC equipment with equipment that has the capacity to adequately control indoor air quality
Estimated Cost:	2.5 Million
Benefits:	Improved indoor air quality.
Plan for Implementation	
Responsible Organization/Department:	East Buchanan C-1 School District
Supporting Organization/Department:	
Action/Project Priority:	High
Timeline for Completion:	May 2021 - Aug 2021
Potential Fund Sources:	ESSER Federal Funds / lease funds / local tax
Local Planning Mechanisms to be Used in Implementation, if any:	East Buchanan C-1 Board of Education
Progress Report	
Action Status:	
Report of Progress:	

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: Buchanan R-IV School District

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.2.8	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.		Yes		Thrillshare public address notification	
3.1.9	Educate children in disaster preparedness and how to survive disasters		Yes		On-site training , review, and drills.	

EASTON

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.5	Add shelters in the construction of new public facilitates like libraries, community centers, etc.			✓	NO CONSTRUCTION OF THIS TYPE	X
1.1.9	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.			✓	NO EMERGENCY SHELTERS	X
1.1.24	Perform street improvements to further improve drainage throughout the community		✓		IN PROCESS OF STREET REPAIRS THEN WILL TACKLE CRITICAL RUN OFF AREAS	✓
1.3.4	Accommodate individuals with special needs in emergency shelters, including compliance with the Americans with Disabilities Act (ADA).			✓	NO EMERGENCY SHELTERS	✓
2.1.13	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.				delete per Sally's email May 10	??
2.3.2	Enact ordinances prohibiting residential and commercial development in all high-hazard prone areas.			✓	N/A	X
2.3.9	Follow guidelines as suggested in the Missouri 2002 Drought Plan, developed by MDNR.			✓	THIS ACTION IS FOLLOWED	X

email 5-10 for update on this

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
3.1.5	Conduct a public education campaign to inform citizen across the region of the benefits of constructing a tornado safe room in their homes.			✓	HARD FOR MOST HOMES TO CONSTRUCT SAFE ROOM IN/ON THEIR PROPERTY	X
3.1.6	Promote Ready-In-Three Campaign					??
4.1.6	Execute mutual aid agreements with all relevant agencies		✓		COUNCIL NEEDS TO BE MORE ACTIVE IN THIS AREA	✓
	WEB SITE - PUBLIC ACCESS TO CURRENT ORDINANCES! OTHER INFO		✓			
	UPDATE ZONING ORDINANCES		✓		JUST STARTING PROCESS	✓

new actions?

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: Lewis and Clark Village

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.20	Review emergency access routes and evacuation routes and mitigate any problem areas.		X		Look at MODOT Resources for Improving Ingress and Egress and Water Flow under the Main Road	✓
2.1.3	Participate in buyout program for the highest risk properties located in the highest-risk flood areas.		X		Community is in/near Flood plain so there is need for Continued Participation	✓

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
2.1.6	Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs).		X		Require Flood plain development Permits with elevation Certificates For Substantial Improvement or new construction	✓
2.1.10	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.			X	No City property is subjected to a higher risk more than the Community as a whole.	X
2.1.14	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.		X		Addressed City ROAD Drainage issues But need Further look at Drainage underneath the MAin Entrance	✓
3.1.7	Promote Ready-In-Three Campaign.		X		Created a Social media page For the City and will Develop a Informational Packet for new and Exsisting residents	✓
4.1.7	Execute mutual aid agreements with all relevant agencies.	X			Council signed a Mutual Aid Agreement with Buchanan County	X
4.1.10	Schools and emergency responders to participate in Electronic Response Information Portal (ERIP).			X	Fire department and Schools ~~have~~ are their own Entity and have Measures in place	X

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: Mid Buchanan School District

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.2.9	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.		X			
3.1.10	Educate children in disaster preparedness and how to survive disasters.		X			

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: Missouri Western State University

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		

MISSOURI WESTERN STATE UNIVERSITY

1.1.6	Add shelters in the construction of new public facilitates like libraries community centers, etc.			X	Funding is currently unavailable for these types of projects.	M
1.1.10	Maintain up-to-date list of addresses of shelters to assist fire departments and emergency services agencies to locate survivors after a disaster.	X			Department Chairperson keeps personal list and schedule for all faculty/staff employees.	✓
1.1.15	Implement snow day policies for employees to reduce the number of people on the roadway during severe winter weather.	X			Administration declares snow days based on weather reports. All Employees are notified through Griffon Alert phone system or by local TV stations.	✓
1.1.17	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.		X		Marking and labeling of safe areas is an on-going process under review. Additional signs will be placed up once the review is finished.	✓
1.2.1	NOAA weather radio on continuous operation in university facilities.	X			Locations of units: University Police Office, Physical Plant office.	✓
1.3.6	Update inventory of facilities with generators and emergency power than can be used as shelters in the event of a disaster. Retrofit shelters to be equipped to connect with generators.			X	Funding is currently unavailable these for these types of projects. The University operates only two backup generators for the Biology Department and the Computer center. These are anchored building specific units. They are not suitable for emergency use in emergency shelters. Funding is not currently available or planned for additional portable units.	M

2.3.7	Maintain and update list of names, phone numbers and duties for all employees during regular operation and off hours.	X			The University Human Resource office and the individual academic departments keep a current list of employees, home addresses and contact numbers.	✓
5.1.3	Assess critical facilities and infrastructure for needed upgrades and retrofits	X			The Physical Plant Maintenance Department monthly assess the campus facilities for operational and safety concerns, repairs, upgrades and remodels.	✓

ACTION WORKSHEET
*Highlighted items must be filled out by Jurisdiction

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Hazard(s) Addressed:	Thunderstorm / Lightning
Problem being Mitigated:	Water damaged caused by thunderstorm due to damaged roof shingels
Action or Project	
Applicable Goal Statement:	Protect the lives, property of the Physical plant office
Action/Project Number:	MWSU 1
Name of Action or Project:	Physical Plant office roof repair
Mitigation Category:	Prevention, structure repair
Action or Project Description:	Repair of roof and reshingleing of Physical Plant office
Estimated Cost:	$ 10,000
Benefits:	Repair and reshingleing will keep office weather resistant, Communication hub for physical Plant employees.
Plan for Implementation	
Responsible Organization/Department:	Physical Plant: Director of Facilities, Supervisor of Buildings and Grounds
Supporting Organization/Department:	Business office - Vice President of Finance
Action/Project Priority:	
Timeline for Completion:	(30) days if approved
Potential Fund Sources:	Internal (State) Funding if approved
Local Planning Mechanisms to be Used in Implementation, if any:	Internal repair thru employee staff. Project may try to utilize (HMGP) Funding if available.
Progress Report	
Action Status:	New
Report of Progress:	Funding allocation has not yet been approved.

Rob

3.1.

ACTION WORKSHEET
***Highlighted items must be filled out by Jurisdiction**

Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Hazard(s) Addressed:	Life Safety vulnerabitity in Structure Fires.
Problem being Mitigated:	Absence of posted Fire exit safety Maps.
Action or Project	
Applicable Goal Statement:	Creation and posting of Fire exit maps through out buildings across campus.
Action/Project Number:	MWSU 3
Name of Action or Project:	MWSU Fire exit safety maps.
Mitigation Category:	Prevention; Structure Fires
Action or Project Description:	Submit notice of interest for the Creation of Fire exit safety maps for all campus buildings
Estimated Cost:	Unknown
Benefits:	The saving of student, staff and faculty lives.
Plan for Implementation	
Responsible Organization/Department:	Physical Plant: Director of Facilities Supervisor of Buildings and Grounds
Supporting Organization/Department:	MWSU Business office: Vice President of Finance
Action/Project Priority:	
Timeline for Completion:	Unknown
Potential Fund Sources:	Internal State Funding, possible (HMGP) grant
Local Planning Mechanisms to be Used in Implementation, if any:	Internal maintenance staff.
Progress Report	
Action Status:	New
Report of Progress:	Barriers to map creation maybe current funding needs of other projects preplanned for campus.

16 | 6

ACTION WORKSHEET
*Highlighted items must be filled out by Jurisdiction

*Action Worksheet	
Name of Jurisdiction:	Missouri Western State University
Risk / Vulnerability	
Hazard(s) Addressed:	Tornado
Problem being Mitigated:	Vulnerable students, staff and faculty
Action or Project	
Applicable Goal Statement:	Protect the Lives, property and livelihoods on campus
Action/Project Number:	MWSU 2
Name of Action or Project:	Safe Rooms for Missouri Western State University
Mitigation Category:	
Action or Project Description:	Submit notice of interest for construction of Safe rooms across the University Campus.
Estimated Cost:	UnKnow
Benefits:	Safety of the campus community during a tornado event.
Plan for Implementation	
Responsible Organization/Department:	Physical Plant; Director of Facilities Supervisor of Buildings and Grounds
Supporting Organization/Department:	Business office - Vice President of Finance.
Action/Project Priority:	
Timeline for Completion:	Unknown
Potential Fund Sources:	Internal State Funding, possible (BRIC) grant
Local Planning Mechanisms to be Used in Implementation, if any:	"Shelter in Place Plan", Internal Use of Alertus System for emergency campus notifications, Griffon Alert
Progress Report	
Action Status:	New
Report of Progress:	NA Funding allocation has not been approved.

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: Rushville

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
	N/A					

ACTION WORKSHEET
***Highlighted items must be filled out by Jurisdiction**

Action Worksheet	
Name of Jurisdiction:	VILLAGE OF RUSHVILLE, MO
Risk / Vulnerability	
Hazard(s) Addressed:	TORNADOES, THUNDERSTORM
Problem being Mitigated:	PUBLIC NOT HAVING A STORM SHELTER NEARBY
Action or Project	
Applicable Goal Statement:	PROTECT THE LIVES, PROPERTY AND LIVELIHOOD OFF ALL CITIZENS
Action/Project Number:	1.1.18
Name of Action or Project:	
Mitigation Category:	
Action or Project Description:	WORK WITH PRIVATE ENTITIES, SUCH AS CHURCHES AND BUSINESSES TO CONSTRUCT TORNADO SHELTER IN FACILITIES WHERE LARGE NUMBERS OF PEOPLE LIVE, WORK OR CONGREGATE
Estimated Cost:	VARIES DEPENDING ON PROJECT
Benefits:	PROTECTED PUBLIC
Plan for Implementation	
Responsible Organization/Department:	VILLAGE OF RUSHVILLE TRUSTEES
Supporting Organization/Department:	
Action/Project Priority:	LOW
Timeline for Completion:	5 YEARS
Potential Fund Sources:	GRANTS, INTERNAL, PRIVATE
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	
Report of Progress:	

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: __St. Joseph _____

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.2	Public education outreach to inform residents to purchase weather radios to ensure they have sufficient access to information in times of disasters.	✓	SEE NEW SHEET	X	CELL PHONES HAVE REPLACED NEED FOR MOST RADIOS	X M
1.1.4	Adding shelters in the construction of new public facilitates like libraries, community centers, etc.		✓		BUILDING CODE INCLUDES THIS TERMINOLOGY	M
1.1.7	Incorporate hazard buffer zones into subdivision platting regulations		X		SAME	✓

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
1.1.1 3	Work with private entities, such as churches and businesses, to construct tornado shelters in facilities where large numbers of people live, work, or congregate.		X		IMPLEMENT A PUBLIC RELATIONS PROGRAM	M K
1.1.1 4	Implement snow day policies for employees to reduce the number of people on the roadway during severe winter weather.				DELETE	X
1.1.1 6	Assess existing public facilities for the location of suitable safe areas. If available, these safe areas should be clearly marked and employees and visitors informed of their locations in public facilities.		X		CONTINUE WITH PR PROGRAM	M K
1.1.2 1	Review emergency access routes and evacuation routes and mitigate any problem areas.		X		CONSIDER EXPANDING CURRENT SNOW ROUTE MAP FOR THIS	M K
1.1.2 2	Form and train Community Response Teams in cities and neighborhood associations.		X		CONTINUE TO DEVELOP VIABLE ROSTER of MEMBERS	✓
1.2.2	NOAA weather radio on continuous operation in all facilities offering public accommodations.	SEE NEW SHEET		X		X
1.2.6	Use electronic methods, including the Internet, Twitter, texting and call systems to notify public of a hazard.			X	COMBINED WITH NEW 1.1.2 SHEET	X
1.3.2	Inform citizens what to do to help elderly and disabled friends and neighbors or employees.		X		CONTINUE PROGRAM	✓
2.1.1 1	Find alternative uses for flood-prone areas, such as sports fields, parks, wildlife habitats, etc. and incorporate this in all comprehensive land use plan updates.		X		CONTINUE PROGRAM	✓

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
2.1.15	Continue to review needs and participate in countywide considerations of a multi-jurisdictional comprehensive storm water management plan.		X		SEVERAL PHASES of CSO PROJECT HAVE BEEN COMPLETED	✓
2.1.16	Amend municipal ordinances to include a section mandating the building of a storm shelter with a capacity to handle the expected population in any new mobile home park or park undergoing renovation or expansion.		X		BUILDING CODES HAVE THIS INCLUDING FOR NEW CONSTRUCTION	M
2.3.1	Encourage up-to-date commercial and industrial disaster plans that are coordinated with community disaster plans.		X		CONTINUE	✓
2.3.6	Maintain and update list of names, phone numbers and duties for all employees during regular operation and off hours.		X		KEEP LIST UPDATED	✓
2.3.10	Follow guidelines as suggested in the Missouri 2002 Drought Plan, developed by MDNR.	X				X
4.1.11	Schools and emergency responders to participate in Electronic Response Information Portal (ERIP)			X	NOT ADOPTED	X
5.1.2	Assess critical facilities and infrastructure for needed upgrades and retrofits		X		CONTINUE TO IDENTIFY SITES	~~M~~ K
5.1.4	Work with utility providers to assess vulnerability to hazards and to implement needed upgrades and retrofits		X		CONTINUE TO IDENTIFY SITES	~~M~~ K
	ATTACHED 2 NEW SHEETS					

delete wkst - add completed action verbiage

1.1.2.

ACTION WORKSHEET
***Highlighted items must be filled out by Jurisdiction**

Action Worksheet	
Name of Jurisdiction:	SJ
Risk / Vulnerability	
Hazard(s) Addressed:	
Problem being Mitigated:	PUBLIC NOTIFICATION
Action or Project	
Applicable Goal Statement:	
Action/Project Number:	
Name of Action or Project:	
Mitigation Category:	
Action or Project Description:	INCREASE PUBLIC NOTIFICATION THROUGH USE OF NIXLE ALERTS
Estimated Cost:	0
Benefits:	BETTER INFORMED PUBLIC
Plan for Implementation	
Responsible Organization/Department:	COMMUNICATIONS CENTER
Supporting Organization/Department:	
Action/Project Priority:	HIGH
Timeline for Completion:	ACTIVE NOW
Potential Fund Sources:	INTERNAL
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	CONTINUED PROJECT
Report of Progress:	USE HAS INCREASED YEARLY

1.2.2

ACTION WORKSHEET
***Highlighted items must be filled out by Jurisdiction**

Action Worksheet	
Name of Jurisdiction:	SJ
Risk / Vulnerability	
Hazard(s) Addressed:	
Problem being Mitigated:	PUBLIC NOTIFICATION
Action or Project	
Applicable Goal Statement:	
Action/Project Number:	
Name of Action or Project:	
Mitigation Category:	
Action or Project Description:	KEEP AREAS OF THE CITY COVERED WITH STORM SIREN ALERTS
Estimated Cost:	60,000.00
Benefits:	BETTER INFORMED PUBLIC
Plan for Implementation	
Responsible Organization/Department:	EMERGENCY MANAGEMENT
Supporting Organization/Department:	SEMA STATE EMERGENCY MANAGEMENT
Action/Project Priority:	HIGH
Timeline for Completion:	CONTINUOUS
Potential Fund Sources:	SEMA
Local Planning Mechanisms to be Used in Implementation, if any:	
Progress Report	
Action Status:	CONTINUED PROJECT
Report of Progress:	2 NEW SIRENS PLACED AND OPERATIONAL

ASSESSMENT OF PREVIOUSLY PROPOSED ACTIONS

Jurisdiction: St. Joseph School District

The contractor/plan development facilitator has provided a list of actions proposed in the previously approved plan for each jurisdiction. Use the worksheet below to evaluate whether each action is still current, feasible, desirable, and/or creates benefit that outweighs the cost.

The worksheet should include information on the status of the action and progress made in implementation, if any. This includes:

- For **completed actions** provide a description of the implementation process. This may be a success story you would like to publicize in your community.
- Some of the actions might have been **ongoing** in nature, such public information and education programs. When this is the case, indicate what activity has occurred during the previous five years, and indicate if this program is still viable enough that it should be carried on into the future.
- If **no progress** has been made in the implementation of a given action, discuss why. Note that implementation is not a requirement. However, if no progress has been made, perhaps this is an action that would be appropriate to delete in the updated plan.

During review of the previously approved actions, consider whether any new actions should be proposed. Perhaps damages from a recent hazard event have indicated the need for new approaches to protect property and life. Review the problem statements from the updated plan for ideas. Also review the FEMA publication *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (January 2013).*

#	Action	Status			Description of Implementation Activities or Reasons for Lack of Progress	Keep – ✓ Delete – X Modify – M
		Complete	Ongoing	No Progress		
3.1.2	Educate children in disaster preparedness and how to survive disasters.		x		Periodic drills and informational programs with students.	Keep

Appendix D: Adoption Resolutions

VILLAGE OF AGENCY Missouri RESOLUTION NO. 2021-66

A RESOLUTION OF VILLAGE OF AGENCY ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS Village of Agency recognizes the threat that natural hazards pose to people and property within Village of Agency and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Village of Agency from the impacts of future hazards and disasters; and

WHEREAS Village of Agency recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, Village of Agency will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by Village of Agency demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY Village of Agency in the State of Missouri, THAT:

In accordance with Council Policy, Village of Agency adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 5 in favor and 0 against, and 0 abstaining, this 26 day of October, 2021.

By (Sig): Sandra J Wood
Print name: Sandra J Wood

ATTEST:
By (Sig.): Heather Marti
Print name: Heather Marti

APPROVED AS TO FORM:
By (Sig.): _____
Print name: _____

BUCHANAN COUNTY R-IV SCHOOL DISTRICT Missouri RESOLUTION NO. 1.

A RESOLUTION OF BUCHANAN COUNTY R-IV SCHOOL DISTRICT ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS Buchanan County R-IV School District recognizes the threat that natural hazards pose to people and property within Buchanan County School District and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Buchanan County R-IV School District from the impacts of future hazards and disasters; and

WHEREAS Buchanan County R-IV School District recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, Buchanan County School District will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by Buchanan County R-IV School District demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY Buchanan County R-IV School District in the State of Missouri, THAT:

In accordance with process of Board Policy, the Buchanan County R-IV School District adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 5 in favor and 0 against, and 0 abstaining, this 15th day of September, 2021.

By (Sig): _____
Print name: JEREMY HANSHAW

ATTEST:
By (Sig.): _____
Print name: Travis Dittemore

APPROVED AS TO FORM:
By (Sig.): _____
Print name: _____

ORIGINATOR: COUNCILMEMBER

RESOLUTION No. 46379

A RESOLUTION ADOPTING AND APPROVING ALL ASPECTS PERTAINING TO THE CITY OF ST. JOSEPH IN BUCHANAN COUNTY'S MULTI-JURISDICTIONAL NATURAL HAZARD MITIGATION PLAN WITH THE INTENT TO WORK TOWARD BECOMING A SAFER COMMUNITY.

WHEREAS, the City of St. Joseph recognizes that no community is immune from natural hazards whether it be tornado/severe thunderstorm, flood, severe winter weather, drought, heat-wave, earthquake, dam failure, or wildfire, and recognizes the importance of enhancing its ability to withstand natural hazards as well as the importance of reducing the human suffering, property damage, interruption of public services and economic losses caused by those hazards; and

WHEREAS, the City of St. Joseph may have previously pursued measures such as building codes, fire codes, floodplain management regulations, zoning ordinance, and storm-water management regulations to minimize the impact of natural hazards; and

WHEREAS, the Federal Emergency Management Agency and the State Emergency Management Agency have developed a natural hazard mitigation program that assists communities in their efforts to become Disaster-Resistant Communities which are sustainable communities after a natural disaster that focus, not just on disaster relief, but also on recovery and reconstruction that brings the community to at least pre-disaster conditions in an accelerated, orderly, and preplanned manner; and

WHEREAS, by participating in the Natural Hazards Mitigation Program, St. Joseph will be eligible to apply for post-disaster mitigation funds; and

WHEREAS, St. Joseph desires to commit to working with government partners and community partners to implement the Natural Hazards Mitigation Plan; and

WHEREAS, St. Joseph will implement pertinent precepts of the mitigation plan by incorporation into other community plans and mechanisms where appropriate; and

WHEREAS, St. Joseph will participate in the evaluation and review of the Plan after a disaster as well as complete mandated five-year update submitted to the State Emergency Management Agency and the Federal Emergency Management Agency for review and approval.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF ST. JOSEPH, MISSOURI, AS FOLLOWS:

SECTION 1. That the Council of the City of St. Joseph, Missouri, hereby adopts and approves all aspects pertaining to the City of St. Joseph in Buchanan County's Multi-Jurisdictional Natural Hazard Mitigation Plan, a copy of which is on file in the office of the City Clerk and incorporated herein by reference, for the purpose of building a safe community by reducing natural hazard vulnerability.

SECTION 2. That all ordinances and resolutions or part of ordinances and resolutions in conflict herewith be, and hereby are, repealed.

Authenticated Copy
of Reso., G.O., S.O. 46379
PAULA HEYDE, City Clerk
By Rita R. Robinson Deputy
Date 8-13-21

Approved as to form:

City Attorney

Attest: Paula Heyde
(SEAL) City Clerk

Adopted August 9, 20 21

Mayor

EAST BUCHANAN SCHOOL DISTRICT Missouri RESOLUTION NO. ___

A RESOLUTION OF EAST BUCHANAN SCHOOL DISTRICT ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS East Buchanan School District recognizes the threat that natural hazards pose to people and property within East Buchanan School District and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in East Buchanan School District from the impacts of future hazards and disasters; and

WHEREAS East Buchanan School District recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, East Buchanan School District will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by East Buchanan School District demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY East Buchanan School District in the State of Missouri, THAT:

The East Buchanan School District adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 7 in favor and 0 against, and 0 abstaining, this 16th day of August, 2021.

By (Sig): [signature]
Print name: John Newell

ATTEST:
By (Sig.): [signature]
Print name: Beth Carr

APPROVED AS TO FORM:
By (Sig.): [signature]
Print name: Beth Carr

VILLAGE OF LEWIS AND CLARK Missouri RESOLUTION NO. 10/7/21

A RESOLUTION OF VILLAGE OF LEWIS AND CLARK ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS Village of Lewis and Clark recognizes the threat that natural hazards pose to people and property within Village of Lewis and Clark and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Village of Lewis and Clark from the impacts of future hazards and disasters; and

WHEREAS Village of Lewis and Clark recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, Village of Lewis and Clark will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by Village of Lewis and Clark demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY Village of Lewis and Clark in the State of Missouri, THAT:

In accordance with (*the authority given to the Council set forth in Ordinance 1*), Village of Lewis and Clark adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of_____in favor and__against, and__abstaining, this_____day of _____,_____.

By (Sig): Matt Larkin
Print name: Matt Larkin

ATTEST:
By (Sig.): Gene Wagner
Print name: Gene Wagner

APPROVED AS TO FORM:
By (Sig.):
Print name:

MID-BUCHANAN SCHOOL DISTRICT Missouri RESOLUTION NO. ____

A RESOLUTION OF MID-BUCHANAN SCHOOL DISTRICT ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS Mid-Buchanan County School District recognizes the threat that natural hazards pose to people and property within Mid-Buchanan County School District and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Mid-Buchanan County School District from the impacts of future hazards and disasters; and

WHEREAS Mid-Buchanan County School District recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, Mid-Buchanan County School District will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by Mid-Buchanan County School District demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY Mid-Buchanan County School District in the State of Missouri, THAT:

In accordance with (*local rule for adopting resolutions*), Mid-Buchanan County School District adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 6 in favor and 0 against, and 0 abstaining, this 18th day of Oct, 2021.

By (Sig): Jay Albright
Print name: Jay Albright

ATTEST:
By (Sig.): Ginger L Skaggs
Print name: Ginger L Skaggs

APPROVED AS TO FORM:
By (Sig.): _____
Print name: _____

County Commission, Buchanan County, Missouri

STATE OF MISSOURI,
County of Buchanan, } **SS.** **JULY TERM, 2021**

In the County Commission of said County, on the 5 August 2021 the following, among other proceeding, were had viz:

The Buchanan County Commission hereby orders they are adopting the 2022 Buchanan County Multi-Jurisdictional Natural Hazard Mitigation Plan as an official plan as recommended by the County's Emergency Manage ment Officer, Bill Brinton. The official plan is located on the Mo-Kan website at https://www.mo-kan.org/community/hazard-mitigation/

Buchanan County HMP 6-30-21

It is so ordered.

Ron Hook	**Lee Sawyer**	**Scott Burnham**
Western District Commissioner	**Presiding Commissioner**	**Eastern District Commissioner**

STATE OF MISSOURI,
County of Buchanan, } I, **Mary Baack-Garvey**, Clerk of the County Commission and for said County, hereby certify the above and foregoing to be a true copy of the proceedings of said County Commission, on the day and year above written, as the same appears of record, in my office. In Testimony Whereof, I have hereunto set my hand and affixed the seal of said County Commission at office in the Courthouse in St. Joseph, MO, this 5 August 2021.

Mary B. Garvey
Clerk County Commission

By Amy Kendall

Record Book: Page:

RESOLUTION # 224

A RESOLUTION OF THE CITY OF EASTON, MISSOURI, ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS the City of Easton, Missouri recognizes the threat that natural hazards pose to people and property within the City of Easton, Missouri and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, herein after referred to as the *Plan,* in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Easton, Missouri from the impacts of future hazards and disasters; and

WHEREAS the City of Easton, Missouri recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, the City of Easton, Missouri will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by the City of Easton, Missouri demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan.*

NOW THEREFORE, BE IT RESOLVED BY the City of Easton, Missouri, THAT:

In accordance with RSMo 79.130, the City of Easton, Missouri adopts the final *FEMA-approved Plan.*

This Resolution shall be in full force and effect upon adoption this 8th day of September, 2021.

By (Sig): _____
Print Name: Michael Kerns - Mayor

ATTEST:
By (Sig): _____
Print Name: Misty St. Clair - City Clerk

APPROVED AS TO FORM:
By (Sig): _____
Print Name: Misty St. Clair - City Clerk

VILLAGE OF RUSHVILLE Missouri RESOLUTION NO. 2021-01

A RESOLUTION OF VILLAGE OF RUSHVILLE ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS Village of Rushville recognizes the threat that natural hazards pose to people and property within Village of Rushville and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Village of Rushville from the impacts of future hazards and disasters; and

WHEREAS Village of Rushville recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, Village of Rushville will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by Village of Rushville demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY Village of Rushville in the State of Missouri, THAT:

In accordance with (***local rule for adopting resolutions***), Village of Rushville adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 3 in favor and 0 against, and 0 abstaining, this 2ND day of AUGUST, 2021.

By (Sig): Jeff Klawuhn
Print name: JEFF KLAWUHN, CHAIRMAN OF TRUSTEE'S

ATTEST:
By (Sig.): Gary E Black
Print name: GARY E BLACK, VICE CHAIRMAN OF TRUSTEES

APPROVED AS TO FORM: Michael L. Frakes CLERK
By (Sig.):
Print name: MICHAEL L. FRAKES

ST. JOSEPH SCHOOL DISTRICT Missouri RESOLUTION NO. __

A RESOLUTION OF ST. JOSEPH SCHOOL DISTRICT ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS St. Joseph School District recognizes the threat that natural hazards pose to people and property within St. Joseph School District and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan, hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan, hereafter referred to as the *Plan*, in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in St. Joseph School District from the impacts of future hazards and disasters; and

WHEREAS St. Joseph School District recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards, St. Joseph School District will endeavor to integrate the *Plan* into the comprehensive planning process; and

WHEREAS adoption by St. Joseph School District demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan*.

NOW THEREFORE, BE IT RESOLVED BY St. Joseph School District in the State of Missouri, THAT:

In accordance with (*local rule for adopting resolutions*), St. Joseph School District adopts the final *FEMA-approved Plan*.

ADOPTED by a vote of 7 in favor and 0 against, and 0 abstaining, this 27 day of September 2021.

By (Sig): Tami L. Pasley
Print name: Tami L. Pasley

ATTEST:
By (Sig.): Donna G. Baker
Print name: Donna G. Baker

APPROVED AS TO FORM:
By (Sig.): _____
Print name: _____

Attachment #7

MISSOURI WESTERN STATE UNIVERSITY Missouri RESOLUTION NO 10.28

A RESOLUTION OF MISSOURI WESTERN STATE UNIVERSITY ADOPTING THE BUCHANAN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS Missouri Western State University recognizes the threat that natural hazards pose to people and property within Missouri Western State University and

WHEREAS has participated in the preparation of a multi-jurisdictional local hazard mitigation plan hereby known as the Buchanan County Multi-Jurisdictional Hazard Mitigation Plan hereafter referred to as the *Plan* in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS the *Plan* identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Missouri Western State University from the impacts of future hazards and disasters; and

WHEREAS Missouri Western State University recognizes that land use policies have a major impact on whether people and property are exposed to natural hazards Missouri Western State University will endeavor to integrate the *plan* into the comprehensive planning process; and

WHEREAS adoption by Missouri Western State University demonstrates their commitment to hazard mitigation and achieving the goals outlined in the *Plan.*

NOW THEREFORE BE IT RESOLVED BY Missouri Western State University in the State of Missouri, THAT:

In accordance with the Board of Governors of Missouri Western State University adopts the final *FEMA-approved Plan.*

ADOPTED by a vote of 5 in favor and 0 against, and 0 abstaining, this 28th day of October, 2021.

By (Sig): _____
Print Name: Dr. Elizabeth Kennedy, President of MWSU

Attest:
By (Sig): _____
Print Name: Dana Gertner,

APPROVED AS TO FORM:

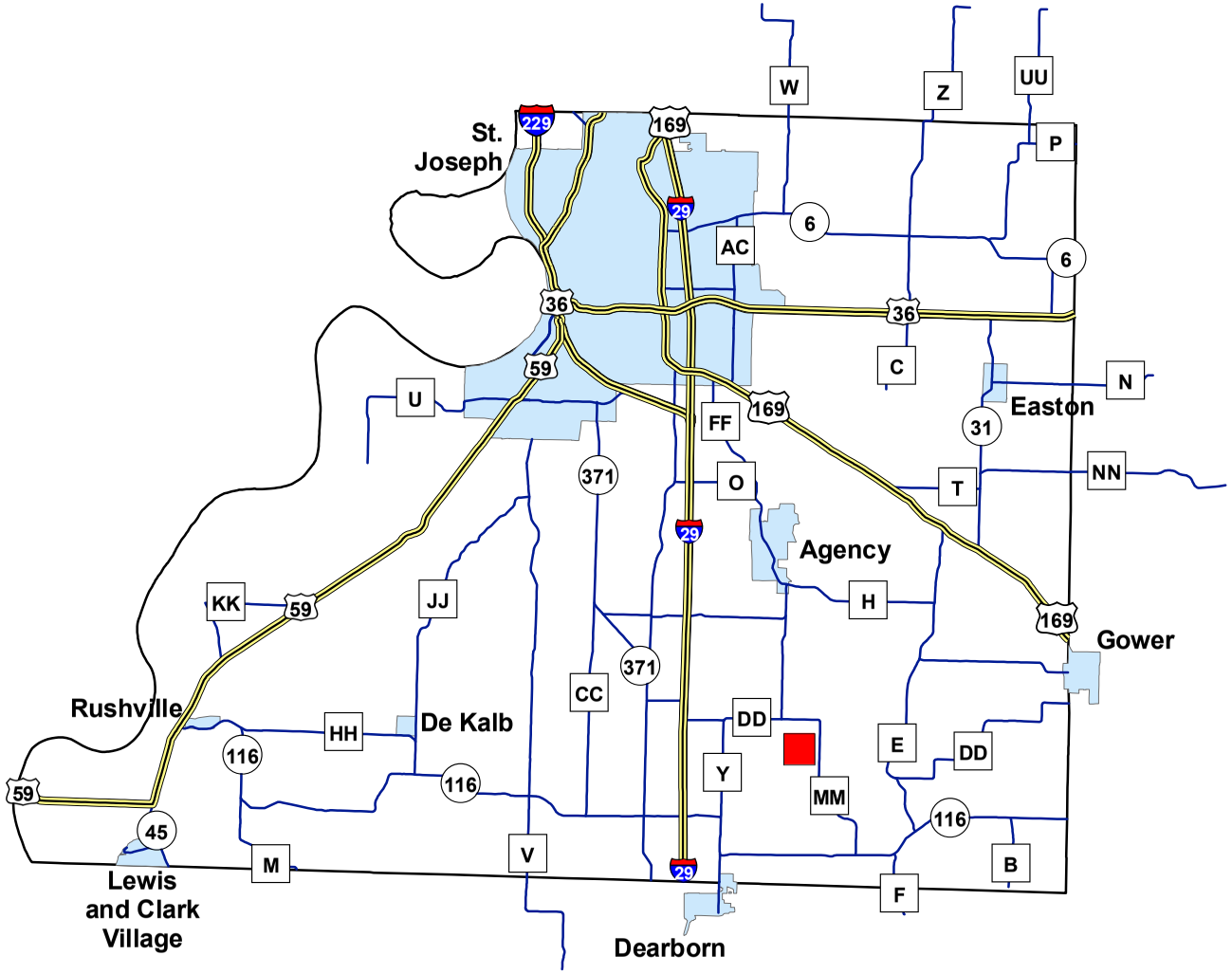
By (Sig): _____
Print Name: Darrell R. Morrison, VP Finance and Administration

Appendix E: Critical/Essential Facilities (Redacted from Public Version)

1/14/11

Belcher Branch Lake Dam

Breach Inundation Map



Buchanan County, Missouri

BUCHANAN_MO12290

Note: Actual areas inundated will depend on the actual dam failure criteria and may differ from the areas shown. Due to limitations, methods, assumptions, and procedures used to develop the inundation area, the map should only be used for evacuation and emergency purposes.

Missouri Department of Natural Resources

Water Resources Center
P.O. Box 176
Jefferson City, MO 65102

Explanation Sheet

Project:
Belcher Branch Lake Dam Breach Analysis

Drawing Title:
Explanation Sheet 1 of 1

Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102

Project ID: BUCHANAN_MO12290

Explanation of Maps

The following maps indicate the areas which are predicted to be inundated during the occurance of a sunny day breach of the dam. The pool elevation at failure is assumed to be at the emergency spillway crest elevation or at the crest of the dam in the absence of an emergency spillway.

Use of Maps

The following maps provide a baseline for evaluation of existing emergency action plans and environmental hazards downstream of the regulated structure.

Definition of Terms

Pool Elevation- Water level in the reservoir.

Dam Crest- The lowest elevation measured along the dam crest.

Spillway Crest- The lowest elevation measured along the crest of the spillway.

Arrival Time- Elapsed time between the breach initiation and the time that water levels first begin to rise at any given point.

Assumed Conditions of Flooding

The pool elevation at failure is assumed to be at the emergency spillway crest elevation or at the crest of the dam in the absence of an emergency spillway. The assumed overtopping erodes a section of the dam resulting in a dangerous and quick release of water. For the hydraulic analysis flow initiation is required and therefore a baseflow of water has been included in the analysis.

Dam Facts

ID: MO_12290

County: Buchanan

Location: S16, T55 N, R34 W

Height of Dam: 47'

Tributary: Unnamed trib. to Belcher Branch

Lake Area: 46 acres

Max Storage Capacity: 1765 ac-ft

Breach Parameters (Froehlich, 1995)

Side slopes: 1.4:1

Bottom width: 66'

Bottom elevation: 852.5'

Breach formation time: 0.52 hr

Pool Elevation at Failure: 880'

Pool Volume at Failure: 955 ac-ft

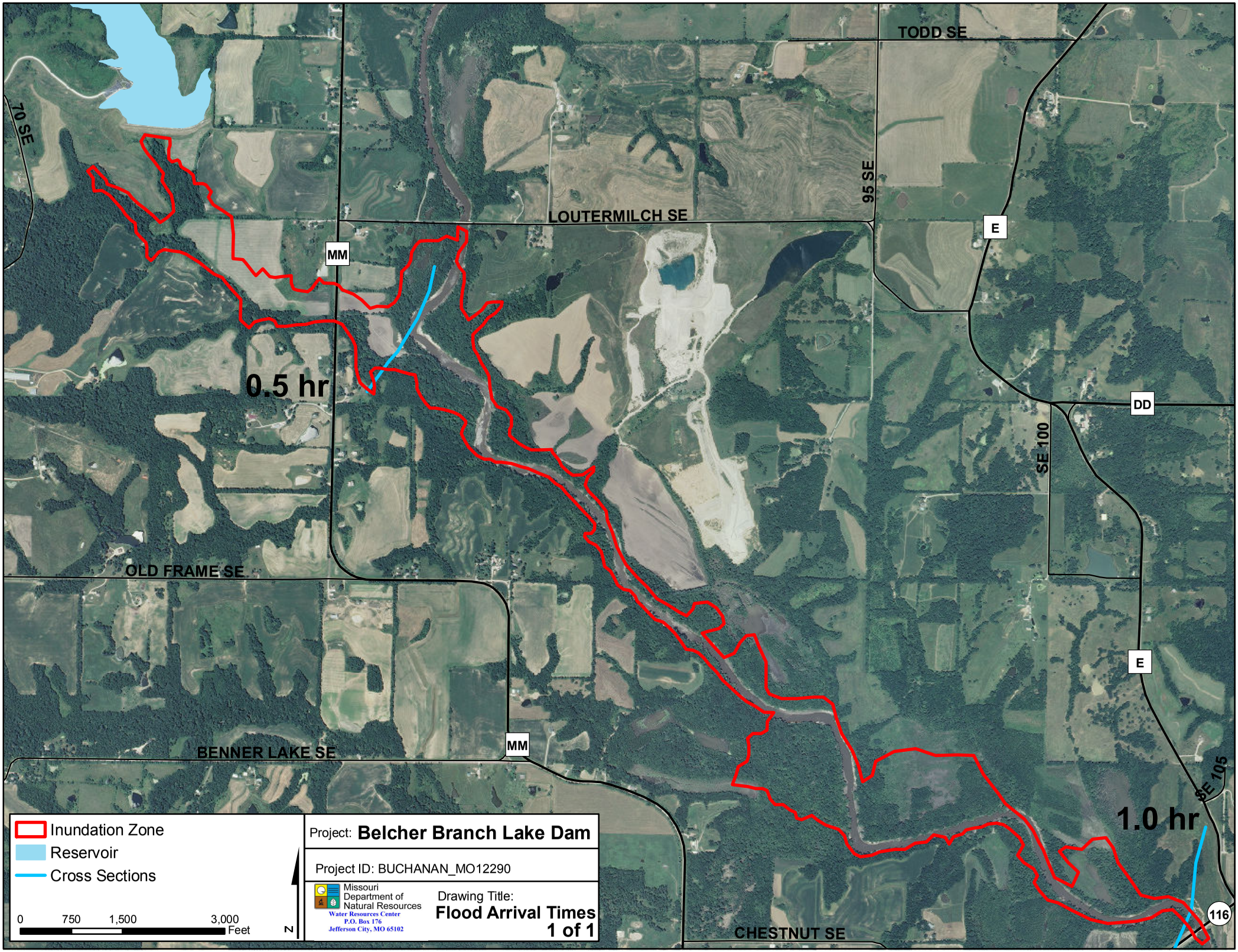
Downstream Crossings

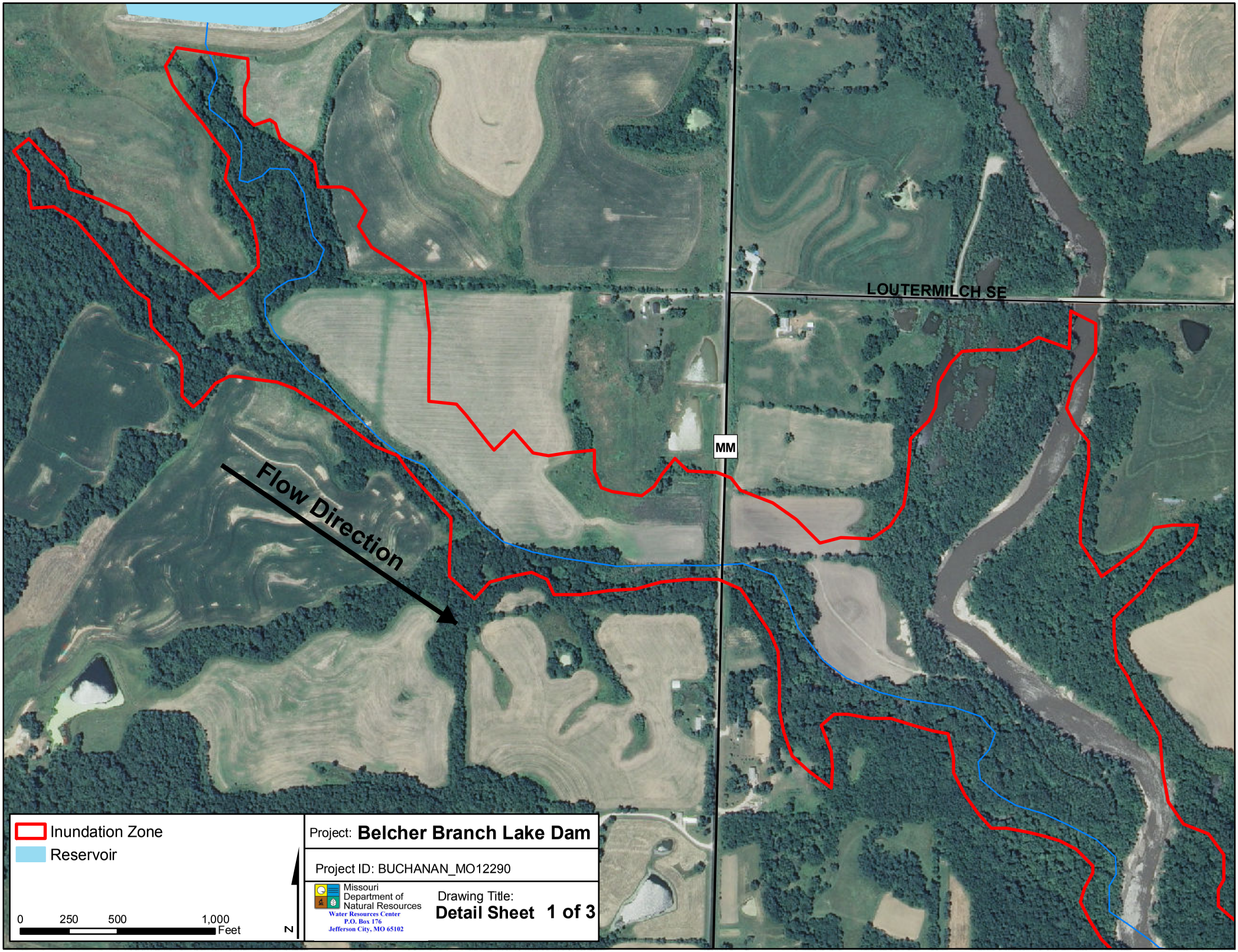
Rt MM

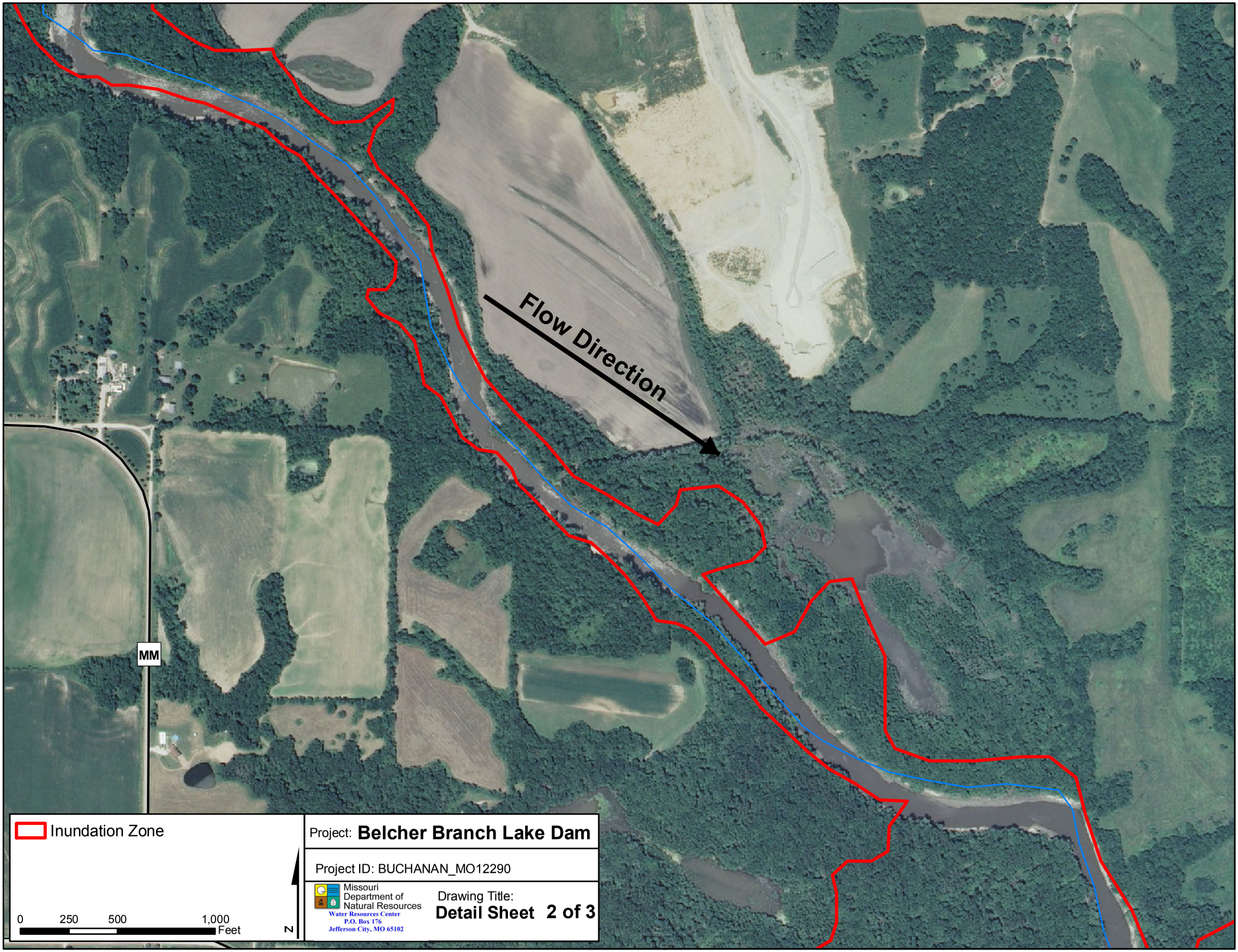
MO 116

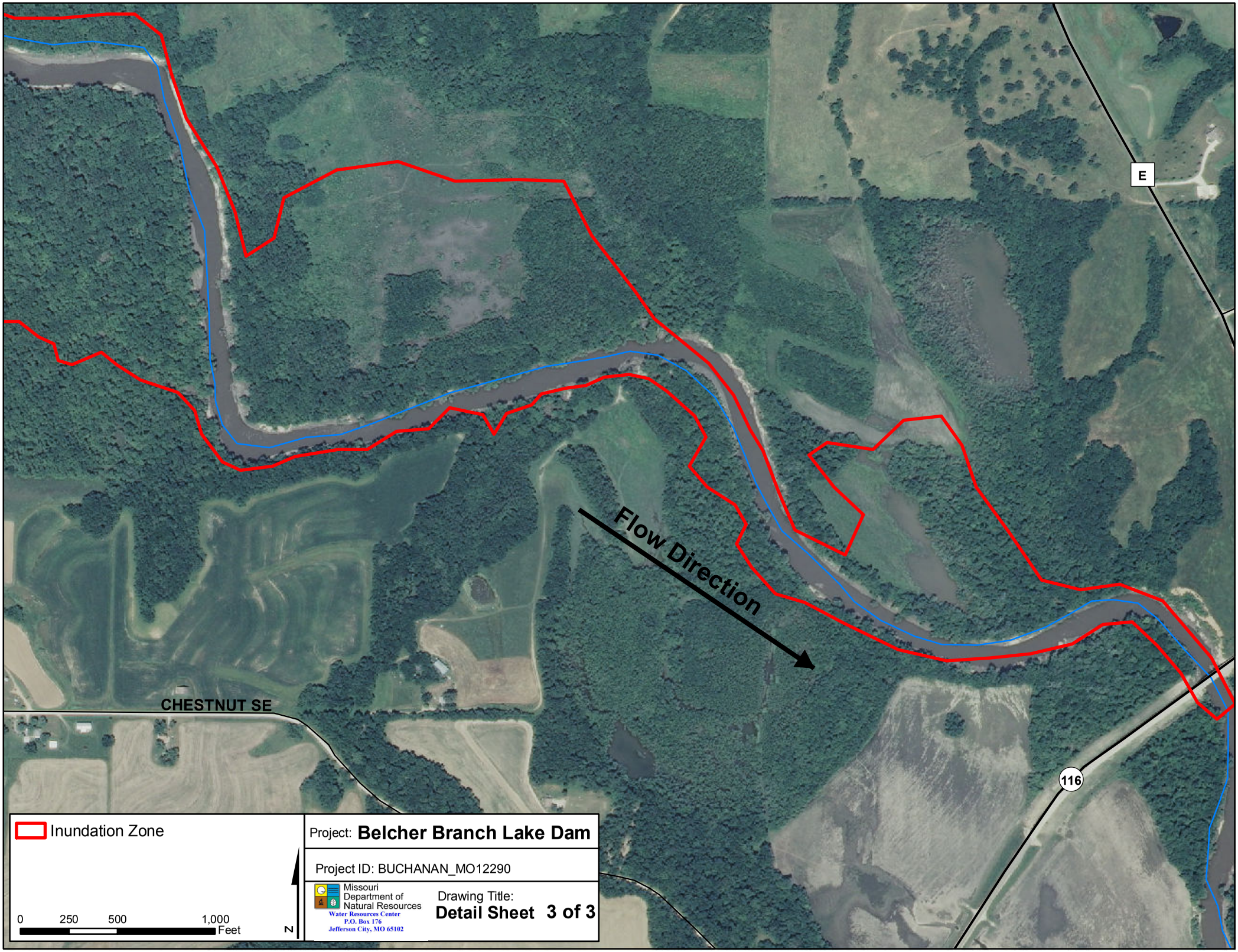
NOTE: LiDAR Elevation data unavailable for Buchanan County. Analysis was completed with 10 meter Digital Elevation Model

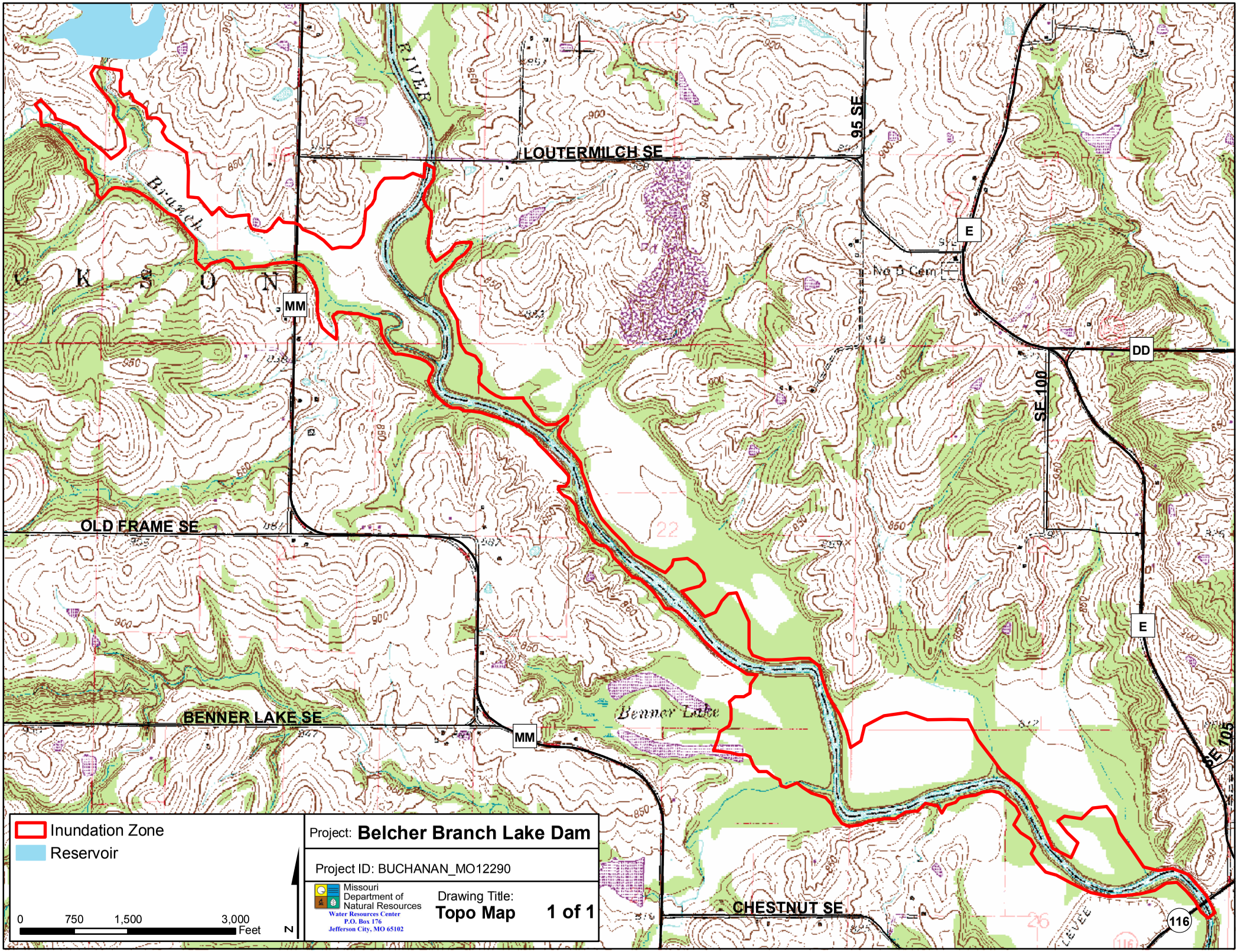
Date of Aerial Photo: August 18, 2009


TODD SE
70 SE
95 SE
LOUTERMILCH SE
E
MM
0.5 hr
DD
SE 100
OLD FRAME SE
E
BENNER LAKE SE
MM
SE 105
1.0 hr
116
CHESTNUT SE
Inundation Zone
Reservoir
Cross Sections
0 750 1,500 3,000 Feet
N
Project: Belcher Branch Lake Dam
Project ID: BUCHANAN_MO12290
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Flood Arrival Times
1 of 1


LOUTERMILCH SE
MM
Flow Direction
Inundation Zone
Reservoir
0 250 500 1,000 Feet
N
Project: Belcher Branch Lake Dam
Project ID: BUCHANAN_MO12290
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Detail Sheet 1 of 3

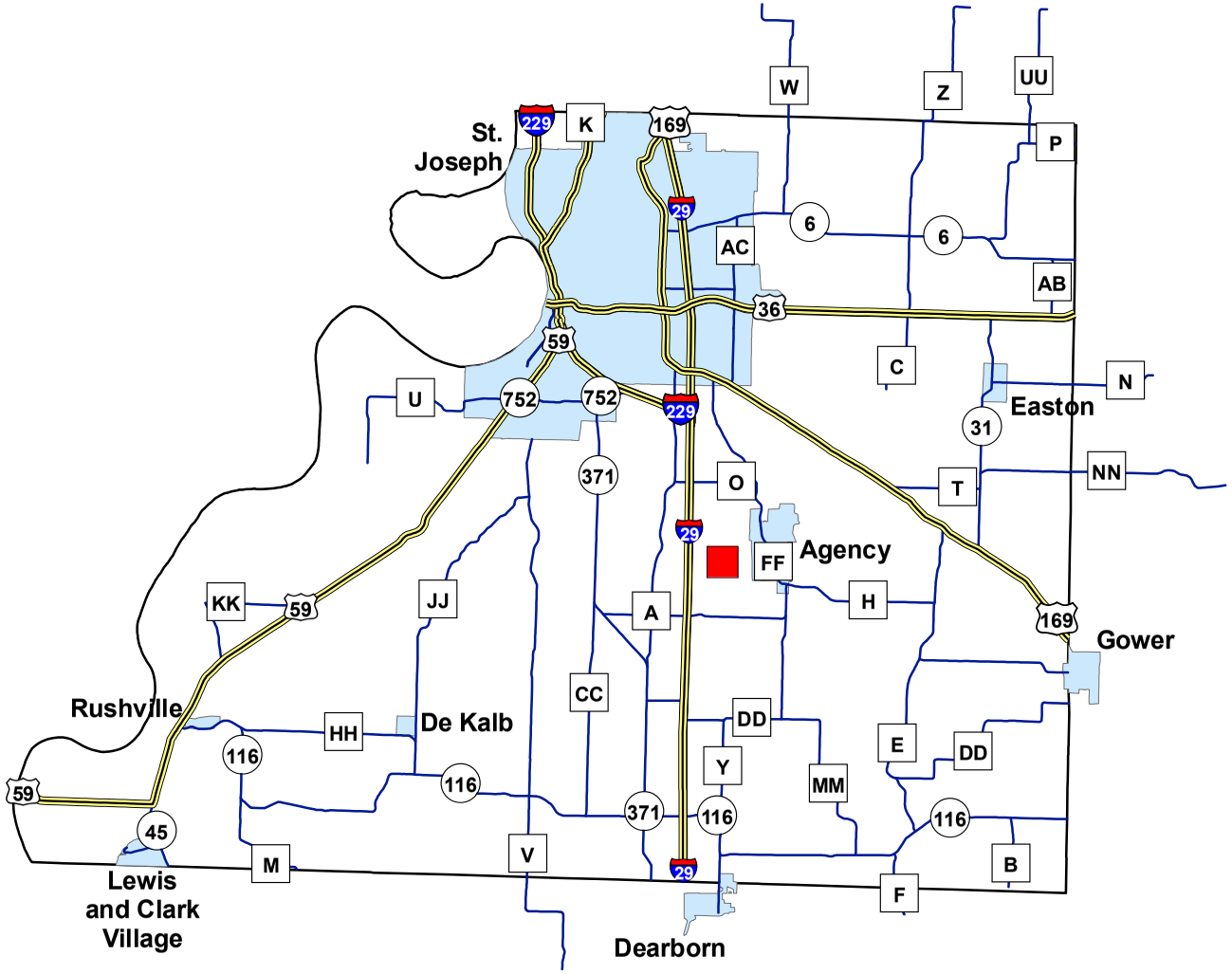

Flow Direction
MM
Inundation Zone
0 250 500 1,000 Feet
N
Project: Belcher Branch Lake Dam
Project ID: BUCHANAN_MO12290
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Detail Sheet 2 of 3


E
Flow Direction
CHESTNUT SE
116
Inundation Zone
0 250 500 1,000 Feet
N
Project: Belcher Branch Lake Dam
Project ID: BUCHANAN_MO12290
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Detail Sheet 3 of 3


LOUTERMILCH SE
95 SE
E
DD
SE 100
MM
OLD FRAME SE
BENNER LAKE SE
Benner Lake
CHESTNUT SE
SE 105
116
Inundation Zone
Reservoir
0 750 1,500 3,000 Feet
N
Project: Belcher Branch Lake Dam
Project ID: BUCHANAN_MO12290
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Topo Map
1 of 1

1/13/11

Komer Lake Dam
Breach Inundation Map



Buchanan County, Missouri
BUCHANAN_MO10995

Note: Actual areas inundated will depend on the actual dam failure criteria and may differ from the areas shown. Due to limitations, methods, assumptions, and procedures used to develop the inundation area, the map should only be used for evacuation and emergency purposes.

Missouri Department of Natural Resources

Water Resources Center
P.O. Box 176
Jefferson City, MO 65201

Explanation Sheet

Project: Komer Lake Dam Breach Analysis	
Drawing Title: Explanation Sheet	1 of 1
Missouri Department of Natural Resources, Water Resources Center, P.O. Box 176, Jefferson City, MO 65102	Project ID: BUCHANAN_MO10995

Explanation of Maps

The following maps indicate the areas which are predicted to be inundated during the occurance of a sunny day breach of the dam. The pool elevation at failure is assumed to be at the emergency spillway crest elevation or at the crest of the dam in the absence of an emergency spillway.

Use of Maps

The following maps provide a baseline for evaluation of existing emergency action plans and environmental hazards downstream of the regulated structure.

Definition of Terms

Pool Elevation- Water level in the reservoir.

Dam Crest- The lowest elevation measured along the dam crest.

Spillway Crest- The lowest elevation measured along the crest of the spillway.

Arrival Time- Elapsed time between the breach initiation and the time that water levels first begin to rise at any given point.

Assumed Conditions of Flooding

The pool elevation at failure is assumed to be at the emergency spillway crest elevation or at the crest of the dam in the absence of an emergency spillway. The assumed overtopping erodes a section of the dam resulting in a dangerous and quick release of water. For the hydraulic analysis flow initiation is required and therefore a baseflow of water has been included in the analysis.

Dam Facts

ID: MO_10995

County: Buchanan

Location: S24, T56 N, R35 W

Height of Dam: 39'

Tributary: Unnamed trib. to Possum Hollow

Lake Area: 4.8 acres

Max Storage Capacity: 175 ac-ft

Breach Parameters (Froehlich, 1995)

Side slopes: 1.4:1

Bottom width: 12'

Bottom elevation: 945'

Breach formation time: 0.18 hr

Pool Elevation at Failure: 982.28'

Pool Volume at Failure: 165 ac-ft

Downstream Crossings

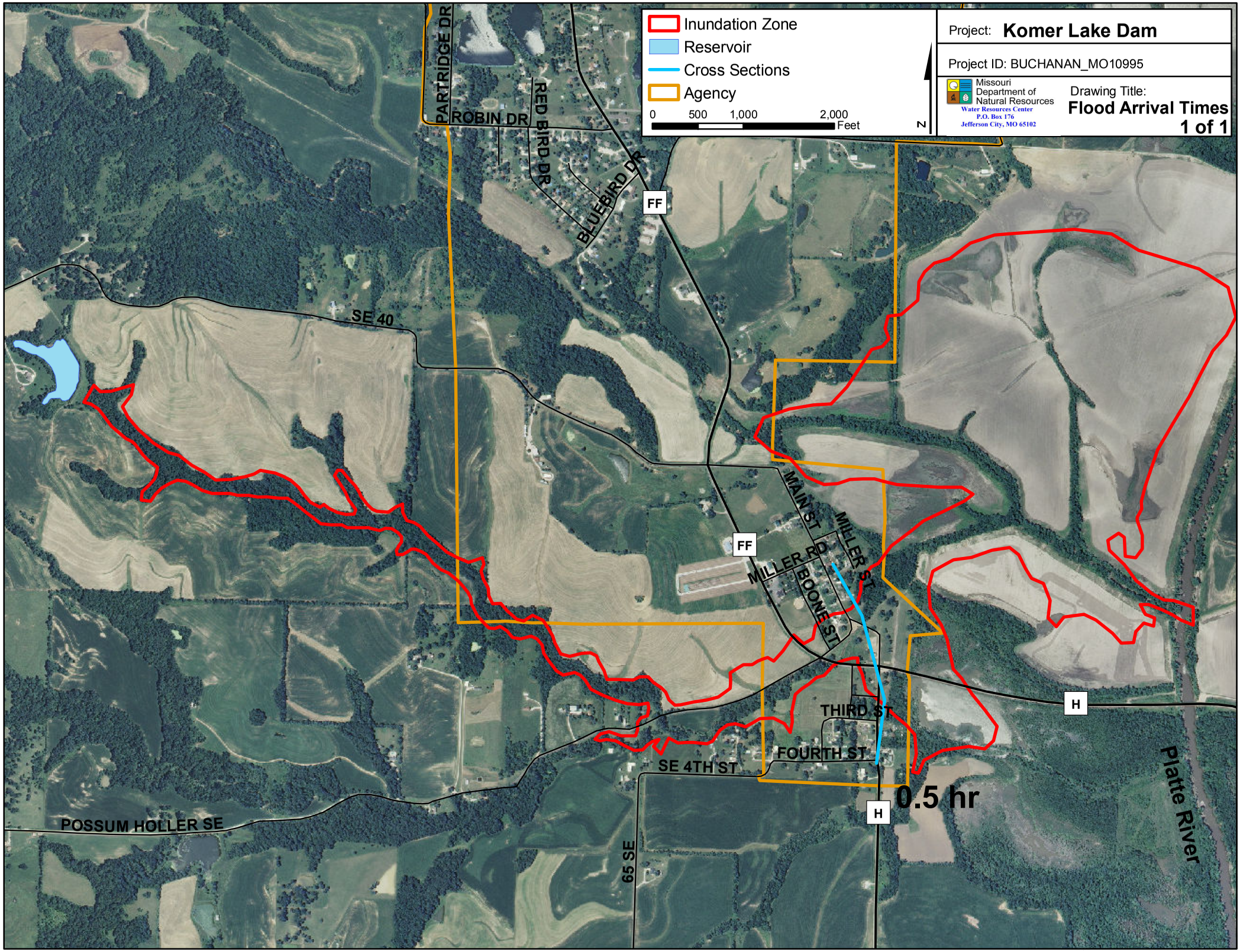
Possum Holler Rd

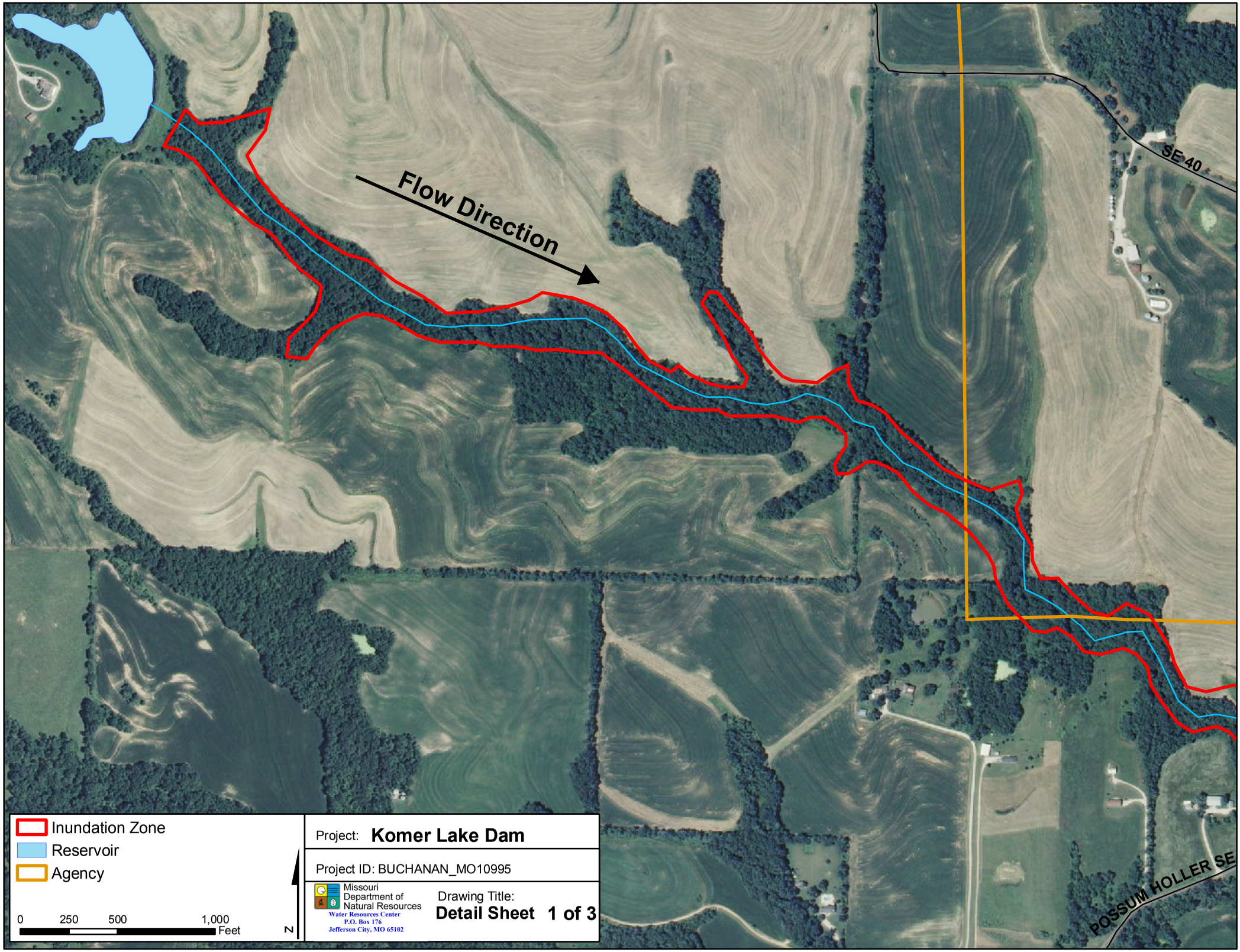
Rt FF

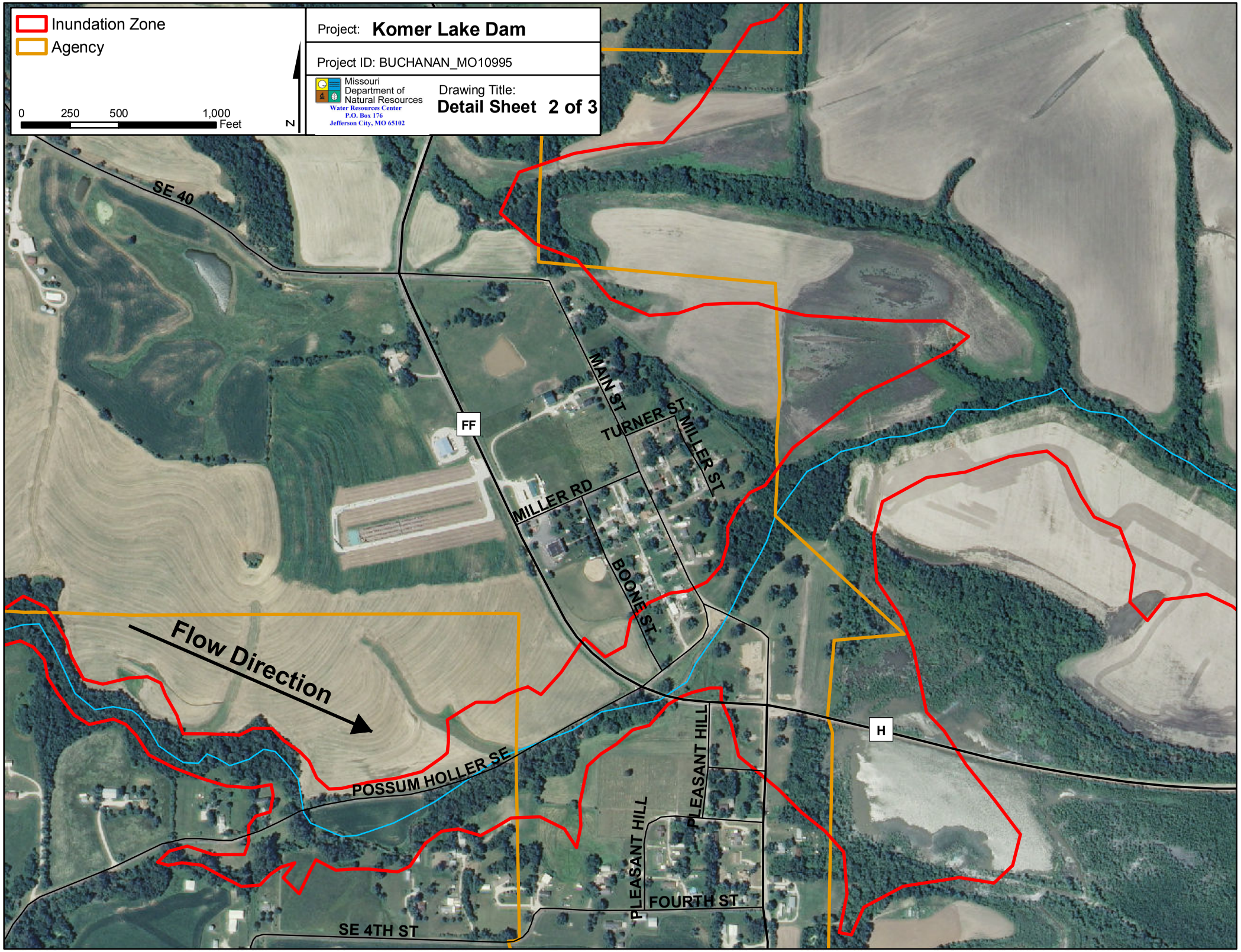
Main St (Agency)

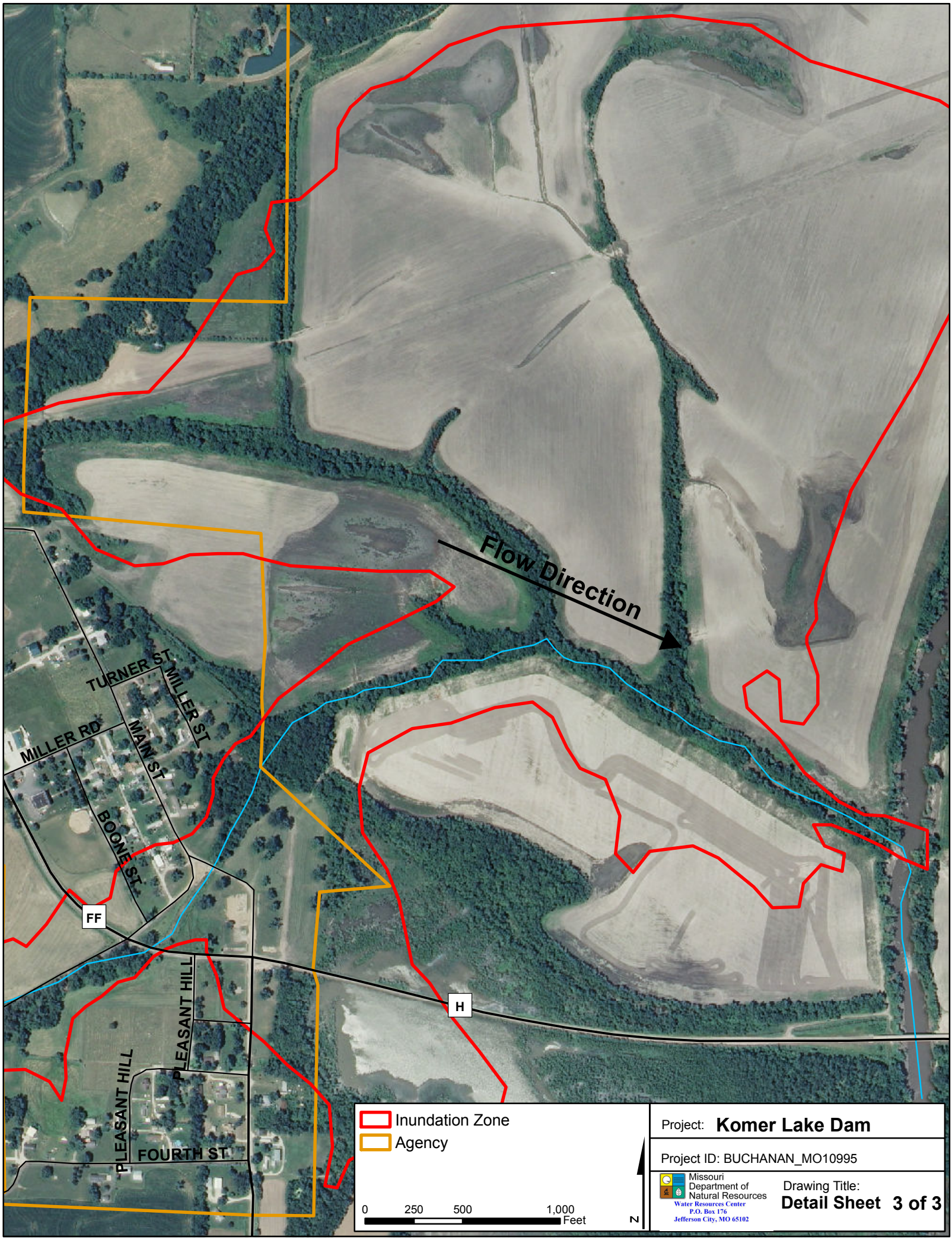
NOTE: LiDAR Elevation data unavailable for Buchanan County. Analysis was completed with 10 meter Digital Elevation Model

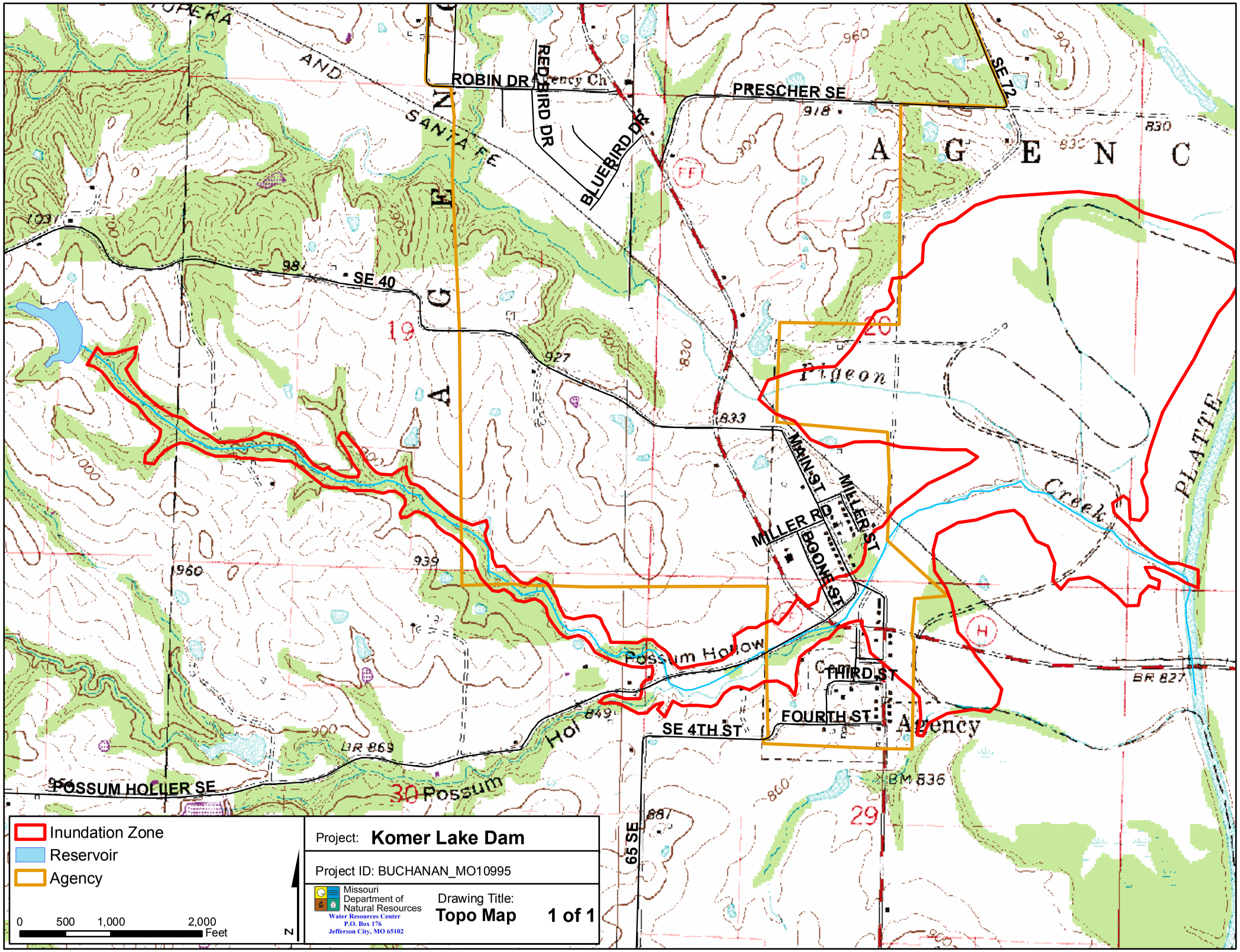
Date of Aerial Photo: August 18, 2009


Inundation Zone
Reservoir
Cross Sections
Agency
0 500 1,000 2,000
Feet
N
Project: Komer Lake Dam
Project ID: BUCHANAN_MO10995
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Flood Arrival Times
1 of 1
PARTRIDGE DR
ROBIN DR
RED BIRD DR
BLUEBIRD DR
FF
SE 40
MAIN ST
MILLER ST
MILLER RD
BOONE ST
FF
THIRD ST
FOURTH ST
SE 4TH ST
H
H
0.5 hr
POSSUM HOLLER SE
65 SE
Platte River


Flow Direction
SE 40
POSSUM HOLLER SE
Inundation Zone
Reservoir
Agency
0 250 500 1,000 Feet
N
Project: Komer Lake Dam
Project ID: BUCHANAN_MO10995
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Detail Sheet 1 of 3


Inundation Zone
Agency
0 250 500 1,000 Feet
N
Project: Komer Lake Dam
Project ID: BUCHANAN_MO10995
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Detail Sheet 2 of 3
SE 40
FF
MAIN ST
TURNER ST
MILLER ST
MILLER RD
BOONE ST
Flow Direction
POSSUM HOLLER SE
H
PLEASANT HILL
PLEASANT HILL
FOURTH ST
SE 4TH ST


Flow Direction
TURNER ST
MILLER ST
MILLER RD
MAIN ST
BOONE ST
FF
H
PLEASANT HILL
PLEASANT HILL
FOURTH ST
Inundation Zone
Agency
0
250
500
1,000
Feet
N
Project: Komer Lake Dam
Project ID: BUCHANAN_MO10995
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Detail Sheet 3 of 3


ROBIN DR
RED BIRD DR
BLUEBIRD DR
PRESCHER SE
SE 72
SE 40
MAIN ST
MILLER ST
MILLER RD
BOONE ST
THIRD ST
FOURTH ST
SE 4TH ST
POSSUM HOLLER SE
65 SE
Possum Hollow
Pigeon
Creek
PLATTE
Agency
Inundation Zone
Reservoir
Agency
0 500 1,000 2,000 Feet
N
Project: Komer Lake Dam
Project ID: BUCHANAN_MO10995
Missouri Department of Natural Resources
Water Resources Center
P.O. Box 176
Jefferson City, MO 65102
Drawing Title:
Topo Map
1 of 1

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MEMORANDUM

DATE: April 4, 1995

TO: **FILES** McPheeters Lake Dam (MO 10525) Buchanan County

FROM: Jim Alexander JLA

SUBJECT: Breach of Dam

Fields

On March 29, 1995 Jordan Ott and I made a site visit to Buchanan County. The purpose of our site visit was to meet with Ivan ~~Fields~~ Natural Resources Conservation Service (NRCS) to discuss some sites they were working with that might be of interest to the Dam and Reservoir Safety Program (DRSP). One of these sites was the McPheeters Dam which was declassified as a dam within the last year.

According to Ivan, the McPheeters Dam failed in 1993 during the record flooding that occurred in the area. The cause of the failure was reportedly piping around the outside of the primary spillway pipe. This led to sinkholes forming in the dam and the collapse of the embankment in the vicinity of the primary spillway pipe. The breach is trapezoidal shaped with a bottom width of roughly 50 ft. and 1H:1V side slopes. The breach extends through the crest of the dam and into the sediment ponded behind the dam. Local runoff continues to erode a channel into the sediment.

The NRCS is currently considering repairing the breach, replacing the spillway pipe, and raising the crest of the dam to provide additional flood and sediment storage. If they do, the McPheeters Dam would once again be a regulated structure. The NRCS would be required to obtain a construction permit to modify the dam.

RECYCLED PAPER

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MEMORANDUM

DATE: August 8, 1994

TO: **FILES** McPheeters Lake Dam (MO 10525) Buchanan County

FROM: Jim Alexander JLA

SUBJECT: Retaining Exemption

Based on the recent Attorney General's opinion and the subsequent elimination of the retaining/retarding exemption from the rules and regulations, the retaining exemption previously issued for the McPheeters Lake Dam is no longer valid. However, based on a site visit made by Russ Adams and Ralph Hess on September 24, 1986, it appears that this structure is not capable of storing water. This is due to the reservoir being filled with sediment. Based on the definition of a dam contained in Chapter 236.400.(5) RSMo (1986), this structure no longer should be considered a dam. For this reason, the McPheeters Lake Dam is being removed from the dam safety data base (Status.dbf) and NATDAM.

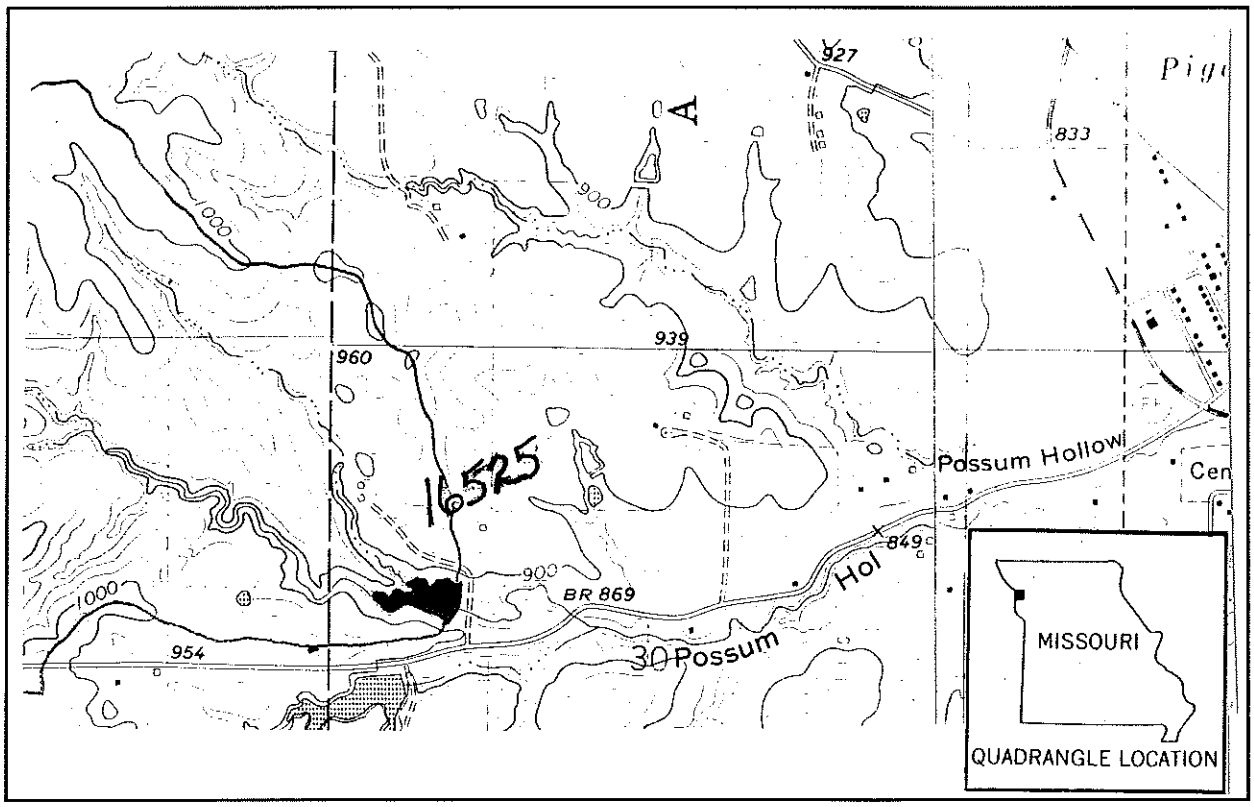
RECYCLED PAPER

DAM AND RESERVOIR SAFETY COUNCIL
December 6, 1990

McPheeters Lake Dam
MO 10525
Buchanan County

Owner:	**Mrs. R.A. McPheeters**
Address:	**Route 1, Box 80A Agency, Missouri 64401**
Height	**37 ft**
Res. Area:	**3 acres**
Watershed:	**617 acres**
D/S Hazard Zone:	**II, Located on Possum Hollow, upstream of the town of Agency**
Type of Dam:	**Earthfill**
Spillway(s):	**The principal spillway is a 48" diameter corrugated metal pipe connected to a 36" diameter drop inlet riser. There is a grass lined open channel emergency spillway in the left abutment.**
Use of reservoir:	**The purpose of the dam is for soil stabilization and flood protection.**

The Dam and Reservoir Safety Program granted a retaining exemption for the McPheeters Lake Dam in September 1986. The reservoir is entirely silted in.



JOHN ASHCROFT
Governor

FREDERICK A. BRUNNER
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation,
and Historic Preservation

DIVISION OF GEOLOGY & LAND SURVEY
P.O. Box 250, 111 Fairgrounds Road
Rolla, MO 65401
314-364-1752

September 26, 1986

Mrs. R. A. McPheeters
Route 1, Box 80A
Agency, Missouri 64401

RE: McPheeters Lake Dam (MO 10525) Buchanan County

Dear Mrs. McPheeters:

It recently came to our attention while making a site visit to a dam owned by your neighbor, Mr. Ussary, that your lake has silted in. This was verified during the same visit. It was not the intent of the Legislature in enacting the Dam Safety Law that silted in lakes be regulated. Based upon this, your dam will no longer be regulated by the State of Missouri. Please disregard any earlier correspondence regarding the registration of your dam.

Sincerely,

DAM & RESERVOIR SAFETY PROGRAM

Brian J. Swenty

Brian J. Swenty, P.E.
Chief Engineer

BJS/mjp

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

August 22, 2016

Mr. Mark Noland
5100 Pigeon Hill Road
Agency, Missouri 64401

RE: Komer Lake Dam (MO10995) Buchanan County

Dear Mr. Noland:

As a result of an inspection of the Komer Lake Dam on August 16, 2016, I am pleased to inform you that Registration Permit R-502 has been renewed and is enclosed for your use. The permit will be valid for a period of three years from the expiration date of the last permit issued for the dam and will expire on September 20, 2019. At that time the dam will be reinspected by the Dam and Reservoir Safety Program at no cost to you. The permit is being renewed for three years based on the downstream environmental zone classification.

Please refer to the enclosed inspection reports for additional information on the inspections. If you have any questions or need further assistance, please feel free to contact Glenn Lloyd at (573) 368-2175. Thanks for your cooperation.

Sincerely,

MISSOURI GEOLOGICAL SURVEY

Ryan P. Stack, P.E.
Chief Engineer
Dam and Reservoir Safety Program

RPS/clb
enclosures

Recycled Paper

Registration Permit No. R-502
Renewed August 22, 2016

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
DAM AND RESERVOIR SAFETY COUNCIL

SAFETY PERMIT

Pursuant to Chapters 236.400 through 236.500 of the Revised Statutes of Missouri and the rules established by the Dam and Reservoir Safety Council, and on the basis of an inspection by the Department of Natural Resources for the Komer Lake Dam, Buchanan County, all of which are made a part hereof by reference, **PERMISSION IS HEREBY GRANTED** to Mr. Mark Noland , hereafter known as the permittee, whose address for the purpose of notices and other communications pertaining to this permit is 5100 Pigeon Hill Road; Agency, Missouri 64401, which address is subject to change by written notice from the permittee, **TO OPERATE** said dam and reservoir located in Section 24, Township 56 North, Range 35 West, having identification number of MO 10995, a dam height of 39 feet, a principal spillway elevation of 974.9 feet (UTM NAD83 Zone15N GEOID12A), an emergency spillway elevation of 976.6 feet (UTM NAD83 Zone15N GEOID12A), a minimum crest elevation of 979.4 feet (UTM NAD83 Zone15N GEOID12A), a reservoir area of 4.8 acres at the water storage elevation and approximate UTM Coordinates of 4,390,705 meters North and 348,018 meters East, Zone 15, subject to the following provisions:

GENERAL PROVISIONS:

1. No liability shall be imposed upon or incurred by the State of Missouri and/or the Dam and Reservoir Safety Council, or any of their officers, agents, employees, and members, officially or personally, on account of the granting hereof or on account of any damage to any person or property resulting from any act or omission of the permittee or any of its agents, employees, or contractors, or closed corporations or successors relating to any matter hereunder. This permit shall not be construed as estopping or limiting any legal claim or right of action of the state against the permittee, its agents, employees or contractors for any damages or injury resulting from any such act or omission by them or for violation of or failure to comply with the provisions of the permit or applicable provisions of law.

DEPARTMENT OF NATURAL RESOURCES
DAM & RESERVOIR SAFETY PROGRAM
DAM INSPECTION REPORT

DATE: *August 19, 2016*

COVER SHEET

NAME OF DAM: *Komer Lake Dam* **I.D. # :** *MO10995*

LOCATION: County: *Buchanan* *Section: 24, Twp. 56 N, Rge. 35 W*

OWNER: *Mr. Mark Noland*	
ADDRESS: *5100 Pigeon Hill Road*	
CITY/STATE/ZIP: *Agency, Missouri 64401*	
TELEPHONE: *816-752-8060*	

PERMIT #	HAZARD CLASS	TYPE OF DAM
R-502	CLASS II	EARTHFILL

TYPE OF SPILLWAY (s) **Principal** *7 inch steel pipe*
Emergency *Grass lined open channel on left abutment 30 feet wide*

☒ **I hereby certify that the** *Komer Lake Dam* **was inspected on** *August 16, 2016* **in accordance with RSMO 236.400 through RSMO 236.500.**

☒ **I hereby certify that the** *Komer Lake Dam* **did not have any observed defects that required correction at the time of the inspection.**

☒ **Judgement of Slope Stability – The embankment and appurtenant structures appeared to be in good overall condition at the time of the inspection, with no indications of slope instability or excessive seepage.**

☐ **Defects were found that will have to be corrected prior to the permit being renewed.**

STATION	ELEVATION	COMMENTS
TBM	974.9	Principal spillway inlet
	979.4	Minimum crest of dam
	974.9	Water surface
	976.6	Emergency spillway crest

Elevations are in feet and are based on UTM NAD Zone 83 GEOID12A.

STATE OF MISSOURI GLENN DELMORE LLOYD NUMBER E-28021 REGISTERED PROFESSIONAL ENGINEER

INSPECTING ENGINEER
Glenn Lloyd P.E.

Inspection Checklist

NAME OF DAM:	Komer Lake Dam	INSPECTION DATE: August 16, 2016
ID #: MO 10995	COUNTY: Buchanan	HAZARD CLASS: 2

HAZARD CLASSIFICATION: ☒ Unchanged ☐ Changed

Item	Condition*	Comments
1. Vegetation	M.R.	Cut and remove the excess vegetation on the upstream and downstream faces of the dam (see page 2 of appendix A) Cut and remove the tree growing above the principal spillway outlet pipe near the toe of the dam.
2. Seepage	O.R.	Monitor the seepage at the toe of the dam. Report any change in flow rate or color to the Dam and Reservoir Safety Program.
3. Principal Spillway	N.P.	
4. Emergency Spillway	M.R.	Cut and remove the excess vegetation at the entrance to the emergency spillway (see page 2 of appendix B)
5. Embankment	N.P.	
6. Reservoir Area	N.P.	
7. Lake Drain Gates or Valves	N.A.	
8. Spillway Outlet Channels	N.P.	
9. Embankment Drain Outlets	N.A.	
10. Riprap	N.A.	

*N.P. = No observable problem; M.R. = Maintenance Required; D.O. = Defect Observed; E.C = Emergency Condition; O.R. = Observation Required; N.A. = Not Applicable

Required Freeboard	Available Freeboard
3.3 feet	4.5 feet

RECOMMENDATION:

☒ **Permit is being renewed**

☐ **Permit is not being renewed**

APPENDIX A: Photographs of MO10995 on August 16, 2016 page 1

Upstream face and crest

Downstream face

Principal spillway inlet

Seepage at the toe of the dam

Emergency spillway inlet

Emergency spillway channel

2. The permittee shall comply with all Federal, State and local laws and regulations, and shall obtain such other permits as may be required.

3. In cases where the doing by the permittee of anything authorized by this permit shall involve the taking, using or damaging of any property rights or interest of any other person or persons, or of any publicly owned lands or improvements thereon or interests therein, it is the sole responsibility of the permittee, before proceeding therewith, to obtain the written consent of all persons, agencies, or authorities concerned, and to acquire all property, rights and interests necessary therefore, including flood easements or permissions for all properties which may be inundated by the dam on a temporary or permanent basis in the upstream impoundment area below the top of dam elevation.

4. The permittee shall notify the Dam and Reservoir Safety Council in writing upon the sale or other transfer of interest in the dam or reservoir.

5. Based on conditions existing at the time of issuing this permit, the Downstream Environment Zone is Class II. Future development in the vicinity of the dam and flood plain below the dam may result in a change in classification. This change will necessitate hydraulic and structural upgrading of the dam so the dam is in compliance with the rules and regulations of the Missouri Dam and Reservoir Safety Council. Permittee or its representatives, successors or assigns shall perform any such upgrading upon a change in classification and upon notification from the Missouri Dam and Reservoir Safety council.

6. The permittee shall not alter, enlarge, reduce, repair or remove the dam, reservoir or appurtenances without first obtaining a construction permit from the Dam and Reservoir Safety Council.

7. The permittee shall immediately notify in writing the Chief Engineer of any conditions relating to structural stability of and seepage through the dam discovered during the term of this permit which differs from those conditions identified in the renewal inspection summary.

8. The terms and provisions of this permit shall extend to and bind the successors in authority of the Dam and Reservoir Safety Council and the legally assigned successors in interest of the permittee.

9. Maintenance of the dam and reservoir herein permitted shall be the responsibility of the permittee.

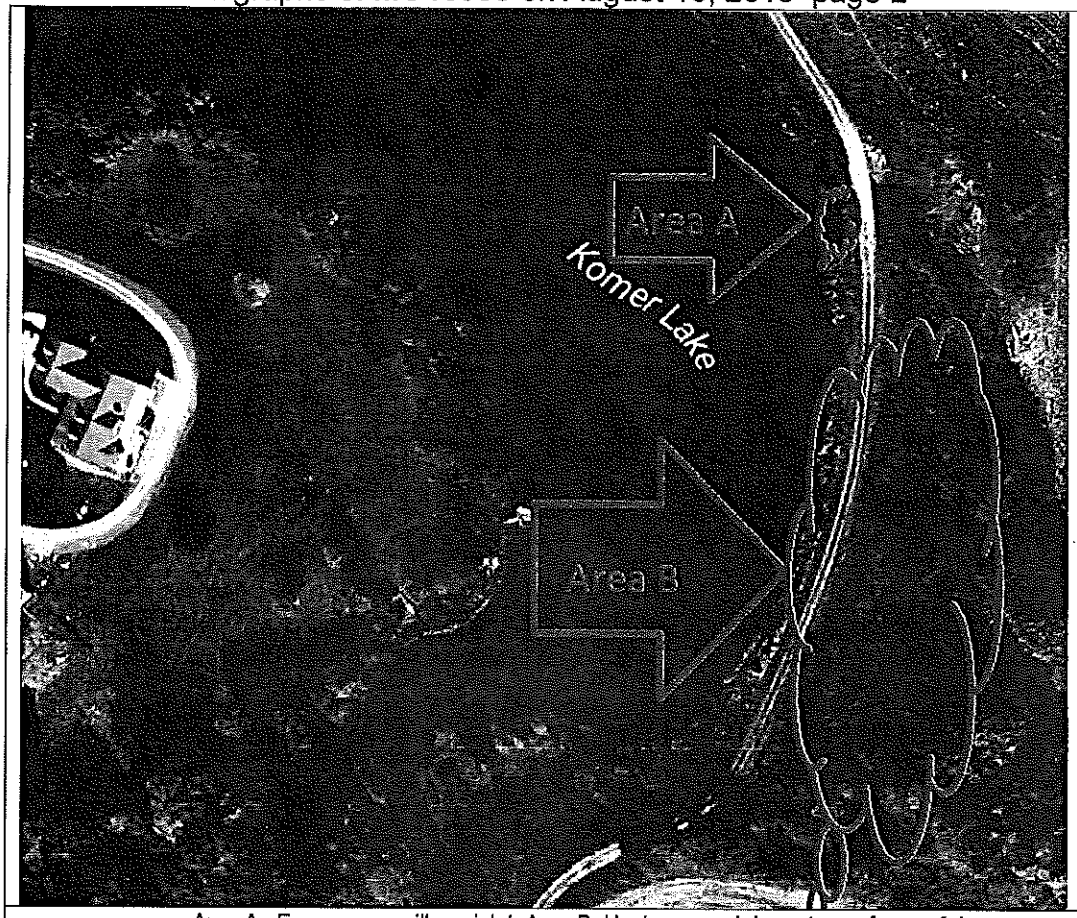
10. The term of this permit shall be three (3) years from the date of the last safety permit issued expiring on September 20, 2019. The permittee shall apply for renewal not less than sixty (60) days prior to this expiration date.

Executed at Rolla, Missouri on this 2nd day of August, 2016

DAM & RESERVOIR SAFETY COUNCIL

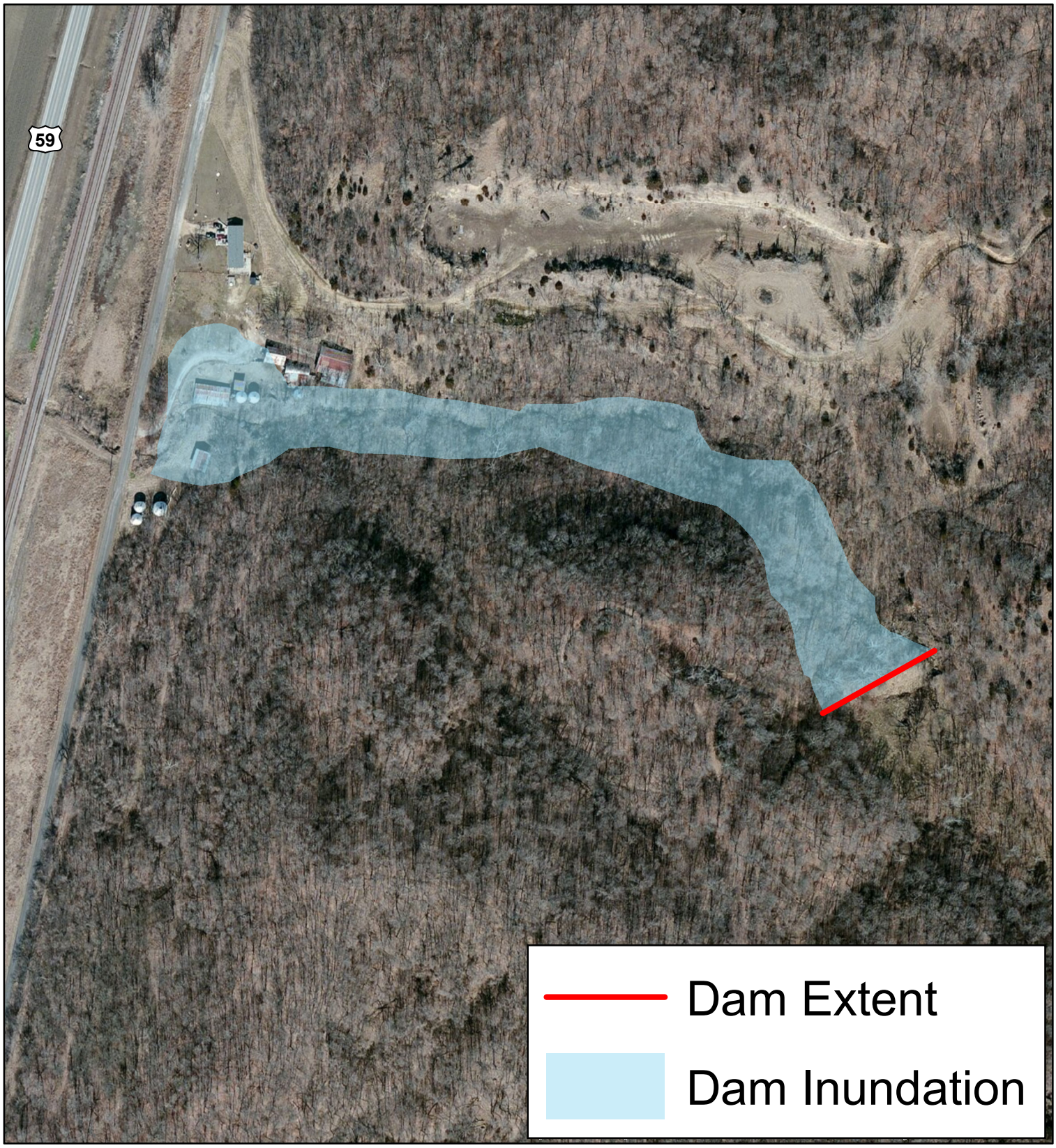
By _____
Chief Engineer
Dam and Reservoir Safety Program

APPENDIX A: Photographs of MO10995 on August 16, 2016 page 2



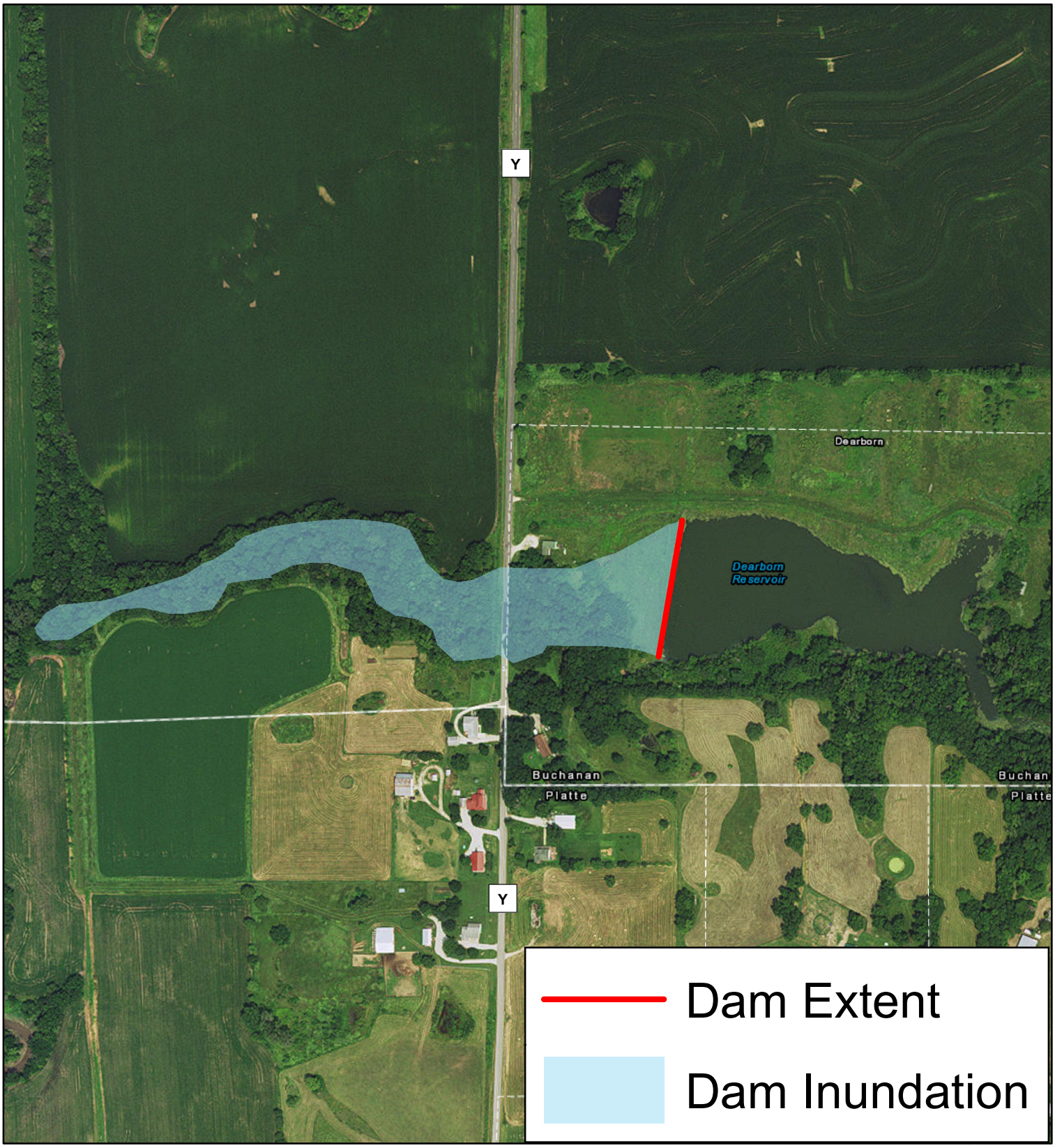
Area A: Emergency spillway inlet Area B: Upstream and downstream faces of dam

Dead Man's Hole Dam Inundation



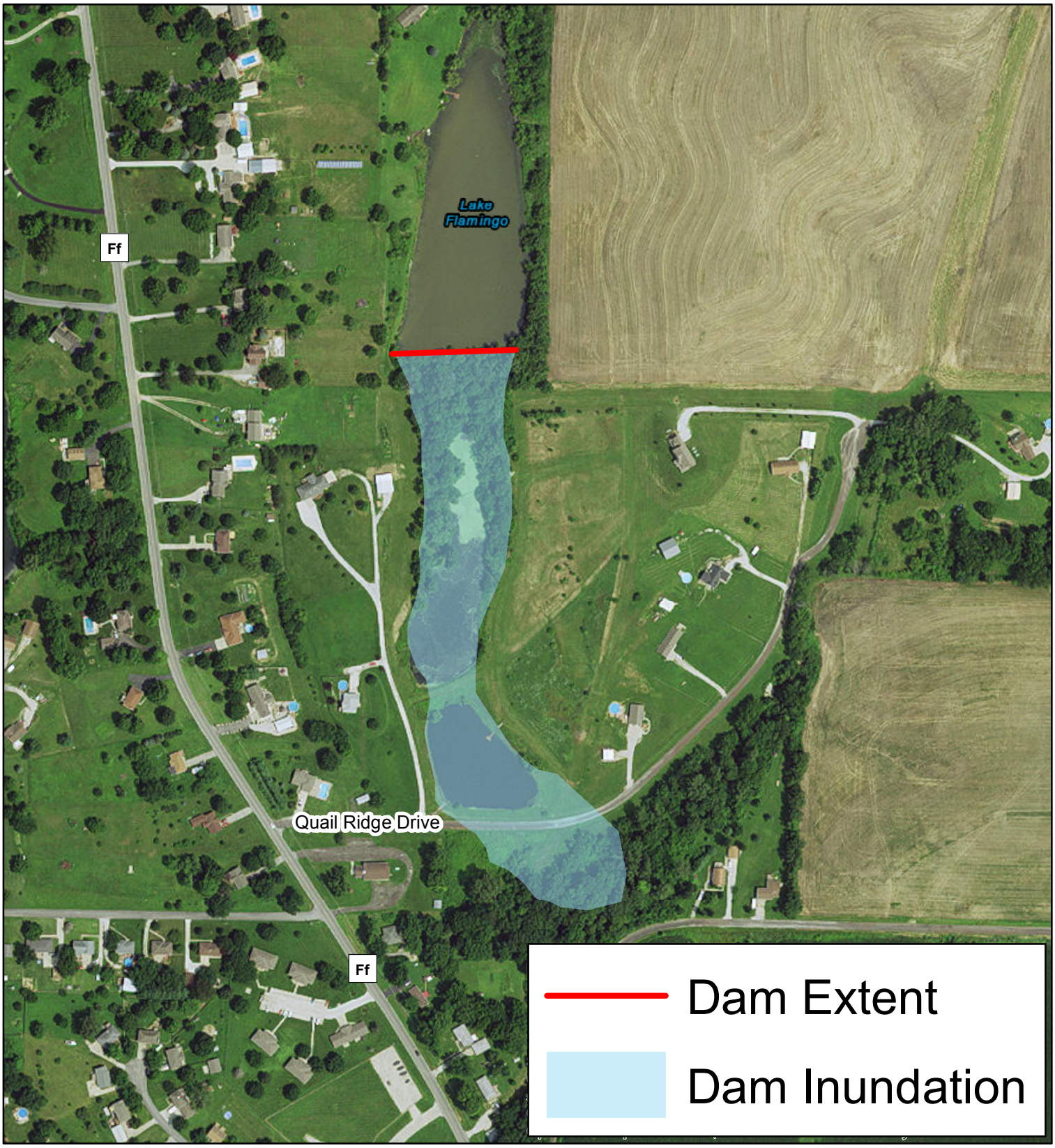
0 375 750 1,500 Feet

Dearborn Reservoir Dam Inundation



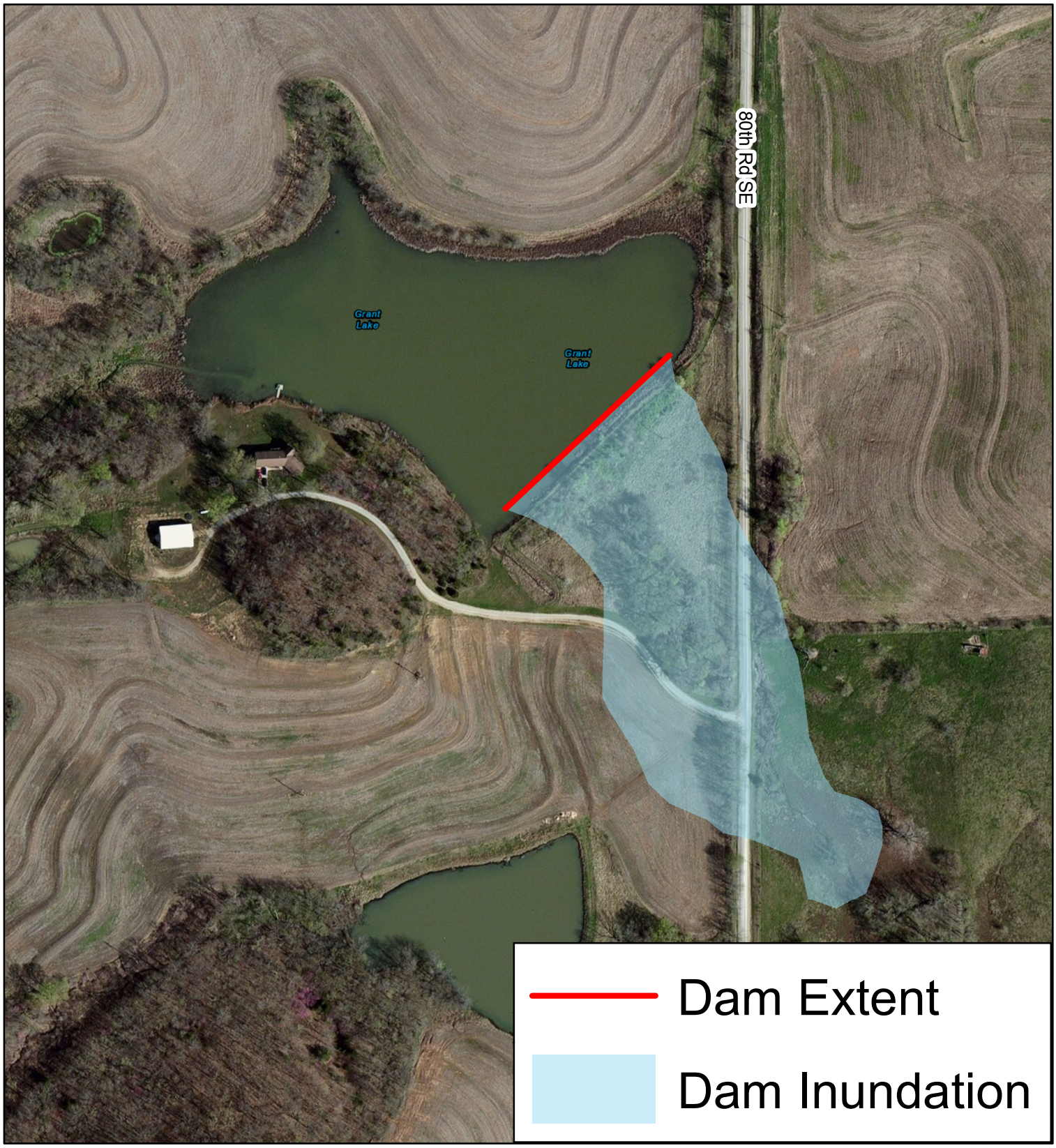
0 700 1,400 2,800 Feet

Lake Flamingo Dam Inundation



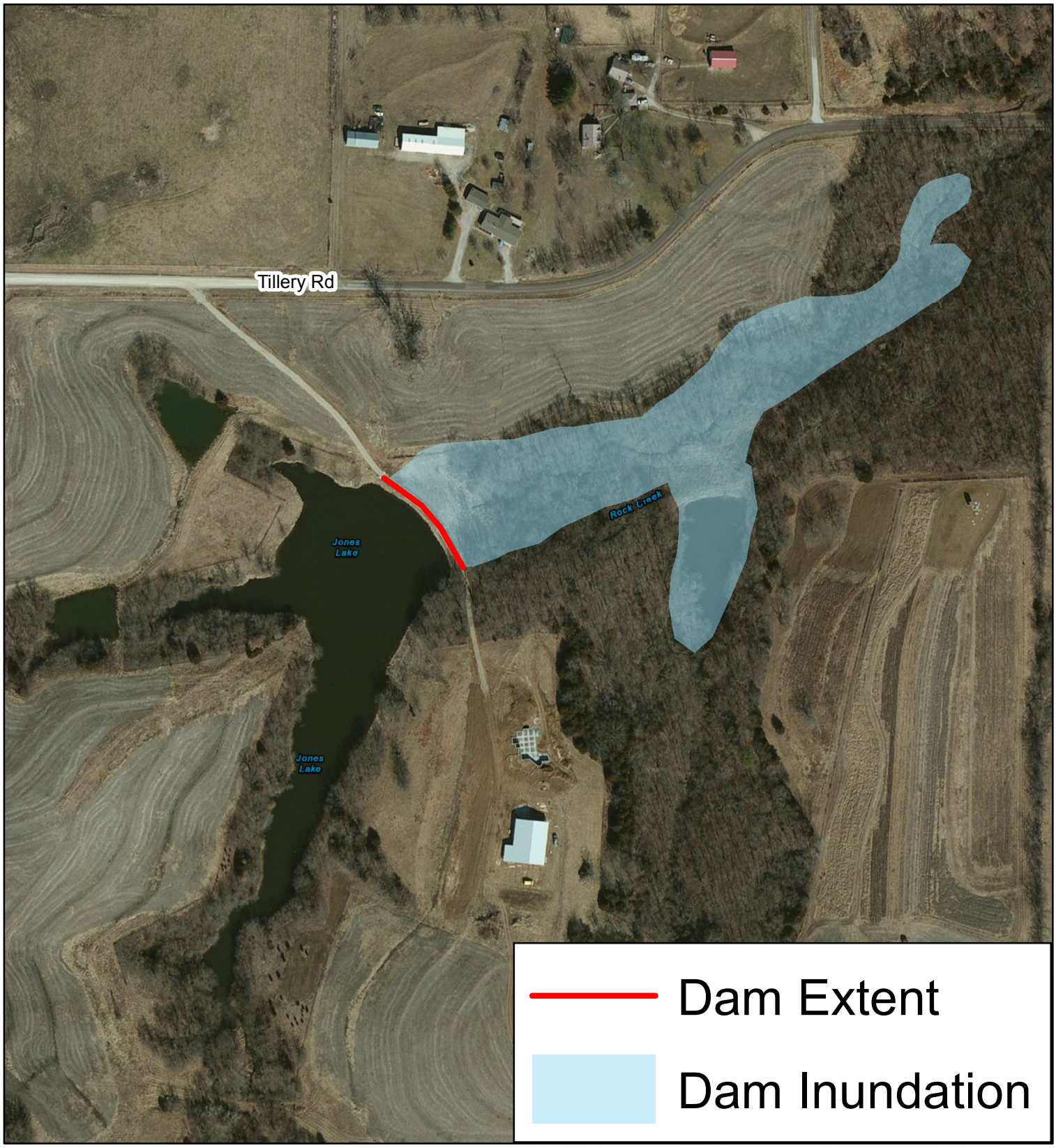
0 500 1,000 2,000 Feet

Grant Lake Dam Inundation



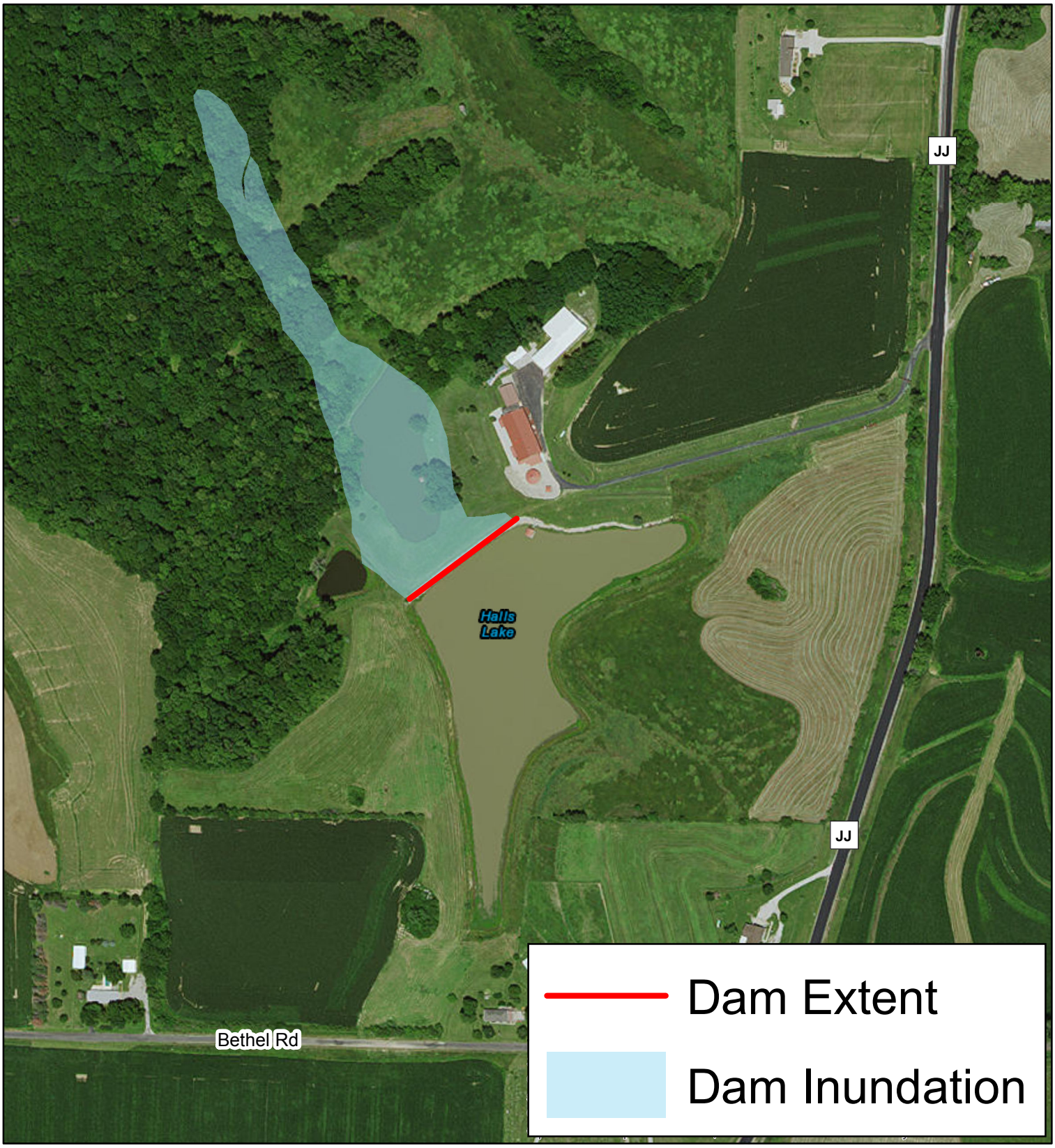
0 375 750 1,500 Feet

Jones Lake Dam Inundation



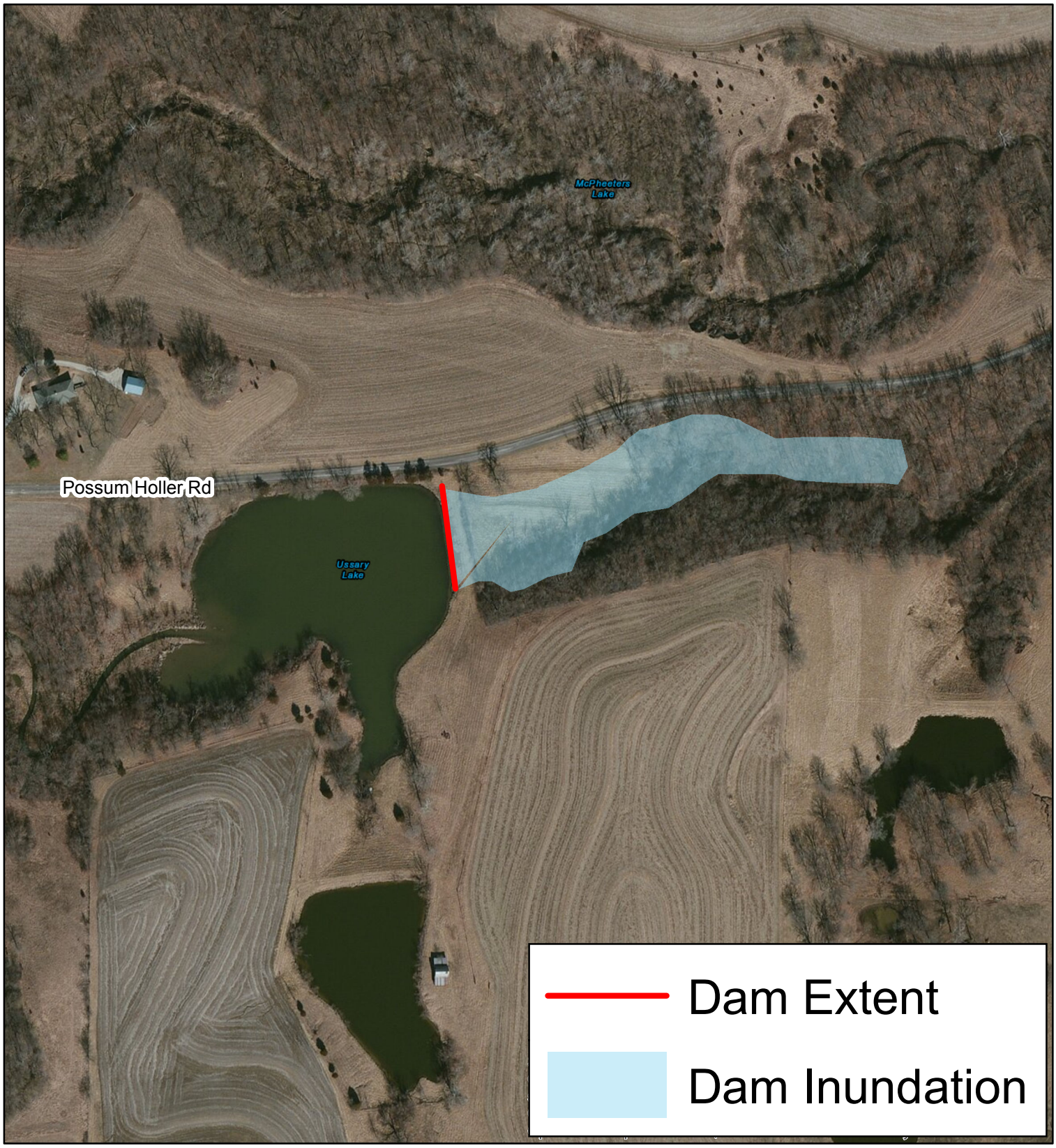
0 375 750 1,500 Feet

Scotty's Lake Dam Inundation



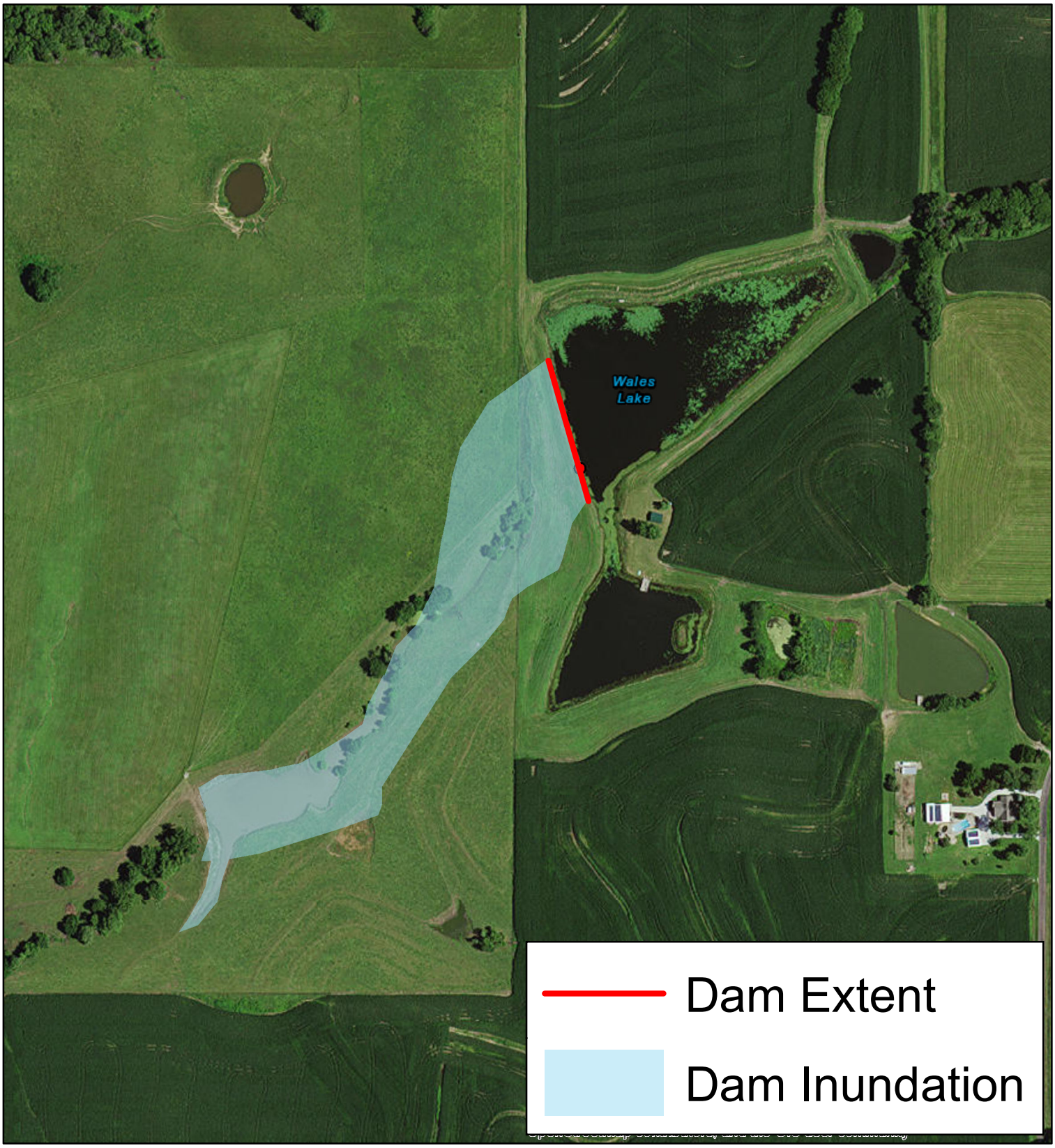
0 500 1,000 2,000 Feet

Ussary Lake Dam Inundation



0 375 750 1,500 Feet

Wales Lake Dam Inundation



0 500 1,000 2,000 Feet

FEMA Digital Flood Map Products

- **FIRM Panel Image:** Flood Insurance Rate Maps (FIRM) are digital images of flood hazard maps. The images are digital pictures of entire flood map panels that can be viewed and printed from a computer. Most communities and counties have many map panels to cover the entire jurisdiction and an index map that shows the location of each map panel.

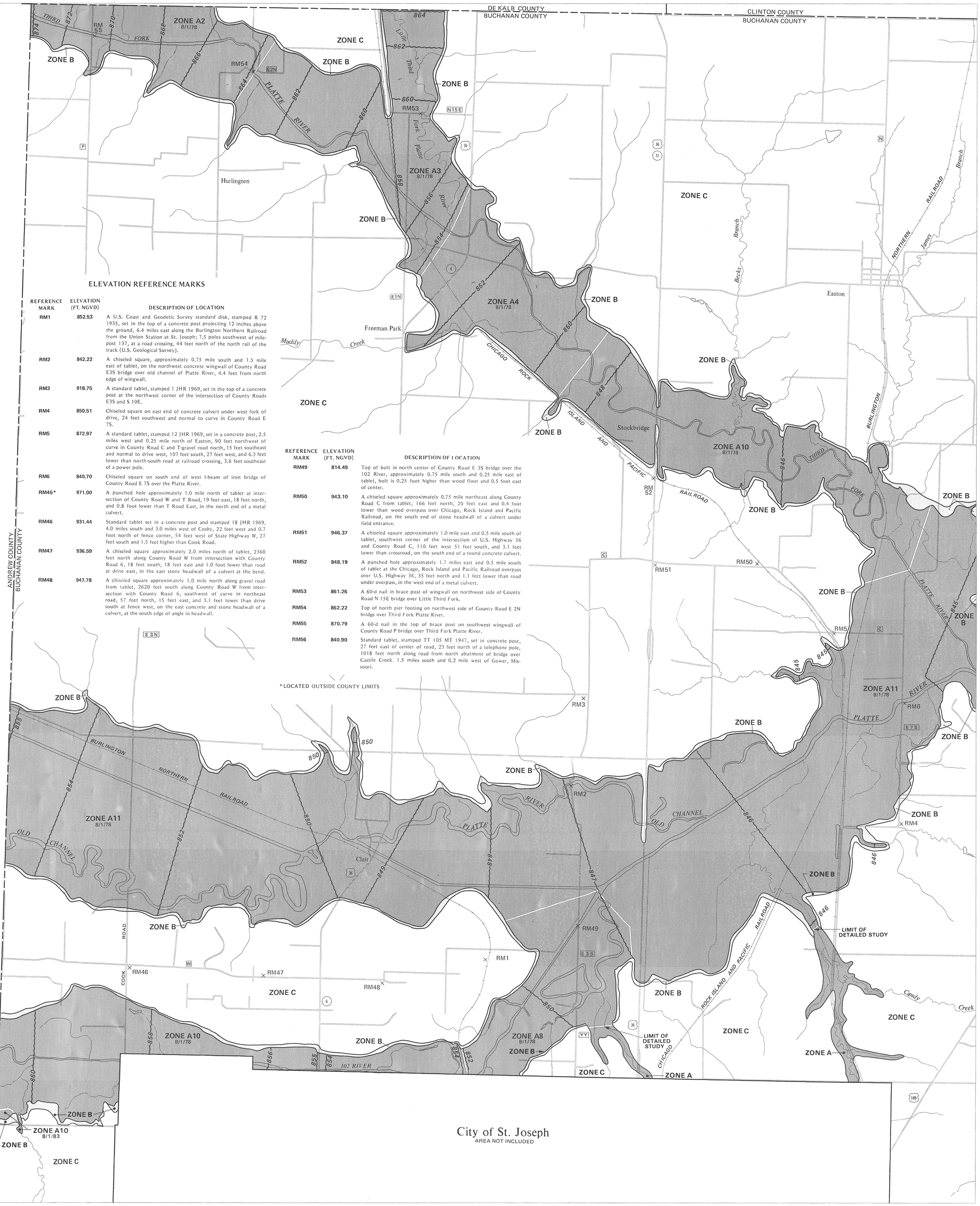
- **FIRM Worldfile:** A TFW or PGW file may accompany your flood hazard map. They are used to help view the flood maps in GIS applications.

FIRM Panel Images are TIF or PNG image files and have file names with a Community or County ID followed by a 4-digital panel number and letter suffix representing a version (e.g. 12345C0123F.tif). The FIRM worldfiles will have the same filenames but with a .tfw or .pgw extension.

FIRM Panel Images can be viewed using most freely available image viewer applications. You can also use the FIRMette-Desktop software available from the FEMA Flood Map Service Center (MSC) website at msc.fema.gov/portal/resources/firmettes. FIRM images can also be viewed in specialized GIS software where the worldfiles are used to make the images compatiable with other GIS data. See the MSC Products and Tools Overview page for more information on avialable data and tools for using FEMA's flood risk data.

For more information on available digital products, visit FEMA's Map Service Center website at https://msc.fema.gov or call the FEMA Map Information eXchange (FMIX) at 877-336-2627.

RiskMAP
Increasing Resilience Together



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM1	852.53	A U.S. Coast and Geodetic Survey standard disk, stamped R 72 1935, set in the top of a concrete post projecting 12 inches above the ground, 6.4 miles east along the Burlington Northern Railroad from the Union Station at St. Joseph; 7.5 poles southwest of mile-post 137, at a road crossing, 44 feet north of the north rail of the track (U.S. Geological Survey).
RM2	842.22	A chiseled square, approximately 0.75 mile south and 1.5 mile east of tablet, on the northwest concrete wingwall of County Road E3S bridge over old channel of Platte River, 4.4 feet from north edge of wingwall.
RM3	918.75	A standard tablet, stamped 1 JHR 1969, set in the top of a concrete post at the northwest corner of the intersection of County Roads E3S and S 10E.
RM4	850.51	Chiseled square on east end of concrete culvert under west fork of drive, 24 feet southwest and normal to curve in County Road E 7S.
RM5	872.97	A standard tablet, stamped 12 JHR 1969, set in a concrete post, 2.5 miles west and 0.25 mile north of Easton, 90 feet northwest of curve in County Road C and T-gravel road north, 15 feet southeast and normal to drive west, 107 feet south, 27 feet west, and 6.3 feet lower than north-south road at railroad crossing, 3.6 feet southeast of a power pole.
RM6	840.70	Chiseled square on south end of west I-beam of iron bridge of County Road E 7S over the Platte River.
RM45*	971.00	A punched hole approximately 1.0 mile north of tablet at intersection of County Road W and T Road, 19 feet east, 18 feet north, and 0.8 foot lower than T Road East, in the north end of a metal culvert.
RM46	931.44	Standard tablet set in a concrete post and stamped 18 JHR 1969, 4.0 miles south and 3.0 miles west of Cosby, 22 feet west and 0.7 foot north of fence corner, 54 feet west of State Highway W, 27 feet south and 1.5 feet higher than Cook Road.
RM47	936.59	A chiseled square approximately 2.0 miles north of tablet, 2360 feet north along County Road W from intersection with County Road 6, 18 feet south, 18 feet east and 1.0 foot lower than road at drive east, in the east stone headwall of a culvert at the bend.
RM48	947.78	A chiseled square approximately 1.0 mile north along gravel road from tablet, 2620 feet south along County Road W from intersection with County Road 6, southwest of curve in northeast road, 57 feet north, 15 feet east, and 3.1 feet lower than drive south at fence west, on the east concrete and stone headwall of a culvert, at the south edge of angle in headwall.
RM49	814.49	Top of bolt in north center of County Road E 3S bridge over the 102 River, approximately 0.75 mile south and 0.25 mile east of tablet, bolt is 0.25 foot higher than wood floor and 0.5 foot east of center.
RM50	943.10	A chiseled square approximately 0.75 mile northeast along County Road C from tablet, 166 feet north, 20 feet east and 0.4 foot lower than wood overpass over Chicago, Rock Island and Pacific Railroad, on the south end of stone headwall of a culvert under field entrance.
RM51	946.37	A chiseled square approximately 1.0 mile east and 0.5 mile south of tablet, southwest corner of the intersection of U.S. Highway 36 and County Road C, 110 feet west 51 feet south, and 3.1 feet lower than crossroad, on the south end of a round concrete culvert.
RM52	848.19	A punched hole approximately 1.7 miles east and 0.5 mile south of tablet at the Chicago, Rock Island and Pacific Railroad overpass over U.S. Highway 36, 35 feet north and 1.1 feet lower than road under overpass, in the west end of a metal culvert.
RM53	861.26	A 60-d nail in brace post of wingwall on northwest side of County Road N 15E bridge over Little Third Fork.
RM54	862.22	Top of north pier footing on northwest side of County Road E 2N bridge over Third Fork Platte River.
RM55	870.79	A 60-d nail in the top of brace post on southwest wingwall of County Road P bridge over Third Fork Platte River.
RM56	840.90	Standard tablet, stamped TT 105 MT 1947, set in concrete post, 27 feet east of center of road, 23 feet north of a telephone pole, 1018 feet north along road from north abutment of bridge over Castile Creek, 1.5 miles south and 0.2 mile west of Gower, Missouri.

*LOCATED OUTSIDE COUNTY LIMITS

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE B / ZONE A1 / ZONE A6 / ZONE B
100-Year Flood Boundary	
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
AUGUST 1, 1978

FLOOD HAZARD BOUNDARY MAP REVISIONS:

FLOOD INSURANCE RATE MAP EFFECTIVE:
AUGUST 1, 1978

FLOOD INSURANCE RATE MAP REVISIONS:
August 1, 1983; to change Corporate Limits, to add new Special Flood Hazard Areas, to add Zone Designations, to add Base Flood Elevations, to add Streets, and to reduce Special Flood Hazard Areas.

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

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

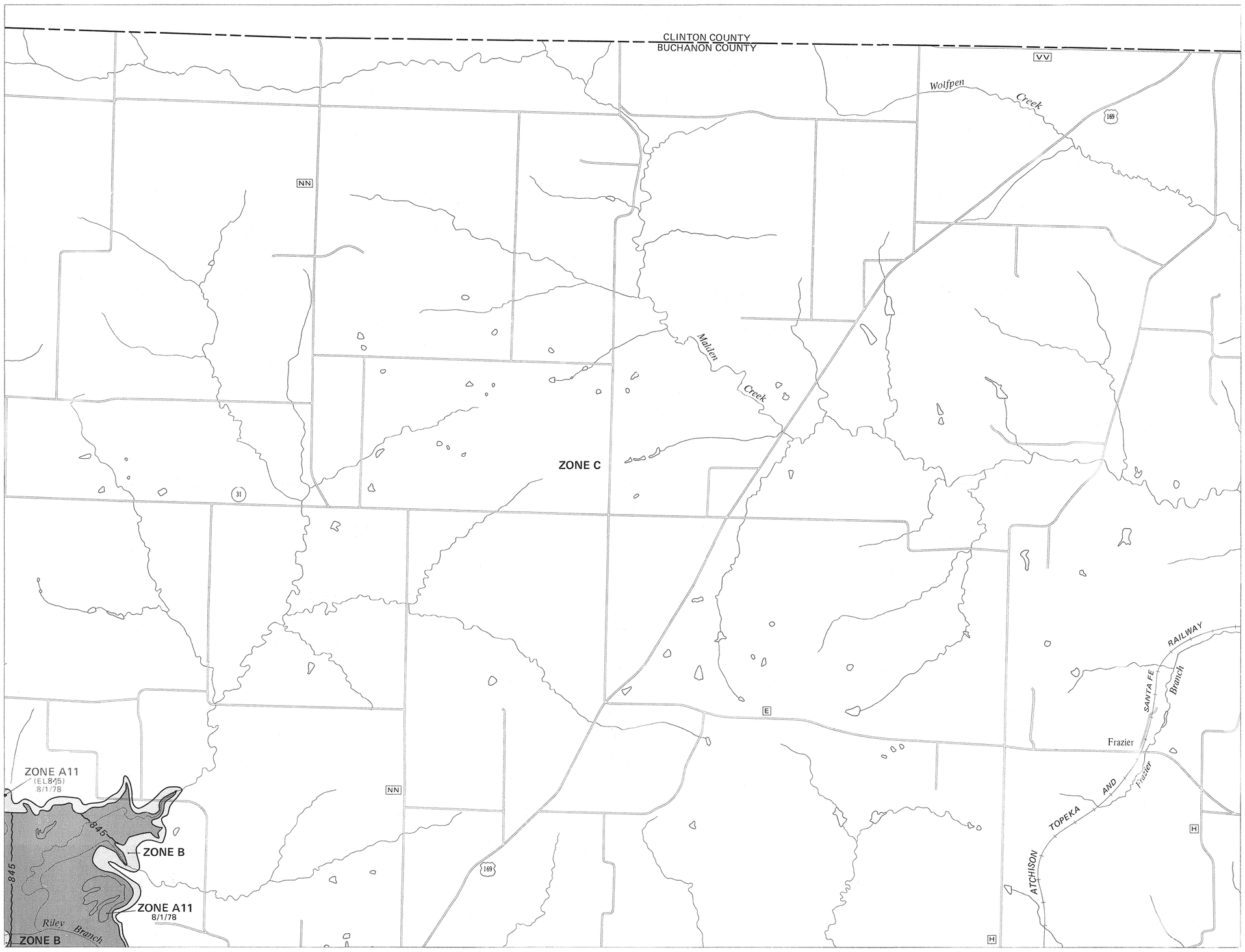
BUCHANAN COUNTY, MISSOURI
UNINCORPORATED AREA

PANEL 25 OF 125
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
290040 0025 B

MAP REVISED:
AUGUST 1, 1983

Federal Emergency Management Agency



KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary

ZONE B
ZONE A1 DATE
ZONE A5 DATE
ZONE B

Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7 ×

River Mile — • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all pianimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION
AUGUST 1, 1978

CONVERSION TO REGULAR PROGRAM
AUGUST 1, 1978

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.

N

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

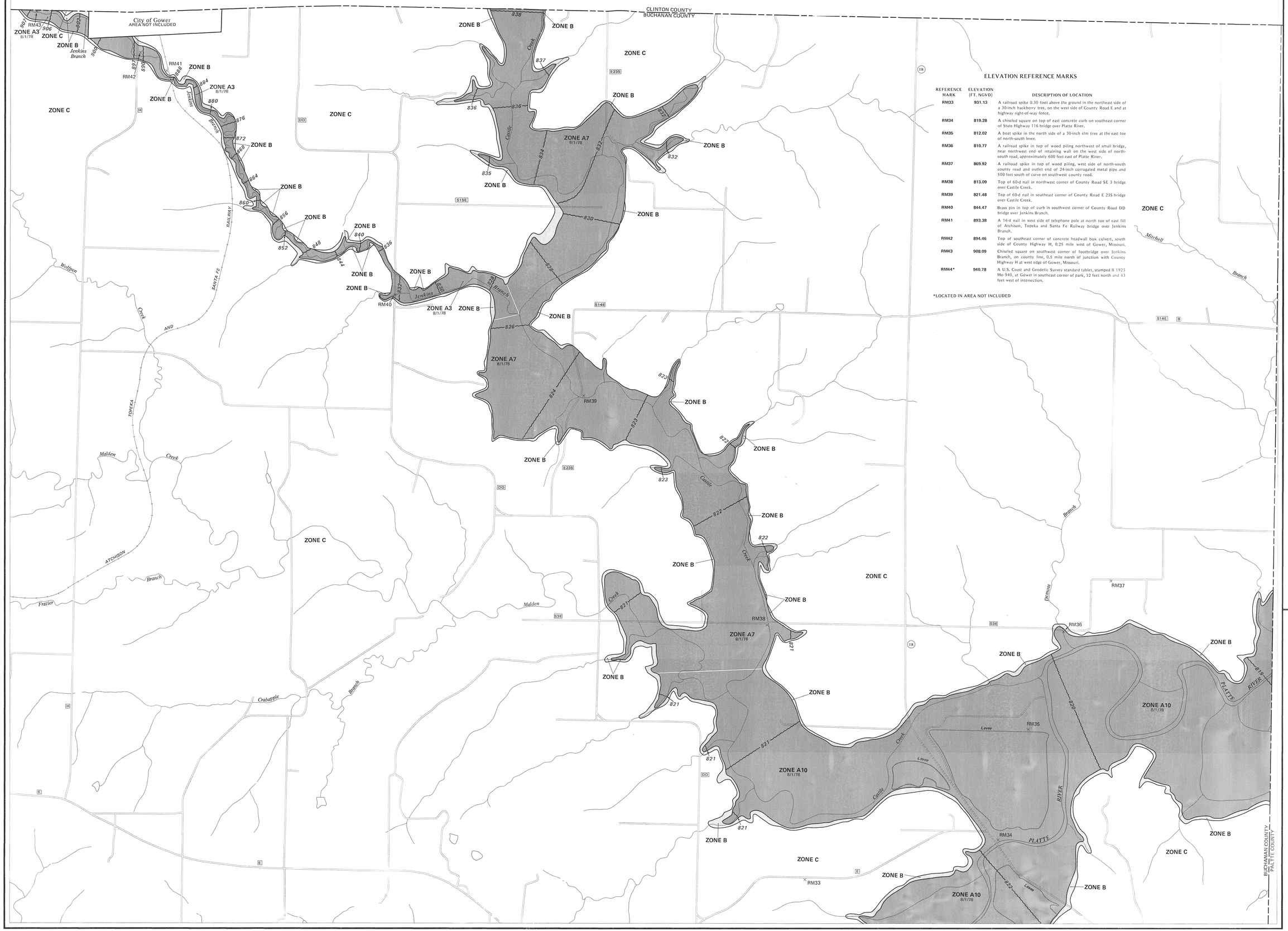
BUCHANAN COUNTY, MISSOURI
(UNINCORPORATED AREAS)

COMMUNITY-PANEL NUMBER
290040 0030 A

PAGE 30 OF 150
(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE
AUGUST 1, 1978

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM33	931.13	A railroad spike 0.30 foot above the ground in the northeast side of a 30-inch hackberry tree, on the west side of County Road E and at highway right-of-way fence.
RM34	819.28	A chiseled square on top of east concrete curb on southeast corner of State Highway 116 bridge over Platte River.
RM35	812.02	A boat spike in the north side of a 30-inch elm tree at the east toe of north-south levee.
RM36	810.77	A railroad spike in top of wood piling northwest of small bridge, near northwest end of retaining wall on the west side of north-south road, approximately 600 feet east of Platte River.
RM37	869.92	A railroad spike in top of wood piling, west side of north-south county road and outlet end of 24-inch corrugated metal pipe and 500 feet south of curve on southwest county road.
RM38	813.09	Top of 60-d nail in northwest corner of County Road SE 3 bridge over Castile Creek.
RM39	821.48	Top of 60-d nail in southeast corner of County Road E 235 bridge over Castile Creek.
RM40	844.47	Brass pin in top of curb in southwest corner of County Road DD bridge over Jenkins Branch.
RM41	893.38	A 16-d nail in west side of telephone pole at north toe of east fill of Atchison, Topeka and Santa Fe Railway bridge over Jenkins Branch.
RM42	894.46	Top of southeast corner of concrete headwall box culvert, south side of County Highway H, 0.25 mile west of Gower, Missouri.
RM43	908.09	Chiseled square on southwest corner of footbridge over Jenkins Branch, on county line, 0.5 mile north of junction with County Highway H at west edge of Gower, Missouri.
RM44*	940.78	A U.S. Coast and Geodetic Survey standard tablet, stamped B 1923 Mo 940, at Gower in southeast corner of park, 32 feet north and 43 feet west of intersection.

*LOCATED IN AREA NOT INCLUDED

KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary
Base Flood Elevation Line With Elevation In Feet**
Base Flood Elevation In Feet Where Uniform Within Zone**
Elevation Reference Mark
River Mile

ZONE B
ZONE A1 DATE / ZONE A5 DATE
ZONE B
513
(EL 987)
RM7
M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION
AUGUST 1, 1978

CONVERSION TO REGULAR PROGRAM
AUGUST 1, 1978

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE
1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

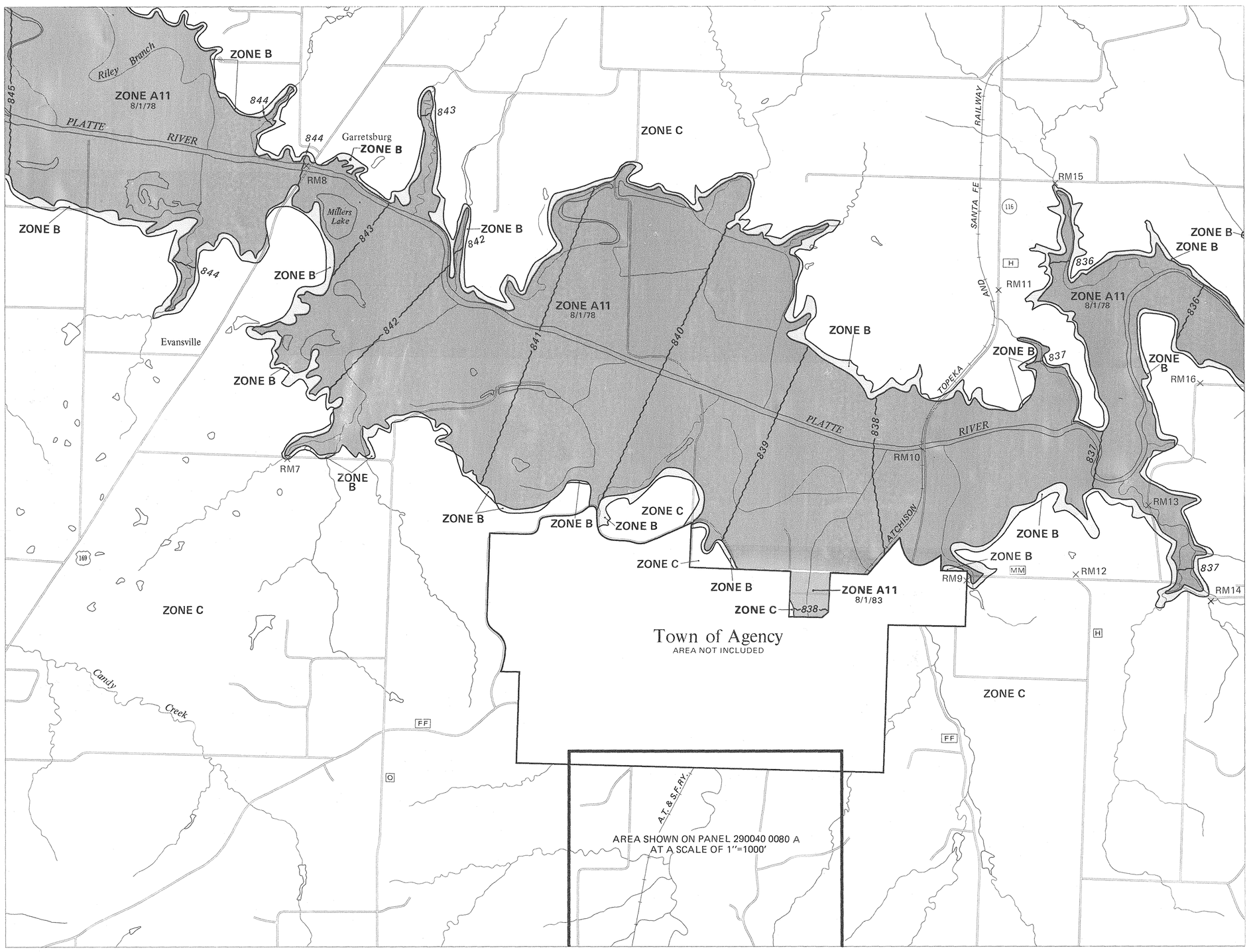
BUCHANAN COUNTY, MISSOURI
(UNINCORPORATED AREAS)

COMMUNITY-PANEL NUMBER
290040 0035 A

PAGE 35 OF 150
(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE
AUGUST 1, 1978

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM7	847.03	Chiseled square on southwest corner of concrete headwall of large box culvert, approximately 3 miles north and 0.5 mile east of Agency, Missouri.
RM8	836.00	Standard tablet in top of right corner of upstream end of east abutment of former U.S. Highway 169 bridge, 20 feet west of east abutment of present bridge carrying U.S. Highway 169 over Platte River. (U.S. Geological Survey)
RM9	835.53	Standard tablet in concrete post, 27 feet west of center of County Road MM, 3 feet east of fence, 20 feet south of T fence west, 610 feet south from T road west in south part of Agency, Missouri.
RM10	921.12	A chiseled square at southwest corner of west concrete pier of main span of the Atchison, Topeka and Santa Fe Railway bridge over Platte River.
RM11	885.05	Standard tablet in concrete post, 442 feet west of junction of County Highway H and gravel road, 32 feet north of center of County Highway H, 2 miles east, and 0.3 mile south of Agency, Missouri.
RM12	930.03	A boat spike in the west side of a telephone pole 0.30 foot above the ground, on east side of highway at junction of County Highway H and County Road MM.
RM13	829.29	A chiseled square on top of concrete retaining wall at the southwest corner of County Road MM bridge over Rock Creek, 0.80 foot above bridge floor.
RM14	849.56	Top of bolt on north side of 3-foot steel pier, 21 feet south and 7 feet west of north end of steel and wood bridge 1.1 miles south of Agency, Missouri.
RM15	846.91	A chiseled square at top of concrete headwall of concrete box culvert on County Road S 10E over a large creek, 1400 feet south from intersection with County Highway H.
RM16	854.31	A boat spike, 0.20 foot above the ground, in the west side of a power pole on the east side of north and south gravel road and 125 feet south of turn to west.

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	ZONE B
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
AUGUST 1, 1978

FLOOD HAZARD BOUNDARY MAP REVISIONS:

FLOOD INSURANCE RATE MAP EFFECTIVE:
AUGUST 1, 1978

FLOOD INSURANCE RATE MAP REVISIONS:
August 1, 1983; to change Corporate Limits, to add new Special Flood Hazard Areas, to add Zone Designations, to add Base Flood Elevations, to add Streets, and to reduce Special Flood Hazard Areas.

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

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

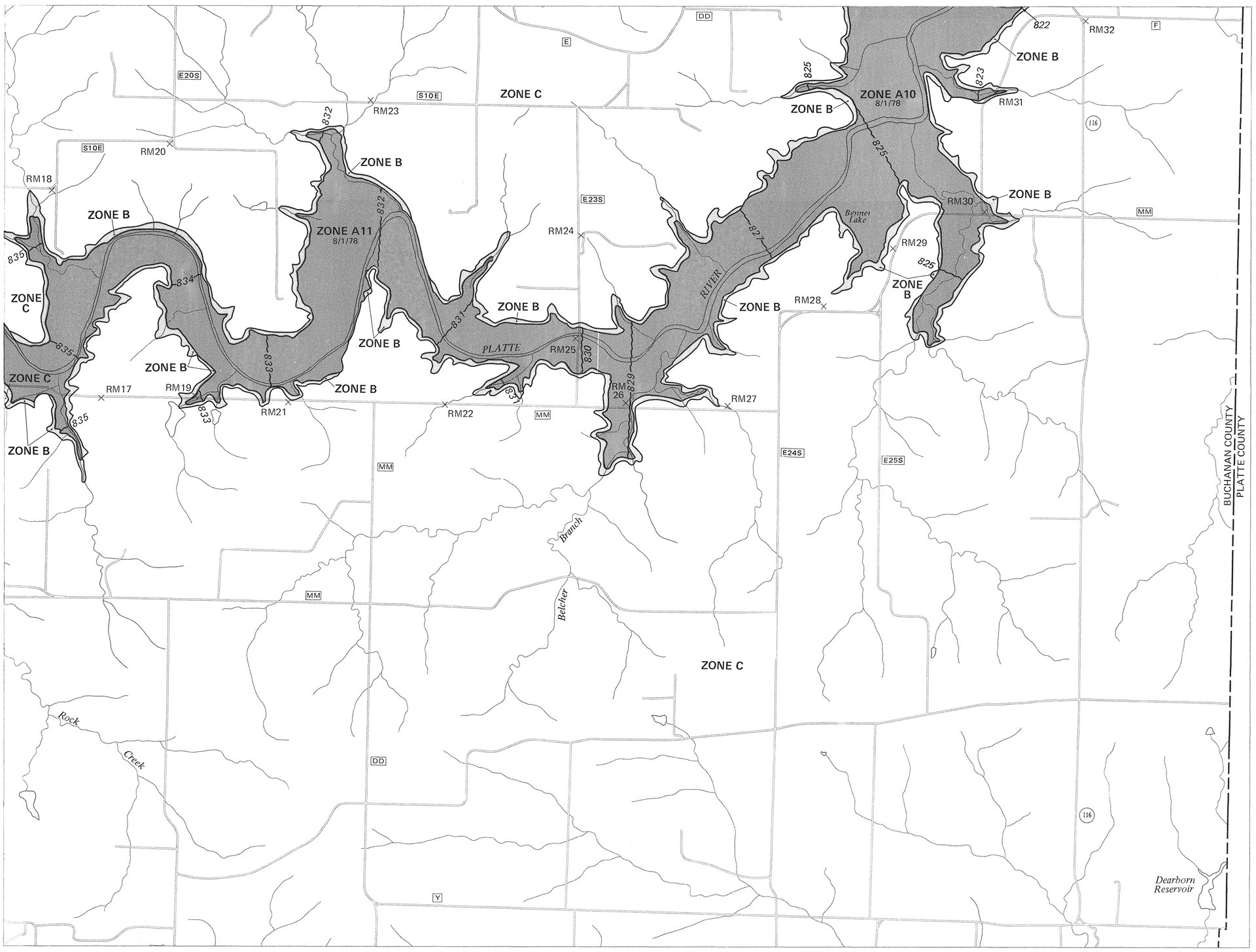
BUCHANAN COUNTY, MISSOURI
UNINCORPORATED AREA

PANEL 40 OF 125
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
290040 0040 B

MAP REVISED:
AUGUST 1, 1983

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM17	874.71	A boat spike, 0.20 foot above the ground, in the northeast side of a telephone pole on the west side of north and south gravel road.
RM18	861.18	A boat spike, 0.10 foot above the ground, in north side of telephone poles at the northwest corner of County Road S 10E and an east-west road.
RM19	828.70	A boat spike, 0.20 foot above the ground, in the west side of a power transformer pole, on the east side of a north and south gravel road, 150 feet west of abandoned farm house.
RM20	903.07	A boat spike, 0.30 foot above the ground, in the southeast side of a power pole, at the northwest corner of intersection of County Roads E 20S and S 10E.
RM21	835.57	A boat spike, 0.20 foot above the ground, in the east side of telephone pole on the west side of north-south gravel road.
RM22	848.42	A chiseled square on top of center of the west concrete headwall for a 30-inch concrete drain pipe under County Road MM.
RM23	849.30	A boat spike, 0.30 foot above the ground, in the west side of a transformer power pole, on the east side of a north-south gravel road across from a rock quarry.
RM24	900.74	A chiseled square on southwest corner of south concrete headwall for an 18-inch reinforced concrete pipe under County Road E 23S.
RM25	827.34	A chiseled square on the northeast corner of riverward edge of steel I-beam seat on the west end of steel 2.5 feet below bridge floor on the west end of steel County Road 235 bridge over Platte River, 2.5 feet below bridge floor.
RM26	819.28	A chiseled square on the northeast corner of the east headwall of concrete box culvert on County Road MM over Belcher Branch.
RM27	844.73	A chiseled square on the southeast corner of the east headwall of concrete box culvert on County Road MM.
RM28	856.21	A boat spike, 0.20 foot above ground, in the west side of a telephone pole on the east side of County Road MM.
RM29	839.97	A chiseled cross on top of north end of 18-inch corrugated metal pipe on County Road MM, approximately 140 feet southeast of farm drive north.
RM30	818.90	A chiseled square on the south end of east headwall of concrete box culvert on County Road MM.
RM31	827.01	A chiseled square on the west corner of concrete box culvert on the southwest side of gravel road.
RM32	914.61	A boat spike in the west side of a power pole at the southwest corner of intersection of State Highway 116 and County Road F.

KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary

ZONE B
ZONE A1 DATE
ZONE A5 DATE
ZONE B

Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7 ×

River Mile — • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION
AUGUST 1, 1978

CONVERSION TO REGULAR PROGRAM
AUGUST 1, 1978

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

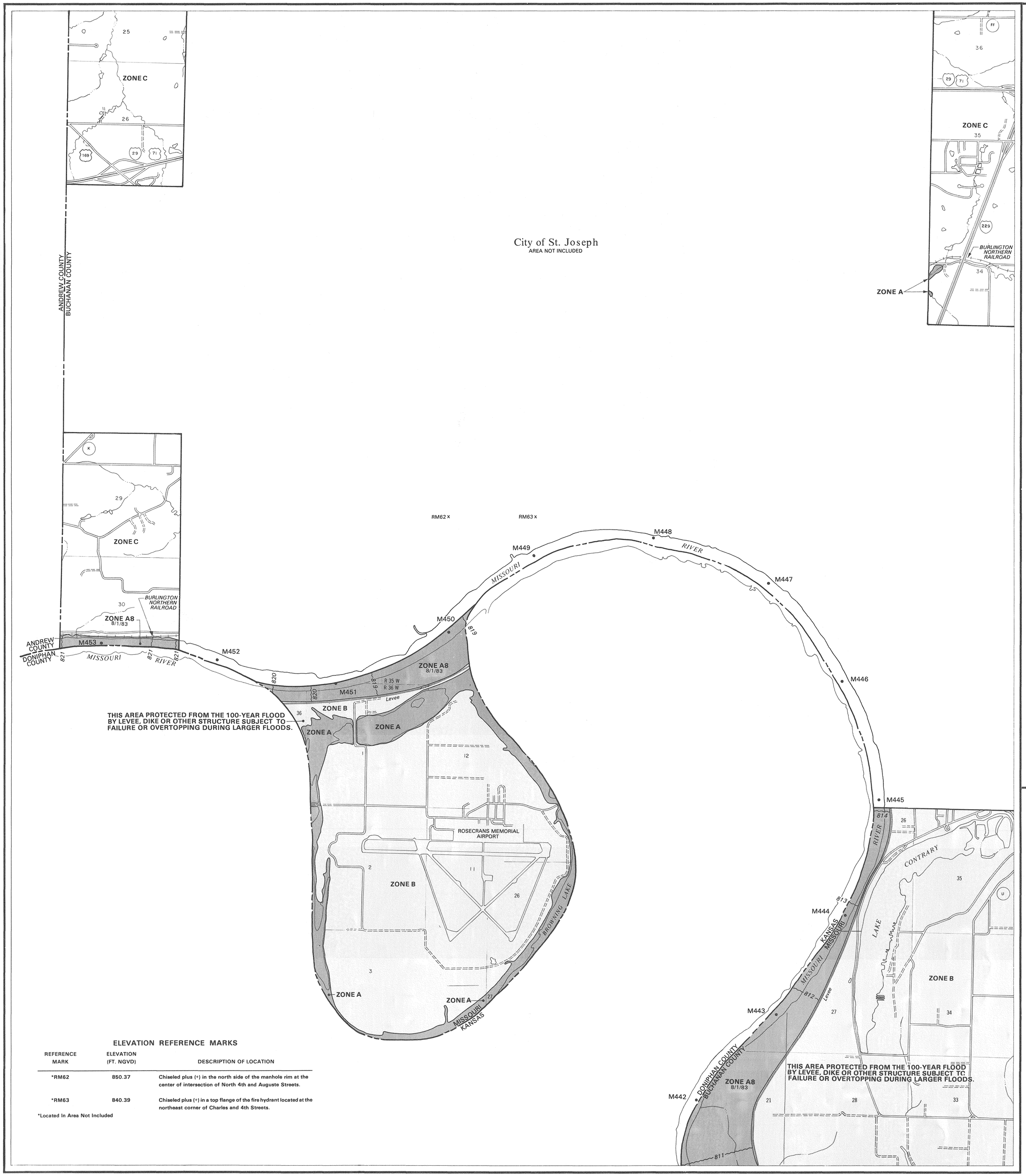
BUCHANAN COUNTY, MISSOURI
(UNINCORPORATED AREAS)

COMMUNITY-PANEL NUMBER
290040 0045 A

PAGE 45 OF 150
(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE
AUGUST 1, 1978

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
*RM62	850.37	Chiseled plus (+) in the north side of the manhole rim at the center of intersection of North 4th and Auguste Streets.
*RM63	840.39	Chiseled plus (+) in a top flange of the fire hydrant located at the northeast corner of Charles and 4th Streets.

*Located In Area Not Included

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	ZONE B
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A1 / ZONE A5
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
AUGUST 1, 1978

FLOOD HAZARD BOUNDARY MAP REVISIONS:

FLOOD INSURANCE RATE MAP EFFECTIVE:
AUGUST 1, 1978

FLOOD INSURANCE RATE MAP REVISIONS:
August 1, 1983; to change Corporate Limits, to add new Special Flood Hazard Areas, to add Zone Designations, to add Base Flood Elevations, and to add Streets.

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

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

BUCHANAN COUNTY, MISSOURI
UNINCORPORATED AREA

PANEL 75 OF 125
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
290040 0075 B

MAP REVISED:
AUGUST 1, 1983

Federal Emergency Management Agency

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	ZONE B
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7 ×
River Mile	• M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION
AUGUST 1, 1978

CONVERSION TO REGULAR PROGRAM
AUGUST 1, 1978

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE
1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

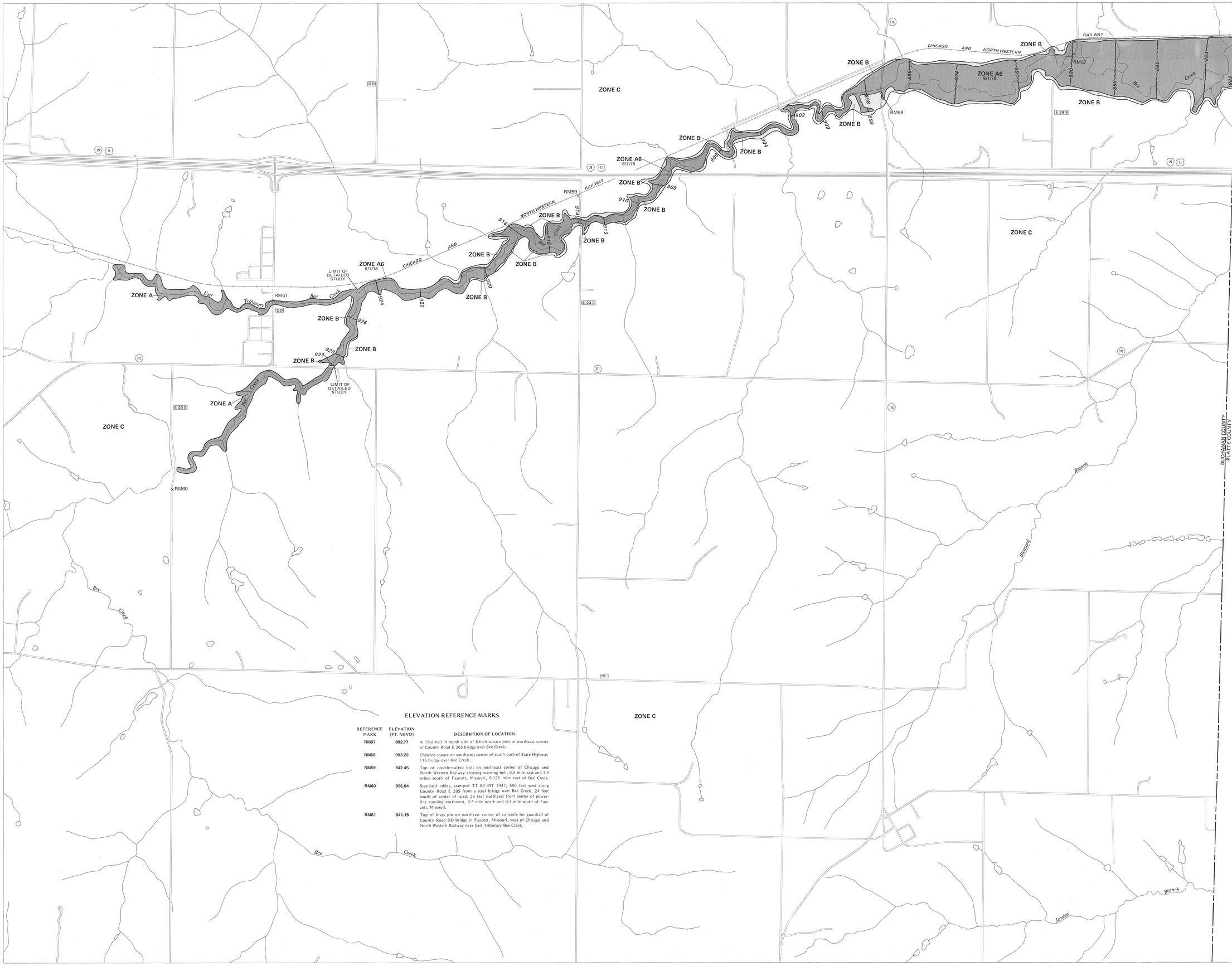
BUCHANAN COUNTY, MISSOURI
(UNINCORPORATED AREAS)

COMMUNITY-PANEL NUMBER
290040 0080 A

PAGE 80 OF 150
(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE
AUGUST 1, 1978

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM57	892.77	A 16-d nail in north side of 6-inch square post at northeast corner of County Road E 26S bridge over Bee Creek.
RM58	903.22	Chiseled square on southwest corner of south curb of State Highway 116 bridge over Bee Creek.
RM59	942.45	Top of double-nutted bolt on northeast corner of Chicago and North Western Railway crossing warning bell, 0.5 mile east and 1.5 miles south of Faucett, Missouri, 0.125 mile east of Bee Creek.
RM60	956.94	Standard tablet, stamped TT 80 MT 1947, 600 feet west along County Road E 20S from a steel bridge over Bee Creek, 24 feet south of center of road, 26 feet northeast from center of power-line running northwest, 0.5 mile north and 0.5 mile south of Faucett, Missouri.
RM61	941.15	Top of brass pin on northeast corner of concrete for guardrail of County Road DD bridge in Faucett, Missouri, west of Chicago and North Western Railway over East Tributary Bee Creek.

KEY TO MAP

500-Year Flood Boundary → ZONE B
100-Year Flood Boundary →
Zone Designations* With Date of Identification e.g., 12/2/74 → ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary →
500-Year Flood Boundary → ZONE B

Base Flood Elevation Line With Elevation In Feet** — 513 —

Base Flood Elevation In Feet Where Uniform Within Zone** (EL 987)

Elevation Reference Mark RM7 ×

River Mile • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION
AUGUST 1, 1978

CONVERSION TO REGULAR PROGRAM
AUGUST 1, 1978

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE
1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

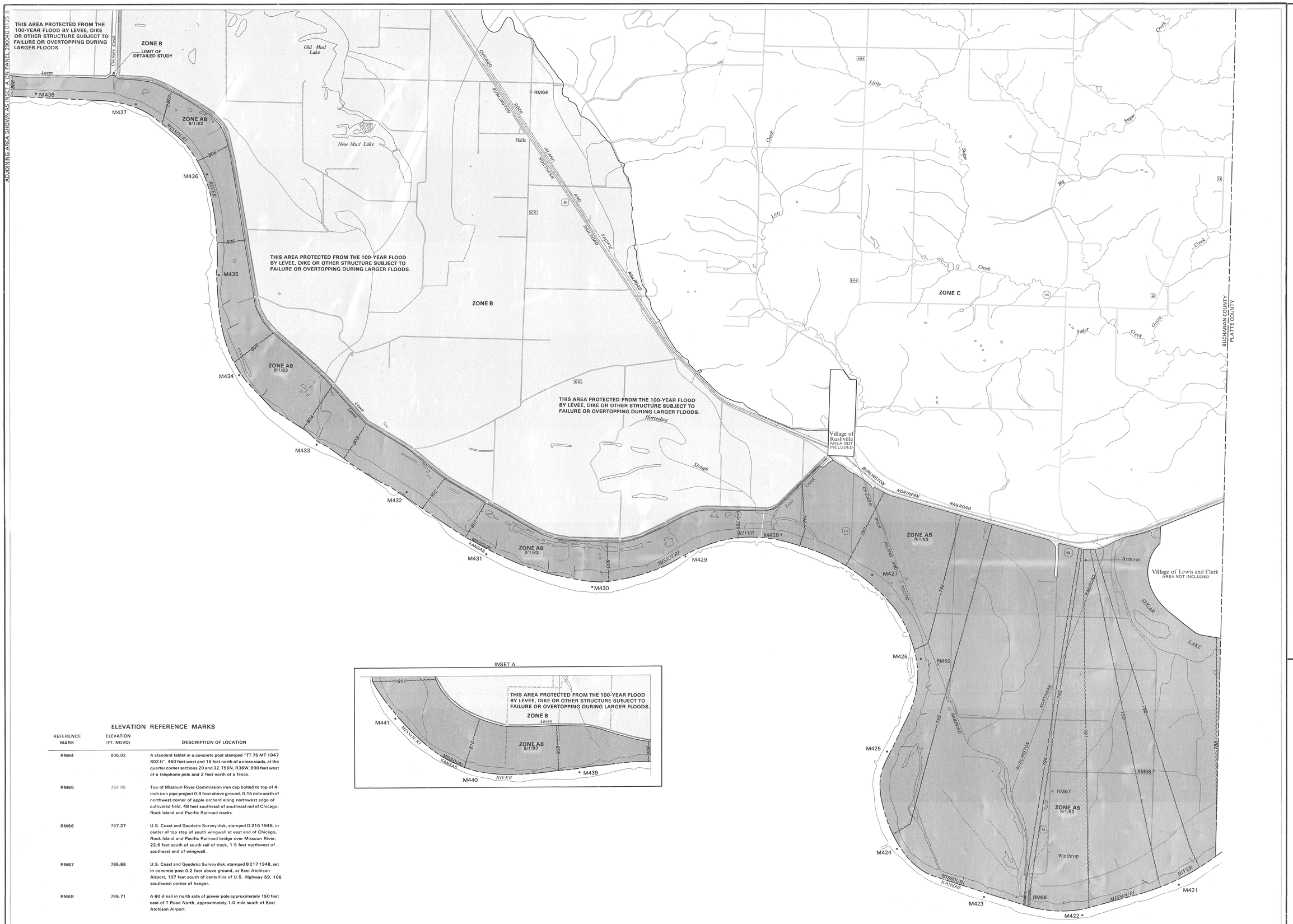
BUCHANAN COUNTY, MISSOURI
(UNINCORPORATED AREAS)

COMMUNITY-PANEL NUMBER
290040 0085 A

PAGE 85 OF 150
(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE
AUGUST 1, 1978

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM64	806.02	A standard tablet in a concrete post stamped "TT 75 MT 1947 803 ft", 460 feet west and 15 feet north of a cross roads, at the quarter corner sections 29 and 32, T56N, R36W, 890 feet west of a telephone pole and 2 feet north of a fence.
RM65	792.06	Top of Missouri River Commission iron cap bolted to top of 4-inch iron pipe project 0.4 foot above ground, 0.15 mile north of northwest corner of apple orchard along northwest edge of cultivated field, 48 feet southeast of southeast rail of Chicago, Rock Island and Pacific Railroad tracks.
RM66	797.27	U.S. Coast and Geodetic Survey disk, stamped D 216 1948, in center of top step of south wingwall at east end of Chicago, Rock Island and Pacific Railroad bridge over Missouri River, 22.6 feet south of south rail of track, 1.5 feet northwest of southeast end of wingwall.
RM67	785.68	U.S. Coast and Geodetic Survey disk, stamped B 217 1948, set in concrete post 0.2 foot above ground, at East Atchison Airport, 107 feet south of centerline of U.S. Highway 59, 106 southwest corner of hanger.
RM68	786.71	A 60-d nail in north side of power pole approximately 150 feet east of T Road North, approximately 1.0 mile south of East Atchison Airport.

KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary
ZONE B / ZONE A1 DATE / ZONE A5 DATE / ZONE B
Base Flood Elevation Line With Elevation In Feet** — 513
Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)
Elevation Reference Mark — RM7x
Zone D Boundary
River Mile — •M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
AUGUST 1, 1978

FLOOD HAZARD BOUNDARY MAP REVISIONS:

FLOOD INSURANCE RATE MAP EFFECTIVE:
AUGUST 1, 1978

FLOOD INSURANCE RATE MAP REVISIONS:
August 1, 1983: to change Corporate Limits, to add new Special Flood Hazard Areas, to add Zone Designations, to add Base Flood Elevations, and to add Streets.

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

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

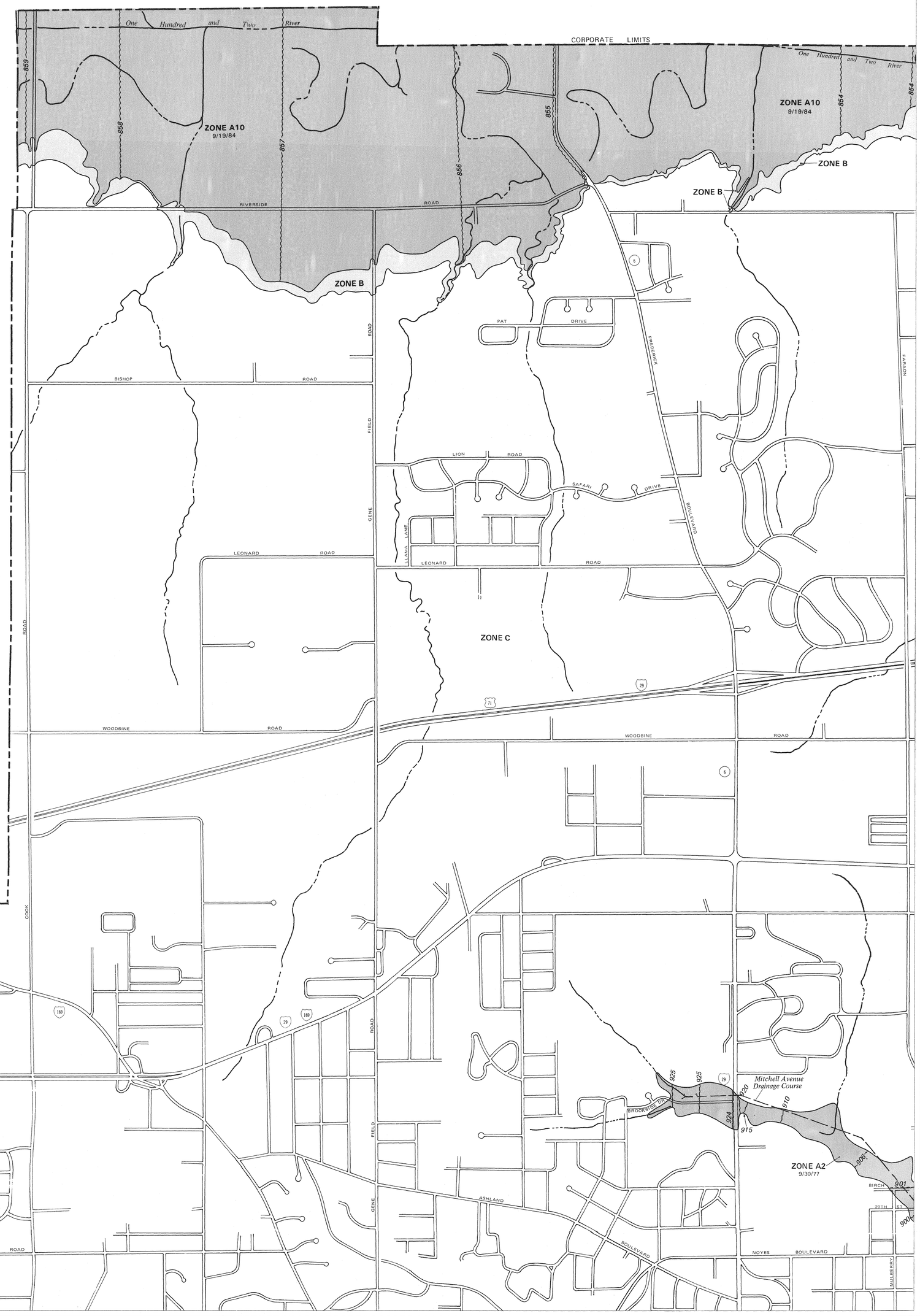
BUCHANAN COUNTY, MISSOURI
UNINCORPORATED AREA

PANEL 125 OF 125
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
290040 0125 B

MAP REVISED:
AUGUST 1, 1983

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM15	954.91	Chiseled plus (+) in the north side of the manhole rim at Northridge and La Vina Drives.
*RM19	931.44	Standard tablet set in a concrete post and stamped 18 JHR 1969, 4.0 miles south and 3.0 miles west of Cosby, 22 feet west and 0.7 foot north of fence corner, 54 feet west of State Highway W, 27 feet south and 1.5 feet higher than Cook Road.
*RM20	936.59	A chiseled square approximately 2.0 miles north of tablet, 2360 feet north along County Road W from intersection with County Road 6, 18 feet south, 18 feet east and 1.0 foot lower than road at drive east, in the east stone headwall of a culvert at the bend.
*RM21	947.78	A chiseled square approximately 1.0 mile north along gravel road from tablet, 2620 feet south along County Road W from intersection with County Road 6, southwest of curve in northeast road, 57 feet north, 15 feet east, and 3.1 feet lower than drive south at fence west, on the east concrete and stone headwall of a culvert, at the south edge of angle in headwall.

*Located Outside Corporate Limits

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	ZONE B
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Map Index.

INITIAL IDENTIFICATION:
JUNE 7, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 10, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 30, 1977

FLOOD INSURANCE RATE MAP REVISIONS:
Map revised September 19, 1984 to change special flood hazard area and zone designations, add base flood elevations; and reflect revised FEMA title block.

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

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

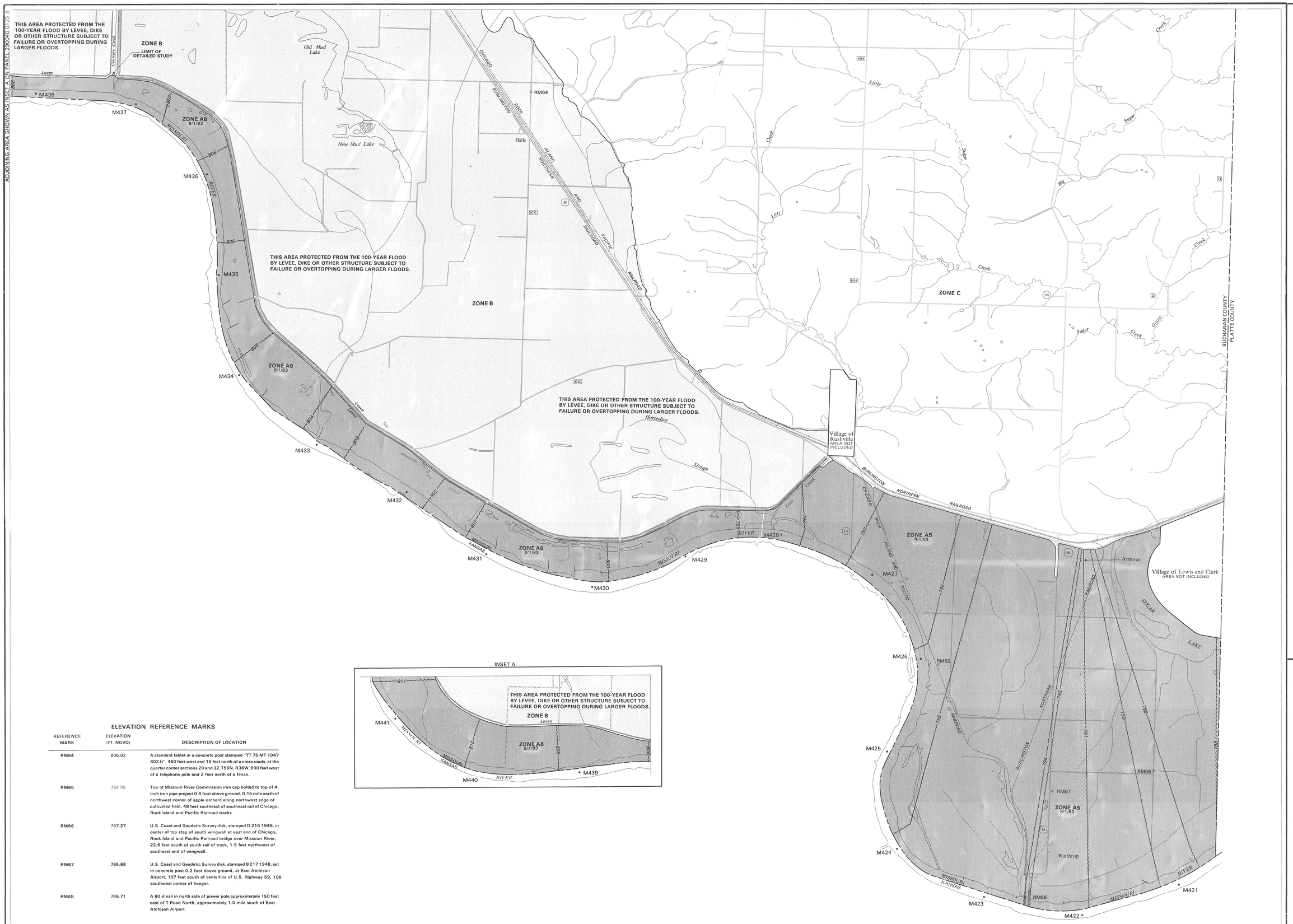
CITY OF ST. JOSEPH, MISSOURI
BUCHANAN COUNTY

PANEL 5 OF 20

COMMUNITY-PANEL NUMBER
290043 0005 C

MAP REVISED:
SEPTEMBER 19, 1984

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM64	806.02	A standard tablet in a concrete post stamped "TT 75 MT 1947 803 ft", 460 feet west and 15 feet north of a cross roads, at the quarter corner sections 29 and 32, T56N, R36W, 890 feet west of a telephone pole and 2 feet north of a fence.
RM65	792.06	Top of Missouri River Commission iron cap bolted to top of 4-inch iron pipe project 0.4 foot above ground, 0.15 mile north of northwest corner of apple orchard along northwest edge of cultivated field, 48 feet southeast of southeast rail of Chicago, Rock Island and Pacific Railroad tracks.
RM66	797.27	U.S. Coast and Geodetic Survey disk, stamped D 216 1948, in center of top step of south wingwall at east end of Chicago, Rock Island and Pacific Railroad bridge over Missouri River, 22.6 feet south of south rail of track, 1.5 feet northwest of southeast end of wingwall.
RM67	785.68	U.S. Coast and Geodetic Survey disk, stamped B 217 1948, set in concrete post 0.2 foot above ground, at East Atchison Airport, 107 feet south of centerline of U.S. Highway 59, 106 southwest corner of hanger.
RM68	786.71	A 60-d nail in north side of power pole approximately 150 feet east of T Road North, approximately 1.0 mile south of East Atchison Airport.

KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary
ZONE B / ZONE A1 DATE / ZONE A5 DATE / ZONE B
Base Flood Elevation Line With Elevation In Feet** — 513
Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)
Elevation Reference Mark — RM7x
Zone D Boundary
River Mile — •M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
AUGUST 1, 1978

FLOOD HAZARD BOUNDARY MAP REVISIONS:

FLOOD INSURANCE RATE MAP EFFECTIVE:
AUGUST 1, 1978

FLOOD INSURANCE RATE MAP REVISIONS:
August 1, 1983: to change Corporate Limits, to add new Special Flood Hazard Areas, to add Zone Designations, to add Base Flood Elevations, and to add Streets.

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

APPROXIMATE SCALE
2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

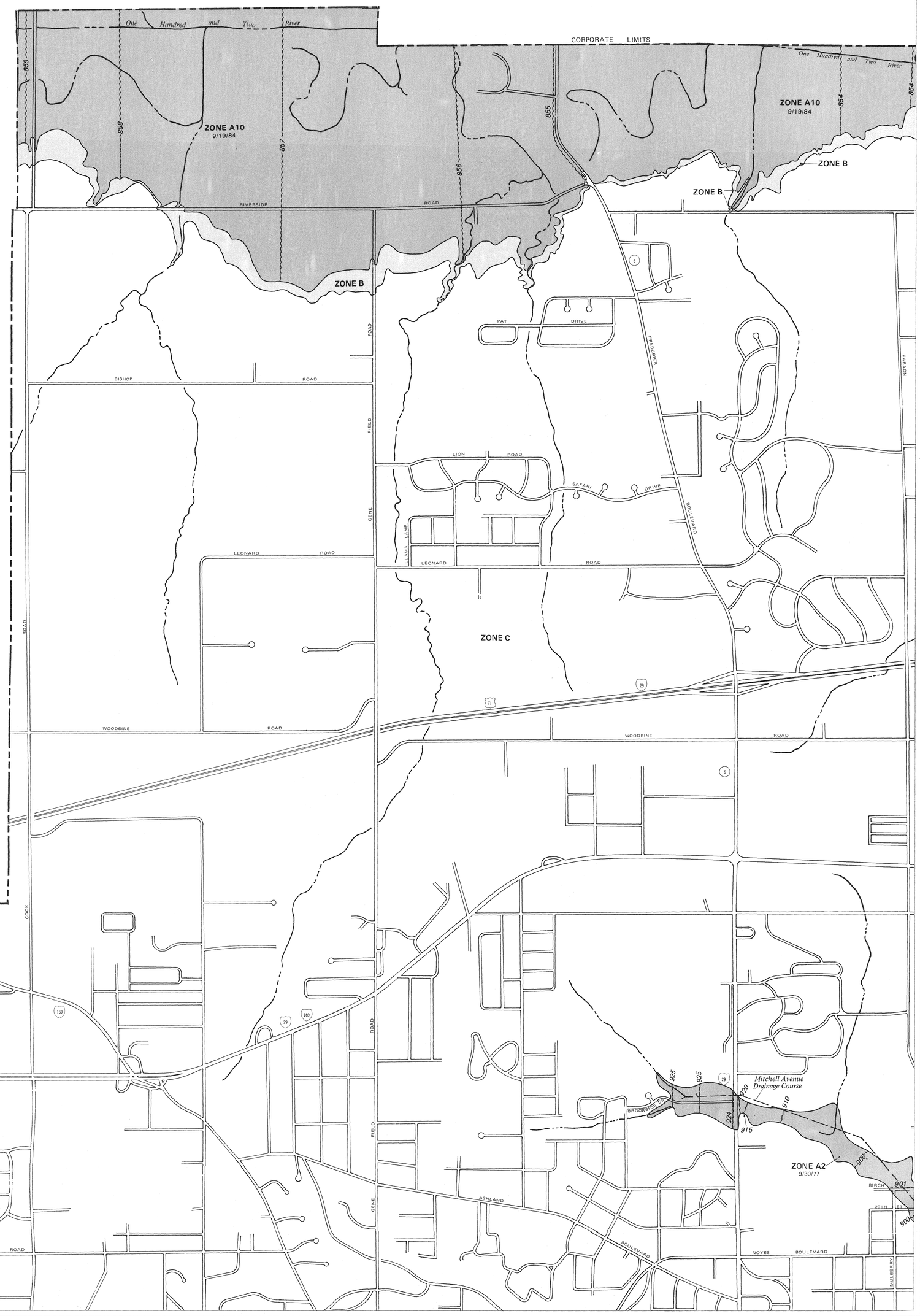
BUCHANAN COUNTY, MISSOURI
UNINCORPORATED AREA

PANEL 125 OF 125
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
290040 0125 B

MAP REVISED:
AUGUST 1, 1983

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM15	954.91	Chiseled plus (+) in the north side of the manhole rim at Northridge and La Vina Drives.
*RM19	931.44	Standard tablet set in a concrete post and stamped 18 JHR 1969, 4.0 miles south and 3.0 miles west of Cosby, 22 feet west and 0.7 foot north of fence corner, 54 feet west of State Highway W, 27 feet south and 1.5 feet higher than Cook Road.
*RM20	936.59	A chiseled square approximately 2.0 miles north of tablet, 2360 feet north along County Road W from intersection with County Road 6, 18 feet south, 18 feet east and 1.0 foot lower than road at drive east, in the east stone headwall of a culvert at the bend.
*RM21	947.78	A chiseled square approximately 1.0 mile north along gravel road from tablet, 2620 feet south along County Road W from intersection with County Road 6, southwest of curve in northeast road, 57 feet north, 15 feet east, and 3.1 feet lower than drive south at fence west, on the east concrete and stone headwall of a culvert, at the south edge of angle in headwall.

*Located Outside Corporate Limits

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	ZONE B
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Map Index.

INITIAL IDENTIFICATION:
JUNE 7, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 10, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 30, 1977

FLOOD INSURANCE RATE MAP REVISIONS:
Map revised September 19, 1984 to change special flood hazard area and zone designations, add base flood elevations; and reflect revised FEMA title block.

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

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

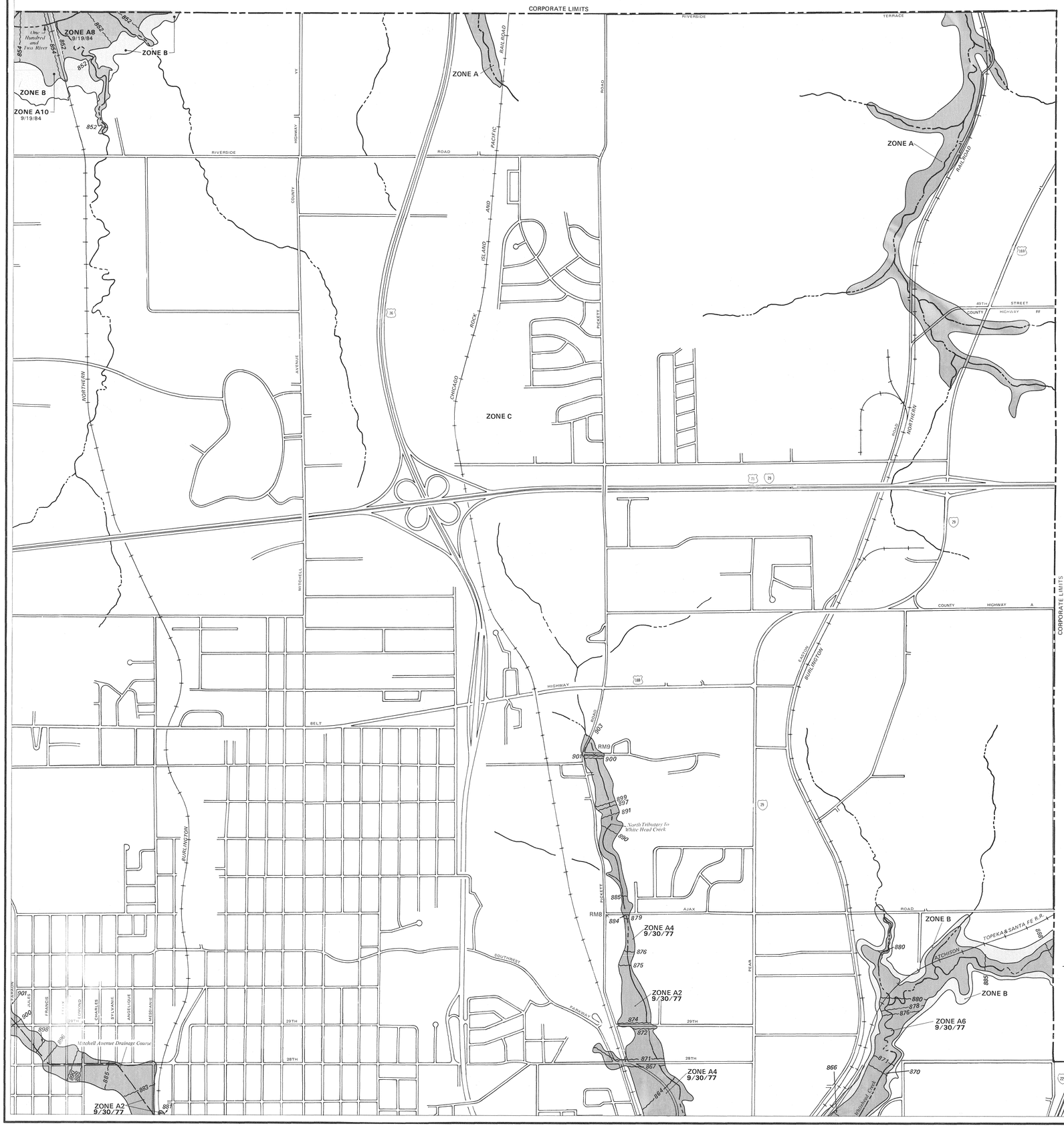
CITY OF ST. JOSEPH, MISSOURI
BUCHANAN COUNTY

PANEL 5 OF 20

COMMUNITY-PANEL NUMBER
290043 0005 C

MAP REVISED:
SEPTEMBER 19, 1984

Federal Emergency Management Agency



KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1 DATE / ZONE A5 DATE
Zone Designations* With Date of Identification e.g., 12/2/74	
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Map Index.

INITIAL IDENTIFICATION:
JUNE 7, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 10, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 30, 1977

FLOOD INSURANCE RATE MAP REVISIONS:

Map revised September 19, 1984 to change special flood hazard area and zone designations, add base flood elevations, and reflect revised FEMA title block.

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM8	892.84	Chiseled plus (+) on the bottom flange bolt of the fire hydrant located on the southsouthwest corner at the intersection of Pickett Road and Ajax Road.
RM9	899.21	Chiseled plus (+) at the south end of the west concrete headwall of the culvert under 36th Street Place, approximately 200 feet south of Pickett Road.

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

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

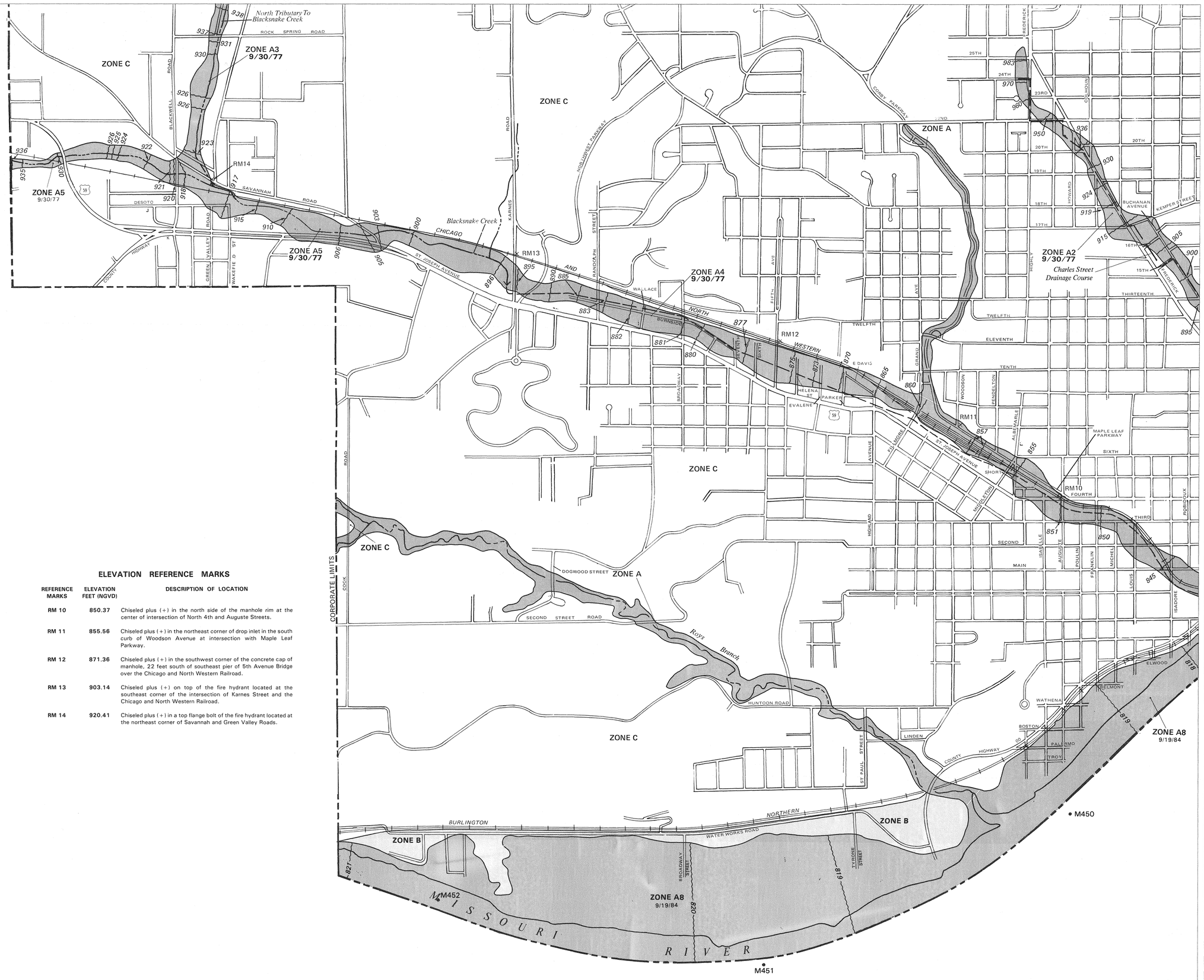
CITY OF ST. JOSEPH, MISSOURI
BUCHANAN COUNTY

PANEL 10 OF 20

COMMUNITY-PANEL NUMBER
290043 0010 C

MAP REVISED:
SEPTEMBER 19, 1984

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARKS	ELEVATION FEET (NGVD)	DESCRIPTION OF LOCATION
RM 10	850.37	Chiseled plus (+) in the north side of the manhole rim at the center of intersection of North 4th and Auguste Streets.
RM 11	855.56	Chiseled plus (+) in the northeast corner of drop inlet in the south curb of Woodson Avenue at intersection with Maple Leaf Parkway.
RM 12	871.36	Chiseled plus (+) in the southwest corner of the concrete cap of manhole, 22 feet south of southeast pier of 5th Avenue Bridge over the Chicago and North Western Railroad.
RM 13	903.14	Chiseled plus (+) on top of the fire hydrant located at the southeast corner of the intersection of Karnes Street and the Chicago and North Western Railroad.
RM 14	920.41	Chiseled plus (+) in a top flange bolt of the fire hydrant located at the northeast corner of Savannah and Green Valley Roads.

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1 DATE / ZONE A5 DATE
Zone Designations* With Date of Identification e.g., 12/2/74	
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation In Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Map Index.

INITIAL IDENTIFICATION:
JUNE 7, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 10, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 30, 1977

FLOOD INSURANCE RATE MAP REVISIONS:
Map revised September 19, 1984 to change special flood hazard area, zone designations, and base flood elevations, and reflect revised FEMA title block.

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

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF ST. JOSEPH, MISSOURI
BUCHANAN COUNTY

PANEL 15 OF 20

COMMUNITY-PANEL NUMBER
290043 0015 C

MAP REVISED:
SEPTEMBER 19, 1984

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM1	844.72	U.S. Coast & Geodetic Survey (USC &GS) bench mark H217. Standard disk set in north end of east abutment to U.S. Highway 36 bridge over the Missouri River, about 250 feet west of 4th Street, 17 feet north of highway centerline and 0.9 foot south of top end of the abutment.
RM2	851.14	Chiseled plus (+) on southwest corner of drop inlet in the north curb of Mitchell Avenue, approximately 100 feet east of 15th Street.
RM3	883.45	USC & GS bench mark. Standard disk stamped V-72-1935, set in the north end of the east concrete abutment of the Burlington Northern Railroad bridge over 26th Street.
RM4	836.02	Chiseled plus (+) in the top of the northeast end of the concrete headwall at the inlet of the storm sewer near the 6th Street overpass of the Burlington Northern Railroad.
RM5	893.04	Chiseled plus (+) on the bottom flange bolt of the fire hydrant located on the southwest corner at the intersection of 11th Street Road and 17th Street.
RM6	922.27	Chiseled plus (+) on the bottom flange bolt of the fire hydrant located on the southeast corner at the intersection of 22nd Street and Center Drive.
RM7	856.09	USC & GS bench mark. Standard disk stamped Z72, set in the top of a concrete light tower footing located between the railroad tracks under the Southwest Parkway overpass south of the intersection of Garfield and 19th Streets.
RM16	833.46	Chiseled plus (+) in a top flange bolt of the fire hydrant located at the northwest corner of Carnegie and Alabama Streets.
RM17	389.70	Chiseled plus (+) in rim of the manhole located at the southwest corner of 8th and Mason Streets.
RM18	340.39	Chiseled plus (+) in a top flange of the fire hydrant located at the northeast corner of Charles and 4th Streets.

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1 DATE
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A5 DATE
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Map Index.

INITIAL IDENTIFICATION:
JUNE 7, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 10, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 30, 1977

FLOOD INSURANCE RATE MAP REVISIONS:

Map revised September 19, 1984 to change zone designations and base flood elevations and to reflect revised FEMA title block.

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

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF ST. JOSEPH, MISSOURI
BUCHANAN COUNTY

PANEL 20 OF 20

COMMUNITY-PANEL NUMBER
290043 0020 C

MAP REVISED:
SEPTEMBER 19, 1984

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM1	844.72	U.S. Coast & Geodetic Survey (USC &GS) bench mark H217. Standard disk set in north end of east abutment to U.S. Highway 36 bridge over the Missouri River, about 250 feet west of 4th Street, 17 feet north of highway centerline and 0.9 foot south of top end of the abutment.
RM2	851.14	Chiseled plus (+) on southwest corner of drop inlet in the north curb of Mitchell Avenue, approximately 100 feet east of 15th Street.
RM3	883.45	USC & GS bench mark. Standard disk stamped V-72-1935, set in the north end of the east concrete abutment of the Burlington Northern Railroad bridge over 26th Street.
RM4	836.02	Chiseled plus (+) in the top of the northeast end of the concrete headwall at the inlet of the storm sewer near the 6th Street overpass of the Burlington Northern Railroad.
RM5	893.04	Chiseled plus (+) on the bottom flange bolt of the fire hydrant located on the southwest corner at the intersection of 11th Street Road and 17th Street.
RM6	922.27	Chiseled plus (+) on the bottom flange bolt of the fire hydrant located on the southeast corner at the intersection of 22nd Street and Center Drive.
RM7	856.09	USC & GS bench mark. Standard disk stamped Z72, set in the top of a concrete light tower footing located between the railroad tracks under the Southwest Parkway overpass south of the intersection of Garfield and 19th Streets.
RM16	833.46	Chiseled plus (+) in a top flange bolt of the fire hydrant located at the northwest corner of Carnegie and Alabama Streets.
RM17	389.70	Chiseled plus (+) in rim of the manhole located at the southwest corner of 8th and Mason Streets.
RM18	340.39	Chiseled plus (+) in a top flange of the fire hydrant located at the northeast corner of Charles and 4th Streets.

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1 DATE
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A5 DATE
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Map Index.

INITIAL IDENTIFICATION:
JUNE 7, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
OCTOBER 10, 1975

FLOOD INSURANCE RATE MAP EFFECTIVE:
SEPTEMBER 30, 1977

FLOOD INSURANCE RATE MAP REVISIONS:

Map revised September 19, 1984 to change zone designations and base flood elevations and to reflect revised FEMA title block.

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

APPROXIMATE SCALE
800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF ST. JOSEPH, MISSOURI
BUCHANAN COUNTY

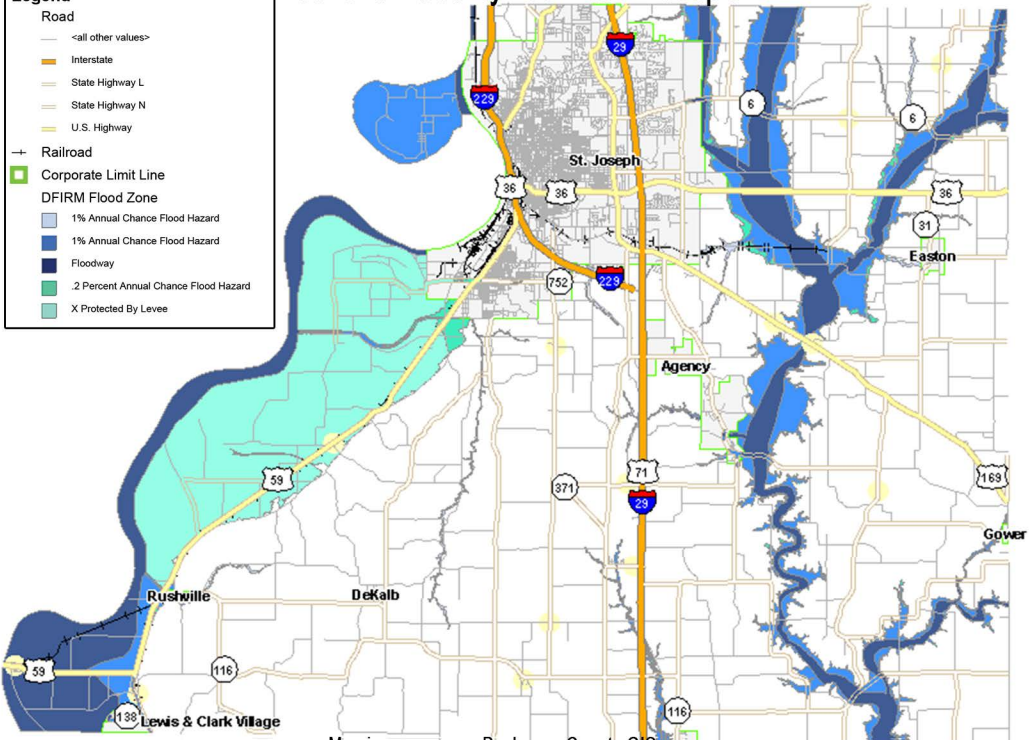
PANEL 20 OF 20

COMMUNITY-PANEL NUMBER
290043 0020 C

MAP REVISED:
SEPTEMBER 19, 1984

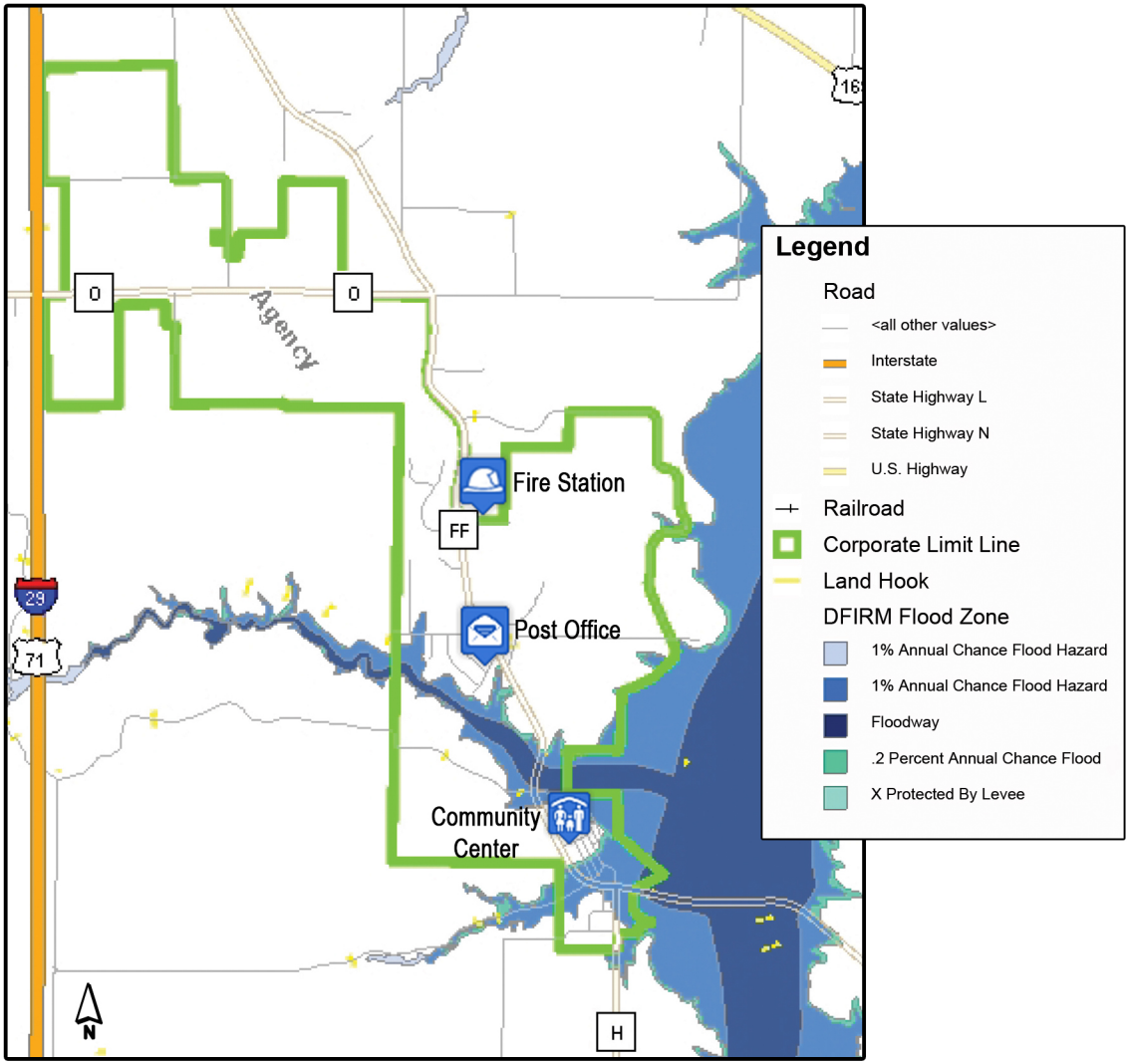
Federal Emergency Management Agency

Buchanan County 100-Year Floodplain



Map image source: Buchanan County GIS

Agency 100-Year Floodplain

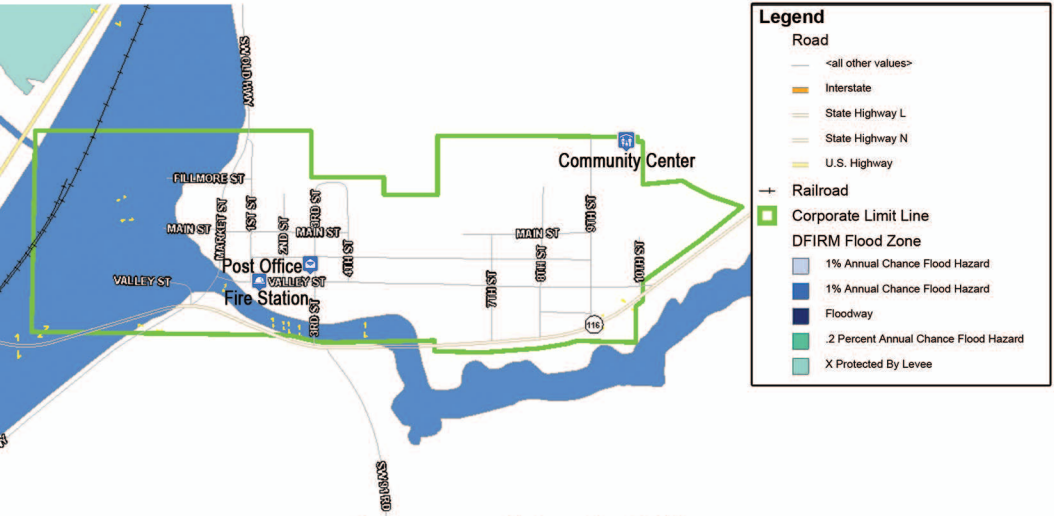


Map image source: Buchanan County GIS

Lewis and Clark Village 100-Year Floodplain

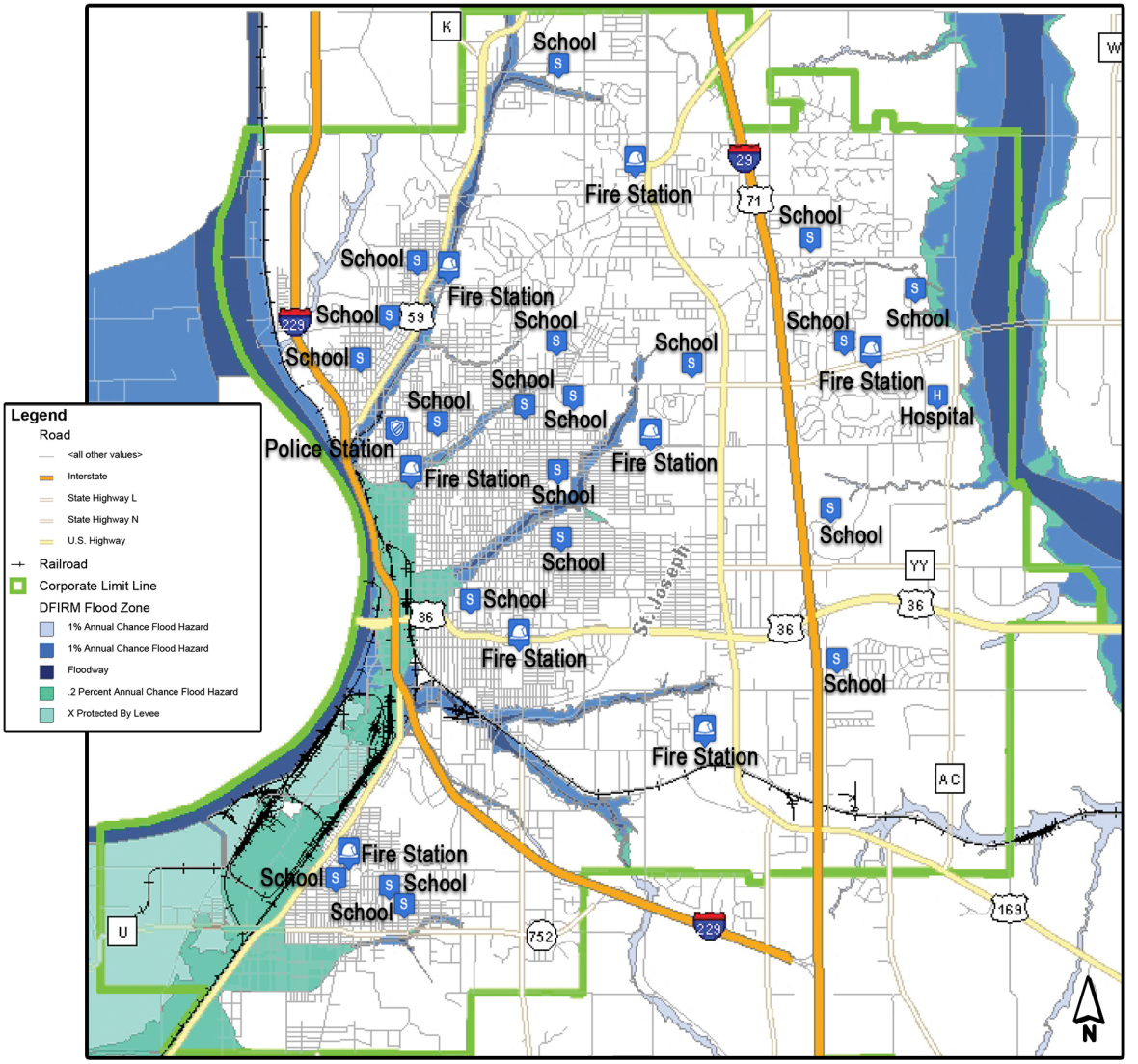
Map image source: Buchanan County GIS

Rushville 100-Year Floodplain



Map image source: Buchanan County GIS

City of St. Joseph 100-Year Floodplain



Map image source: Buchanan County GIS