

## 1.0 INTRODUCTION

### BACKGROUND

The *Jefferson County Hazard Mitigation Plan of 2018* is an update of the previously updated plan in 2013. Mitigation planning regulations mandate jurisdictions to update the Hazard Mitigation Plan every five years from the date of FEMA approval; this is essential for determining the effectiveness of programs, reflecting changes in the land development or programs affecting mitigation priorities. By updating the plan, local communities can also determine the strengths and weaknesses of the plan and what elements may need to be changed.

### PLAN AUTHORITY

In response to continuing large-scale federal outlays of disaster funds to states and communities, during the decade of the 1990's Congress passed the Disaster Mitigation Act of 2000 (DMA, 2K), which required counties to formulate a hazard mitigation plan in order to be eligible for mitigation funds made available by the Federal Emergency Management Agency (FEMA). Section 322 of the Robert T. Stafford Act requires that all states and local jurisdictions develop and submit Mitigation Plans designed to meet the criteria outlined in 44 CFR Parts 201 and 206.

### PURPOSE

The purpose of the mitigation plan is to identify risks and vulnerabilities from hazards that affect Jefferson County to prevent or reduce the loss of life and injury and to limit future damage costs by developing methods to mitigate or eliminate damage from various hazards.

### SCOPE

The *Jefferson County Hazard Mitigation Plan* follows a planning methodology that includes public involvement, a risk assessment for various identified hazards, an inventory of critical facilities and at-risk residential areas, a mitigation strategy for high-risk hazards, and a method to maintain and update the plan.

## UPDATES TO THIS PLAN

Where appropriate, each section in this plan includes a brief description of how the section was updated and improved since 2013.

## COMMUNITY RATING SYSTEM

Jefferson County is one of the five counties in West Virginia that participate in the Community Rating System (CRS), along with Berkeley, Hampshire, Morgan, and Putnam Counties. As such, this hazard mitigation plan follows the necessary steps for CRS planning. The following table illustrates how this hazard mitigation plan and CRS planning are cross-referenced with the regulatory guide and the corresponding section of this plan.

CROSS REFERENCE OF CORE REQUIREMENTS: HMP AND CRS			
<i>Local Mitigation Planning Handbook Task</i>	<i>CRS Planning Steps</i>	<i>Regulatory Guide</i>	<i>Corresponding Section(s) in This Plan</i>
Task 1: Determine the Planning area and Resources	Step 1: Organize		Section 1.0 Introduction
Task 2: Build the Planning Team		44 CFR §201.6 (b)(2) 44 CFR §201.6 (c)(1)	
Task 3: Create an Outreach Strategy	Step 2: Coordinate	44 CFR §201.6 (b)(2) 44 CFR §201.6 (b)(1) 44 CFR §201.6 (c)(4)(iii)	
Task 4: Review Community Capabilities	Step 3: Coordinate	44 CFR §201.6 (c)(3) 44 CFR §201.6 (c)(3)(ii) 44 CFR §201.6 (b)(3)	
Task 5: Conduct a Risk Assessment	Step 4: Assess the hazard	44 CFR §201.6 (c)(2)(iii)	Section 2.0 Risk Assessment
	Step 5: Assess the problem	44 CFR §201.6 (c)(2)(i) 44 CFR §201.6 (c)(2)(ii) 44 CFR §201.6 (d)(3)	
Task 6: Develop a Mitigation Strategy	Step 6: Set Goals	44 CFR §201.6 (c)(3)(i)	Section 3.0 Action Plan
	Step 7: Review possible activities	44 CFR §201.6 (c)(3)(ii) 44 CFR §201.6 (c)(3)(iii)	
	Step 8: Draft and action plan	44 CFR §201.6 (c)(4)(ii) 44 CFR §201.6 (d)(3)	
Task 7: Keep the Plan Current	Step 10: Implement, evaluate, revise	44 CFR §201.6 (c)(4)(i) 44 CFR §201.6 (c)(4)(iii)	Section 4: Plan Maintenance
Task 8: Review and Adopt the Plan	Step 9: Adopt the plan	44 CFR §201.6 (c)(5)	Section 5: Appendices
Task 9: Create a Safe and Resilient Community	Step 10: Implement, evaluate, revise		

## 1.1 THE PLANNING PROCESS

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:

§201.6(b) and  
§201.6(c)(1)

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- (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; and
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[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.

This plan was developed in accordance with Part 201.6 of Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000. Several resources were used during the development of the plan, including the United States Department of Homeland Security (USDHS or DHS) / Federal Emergency Management Agency's (FEMA) *Local Mitigation Planning Handbook* (USDHS/FEMA, 2013), the governing regulations in the Code of Federal Regulations.

### 1.1.1 Plan Update Process of 2018

This section describes the process by which Jefferson County updated the 2018 Jefferson County Hazard Mitigation Plan. With approval of the Jefferson County Commission, Jefferson County Homeland Security and Emergency Management (JCHSEM) contracted the services of JH Consulting, LLC (the consultant) and work began in February of 2018.

JCHSEM contacted the planning committee once again, which had been meeting annually throughout the previous five years, to come together and begin the update process. The committee held four in-person meetings and one teleconference call between February and May of 2018; however, the committee remained in constant contact with the consultant during that time.

The following table lists the committee members that participated; members represent a wide variety of agencies and organizations that came together to update the plan. These members completed a variety of tasks throughout the process, detailed in [Section 1.1.2 Committee Meetings](#). In the last column, the table indicates how the partner participated in the planning process. The numbers correspond to the following descriptions.

1. Attended at least one committee meeting.

2. Provided information to JCHSEM or the consultant directly via email or phone conversation.
3. Posted one or both of the online public surveys on their social media or website.
4. Completed one or all of the tasks during committee meetings.
5. Attended the public meeting.

COMMITTEE PARTICIPATION			
<i>Agency/Organization</i>	<i>Type</i>	<i>Representative(s)</i>	<i>Participation</i>
American Red Cross	Volunteer Organization	Clair Brendel	
City of Charles Town	Jurisdiction	Seth Rivard	
City of Ranson	Jurisdiction	Andy Blake	
City of Ranson Police Department	City Department	William Roper	
First Energy	Private Sector	Thomas Butcher	
Good Shepherd Inter-Faith	Private Sector	Paula Marrone-Reese	
Harpers Ferry National Historic Park	Government Organization	Ryan Levins	
Harpers Ferry Police Department	City Department	J.D. Brown	
Independent Fire Company	Town Department	Ed Smith	
JC Chamber of Commerce	County Government	John Sherwood	
JC Community Organizations Active in Disasters (COAD)	NGO	John Sherwood	
JC Emergency Communications	County Government	Jeff Polczynski	
JC Emergency Services Agency	County Government	Ed Hannon Monte Conner Allen Keyser	
JC Engineering Department	County Government	Mason Carter	
JC Planning and Zoning	County Government	Jennie Brockman	
JC Sheriff's Department	County Government	Pete Dougherty	
JC Homeland Security and Emergency Management	County Government	Steve Allen Brandon Vallee	
JC Development Authority	County Government	Matt Coffey Nicolas Diehl	
JC Health Department	County Government	Kaitlin Lacey	
JC Commission	County Government	Jane Tabb	
JC GIS	County Government	Jessica Gormont	
Jefferson County LEPC	Organization	John Sherwood	
Kent Cartridge	Private Sector	Alan Corzine Douglas Dockeney	
National Weather Service	Federal Department	Christopher Strong	
Region 9 Planning and Development Council		Bill Clark Matt Pennington	
Rep. Alex Mooney's Office	Federal Government	Stephen Smooth Chad Story	
Shepherd University	Education Sector	Holly Frye John McAvoy	
Shepherdstown Fire Department	City Department	Pete Kelley	
Shepherdstown Water	City Department	Frank Welch	
Town of Bolivar	Town Government	Jerry Powell	
US Fish and Wildlife Service	Federal Agency	Karin Christensen	
WV Health Department	State Department	Monica Whyte	
WVU Medicine	Private Sector	Donnie Grubb	

In addition to the previous, JCHSEM also provided the opportunity for other agencies and organizations to participate; however, these organizations did not attend meetings or calls.

- American Public University, education sector
- Bakertown Fire Company, town department
- Blue Ridge Fire Company, town department
- Charles Town Utilities, city department
- CSX, economic sector
- Friendship Fire Company, town department
- Harpers Ferry Water Works, city department
- Hollywood Casino, economic sector
- Jefferson County Board of Education, county agency
- Jefferson County Maintenance Department, county agency
- Jefferson County Public Service District, county agency
- Jefferson County Solid Waste Authority, county agency
- Middleway Fire Company, town department
- Nichols, Dehaven & Associates, economic sector
- Ox Paperboard, economic sector
- Snyder Environmental, economic sector
- Summit Point Raceway, economic sector
- USDA Job Corps, federal agency
- WV Department of Highways, state agency
- WV Division of Homeland Security and Emergency Management, state agency

Other stakeholders that participated by providing valuable information for the research of hazards included the following.

- WV Department of Agriculture, provided information on invasive species in WV
- WV Public Health District 3, provided data on reportable diseases in Jefferson County
- WV Division of Forestry, provided data on wildfires in Jefferson County

#### **1.1.2. Committee Meetings**

JCHSEM and the consultant scheduled four in-person meetings and one teleconference with the committee; each one covered a different topic. The following describes each meeting.

JEFFERSON COUNTY COMMITTEE MEETINGS			
<i>Meeting Date</i>	<i>Meeting Type</i>	<i>In Attendance</i>	<i>Topics</i>
Friday, February 23, 2018	In-Person	28	<ul style="list-style-type: none"> <li>• Brief overview of the hazard mitigation plan update process</li> <li>• Discussion about change in plan priorities</li> <li>• Update plan goals</li> <li>• Update asset list</li> <li>• Introduction to surveys</li> <li>• Tasks: <ul style="list-style-type: none"> <li>○ Updated assets</li> <li>○ Created goals</li> </ul> </li> </ul>
Tuesday, March 27, 2018	In-Person	25	<ul style="list-style-type: none"> <li>• Overview and approval of mitigation goals</li> <li>• Hazards discussion and changes</li> <li>• Future development</li> <li>• Introduction to new projects</li> <li>• Tasks: <ul style="list-style-type: none"> <li>○ Determined 2018 list of hazards</li> <li>○ Completed risk assessment matrix</li> <li>○ Described hazard experiences</li> </ul> </li> </ul>
Wednesday, April 18, 2018	In-Person	19	<ul style="list-style-type: none"> <li>• Review of Section 1.2 draft</li> <li>• New projects</li> <li>• Project prioritization criteria overview</li> <li>• Plan maintenance discussion</li> <li>• Scheduling of public meeting</li> <li>• Tasks: <ul style="list-style-type: none"> <li>○ Created new projects</li> </ul> </li> </ul>
Wednesday, April 25, 2018	Teleconference	10	<ul style="list-style-type: none"> <li>• Review and approval of projects for the plan</li> <li>• Discussion about status of 2013 projects</li> </ul>
Tuesday, May 1, 2018	In-Person		<ul style="list-style-type: none"> <li>• Review of draft</li> <li>• Project prioritization criteria</li> <li>• Scheduling of public meetings</li> <li>• Plan integration</li> <li>• Tasks: <ul style="list-style-type: none"> <li>○ Ranked criteria for project prioritization</li> </ul> </li> </ul>

### February 23, 2018 Meeting

The Jefferson County Director of Homeland Security and Emergency Management welcomed everyone to the meeting and briefly introduced the project. He then turned the meeting over to JH Consulting, the firm contracted to update the plan.

The consultant briefly reviewed the definition of mitigation and went over the different parts that integrate the hazard mitigation plan. During this initial introduction she also reviewed what was expected of the committee members throughout the process of the update. She presented a tentative schedule for the plan in which she outlined the different meetings, agenda items, and expected progress of the project. Delivery to the state is expected to occur in May.

The consultant posed two questions for discussion to the committee: why is mitigation important to you? And, how have your priorities for mitigation changed in the past five years?

After lunch, the committee transitioned to talking about the goals for the plan. The consultant presented a few examples of goals from the FEMA Local Mitigation Planning Handbook as a guide. The committee discussed the goals in three groups for around 20 minutes and at the end presented their findings to the entire group. As the committee members were giving their presentations, the consultant pulled themes and commonalities amongst the three groups and wrote them on a whiteboard for all to see.

The hazards that the committee was most concerned with included aging population, floods and flash floods, opioid use, transportation issues (ingress and egress), communication (infrastructure and personal), winter weather effects, power outages, and water (either too much [floods] or too little [droughts]). These would mainly be the hazards that the goals would address.

During the presentation, the spokespersons mentioned words that identified action goals such as: partner or build-up, educate or train, reduce, improve, mitigate, protect, and assess. These were then used to create goals that addressed the hazards. As a group, the committee came up with two clear goals that could address a variety of hazards and would mitigate them.

The consultant provided a brief overview of the surveys certain committee members needed to take: the NFIP and the capabilities survey online. As for public involvement, the consultant suggested an online survey made available to the public via social media and newsletters to garner public input about hazards.

#### March 27, 2018

First, the committee reviewed the goals they had set forth in the previous meeting and approved them. They recognized the potential to include several hazards and mitigation projects under each goal in different ways. This allowed the committee members to begin thinking about different projects they would like to include in this update cycle.

The main focus of the meeting was discussing and working through hazards. Initially, the consultant presented the list of hazards that were in the previous plan (dam failure, drought, earthquake, flooding, hazardous materials, landslide, land subsidence, severe thunderstorm and hail, severe wind and tornado, severe winter storm, terrorism, and wildfire) and the committee members verified that all these hazards were still relevant to the county. Members then began to express concerns about other hazards not included on the list. After some discussion and specific examples, the committee added public health crisis (including

pandemics, epidemics, and substance abuse), infestation, extreme temperatures (hot and cold), civil disturbance (active shooter, protests, and bomb threats) and urban fires.

The committee decided to rank the hazards by risk (low, medium-low, medium, medium-high, and high). If more than one hazard is listed under one category, they will then be listed alphabetically under the risk category.

Meeting attendees completed two activities relating to the hazards that they agreed upon. The first was completing a narrative of three to five instances of different hazards that they had experienced in the past five years, more if so needed. The second activity consisted of ranking all the hazards in a risk assessment matrix where the committee members listed the hazards under their perceived probability and severity. After the activity, the committee members compared their results and noted that some hazard rankings were similar in risk such as earthquakes, but others were ranked in three different risk categories, such as severe wind and tornado.

The consultant presented a summary of the results of the online public survey thus far; the committee members agreed with the public about the results. Generally, the public and the committee members had similar perspectives of the hazards in the county, giving validity to both the public opinion and the opinion of the committee members.

Being aware of and analyzing future development and development since the last plan update in the county is critical to the success of mitigation. The committee discussed specific locations of recent and future development such as residential buildings, road expansions, and industrial parks that will be included in the plan.

#### April 18, 2018

The committee members met for the third time on Wednesday, April 18 at the Jefferson County maintenance building to continue the update process of the hazard mitigation plan. The committee reviewed the draft of sections 1.2 Planning Area and 2.0 Risk Assessment that the consultant had sent them previously for their reference; the consultant explained the layout and content of the draft and answered some questions from the committee.

The consultant presented the results thus far of the second public survey regarding mitigation actions. The consultant briefly went over some relevant questions and data, but concentrated mainly on the questions that required comments. The consultant presented the comments to the committee members; for the most part the answers and comments from the survey were consistent with what they would have expected.



The committee completed worksheets regarding new projects they would like to include in the mitigation plan. The majority of projects focused on the need for more responder resources (equipment and personnel), education and awareness for the public, officials, and responders, and projects that address the public health crisis in the county, mainly substance abuse.

#### April 25, 2018

Members of the committee convened on Wednesday, April 25, 2018, via a teleconference to review, discuss, and approve the new mitigation projects they created at the last in-person meeting. The consultant presented the project list on the screen and briefly explained the process by which she had arrived at the specific list.

The consultant transcribed all the projects from the worksheets from the previous meeting and categorized them by theme. Some themes that arose included first responder resources, flood, violent disturbance, training and partnerships for agencies, training and education for the public, public health crisis, generators, shelters, landslide, dam failures, and fire prevention. Several people wrote very similar projects, so the consultant consolidated some projects cohesively. Committee members agreed to this during the call and had an opportunity to see examples.

The Region 9 PDC mentioned that they could assist the county in obtaining grants for flooding projects and that they could work together for this. One committee member expressed the need for a project relating to revisiting regulations for buffers along creeks, streams, and rivers.

Once the committee approved new projects, the consultant turned to the projects from the 2013 plan. The committee largely has updated the projects (or strategies as called in the previous plan) from the 2013 plan; they held annual meetings in which they reviewed each project and reported a status. JCHSEM would compile a report after each meeting with the updates. The latest was the 2017 report in which all the projects had a description of the status. Most of the projects were designated as complete, complete and ongoing, ongoing, or deleted. If projects are complete or deleted, they will not be included in this version of the plan. If the projects are complete and ongoing or ongoing, they will be included as projects for this plan update. The projects that did not have a clear status will also be included as ongoing projects.

#### May 1, 2018

During this meeting the consultant presented a rough draft of the entire plan to the committee. The consultant went through the document to review each section and indicate where more information was still needed for the plan. The consultant gave a brief update of the status of the public survey results; there were few new responses since the last meeting.

One major activity that the committee completed was the project prioritization criteria. Based on the discussion with the committee from previous meetings, the consultant created a list of criteria by which the committee scored the projects. Each member ranked the criteria according to what they considered to be most or least important utilizing a score of 1-15. Fifteen means the criterion was the most important and 1 meant the criteria had least importance.

The committee members compared their results at the end of the activity and found that some had placed a higher point on criteria that others scored lowest. The committee discussed their points of view and why they had given the points to each criterion. For the most part, the highest and lowest points given were most polarized, the middle points, most committee members tended to agree upon.

After concluding this activity, the committee members talked about different plans in which their organizations could include hazard mitigation principals and projects and vice versa. At first, some didn't think there could be a connection between their plans and hazard mitigation, but after some brief discussion and questions from the consultant, they could see how their plans had opportunities for integration.

The committee scheduled two public meetings for Tuesday, May 15, 2018; the first in the early afternoon, at 1:30 p.m., and the second in the evening, at 7:00 p.m., to attract as many people as possible. Both meetings were held in the Jefferson County Commission room and were transmitted live.

### **1.1.3 Public Involvement**

The committee conducted two online public surveys; the first addresses general hazards and is based on Worksheet 3.1 in the FEMA Local Mitigation Planning Handbook (2013). The second public survey addresses mitigation projects and is based on best practices and the consultant's experience with hazard mitigation plans. Members of the committee shared the survey links on their agency's various social media pages.

**DESCRIBE SUMMARY OF PUBLIC SURVEYS AND PUBLIC MEETINGS HELD IN MAY.**

### **1.1.4 Other Stakeholder Participation**

At the end of March, JCHSEM reached out to their neighboring counties and planning organizations in West Virginia, Virginia, and Maryland to request input for the hazard mitigation plan. JCHSEM requested information from these partners regarding hazards that originate in Jefferson County and affect their jurisdictions, and conversely, hazards that originate in their jurisdictions that may affect Jefferson County. The following table lists the contacts, the agency, and if they replied to the request. **These partners will also have the opportunity to review the draft plan once it is posted on the JCHEM or Jefferson County websites.**

NEIGHBORING JURISDICTIONS CONTACTED BY JCHSEM FOR INPUT				
<i>State</i>	<i>County</i>	<i>Contact</i>	<i>Agency</i>	<i>Replied</i>
VA	Frederick	Chester Lauck	Frederick County Emergency Management	No
VA	Clarke	Brian Lichty	Clarke County Fire, EMS & Emergency Management	No
VA	Loudoun	Kevin Johnson	Loudoun County Office of Emergency Management	Yes
WV	Berkeley	Eddie Gochenour	Berkeley County Homeland Security & Emergency Management	No
MD	Washington	Charlie Summers	Washington County Division of Emergency Services	Yes
		Tom Brown	Washington County Division of Emergency Services	
MD	Washington	Amy Jacobs	Tri-County Council for Western Maryland	No
WV	Berkeley	Matt Pennington	Region 9 Planning and Development Council	No
VA	N/A	Brandon Davis	Northern Shenandoah Valley Regional Commission	No
VA	N/A	Robert Lazaro	Northern Virginia RC	No

The partners' responses who responded to the JCHSEM request are included within the appropriate profiles. The hazards of most concern were hazardous materials incidents, rockslides, and flooding.

### 1.1.5 Document Preparation

JH Consulting, LLC completed the documentation of the process, narratives, research, and compilation of the plan. The research conducted for the risk assessment phase of this update included data from federal, state, higher education, and mass media sources. The research aim was primarily to validate and describe the hazards included for consideration in this plan. Specific sources relative to individual hazards are listed in [Appendix 6 Citations](#).

The consultant reviewed a number of existing plans and reports to (a) identify any obvious inconsistencies between other development and mitigation efforts, (b) as baseline information for such sections as development trends, and (c) to support discussions surrounding mitigation projects. Those documents included the following.

REFERENCED DOCUMENTS		
<i>Document Type</i>	<i>Document Citation</i>	<i>How Incorporated Into Plan</i>
Plan	Various Comprehensive Plans of jurisdictions in Jefferson County. See <a href="#">Appendix 6 Citations</a> .	Used as reference for development trends, general information of the jurisdictions, and project ideas.
Report	USDHS FEMA. (1 January 2017). <i>Flood Risk Report Washington County Maryland</i> . Federal Government. Washington, D.C.	Used as technical information for new FEMA flood maps in the area.
Technical Information	USDHS FEMA Region III. (July, 2015). <i>Plan Integration: Linking Local Planning Efforts</i> . Federal Government: Washington, D.C.	Used as guidance on incorporating local planning efforts/plans into the planning process.
Technical Information	USDHS FEMA. (June, 2016). <i>National Mitigation Framework</i> . Federal Government: Washington, DC	Used as general guidance on mitigation planning.
Technical Information	USDHS FEMA. (May, 2005). <i>Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning</i> . Federal Government: Washington, D.C.	Used as general guidance for incorporating historic property and cultural protection.
Technical Information	USDHS FEMA. (March, 2013). <i>Local mitigation planning handbook</i> . Federal Government: Washington, D.C.	Used as general guidance on revised mitigation planning process.
Technical Information	USDHS FEMA. (March, 2013). <i>Integrating Hazard Mitigation Into Local Planning</i> . Federal Government: Washington, D.C.	Used as general guidance on existing plan integration for hazard mitigation.
Technical Information	USDHS FEMA. (May, 2015). <i>National Flood Insurance Program Community Rating System</i> . Federal Government: Washington, D.C.	Used as reference and guidance for Community Rating System information.

#### 1.1.6. Project Timeline

The timeline for completion for the Jefferson County Hazard Mitigation Plan was roughly four months. The following graphic describes the various tasks completed in each month.

#### February 2018

- Jefferson County hired JH Consulting
- First in-person committee meeting
- Research
- First online public survey posted
- Jurisdictional capabilities and NFIP surveys distributed

#### March 2018

- Second in-person committee meeting
- Ongoing hazards research
- Narrative writing
- Second online public survey posted

#### April 2018

- Third in-person committee meeting
- First committee teleconference call
- Jurisdictional capabilities survey completed
- Ongoing hazards research
- Narrative writing
- Reach out to neighboring jurisdictions

#### May 2018

- Draft to committee for review and approval
- Public meetings held
- Public comment period open
- Public and official comments incorporated into final document

#### June 2018

- Submittal to the State and FEMA

### 1.1.7 Plan Maintenance between 2013 and 2018

Between each update, five years apart, the Jefferson County Hazard Mitigation Plan Committee maintained the plan current by meeting annually every year after the adoption. The committee mainly discussed updates to the mitigation actions and generated annual reports. The following table outlines the committee members present during each update.

ANNUAL UPDATE MEETING PARTICIPATION				
Organization	2014	2015	2016	2017
American Red Cross		✓		
City of Charles Town		✓	✓	✓

ANNUAL UPDATE MEETING PARTICIPATION				
<i>Organization</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>
City of Ranson			✓	✓
JC Emergency Services Agency		✓		
JC Planning and Zoning	✓	✓	✓	✓
JC Public Service District			✓	
JC Sheriff's Dept.	✓			
JC Utilities			✓	
JCHSEM	✓	✓	✓	✓
JC Health Department			✓	✓
JC GIS	✓	✓	✓	
Region 9 PDC	✓		✓	
Shepherdstown Water	✓			✓
Snyder Environmental			✓	
Volunteer			✓	
WV Health Department				✓
WVDHSEM				✓
WVDHSEM Region 3	✓			
WVU Extension Service				✓
WVU Jefferson Medical Center	✓	✓		

### 1.1.8 Previous Plan Updates

The following table describes the process by which this plan has been updated since its initial writing in 2002. Since then, the committee in charge of maintaining the plan has updated it in 2007, 2013, and currently in 2018.

HAZARD MITIGATION PLANNING PROCESS TIMELINE		
<i>Date</i>	<i>Activity</i>	<i>Purpose</i>
Original Plan Development		
February, 2002	Partnerships formed with community	Establish Project Impact partnership
April, 2002	Risk Assessment/Mitigation Planning Committee formed	Begin risk assessment and mitigation planning process
April, 2002	Contacted other PI Communities	For examples of hazard mitigation plans
April, 2002	Mitigation 101 Educational Workshop	Conducted for Risk Assessment/Mitigation Planning Committee
May 28, 2002	Risk Assessment/Mitigation Planning Committee finalize scope of services and RFP	Make recommendation to Steering Committee
April-June, 2002	Risk Assessment/Mitigation Planning Committee meetings	Data collection
June 15, 2002	Gather existing information from agencies	Data collection
June 19, 2002	FEMA workshop	Training on new planning regulations
June 25-28, 2002	Revised RFP	Update to include DMA 2000 requirements
June 28, 2002	Revised RFP to Scope of Services Committee	Review and approval
July 9, 2002	Scope of Services Committee meeting Risk Assessment Committee meeting	Finalize RFP for release
July 23, 2002	Steering Committee action	Approved RFP

HAZARD MITIGATION PLANNING PROCESS TIMELINE		
<i>Date</i>	<i>Activity</i>	<i>Purpose</i>
July 29, 2002	Legal ad for Spirit of Jefferson Mail out legal ad to list of potential bidders	Advertise RFP
July 30, 2002	WVDHSEM Hazard Mitigation Planning Workshop	Obtain additional information about mitigation planning and state support
August 1 & 8, 2002	Legal ad to appear in local newspaper	Advertise RFP
August 8, 2002	Prepare Pre-bid packets and presentation	For pre-bid meeting
August 13, 2002	Pre-bid meeting	Mandatory meeting for interested bidders
August 14-29, 2002	PI Office appointments and Q&A period	Review GIS data and obtain clarification on RFP
August 30, 2002	Deadline to submit proposals Deadline for municipalities to name representatives	Solicit consultant support for participation on Risk Assessment/Mitigation Planning Committee to meet multi-jurisdictional plan requirements
September 3, 2002	Scope of Services Committee meeting	To open bids and distribute copies
September 3-9, 2002	Scope of Services Committee action	Review of bid documents
September 9, 2002	Scope of Services Committee meeting Notices to short-listed bidders	To select forms for interview
September 17, 2002	Consultant Interviews	To select firm
September 24, 2002	Steering Committee meeting	Recommendation of selected firm
September 26, 2002	County Commission meeting	Approval of selected firm
October 1, 2002	Notification of selected firm	To commence consultant activities
October 10 & 17, 2002	Legal Notice in The Spirit of Jefferson	Notification of kick-off meeting
October 22, 2002	Kick off meetings	For public officials and general public
October 24, 2002	Quarterly Project Impact Partnership meeting Signing of contract	Hazard identification activity To commence consultant activities
November 4, 2002	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	Focus on risk assessment-data collection, hazard identification
November 28, 2002	Legal Notice in The Spirit of Jefferson	Notification of Public meeting
December 2, 2002	Draft risk assessment and maps submitted	For review by core planning team and steering committee
December 5, 2002	Legal Notice in The Spirit of Jefferson	Notification of Public meeting
December 9, 2002	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	To present draft risk assessment and obtain comments
December 16, 2002	Public Meetings	To present draft risk assessment and obtain comments
December 17, 2002	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	Develop goals and objectives for mitigation plan
January 10, 2003	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	Develop mitigation strategies
January 29, 2003	Draft Plan submitted	For review by core planning team and steering committee
January 30, 2003	Legal Notice in The Spirit of Jefferson	Notification of public meeting
February 5, 2003	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	To present draft plan and obtain comments
February 6, 2003	Legal notice in The Spirit of Jefferson	Notification of public meeting
February 10, 2003	Public Meeting	To present draft plan and obtain comments
February 10-March 10, 2003	Public comment period	To obtain public comments
March 7, 2003	Steering Committee meeting	Final plan review
March 10, 2003	Plan to WVDHSEM for review	To obtain state comments
March 13, 2003	Final plan submitted to Jefferson County	Final version with revision incorporated

HAZARD MITIGATION PLANNING PROCESS TIMELINE		
<i>Date</i>	<i>Activity</i>	<i>Purpose</i>
March 13, 2003	Jefferson County Commission meeting	Presentation of plan for adoption
March 17, 2003	Charles Town City Council meeting	Presentation of plan for adoption
March 18, 2003	Ranson City Council meeting	Presentation of plan for adoption
April 1, 2003	Bolivar city Council meeting	Presentation of plan for adoption
April 8, 2003	Shepherdstown City Council meeting	Presentation of plan for adoption
April 14, 2003	Harpers Ferry City Council meeting	Presentation of plan for adoption
TBD	Adopted plan submitted to FEMA Region III for approval	Plan comment, review, and approval
TBD	Plan revision	As needed based on FEMA review
June 15, 2004	End of grant period	Jefferson County Project Impact
First Plan Update		
May 10, 2007	WVDHSEM-Mitigation Department- Jefferson County received fax regarding review process of the All Hazard Mitigation Plan	To notify the County regarding review process
November 6, 2007	JCHSEM Staff Meeting	To review process and prepare for kick-off meeting
November 14, 2007	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	Focus on risk assessment – data collection, hazard identification
January 23, 2008	Risk Assessment/Mitigation Planning Committee (Core Planning Team) meeting	Focus on risk assessment goals and objectives
February 27, 2008	Risk Assessment/Mitigation Planning Committee (Core Planning Team) plan update meeting	Focus on updating the loss estimations section; goals, objectives and strategies section, and all remaining sections
Second Plan Update		
June, 2009	Risk Assessment Committee Meeting.	Conducted annual plan review.
June 30, 2010	Risk Assessment Committee Meeting.	Conducted annual plan review.
June 22, 2011	Risk Assessment Committee Meeting.	Conducted annual plan review.
March, 2012	Partnerships formed with community	Established project partnerships.
April, 2012	Risk Assessment/Core Planning Committee reformed.	Begin risk assessment and mitigation planning process.
April, 2012	Core Planning Committee finalized scope of services.	Make recommendation to County Commission.
May 16, 2012	Accept proposals from consultants.	Select consultant to assist with plan update.
May 24, 2012	Notification of selected firm.	To commence consultant activities.
July 24, 2012	JCHSEM & Mitigation Planning Committee Meeting.	Annual review of the mitigation plan. Primarily discussed updating goals, objective, and strategies.
August 7, 2012	Project Kick-off Meeting	For CPC and consultants to kick to project off.
August 29, 2012	Two Core Planning Committee / Public Meeting one @ 2pm and one @ 7pm.	Discussed and presented what a risk assessment is, discussed hazards that should be included in the plan, any that should be added or removed, discussed profiling hazards and development trends within the county.
Sept. 18, 2012	Core Planning Committee Meeting / Public Meeting	Review of the Hazard Risk Assessment to integrate changes that have taken place.
October 23, 2012	Core Planning Committee Meeting/ Public Meeting	Review of the Action Plan to assign status notes to goals, objectives, and strategies.
November 27, 2012	Core Planning Committee Meeting/ Public Meeting	The purpose of the meeting was to try and develop new goals, objectives, and



HAZARD MITIGATION PLANNING PROCESS TIMELINE		
<i>Date</i>	<i>Activity</i>	<i>Purpose</i>
		strategies for the municipalities of Jefferson County.
December 5, 2012	Draft Hazard Risk Assessment Submittal to CPC.	To present draft plan and obtain comments from the CPC and public.
December 20, 2012	Draft Action Plan Submittal to CPC.	To present draft plan and obtain comments from the CPCD and public.
January, 2013	Final Plan Submittal to State and Federal Reviewing agency, plan adoptions.	End Project.
Third Plan Update		
February 2018	Initiate current update	

## 1.2 PLANNING AREA

The planning area for the hazard mitigation plan includes the incorporated and unincorporated municipalities within the geographical boundaries of Jefferson County, West Virginia. This section describes the geography, climate, demographics, and unique characteristics of the planning area; these are important to understand in relation to natural, technological, and human-caused hazards because they can inform the type of vulnerabilities different locations or populations could experience. The following table explains and exemplifies how each aspect relates to hazards.

PLANNING AREA TOPICS AND IMPORTANCE			
<i>Topic</i>	<i>Description</i>	<i>Importance</i>	<i>Example</i>
Geography	Location, terrain, rivers, lakes, and physical features.	The geography of the county informs how various hazards will affect different areas.	Due to mountainous areas to the north of the county, this area receives higher amounts of snow throughout the year.
Climate	Typical average temperatures, precipitation.	Climate data provides background information for the hazards.	The overall trend is an increase of severe storms that include hail and tornadoes that impact the county.
Demographics	Population quantity, age, languages, housing, density.	Demographics provide a snapshot of the population make-up within the county. Depending on the social variable, some populations may be more or less vulnerable than others to different hazards.	People who speak languages other than English may not receive adequate or timely hazard warning information.
Transportation	Railways, highways, ports, airports, public transportation.	The availability of transportation networks for evacuation routes and emergency accessibility.	A route that is utilized as a designated evacuation route may experience blockages due to landslides.
Economy	Top employers, unemployment, general economic tendencies.	The economy of the county and its jurisdictions can be impacted by hazards resulting in loss of tax revenue, loss of personal income, and even livelihood.	If a large employer in the county experiences severe impacts from a hazard, it may shut down temporarily or permanently causing loss of tax revenue, personal income, and livelihood.
Education	Schools, higher education institutions, graduation rates.	Schools and higher education institutions have vulnerable and transient populations, community outreach opportunities, and the opportunity for partnership.	Emergency plans should consider higher education students in the county and their possible inability to evacuate.
Health	Overall health and rankings, homelessness.	Age, disability, and general health status can have an effect on the resiliency of the population to different hazards.	Older populations may be more vulnerable to extreme temperatures.
Utilities	Power, gas, water, wastewater, telecommunications.	Utilities constitute critical infrastructure and are therefore lifesaving and life-sustaining partners in emergencies.	Power outages may cause problems in sewer pump stations that may lead to sewer backups.

PLANNING AREA TOPICS AND IMPORTANCE			
<i>Topic</i>	<i>Description</i>	<i>Importance</i>	<i>Example</i>
Media	Radio, newspaper, television.	Utilized mainly for hazard notification and warning.	If a large percentage of the population receives hazard warnings via the television, these should be utilized more often.
Tourism, attractions, and amenities	Natural and cultural attractions, festivals.	Transient populations, vulnerable populations, influx of population, sense of place, livelihood	If a hazard were to occur during a festival, authorities would have to consider the population in attendance and how to keep them safe.
Jurisdictions	Cities, towns.	Describing uniqueness will help inform the character that should be preserved in each jurisdiction.	Historic buildings and sites should be protected from hazards.
Jurisdictional capabilities	Results from a survey that each jurisdiction answered relating to administrative, technical, fiscal, and political capabilities.	Data allows planners to identify strengths and weaknesses relating to ordinances, regulations, and codes.	Stronger enforcement of building codes can lead to more resilient structures and less damage.
Disaster declarations	Emergency and disaster declarations.	Provides historical information on the hazards that are most prevalent or cause most damage in the county.	If the majority of declarations relate to flooding, mitigation actions should focus on flooding.
Development trends	Recent and planned development in the county.	Helps in assessing vulnerability to hazards of certain areas.	If vacant land is being considered for development but is in the floodplain, there should be a reevaluation of development in this area.

### 1.2.1 Geography

Jefferson County is one of 55 counties in the State of West Virginia and is located in the midst of the Blue Ridge and Appalachian Mountains in the eastern-most portion of the state's eastern panhandle. The Potomac River and Washington County, MD border the county on the north, the Potomac and Shenandoah Rivers and Loudoun County, VA on the east, Clarke County, VA on the south, and Opequon Creek and Berkeley County, WV on the west. Jefferson County was created by an act of the Virginia General Assembly on January 8, 1801 from parts of Berkeley County. It was named in honor of Thomas Jefferson, who was then President-elect of the United States, the author of the Declaration of Independence and one of America's greatest statesmen. The county contains five incorporated municipalities including the Towns of Bolivar and Harpers Ferry, the Corporation of Shepherdstown, and the Cities of Ranson and Charles Town, the latter of which functions as the county seat. The county has a total land area of 212 square miles and varies in elevation from a low of 247 feet above sea level at Harpers Ferry to a high of 1,553 feet east of Shannondale. Metropolitan cities located within close proximity to Jefferson County include Washington, D.C. (58 miles), and Baltimore, MD (67 miles).

The county's rolling topography separates Jefferson County into three major drainage divides. The Shenandoah River has a drainage area of 105 square miles at the downstream county boundary; the Potomac River has a drainage area of 62 square miles; and Opequon Creek has a drainage area of 44 square miles. The majority of the streams in the county flow in a northwest-southeast direction toward Opequon Creek or the Shenandoah River. Ultimately, they flow into the lower Potomac River and the Chesapeake Bay. A series of parallel ridges and valleys pierced by occasional water gaps characterizes the topography of Jefferson County. The county is comprised of karst topography that indicates dissolution of underlying rocks by surface water or groundwater.

Jefferson County is part of the Washington metropolitan area that comprises several counties from Virginia and Maryland, and D.C. This metropolitan area is home to more than six million people, surpassing the population of the Philadelphia metropolitan area in 2015 (Freed, 2016).

### 1.2.2 Climate

Jefferson County has a continental-type climate, predominantly influenced by air from the west. The climate of Jefferson County is seasonal in nature, with warm summers, cold winters, stormy springs and mild fall seasons. The average temperatures have increased since the last plan update; average January temperatures five years ago were 29°F and are now 31°F, average July temperatures were 73°F five years ago and are now 74.7°F, creating a mean average temperature of 51°F five years ago and 52.9°F currently. Precipitation is evenly distributed throughout the year, with an annual average of approximately 37 inches as of the last plan update and 40 inches according to current data (NCEI, n.d.). Data from the Martinsburg weather station indicates that the area experiences approximately 26 inches of snowfall per year.

### 1.2.3 Demographics

The following table outlines the population, its median age, household income, race, and density for each incorporated jurisdiction and Jefferson County.

JEFFERSON COUNTY DEMOGRAPHICS						
<i>Description</i>	<i>Jefferson County</i>	<i>Bolivar</i>	<i>Charles Town</i>	<i>Harpers Ferry</i>	<i>Ranson</i>	<i>Shepherdstown</i>
Population*	56,368	1,045	5,945	286	5,166	1,734
Median Age	40.1	41.8	35.4	51.8	34.7	21.0

JEFFERSON COUNTY DEMOGRAPHICS						
Description	Jefferson County	Bolivar	Charles Town	Harpers Ferry	Ranson	Shepherdstown
Educational attainment: Percent high school graduate of higher	88.8%	92.7%	86.9%	93.1%	86.9%	89.7%
Total housing units	22,977	616	2,324	172	2,059	456
Median household income	\$69,753	\$55,417	\$73,229	\$66,250	\$49,063	\$37,386
Foreign-born population	2,837	13	573	4	387	44
Individuals below poverty level	10.9%	12.2%	10.4%	14.6%	17.1%	23.5%
Veterans	4,903	133	544	22	370	64
White alone	48,881	1,129	4,524	190	3,531	1,301
Black or African American	3,758	37	791	10	928	147
American Indian or Alaska Native	98	4	0	0	0	5
Two or more races	1,485	45	159	10	195	87
Hispanic or Latino	2,902	32	567	3	533	62
Asian alone	768	0	123	0	126	38
Other race	541	10	85	3	50	0
Land area (square miles)	212	0.44	5.81	0.6	8.05	0.37
Density (persons per square mile)	266	2,375 <sup>†</sup>	1,025	476 <sup>†</sup>	642	4,686 <sup>†</sup>

\* County and city data from 2016 and village data from 2010

<sup>†</sup> Persons per square mile exceed population counts because land area is less than one square mile.

Sources: U.S. Census (2016) and U.S. Census American Fact Finder (2010)

### Population Density

Population density is measured in persons per square mile. Because Jefferson County's boundaries are set and the population is increasing, population density is also increasing. The population density within the incorporated areas of Jefferson County is much higher than in the rural areas. The table above shows the population, land area, and calculates the population density for each incorporated jurisdiction in the last rows. The highest concentration of residents lives in Charles Town, Bolivar, and Shepherdstown. The rural areas are less densely populated; however, unincorporated areas account for approximately 75% of the county's total population.

The population density within what are termed "rural areas" can vary significantly as well. For instance, subdivision or unincorporated communities may include clusters of residents and homes that result in very small, dense areas located sporadically throughout rural Jefferson County.

### Language

The amount of people in Jefferson County that speak a language other than English is more than double that of the state of West Virginia with 5.79% (2.33% in West Virginia) of the total population in Jefferson County. Overall, this indicates that the county is more culturally diverse than the state, perhaps due to its proximity to the metro D.C. area. The most prevalent language is Spanish (3.48%) followed by French (0.42%), Thai (0.34%), German (0.18%), and Korean (0.18%) (MLA, 2015). Planners should consider language differences when developing outreach strategies and implementing hazard warnings.

### Homelessness

**INCLUDE HOMELESSNESS DATA HERE FROM INFORMATION REQUESTED FROM THE WEST VIRGINIA COALITION TO END HOMELESSNESS. REQUESTED 4/3/18 AND 4/30/18.**

### **1.2.4 Transportation**

The Jefferson County Development Authority offers complete information on different modes of transportation in the county. The following is a description of each type of transportation available in or around the county.

### Highways

Jefferson County is connected to the region's cultural, financial, and industrial centers by numerous interstate, state, and county highways. The region's dense network of roadways makes every corner of Jefferson County readily accessible.

I-70 and I-81 connect Jefferson County to Washington, D.C., Baltimore, and several cities throughout the East Coast, the Upper South, and the Ohio Valley. I-70 is 30 miles away, accessible via U.S. Route 340, and connects Jefferson County to Maryland and Virginia. I-81 is only 10 miles away and accessible via State Route 9, a major east-west state highway that gives Jefferson County quick access to Manassas, Virginia.

S.R. 45 joins northern Jefferson County to nearby Martinsburg, at the interchange of I-81, U.S. Route 11, and S.R. 9. S.R. 51 passes through the county from Charles Town in the east to I-81 and beyond in Berkeley County, West Virginia. S.R. 115 runs east-west through Jefferson County for 20 miles and parallels S.R. 9. S.R. 230 is a north-south state highway in Jefferson County joining U.S. Route 340 just west of Bolivar to S.R. 45 and S.R. 480 in Shepherdstown.

### Airports

Several airports provide Jefferson County with non-stop service to most U.S. cities and to many international destinations. In addition to commercial flights, the region's airports provide round-the-clock cargo flights, material-handling services, and warehousing.

- **Ronald Reagan Washington National Airport (DCA)** is located less than 90 minutes away via U.S.-340, WV-9, and VA-7 in Arlington, VA, just across the Potomac River from the nation's capital. Reagan National offers nonstop service to destinations within 1,250 miles of Washington, D.C., daily nonstop flights to 74 U.S. cities, and direct service to three Canadian cities on 12 domestic airlines.
- **Dulles International Airport (IAD)** is just 40 miles away via VA-9 in Chantilly, Virginia. Dulles offers daily nonstop service to 88 U.S. cities and direct service to 42 foreign cities on 23 international airlines. Twenty-three carriers offer air cargo service in addition to commercial air service. Dulles Airport is in Foreign Trade Zone #137 and offers materials handling and warehousing services in 540,000 square feet of operations space.
- **Baltimore-Washington International Thurgood Marshall Airport (BWI-Marshall)** is located 60 miles to the east along U.S.-340. Baltimore International serves 40 passenger and cargo airlines. Non-stop commercial flights to 69 domestic and ten international destinations are offered daily.
- **Eastern West Virginia Regional Airport (EWVRA)** is located only 12 miles northwest of Jefferson County. It occupies 1,015 acres and can accommodate 747 or C5-class planes. The airport also possesses 8,815 feet of runway, a full instrument landing system, and 24-hour aircraft rescue and firefighting service provided by the West Virginia Air National Guard. The West Virginia Air Guard operates its C-17 Globemaster III aircraft program from this facility.

### Rail Service

The Maryland Area Regional Commuter (MARC) train system offers daily service to Washington, D.C.'s Union Station and other nearby destinations via the Brunswick Line. This line has origination stations in both Martinsburg and Harpers Ferry and includes an extension to Frederick, Maryland. Stops along the Brunswick Line include Washington, D.C., and several metropolitan Maryland-area communities such as Gaithersburg, Rockville, and

Silver Spring. Amtrak provides passenger service from both the Martinsburg and Harpers Ferry MARC stations.

The county is located in a prime portion of Norfolk-Southern Railroad's extensive network, offering direct accessibility to containers, equipment, and logistics solutions. The Front Royal terminal, located fewer than 50 miles to the south, provides intermodal capabilities and services to both national and international customers. CSX mainlines cross Jefferson County and connects to over 2,000 miles of track in West Virginia alone, and TRANSFLO offers bulk rail-to-truck or truck-to-rail commodity service from nearby Clarksburg and Fairmont.

### Seaports

Although there are no ports in Jefferson County, the Virginia Inland Port (VIP) is an intermodal container transfer facility located in Warren County, Virginia that connects Jefferson County with the commercial hubs of Washington, D.C., New York, Baltimore, Maryland, and Norfolk, Virginia. VIP is located only 45 minutes away and consolidates and containerizes local cargo for export, bringing the Port of Virginia 220 miles closer to inland markets. Containerized rail service on over 17,000 feet of track runs five days a week to VIP from both Norfolk International Terminals and the Virginia International Gateway terminal in Portsmouth, Virginia. Intermodal rail cars arrive at VIP and gain access via Norfolk-Southern rail to Harrisburg, Pennsylvania, and the New York-New Jersey region. It is a U.S. Customs-designated port of entry, offering the full range of customs services to its customers.

### **1.2.5 Economy**

According to the WVU Bureau of Business and Economic Research county profile of 2017, the top five industries with most employees were education, services, healthcare and social assistance with 20.8% of the county population employed in the industry; arts, entertainment, recreation, accommodation, and food services (13%); professional, scientific, management, administration and waste management services (12.9%); public administration (11.2%); and retail trade (10.5%). The top 10 employers in Jefferson County are listed in the table.

TOP 10 EMPLOYERS IN JEFFERSON COUNTY	
Rank	Company
1	PNGI Charles Town Gaming
2	Jefferson County Board of Education
3	Shepherd University
4	American Public University
5	Jefferson Medical Center



6	Wal-Mart Stores, Inc.
7	Royal Vendors, Inc.
8	Department of the Interior (National Park Service)
9	Jefferson County Commission
10	Food Lion, LLC.

Source: JCDA, 2014

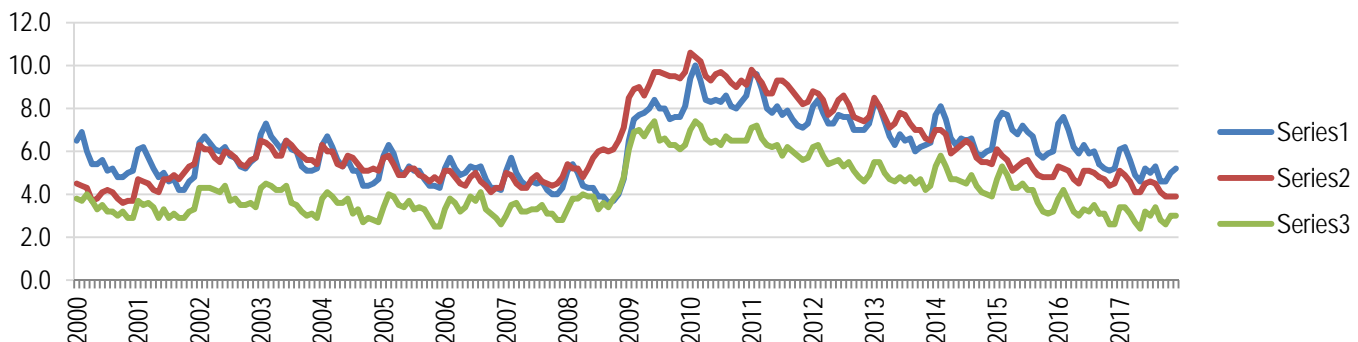
Jefferson County is a rapid-growth community where major federal agencies, innovative companies, and diverse small businesses grow and thrive. Businesses located in Jefferson County benefit from its location within the Mid-Atlantic business corridor, a short 60-minute commute from the Washington D.C. Metropolitan Area.

The State of West Virginia offers a number of incentives to qualifying businesses, including sales tax and property exemptions for certain manufacturing and warehousing operations. In addition, Jefferson County also offers business incentives such as nominal commercial impact fees, payment in lieu of tax program, and fast-track permitting to encourage businesses to move to the area.

One of the major business locations in Jefferson County is Burr Business Park. Each lot within the park is ready to be connected to all utilities, including fiber, water, sewer, electricity, and telecommunications. The park is located just off S.R. 9 in Kearneysville.

Per capita income has risen significantly from \$7,553 in 1969 to \$32,227 in 2014; these figures indicate that Jefferson County residents are making more money. Such a rise in income can be generated in several ways. General prices of goods and services are more expensive in today's economy than in years past. Therefore today's dollars have been adjusted so comparison to 1989 dollars can be made. Finally, many county residents commute to work in areas with a higher cost of living, where positions inherently come with a slightly higher pay scale.

U.S., WEST VIRGINIA, AND JEFFERSON COUNTY UNEMPLOYMENT RATE 2000-2017



### 1.2.6 Education

The Jefferson County Public school system comprises 10 elementary schools, one intermediate school, four middle schools, and two high schools. Jefferson County Schools also runs an opportunity learning center. In addition, there are four private schools. Jefferson County has a 91% high school graduation rate which is just under the national average of 95%, but higher than the rest of the state by 4% (County Health Rankings & Roadmaps, 2018).

Jefferson County is home to two higher education institutions; the American Public University System that runs the online American Public University (APU) and the American Military University (AMU) programs is headquartered in Charles Town, and Shepherd University in Shepherdstown. There are several other colleges and universities that are within close proximity to the county. Blue Ridge Community and Technical College is in Martinsburg, and others within a 50-mile radius of the county include West Virginia University, Marshall University, West Virginia State University, Pennsylvania State University at Mont Alto, and Georgetown University (JCDA, 2016).

### 1.2.7 Health

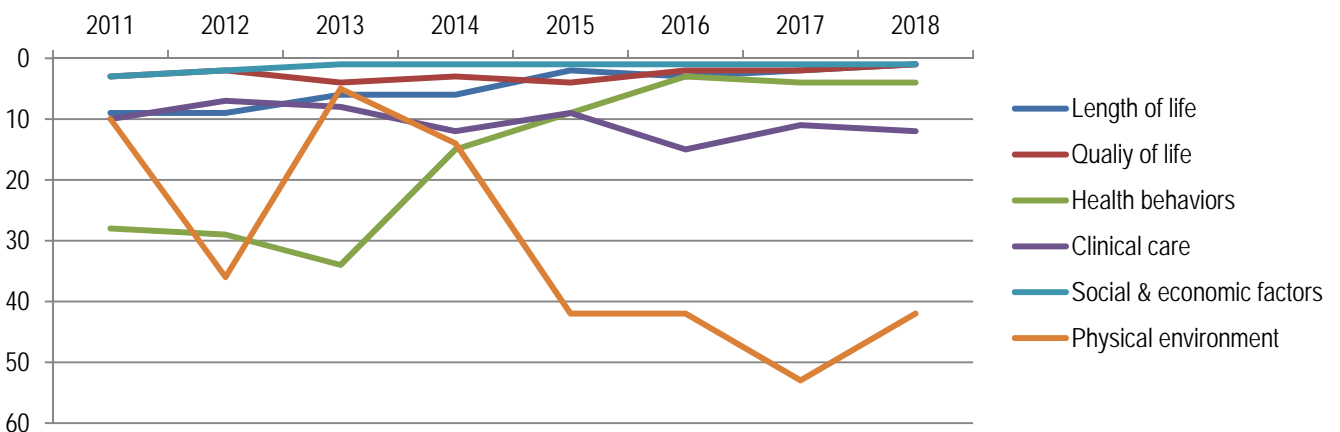
The following table and graph show the overall health of Jefferson County over the past five years. There are 55 counties in West Virginia; different indicators of health rate each county against the others and each receives a place ranking among the other counties in the state. The table presents the ranking of Jefferson County's indicators for length of life, quality of life, health behaviors, clinical care, social and economic factors, and physical environment that can influence overall health.

JEFFERSON COUNTY HEALTH RANKINGS								
Indicator	Jefferson County Ranking by Year (of 55)							
	2011	2012	2013	2014	2015	2016	2017	2018
Length of Life	9	9	6	6	2	3	2	1
<ul style="list-style-type: none"> <li>Premature death</li> </ul>								
Quality of Life	3	2	4	3	4	2	2	1
<ul style="list-style-type: none"> <li>Poor or fair health</li> <li>Poor physical health days</li> <li>Poor mental health days</li> <li>Low birthweight</li> </ul>								
Health Behaviors	28	29	34	15	9	3	4	4
<ul style="list-style-type: none"> <li>Adult Smoking</li> <li>Adult Obesity</li> <li>Excessive drinking</li> <li>Motor vehicle crash deaths</li> <li>Sexually transmitted infections</li> <li>Teen births</li> </ul>								
Clinical Care	10	7	8	12	9	15	11	12

<ul style="list-style-type: none"> <li>• Uninsured</li> <li>• Preventable hospital stays</li> <li>• Diabetes monitoring</li> <li>• Mammography screening</li> </ul>								
<b>Social &amp; Economic Factors</b> <ul style="list-style-type: none"> <li>• High school graduation</li> <li>• Unemployment</li> <li>• Children in poverty</li> <li>• Violent crime</li> </ul>	3	2	1	1	1	1	1	1
<b>Physical Environment</b> <ul style="list-style-type: none"> <li>• Air pollution</li> <li>• Drinking water violations</li> <li>• Access to recreational facilities</li> <li>• Limited access to healthy foods</li> <li>• Fast food restaurants</li> </ul>	10	36	5	14	42	42	53	52

Source: County Health Rankings and Roadmaps annual reports

The graph below shows the trend for each indicator in the corresponding table colors. For example, dark blue is for length of life, red is for quality of life, etc. Jefferson County has been the highest-ranked county for social and economic factors for the past six years. In contrast, the physical environment indicator has declined significantly over the past years, making it almost the last ranking county for this indicator.



According to the 2014 West Virginia Department of Health and Human Resources report, between 2007 and 2011, Jefferson County was ranked almost lowest (best) in the state in nearly every category. The categories included fair or poor health, no health insurance, no leisure time physical activity, obesity, diabetes, cardiovascular disease, hypertension, high cholesterol, asthma, disability, and arthritis. However, binge drinking is a problem in the county as it is ranked fourth highest in the state. Consequently, alcohol related diagnosis and alcohol dependence diagnosis are also high, ranking second and third

in the state. Not surprisingly, Jefferson County DUI arrests between 2008 and 2012 were more than twice the rate of the state.

### 1.2.8 Utilities

The Jefferson County Development Authority offers complete information on available utilities in the county. The following is a description of each type of utility.

#### Electric Service

Potomac Edison, a division of FirstEnergy Corporation delivers power to Jefferson County. FirstEnergy Corporation operates 10 electric utility companies that form one of the nation's largest investor-owned electric systems. It serves six million customers within a 65,000 square-mile area in the Midwest and Mid-Atlantic regions, including Ohio, Pennsylvania, West Virginia, New Jersey, Maryland, and New York.

#### Natural Gas and Propane

Mountaineer Gas, the state's largest natural gas distribution company, provides service to Jefferson County. It is the only natural gas distribution company in West Virginia that has its own training center, customer service center, and corporate office in West Virginia. The company serves 49 of the 55 counties in West Virginia and maintains nearly 6,000 miles of pipeline.

**ADD INFORMATION ABOUT PROPANE**

#### Water Services

Numerous water providers, including Jefferson Utilities (JUI), the Jefferson County Public Service District, the City of Charles Town, and the Corporation of Shepherdstown offer water service in the county. The Public Service Commission of West Virginia Water sets and governs service rates; capacities, connection fees, and consumption rates vary by provider but can save Jefferson County businesses a significant amount of money each year.

While the City of Charles Town uses water from the Shenandoah River, JUI draws its abundant supply from the aquifer below Jefferson County. JUI has a six million gallon-per-day capacity with an additional two million gallons-per-day available from existing wells to accommodate new customers. Its network of 16" transmission mains and two 500,000-

gallon storage tanks ensure reliable water service to the county's business and residential customers.

### Wastewater Service

Various wastewater providers offer services in Charles Town, Harpers Ferry, and Shepherdstown, including the Jefferson County Public Service District, the City of Charles Town, the Harpers Ferry-Bolivar Public Service District, Jefferson Utilities, and the Corporation of Shepherdstown. The Public Service Commission of West Virginia sets and governs rates; capacities, connection fees, and consumption rates vary by provider.

### Telecommunications Service

Jefferson County secures its telecommunications service from Verizon, Comcast, and Frontier Communications. Frontier, one of the area's primary providers, offers Internet, telephone, and Wi-Fi coverage to many commercial sites. Mobile companies such as Verizon, AT&T, Sprint, T-Mobile, and U.S. Cellular offer reliable cellular coverage. These service providers support several large, highly active organizations that run entirely online, including the American Public University System and the United States Coast Guard Operations System Center.

## **1.2.9 Media**

Although Jefferson County receives radio signal from stations in surrounding counties and states, there are only two radio stations within the county: WMRE 1550 AM located in Charles Town, and WSHC 89.7 FM from Shepherdstown. Similarly, there are several newspapers that reach Jefferson County, but only two that originate within the county: the Spirit of Jefferson and Farmer's Advocate is located in Charles Town and publishes every Wednesday and the Shepherdstown Chronicle located in Shepherdstown that publishes weekly on Wednesdays.

## **1.2.10 Tourism, Attractions, and Amenities**

The Jefferson County Development Authority (JCDA) (2016) has extensive information on living in Jefferson County including different community amenities, outdoor recreation opportunities, and art and cultural activities and attractions. Community amenities include the Jefferson County Community Center that houses a gymnasium, fitness room, preschool room, and multipurpose space for community events. There are four large public

libraries that have community activities year-round. Additionally, Jefferson County has seasonal farmers markets where the public can purchase locally grown products.

A variety of outdoor recreation activities are available in Jefferson County. The Appalachian Trail runs through Harpers Ferry, the Shenandoah and Potomac Rivers offer fishing, boating, kayaking, rafting, and other river activities, there are a few golf courses within the county, and a variety of nature parks.

The arts are important to Jefferson County. The Old Opera House and the Contemporary American Theater Festival have a home in the county. There are a variety of shows, educational programs, community outreach programs, and galleries such as the Washington Street Artist Cooperative, the Mountain Heritage Arts and Crafts Festival, the Jefferson Arts Council, and the Over the Mountain Studio that are open to the public. Annual festivals in the county include the West Virginia's Mountain Heritage and Crafts Festival (mentioned previously) in the fall, the Contemporary American Theater Festival in the summer, and The American Conservation Film Festival in the fall.

Another large attraction in the county is the Hollywood Casino in Charles Town that offers a casino and a race track. The casino attracts people from all over the state and neighboring states.

### **1.2.11 Jurisdictions**

#### **Town of Bolivar**

The Town of Bolivar is located at the easternmost tip of West Virginia, west only of the small town of Harpers Ferry. It was originally known as Mudfort. The Virginia General Assembly granted Bolivar a charter as a town in December of 1825. Upon petitioning the Assembly for a town charter, the citizens of Mudfort chose to name their town for the South American Revolutionary leader, Simon Bolivar. The Town of Bolivar can be accessed using U.S. Route 340 and is an hour from Washington, D.C. and Baltimore, MD. While the limited access to Bolivar enhances its security, it does leave the town susceptible to massive traffic tie-ups if there are problems on U.S. Route 340. The town is located one mile from the confluence of the Potomac and Shenandoah Rivers, and is surrounded by the Harpers Ferry National Historic Park. The town is nominally bounded by the Potomac River to the north, Harpers Ferry to the east, Shenandoah River to the south and Bolivar Heights Battlefield to the west.

#### **City of Charles Town**

Charles Washington laid out the City of Charles Town in 1786. Charles Washington was born in Hunting Creek, now Fairfax County, Virginia on May 2, 1738 and was the youngest full brother of George Washington. Charles laid out the streets of Charles Town, naming many of them after his brother and one after his wife, Mildred. He donated the four corner lots at the intersection of George and Washington Streets for public buildings of the town and county, provided that the town became the seat of the county separated from Berkeley County. Charles Town is located in the center of Jefferson County and is the county seat. It is surrounded by the City of Ranson to the north and on the other sides by unincorporated portions of the county.

Gentle slopes characterize the topography of Charles Town with elevations ranging from approximately 475 to 560 feet. The greatest local relief occurs along Evitts Run, which flows through the city several blocks to the west of WV State Route 9. "The area around Charles Town contains the headwaters of several perennial streams, such as Evitts Run, Cattail Run, and Bullskin Run. These small creeks or 'runs' flow west to east and discharge into the Shenandoah River, a major tributary of the Potomac River. Like most tributaries to the Potomac River, the Shenandoah flows from south to north finally discharging into the Potomac at Harpers Ferry. Approximately six miles from the Shenandoah's confluence with the Potomac River, Charles Town withdraws about one million gallons per day for drinking water. This is Charles Town's sole source of water." (City of Charles Town, 2010)

Charles Town sets over carbonate (Limestone and Dolomite) bedrock that contains solution channels. These solution channels are the primary way precipitation gets into the water table. Water percolating into and through the carbonate rock dissolves rock materials and enlarges minute fractures in the rock. This has produced a "karst" geology formation containing caves, sinkholes, springs, disappearing or "losing" streams, and underground streams. One such cave is located in downtown Charles Town and is approximately 300 yards long.

### *Town of Harpers Ferry*

Harpers Ferry is a town of fewer than 300 residents located at the point where the Blue Ridge Mountains split, and the Shenandoah River meets the Potomac River. Harpers Ferry was first settled in 1732 by Peter Stephens whose "squatter's rights" were bought in 1747 by Robert Harper, for whom the town was named, and who first operated ferries across the Potomac and Shenandoah Rivers at that point. In 1763, the Virginia General Assembly established the town as Shenandoah Falls at Mr. Harper's Ferry. The State of

Virginia officially accepted the charter of the Town of Harpers Ferry in 1851. The town was incorporated under the laws of West Virginia in 1872.

Harpers Ferry is a historic town. The town is located on a low lying floodplain created by the two rivers, the Potomac and the Shenandoah; it is thus surrounded by higher ground on all sides. The town is surrounded by the 2,300-acre Harpers Ferry National Historical Park. The general elevation of the town ranges from 247 feet above sea level at the Potomac River level which is the lowest point in the state to 489 feet.

Harpers Ferry was the site of many historical events such as John Brown's Raid, the Civil War, the outfitting of the Lewis and Clark expedition, and the genesis of the NAACP at the former Storer College. Since the 1950s, the National Park Service has tried to rehabilitate and restore the town while at the same time interpret its historical importance to the nearly two million people who visit it each year. Harpers Ferry is the focal point of historic tourism in Jefferson County and an important component of the local economy.

Harpers Ferry can be accessed using U.S. Route 340 and Amtrak. The national passenger rail system provides service to Harpers Ferry two times a day (once in each direction). It is also served by the MARC commuter rail service on its Brunswick line. In addition, several CSX freight trains pass through Harpers Ferry daily and over the bridge spanning the Potomac River.

### City of Ranson

Named for the family that owned much of the 850 acres bordering Charles Town on the north and west, Ranson began as an early economic development district overseen by the Charlestown Mining, Manufacturing & Improvement Company. By the turn of the 20th century, buoyed by boom times in the Shenandoah Valley, the community grew into a town of its own. It was incorporated on October 15, 1910.

"It was named in honor of Dr. James Ranson, a dentist and farmer living in the area. With Washington, D.C. a little more than 60 miles to the southeast and connected to Ranson by rail and multi-lane highways, Ranson could tout the lifestyle advantages of a small rural town with easy access to a global political and economic hub" (City of Ranson Comprehensive Plan, 2012).

There are two main drainage courses, Evitts Run and Flowing Springs Run, that carry storm water runoff toward the Shenandoah River. Each of these tributaries of the Shenandoah River has a 100-year floodplain that is delineated on Federal Flood Insurance



Rate Maps (FIRM). These floodplains store excess storm water runoff to prevent the flooding of downstream properties outside the designated 100-year limits.

“Ranson is connected to the surrounding communities at numerous points along the city limits. Generally, trips to the north use State Route 9, which provides the most efficient connection to Martinsburg, Shepherdstown or Berryville. Local northern traffic uses State Route 115 (Mildred Street). Traveling east, residents use Fifth Avenue with its connections to trips west or south usually start by heading south into Charles Town along Mildred Street and then taking U.S. Route 340 South out of the center of Charles Town. Fredrick, Baltimore and Washington trips are via U.S. Route 340 North, while Leesburg and Dulles are accessed by U.S. Route 340 South or State Route 9 connecting to State Route 7 East” (City of Ranson Comprehensive Plan, 2012).

The early growth and development of Ranson reflects the late 19<sup>th</sup> century boom of the Shenandoah Valley and surrounding areas associated with the rise of the railroads, mining, and manufacturing. Today, Ranson is a thriving community that blends a developing commercial district housing major corporations with rapidly growing residential neighborhoods. Ranson is a largely residential community and is the site of several community facilities such as WVU Healthcare Jefferson Medical Center, and the Jefferson County Council on Aging. The United States Department of Agriculture (USDA) Farm Service Center is also located in Ranson. Recent commercial development includes the Potomac Marketplace which is located just off of S.R 9.

The city has made great strides in providing for parks and open space. The city has acquired the following facilities: Ranson Civic Center, West End Park, Charles C. Marcus Field, Briar Run Park, Cranes Lane Field, and Flowing Springs Park.

### Corporation of Shepherdstown

With all of its modern amenities, it is hard to imagine that the small community of Shepherdstown may be the oldest town in West Virginia. Shepherdstown is situated on a bluff overlooking the Potomac River. Once known as Potomoke, it eventually became known as Mecklenburg in the 1730s and was chartered in 1762 by the Virginia General Assembly. It was renamed Shepherd’s Town in 1798 in honor of Thomas Shepherd, an early settler. After the Civil War, the community was officially recognized as Shepherdstown. The community was briefly considered as a site for the National Capital. That may have come to pass if it were possible for 19<sup>th</sup> century sea-going vessels to sail up the Potomac River.

The Corporation of Shepherdstown can be accessed using State Routes 230 and 480. Shepherdstown's general elevation is approximately 400 feet above sea level. It is a small residential and university community located in the northern portion of the county. Shepherd University's East Campus and West Campus total 164.6 acres.

In general, Shepherdstown's economy is primarily based on commercial shops, service businesses, Shepherd University, and the incomes of residents who are employed elsewhere or retired. Shepherdstown business and commerce is concentrated in a central two-block section of German Street and in the southeast corner of the town. Other isolated business activities are scattered elsewhere in the residential section of the community. Significant developments are taking place along highways leading to Martinsburg and Charles Town. Structures used for public services and buildings are located along King Street in a three-block area and on the north side of the community along the Potomac River. Shepherdstown recent constructed a new town hall and police station.

#### 1.2.12 Jurisdictional Capabilities

**THIS SECTION WILL BE UPDATED WHEN ALL JURISDICTIONS COMPLETE THE ONLINE CAPABILITIES SURVEY.**

Jefferson County itself and the municipalities therein have a number of capabilities that can support mitigation efforts including comprehensive plans, building codes, subdivision and land use ordinances, zoning ordinances, and floodplain regulations. The county's consultant worked with jurisdictional representatives to complete a "capabilities assessment." Representatives answered questions about the following plans, codes, and ordinances from the perspectives of their home jurisdictions.

- **Comprehensive Plans:** Comprehensive plans promote sound land use and regional cooperation among local governments to address planning issues. These plans serve as the official policy guide for influencing the location, type, and extent of future development by establishing the basic decision-making and review processes on zoning matters, subdivision and land development, land uses, public facilities, and housing needs over time.
- **Building Codes:** Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can be adopted that require resistant or resilient building design practices to address hazard impacts common to a given community.

- **Subdivision and Land Development Ordinances:** Subdivision and land development ordinances (SALDOs) are intended to regulate the development of housing, commercial, industrial or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and size of roads and the location of infrastructure can reduce exposure of development to hazard events.
- **Zoning Ordinances:** Zoning ordinances allow for local communities to regulate the use of land in order to protect the interests and safety of the general public. Zoning ordinances can address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development and/or require land development to consider specific hazard vulnerabilities.
- **National Flood Insurance Program (NFIP) Participation and Floodplain Management Ordinances:** Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures located in the floodplain are flood-proofed, dry-proofed, or built above anticipated flood elevations. Floodplain ordinances may also prohibit development in certain areas altogether. The National Flood Insurance Program (NFIP) establishes minimum ordinance requirements which must be met in order for that community to participate in the program. However, a community is permitted and encouraged to adopt standards which exceed NFIP requirements.

The following table summarizes the jurisdictional capabilities of Jefferson County according to the completed online surveys.

JURISDICTIONAL CAPABILITIES							
<i>Jurisdiction</i>	Comprehensive Plan	Building Codes	Participate in NFIP	Subdivision or Land Use Ordinance	Zoning Ordinance	Capital Budget Funds for Mitigation Projects	Public Works Budget for Mitigation projects
Jefferson County							
Bolivar							
Charles Town							
Harpers Ferry							
Ranson							

Shepherdstown							
* Exceeds the minimum standards of NFIP Requirements							
† No, but willing to consider for future projects							

### Administrative and Technical Capability

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise to effectively execute mitigation activities. Common examples of skill sets and technical personnel for hazard mitigation include planners with knowledge of land development/management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g., building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with the education or expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, and fiscal staff to handle complex grant application processes.

### Fiscal Capability

The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of local financial resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Federal programs which may provide financial support for mitigation activities include, but are not limited to:

- Community Development Block Grant (CDBG),
- Disaster Housing Program,
- Emergency Conservation Program,
- Emergency Management Performance Grants (EMPG),
- Emergency Watershed Protection Program,
- Hazard Mitigation Grant Program (HMGP),
- Flood Mitigation Assistance Program,

- Non-Insured Crop Disaster Assistance Program,
- Pre-Disaster Mitigation Program,
- Repetitive Flood Claims Program (RFC),
- Section 108 Loan Guarantee Programs,
- Severe Repetitive Loss (SRL) Program, and
- Weatherization Assistance Program.
- **STATE PROGRAMS?**

### Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to mitigate hazard events. The adoption of hazard mitigation measures may be seen as an impediment to growth and economic development. In many cases, mitigation may not generate interest among local officials when compared with competing priorities. Therefore, the local political climate must be considered when designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing the adoption or implementation of specific actions.

### Self-Assessment

Representative members of the jurisdictions completed a self-assessment for their jurisdiction to serve as representative capabilities within the region to effectively implement hazard mitigation activities. As part of this process, the county consultant encouraged members to consider barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as high, moderate, or limited. The following table summarizes the results of the self-assessment survey as a percentage of the eight responses received.

CAPABILITY SELF-ASSESSMENT			
<i>Capability</i>	<i>High</i>	<i>Moderate</i>	<i>Limited</i>
Planning & Regulatory			
Administrative & Technical			
Fiscal			
Political			

The 2018 self-assessment also included four questions to gauge community receptiveness to several types of mitigation strategies. The following table details the results.

SELF-ASSESSMENT: PROJECT CONSIDERATIONS					
<i>Sample Mitigation Strategy</i>	<i>Very Willing</i>	<i>Willing</i>	<i>Neutral</i>	<i>Unwilling</i>	<i>Very Much Unwilling</i>
XYZ community guides development away from known hazard areas.					
XYZ community restricts public investments or capital improvements within hazard areas.					
XYZ community enforces local development standards (e.g., building codes, floodplain management ordinances, etc.) that go beyond minimum state or federal requirements.					
XYZ community offers financial incentives (e.g., through property tax credits) to individuals and businesses that employ resilient construction techniques (e.g., voluntarily elevate structures, employ landscape designs that establish buffers, install green infrastructure elements, etc.).					

### 1.2.13 Disaster Declarations

When a hazard incident occurs in a state, and the capabilities exceed those of the state, after the preliminary damage assessment, the Governor can request that the President declare an emergency or a disaster.

- **Emergency Declarations:** The President can declare an emergency for any occasion or instance when the President determines federal assistance is needed. Emergency declarations supplement State and local or Indian tribal government efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lessen or avert the threat of a catastrophe in any part of the United States. The total amount of assistance provided for in a single emergency may not exceed \$5 million. The President shall report to Congress if this amount is exceeded.
- **Major Disaster Declarations:** The President can declare a major disaster for any natural event, including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, fire, flood, or explosion, that the President determines has caused damage of such severity that it is beyond the combined

capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work. Assistance available under a major disaster declaration includes individual, public, and hazard mitigation.

The following table summarizes the disaster declarations that included Jefferson County since 2000. There have been no disaster declarations in the county since 2012 (FEMA).

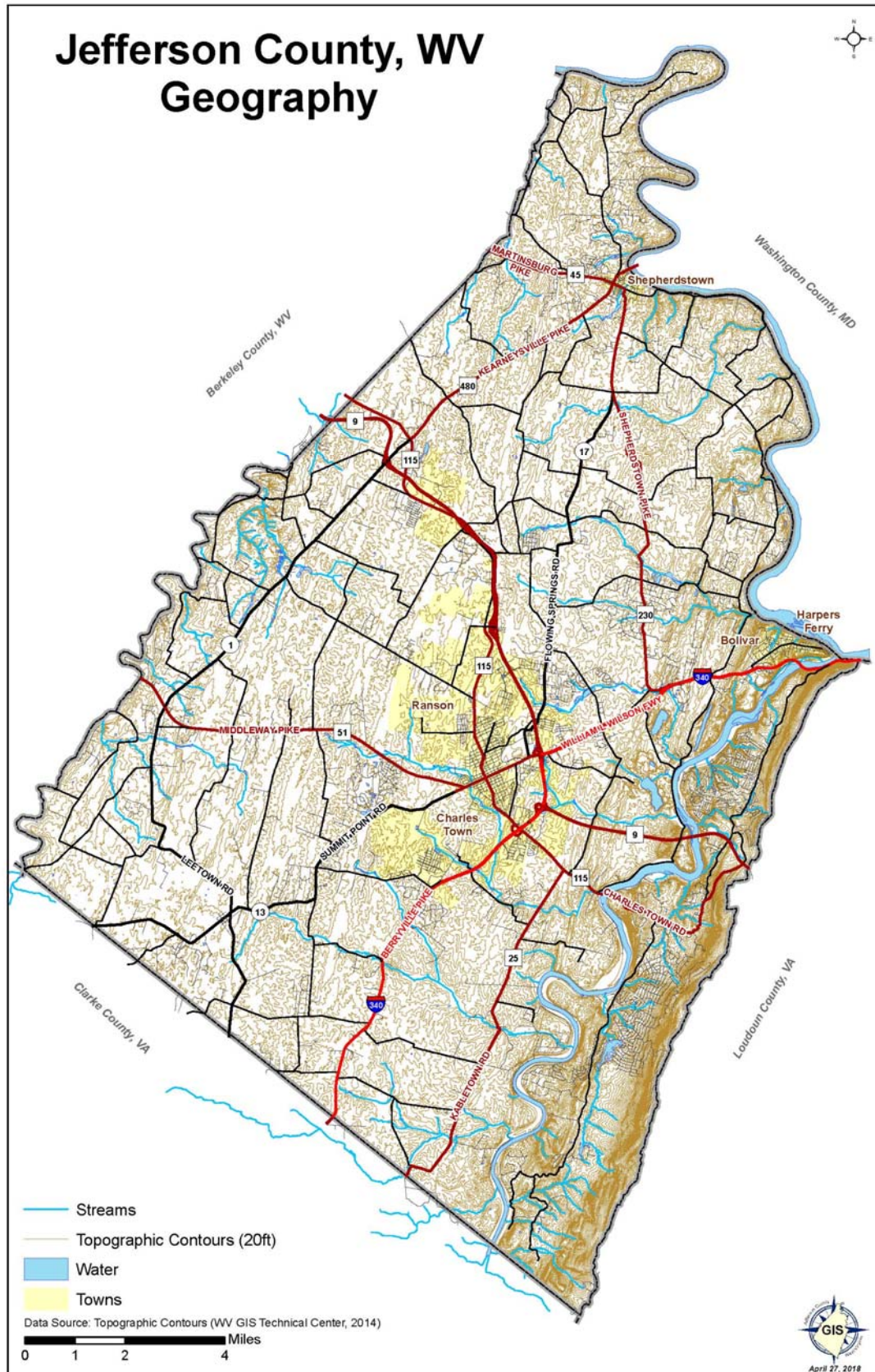
DISASTER DECLARATIONS IN JEFFERSON COUNTY			
<i>Declaration Number</i>	<i>Event Type</i>	<i>Dates of Event</i>	<i>Public (PA) or Individual (IA) Assistance</i>
DR-1769	Severe storms, tornadoes, flooding, mudslides, and landslides	June 3, 2008 to June 7, 2008	\$2,619,379.95 (IA) approved for event \$3,985,862.62 (PA) obligated for event
DR-1881	Severe winter storm and snowstorms	December 18, 2009 to December 20, 2009	\$2,944,843.15 (PA) approved for event
DR-1903	Severe winter storm and snowstorms	February 5, 2010 to February 11, 2010	\$3,302,658.43 (PA) approved for event
EM-3345	Severe storms	June 29, 2012 to July 10, 2012	N/A
DR-4071	Severe storms and straight-line winds	June 29, 2012 to July 8, 2012	\$2,784,278.58 (IA) approved for event \$11,718,720.76 (PA) obligated for event
EM-3358	Hurricane Sandy	October 29, 2012 to November 8, 2012	\$19,645.54 (PA) obligated for event

### 1.2.15 Maps of Jefferson County

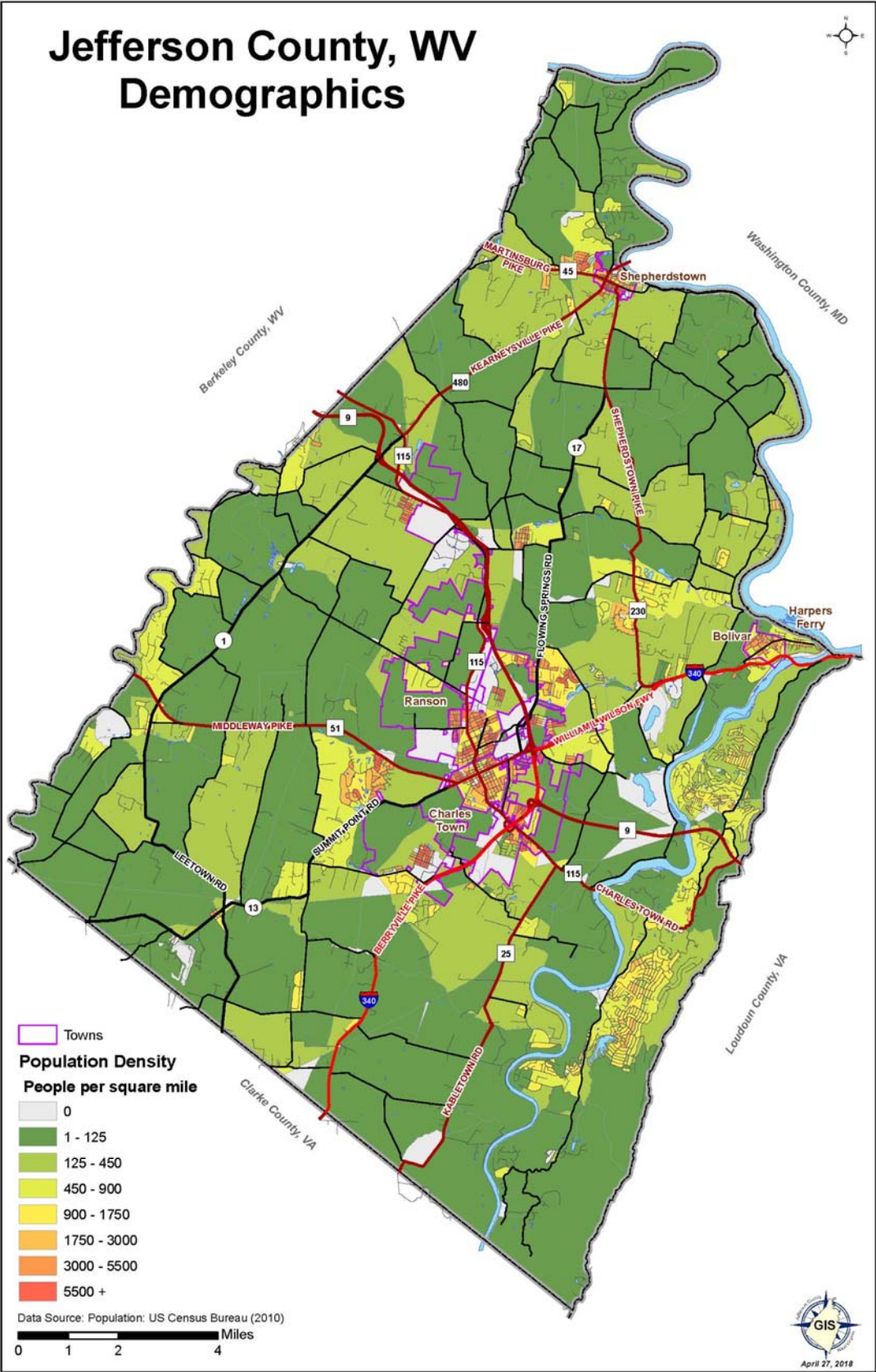
This section contains the following maps of Jefferson County, provided by the Jefferson County GIS department.

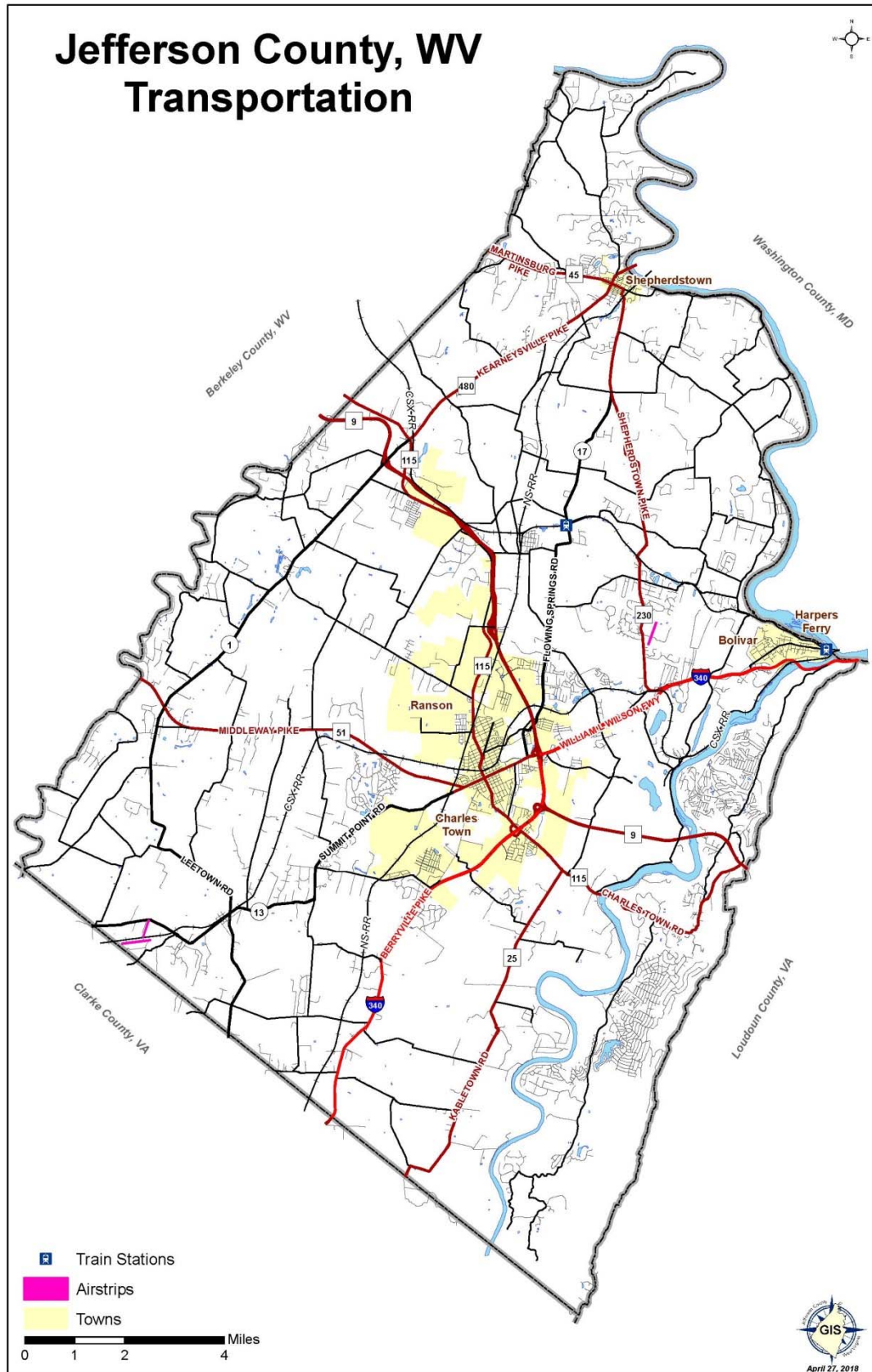
- Jefferson County geography
- Jefferson County demographics
- Jefferson County transportation networks
- Existing Jefferson County land use (2014)



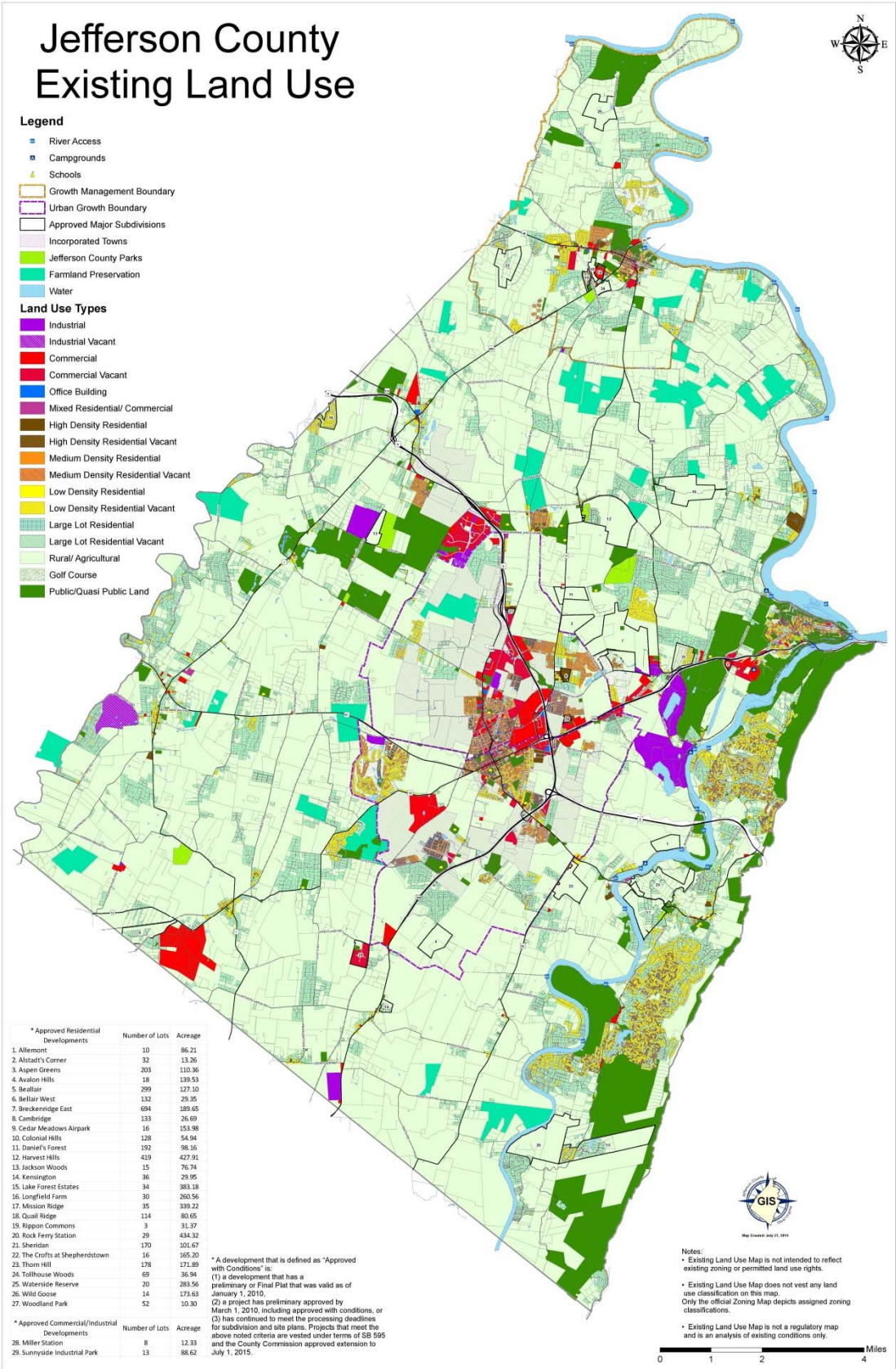












## 1.3 DEVELOPMENT TRENDS

§201.6(c)(2)(ii)(C)

[The plan should describe vulnerability in terms of] providing a general discussion of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

When land is developed or redeveloped it can change the general characteristics of a site. For example, if an area was previously forest and in an effort to introduce agriculture it was deforested, the soil would be different and the ecosystem would change and be vulnerable to new hazards. The same goes for buildings and infrastructure; when a site is modified to add new construction, there are many elements developers should consider.

### 1.3.1 Population Trends

Jefferson County's population continues to grow primarily due to the county's proximity to the Washington D.C. Metro Area. Many of the towns in the county are considered bedroom communities for the greater Washington, D.C. area. "Jefferson County's population grew slowly in the early part of the 20<sup>th</sup> century increasing from approximately 16,000 people to 21,280 over the fifty-year period ending in 1970. The county's population increased dramatically throughout the 1970s, growing by 42.4% from 21,280 to 30,300 in 1980. While no other decade has since equaled that amount of growth, the county's population continued to increase rapidly throughout the 1980s and 1990s. The population growth rate was 18.56% from 1980 to 1990 and 17.4% from 1990 to 2000. The population totals at the end of those periods were 35,926 and 42,190 respectively. Since 1920, the average population growth has been around 3,776 people per decade" (Jefferson County Comprehensive Plan, 2012).

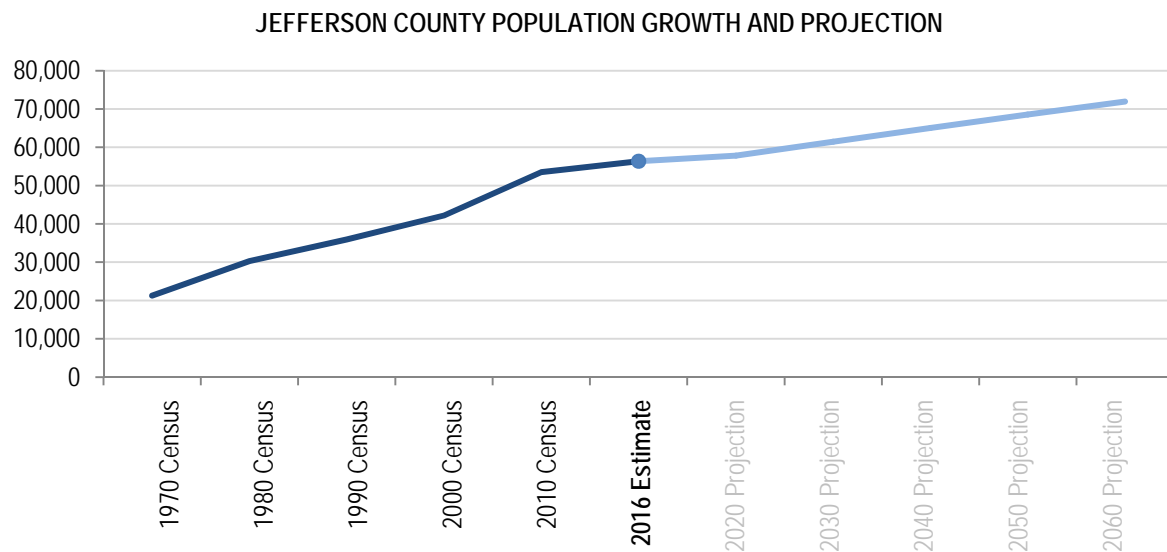
In 2012, the West Virginia University (WVU) College of Business and Economics, Bureau of Business and Economic Research predicted a sharp increase in population over the next several years – up to almost 24% by 2040. However, new data suggests that there will still be an increase in population, but it will not be as high as previously predicted. The table shows the population projections from 2013 (the last plan), and 2018 (the current projections).

JEFFERSON COUNTY POPULATION PROJECTIONS				
Base Data:		2010 U.S. Census – 53,498	2016 U.S. Census - 56,368	
Year	Population Projections 2013	Percent Increase over Year 2010 Population	Population Projections 2018	Percent Increase over Year 2016 Population
2020	62,691	14.66%	57,836	2.5%
2030	71,208	24.87%	61,469	9.01%
2040	N/A	N/A	65,041	15.34%
2050	N/A	N/A	68,538	21.55%
2060	N/A	N/A	71,946	27.59%

Source: WVU, 2012 and Proximity One, 2017

Projections from five years ago show almost a 25% increase in population for 2040; new data suggests only a 15% increase by 2040 and projects to as far out as 2060. This indicates that it could take an extra 20 years to reach the original projected growth for 2040.

The following graph illustrates the population growth in Jefferson County over the years starting in 1970. Since then, population has increased steadily. Planners should take this data into consideration when thinking about future development and availability of resources.



### 1.3.2 Growing the Economy

While there has been a significant amount of commercial development in Jefferson County since the 2004 Comprehensive Plan, it has slowed considerably in recent years. During this same time period, residential growth occurred at a more rapid rate, particularly in the early 2000's. Additionally, Jefferson County's economic development efforts have benefited from a number of public and quasi-public projects and efforts. Despite those gains, the lack of high paying jobs for Jefferson County's skilled workforce requires approximately

36% of all employed individuals to commute to employment centers with higher wages located closer to Washington, D.C. or Baltimore, MD.

With Jefferson County's proximity to Washington, D.C. and Baltimore, MD and with the existing economic cluster of federal agencies, the County has the opportunity to attract additional federal facilities. Some of the industries that the JCDA has identified to target for growth is agriculture development, government, information technology, manufacturing, small business, and tourism.

In the coming decades, creating opportunities that would allow residents with a variety of skills and talents to be employed at jobs located in Jefferson County will continue to be of importance. With the increasing number of high skill workers that have relocated into the community and the presence of Shepherd University, American Public University System (APUS), and other educational facilities, a workforce that is attractive to a wide variety of employers is already present in Jefferson County (Jefferson County, 2015)

### 1.3.3 Improved Infrastructure

One of the most important projects in the area at this time is the improvement of U.S. 340. The WVDOH plan to improve the four-lane road is well under way; in 2016 they published their *Supplemental Draft Environmental Impact Statement* report that addresses a variety of issues that they will run into along the way.

The county also plans improvements to the telecommunications network, particularly in the area of wireless technology and any advanced technologies (Jefferson County, 2015)

### 1.3.4. Planned Development

#### Jefferson County

The Jefferson County Planning and Zoning Department and the Jefferson County GIS Department work together regularly to keep development plans up to date. The map on **[LOCATION]** page illustrates the county's future land use guide. The map specifies preferred growth areas and village expansions in addition to the land use classification of all the areas in the county.

#### Bolivar

**PLANNED DEVELOPMENT FOR BOLIVAR HERE**

#### Charles Town

## **PLANNED DEVELOPMENT FOR CHARLES TOWN HERE**

### Harpers Ferry

## **PLANNED DEVELOPMENT FOR HARPERS FERRY HERE**

### Ranson

In the City of Ranson, there have been several projects built since the last plan update that include demolition and construction projects. Construction projects included hotels, business centers, and residences, among other infrastructure developments. However, the city is not done growing and has several projects in the works over the next several years. Some of the city projects include the following.

- Rockwool Manufacturing and accompanying infrastructure (water, sewer, road, natural gas line installed on Route 9 corridor)
- Civic Center Improvements (HVAC, New Lighting, Flooring, Possible Generator) (This is a Red Cross designated shelter)
- Fairfax Boulevard – Phase 2 to connect to Route 9
- Foundry site redevelopment
- Mildred Street / Beltline stormwater
- Charles Town Sewer Acquisition / Coordination
- Fifth Avenue Streetscape Project
- Flowing Springs Trail Construction

In addition to city projects, there are a variety of private projects scheduled as well.

- Fairfax Crossing Residential Development (been bought recently)
- Completion of Briar Run – Phase 6 (88 Townhouses)
- Shenandoah Springs – Phase 1 completion and planning for Phase 2 (200+ units)
- Rockwool Manufacturing Plan (700,000 sq. feet facility)
- Ranson Gateway Mixed Use (now being marketed)
- Potomac Marketplace – possible expansion
- Uniwest Apartments Expansion – 24 units
- President's Pointe Residential Subdivision (max. 1100 units)
- Locust Knoll Mixed Use Development
- Continuing Old Town incremental development

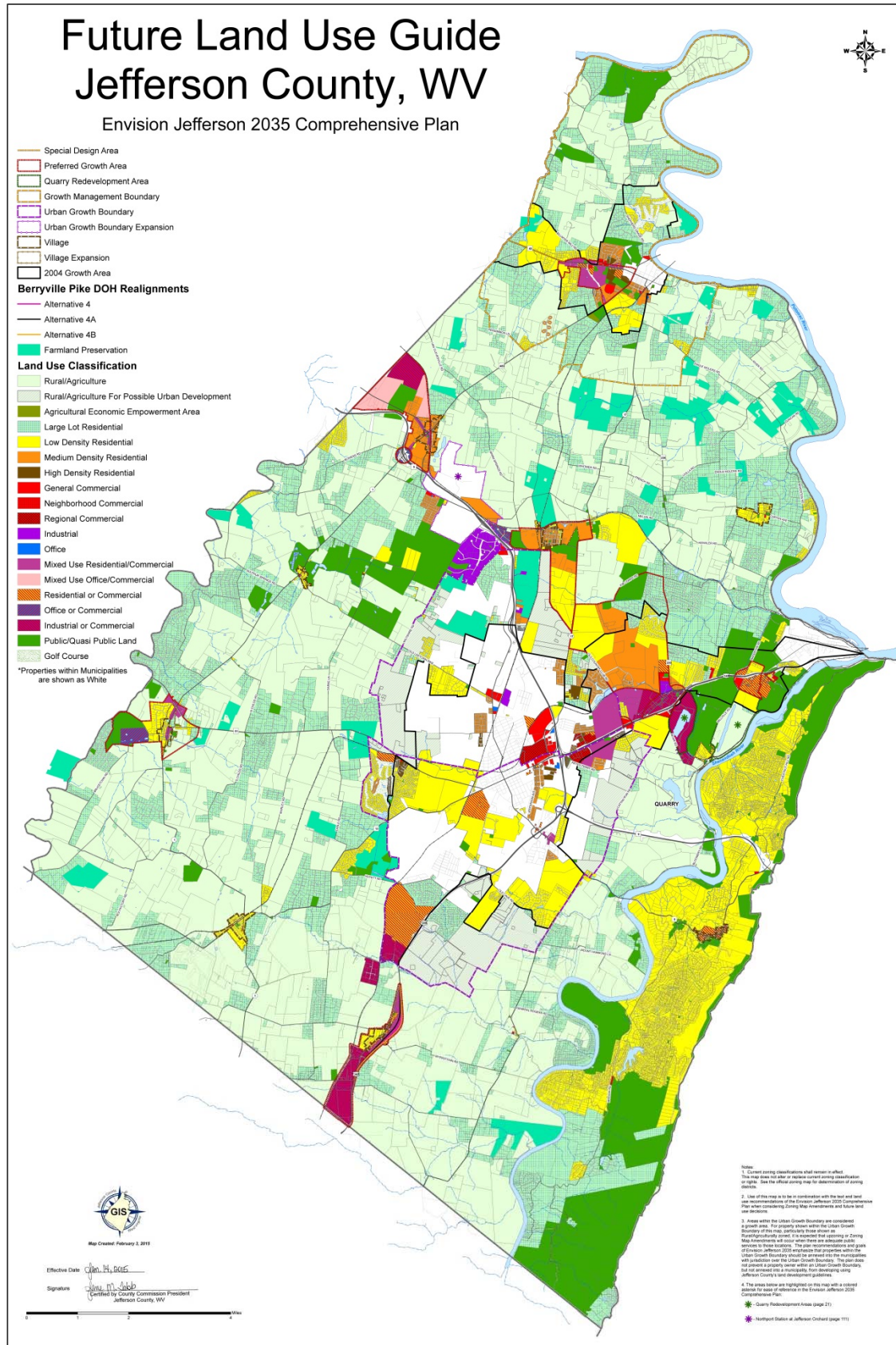


Shepherdstown

**PLANNED DEVELOPMENT FOR SHEPHERDSTOWN HERE**

DRAFT





## 2.0 RISK ASSESSMENT

§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.
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A risk assessment analyzes “the potential for damage, loss, or other impacts created by the interaction of hazards with community assets” (FEMA, 2013). The risk assessment section contains information on

- identified hazards that threaten the region in profiles,
- the vulnerability of the area as it relates to its assets,
- a list of community assets for Jefferson County, and
- an analysis of planned development.

## 2.1 HAZARDS OVERVIEW

§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.
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### 2.1.1 Hazard List Determination

The committee analyzed a variety of natural, technological, and human-caused hazards for inclusion in this plan. The committee did not remove any hazards but did add several that are currently relevant to the county. The following table lists hazards that the plan includes and excludes, describing the reason for each one.

HAZARD INCLUSIONS AND EXCLUSIONS			
<i>Hazard</i>	<i>Type</i>	<i>Status</i>	<i>Description</i>
Avalanche	Natural	Not Included	Avalanches happen mainly in the western United States and Canada (Keller, Devecchio, 2015 p. 229).
Civil Disturbance	Human-caused	Included	Includes active shooters, bomb threats, and protests. See Section
Coastal Erosion	Natural	Not Included	The Atlantic East Coast, where coastal erosion is nearest, is approximately 150 miles away and the Pacific West Coast is approximately 2,400 miles away (Google Earth).
Dam Failure	Natural and Technological	Included	See Section
Drought	Natural	Included	See Section
Earthquake	Natural	Included	See Section
Extreme Temperatures	Natural	Included	See Section
Flood	Natural	Included	Includes riverine flood, flash flood, and nuisance flood. See Section
Hail	Natural	Included	See Section
Hazardous Materials	Human-caused	Included	See Section
Hurricanes	Natural	Not Included	The Atlantic East Coast, where hurricane paths are nearest, is approximately 150 miles away, the Chesapeake Bay is approximately 80 miles away, and the Pacific West Coast is approximately 2,400 miles away (Google Earth). See section
Infestation	Natural	Included	See Section
Land Subsidence	Natural and Human-Caused	Included	See Section
Landslide	Natural	Included	See Section
Lightning	Natural	Included	See Section
Public Health Crisis	Human-caused	Included	Includes pandemics and epidemics, and substance abuse. See Section
Sea Level Rise	Natural	Not Included	Sea level rise occurs in the ocean; the Chesapeake Bay is approximately 80 miles away, and the Pacific West Coast is approximately 2,400 miles away (Google Earth).
Storm Surge	Natural	Not Included	Storm surges occur in the ocean; the Chesapeake Bay is approximately 80 miles away, and the Pacific West Coast is approximately 2,400 miles away (Google Earth).

HAZARD INCLUSIONS AND EXCLUSIONS			
<i>Hazard</i>	<i>Type</i>	<i>Status</i>	<i>Description</i>
Terrorism	Human-Caused	Included	See Section
Tornado	Natural	Included	See Section
Tsunami	Natural	Not Included	The Atlantic East Coast, where tsunamis would be closest, is approximately 150 miles away, the Chesapeake Bay is approximately 80 miles away, and the Pacific West Coast is approximately 2,400 miles away (Google Earth).
Urban Fire	Human-Caused	Included	See Section
Wind	Natural	Included	See Section
Winter Weather	Natural	Included	See Section
Wildfire	Natural and Human-Caused	Included	See Section
Volcanoes	Natural	Not Included	The closest monitored volcano is in Yellowstone National Park in Wyoming (USGS) and is approximately 1,650 miles away (Google Earth).

## 2.1.2 Hazard Research

Many sources informed the hazard profiles. The following table briefly describes the major sources referenced for each hazard analyzed in this plan.

HAZARD RESEARCH AND DATA SOURCES	
<i>Hazard</i>	<i>Research Sources</i>
Civil Disturbance	<ul style="list-style-type: none"> <li>• Appalachia High Intensity Drug Trafficking Areas (HIDTA)</li> <li>• National Gang Center</li> <li>• Local Law Enforcement Offices</li> </ul>
Dam Failure	<ul style="list-style-type: none"> <li>• Association of State Dam Safety Officials</li> <li>• National Performance of Dams Program</li> <li>• National Inventory of Dams</li> </ul>
Drought	<ul style="list-style-type: none"> <li>• USDA Census of Agriculture</li> <li>• National Integrated Drought Information System</li> <li>• National Centers for Environmental Information (NOAA)</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>• Association of American State Geologists</li> <li>• United States Geological Service</li> </ul>
Extreme Temperatures	<ul style="list-style-type: none"> <li>• National Centers for Environmental Information (NOAA)</li> </ul>
Flood	<ul style="list-style-type: none"> <li>• Federal Emergency Management Agency Flood Rate Map</li> <li>• National Centers for Environmental Information (NOAA)</li> <li>• U.S. Environmental Protection Agency</li> </ul>
Hazardous Materials Incident	<ul style="list-style-type: none"> <li>• Federal Railroad Administration</li> <li>• Pipeline and Hazardous Materials Safety Administration</li> <li>• National Transportation Safety Board</li> <li>• National Pipeline Mapping System</li> <li>• USCG National Response Center</li> </ul>
Invasive Species	<ul style="list-style-type: none"> <li>• WV Department of Agriculture</li> </ul>
Land Subsidence	<ul style="list-style-type: none"> <li>• United States Geological Service</li> <li>• West Virginia Division of Highways</li> </ul>
Landslide	<ul style="list-style-type: none"> <li>• WV DOH</li> </ul>

HAZARD RESEARCH AND DATA SOURCES	
<i>Hazard</i>	<i>Research Sources</i>
Public Health Crisis	<ul style="list-style-type: none"> <li>Centers for Disease Control and Prevention</li> <li>Local County Health Departments</li> <li>Local Law Enforcement Offices</li> <li>Local Emergency Medical Services</li> <li>West Virginia Department of Health and Human Resources</li> </ul>
Severe Thunderstorm and Hail	<ul style="list-style-type: none"> <li>National Centers for Environmental Information (NOAA)</li> <li>Northeast Regional Climate Center</li> </ul>
Severe Wind and Tornado	<ul style="list-style-type: none"> <li>National Centers for Environmental Information (NOAA)</li> <li>Northeast Regional Climate Center</li> </ul>
Severe Winter Weather	<ul style="list-style-type: none"> <li>National Centers for Environmental Information (NOAA)</li> <li>Northeast Regional Climate Center</li> </ul>
Terrorism	<ul style="list-style-type: none"> <li></li> </ul>
Wild and Urban Fire	<ul style="list-style-type: none"> <li>National Centers for Environmental Information (NOAA)</li> <li>West Virginia Division of Forestry</li> </ul>

## 2.2 CALCULATING RISK

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

One of the components of the risk assessment is to determine the risk of a hazard through its probability and severity. This process helps identify which hazards pose the most significant risk to Jefferson County and its municipalities. The number of past events within a certain timeframe will inform the probability. The timeframe is based on information available from different resources and varies depending on the data. Different sources provide data on the number of events throughout a period of years. This data is used to calculate the probability.

The probability of occurrence is broken down into five categories as seen in the table to the right. The chance of occurrence of a hazard within the next year can be quantified based on historical data; this can be expressed in a numerical measure or as a percentage of 0-100 percent. It is calculated by adding the total occurrences of a specific hazard and dividing it by the years of data. The profiles will utilize this formula for calculating probability when appropriate (i.e., historical data is available). Although some hazards have zero recorded occurrences, the risk still exists. Since non-natural hazards typically do not depend on weather patterns to occur, they are not informed by this type of historical data. Non-natural and technological hazards are nearly impossible to assign a measurement of probability.

PROBABILITY		
<i>Value</i>	<i>Description</i>	<i>Definition</i>
.81 – 1.0 (81 – 100%)	Frequent	Will occur during a year
.61 – .80 (61 – 80%)	Probable	Likely to occur in a year
.41 – .60 (41 – 60%)	Occasional	May or may not occur in a year
.21 – .40 (21 – 40%)	Remote	Unlikely to occur in a year
0 – .20 (0 – 20%)	Improbable	So unlikely that it can be assumed it will not occur in a year

- Three main factors determine severity:
1. the historical deaths, injuries, and property/crop damage;
  2. the extent of potential secondary and/or cascading impacts of the hazard; and

SEVERITY	
<i>Description</i>	<i>Definition</i>
Catastrophic	Death or major structural loss
Critical	Severe injury, severe illness, or marginal structural damage
Marginal	Minor injury, minor illness, or structural damage
Negligible	Less than minor injury, illness or structural damage

3. the potentially impacted geographic area as determined through risk mapping.

Generally, the severity estimations will be less exact than probability estimations. The four definitions of severity, catastrophic, critical, marginal, and negligible, are shown at the bottom of the previous page.

The Risk Assessment Matrix is the graphical representation of the combination of hazard probability and hazard severity. There are different ways to define the level of risk (i.e., low or very low, high or very high); for this plan, the definitions follow the 2013 West Virginia Statewide Hazard Mitigation Plan Update document to align this plan with the state's plan. The matrix is designed to show the hazards that are of most concern to Jefferson County and its municipalities. Each profile details the level of severity and probability, therefore generating the level of risk.

RISK ASSESSMENT MATRIX					
SEVERITY	PROBABILITY				
		<i>Frequent</i>	<i>Probable</i>	<i>Occasional</i>	<i>Remote</i>
	<i>Catastrophic</i>	High	High	Medium-High	Medium
	<i>Critical</i>	Medium-High	Medium-High	Medium	Medium Low
	<i>Marginal</i>	Medium-High	Medium	Medium Low	Low
	<i>Negligible</i>	Medium	Medium Low	Medium Low	Low

In general, mitigation actions should focus on hazards that fall into the medium, medium-high or high categories to reduce the overall risk. Hazards that fall under the medium-low or low risk categories are still important to mitigate, but focusing efforts in the higher risk category will be of more value to reduce the overall risk.

Members of the committee completed risk assessment matrices individually that included all the hazards they decided to include in the plan. The consultant averaged out the probability and severity of each hazard and calculated the average risk. The results appear in the table under 'committee results.' For calculations, refer to Appendix X. The table also includes the results of public opinion according to the first online public survey. For calculations, refer to Appendix X. The results of the public survey average risk calculations are under 'public results.' The public survey did not include the civil disturbance, extreme temperatures, infestation, and public health crisis because the committee added these hazards after the survey was available online; these appear as N/A or not available.



Hazard	RISK					
	Committee Results			Public Results		
	Average Probability	Average Severity	Average Risk	Average Probability	Average Severity	Average Risk
Civil Disturbance	Occasional	Marginal	Medium Low	N/A	N/A	N/A
Dam Failure	Remote	Marginal	Low	Improbable	Negligible	Low
Drought	Remote	Marginal	Low	Occasional	Marginal	Medium Low
Earthquake	Remote	Marginal	Low	Occasional	Marginal	Medium Low
Extreme Temperatures	Occasional	Marginal	Medium Low	N/A	N/A	N/A
Flood	Probable	Critical	Medium-High	Occasional	Marginal	Medium Low
Hazardous Materials	Occasional	Critical	Medium	Improbable	Critical	Medium Low
Infestation	Occasional	Marginal	Medium Low	N/A	N/A	N/A
Land Subsidence	Remote	Marginal	Low	Improbable	Marginal	Low
Landslide	Remote	Marginal	Low	Improbable	Marginal	Low
Public Health Crisis	Probable	Critical	Medium-High	N/A	N/A	N/A
Severe Thunderstorm and Hail	Probable	Marginal	Medium	Frequent	Critical	Medium-High
Severe Wind and Tornado	Probable	Marginal	Medium	Probable	Critical	Medium-High
Severe Winter Storm	Occasional	Marginal	Medium Low	Frequent	Critical	Medium-High
Terrorism	Remote	Critical	Medium	Improbable	Marginal	Low
Wild and Urban Fires	Remote	Marginal	Low	Improbable	Marginal	Low

Each hazard profile includes a risk assessment matrix and calculates the risk based on historical data and research.



## 2.3 VULNERABILITY

Vulnerability is a “measure of propensity of an object, area, individual, group, community, country, or other entity to incur the consequences of a hazard” (Coppola, 2015, p. 33). Many aspects contribute to the vulnerability of a people; these can include income disparity, class, race or ethnicity, gender, age, disability, health, and literacy (Thomas & Phillips, 2013, p. 2, 3). The following is a brief description of how each of the aspects can contribute to vulnerability to disasters.

- **Income Disparity:** Income disparities produce different outcomes from disasters that can cause more human suffering, and require more external support.
- **Class:** Lower-income families tend to live in housing that suffers disproportionately during disasters.
- **Race or Ethnicity:** Officials tend to issue warning messages in the dominant language with an expectation that people will take the recommended action immediately.
- **Gender:** Domestic and stranger violence increases after a disaster. Although women tend to be the ones most likely to secure relief aid for the family, they are underrepresented and underused in recovery efforts.
- **Age:** Elderly populations are frequently reluctant to seek assistance before and secure aid after a disaster out of concern that they may lose their independence.
- **Disability:** People with disabilities experience challenges in acquiring transportation to evacuate areas as well as to access appropriate shelters and post-disaster housing.
- **Health:** Disasters can disrupt access to care. Individuals on health services are faced with life-threatening circumstances if these services cannot be accessed. Disasters tend to exasperate chronic and mental health conditions.
- **Literacy:** Many emergency preparedness materials are available in written form. Few options exist for people with low reading levels, other languages, or cognitive abilities.

## 2.4 HAZARD PROFILES

The following sections contain a profile of each hazard considered by this plan, which provides details on how the hazard impacts the area. Within each profile, research and historical data informs the following elements.

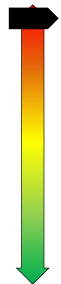
- **Hazard Overview:** Defines the hazard.
- **Possible Causes:** Describes a variety of causes that can contribute to the occurrence of a hazard.
- **Historical Occurrences:** Summarizes significant past events related to the hazard.
- **Impact & Vulnerability:** Describes impacts on different topics such as health, the environment, or infrastructure that may result from the hazard as well as specific populations that may be vulnerable.
- **Location & Extent:** Identifies the physical places in the region that are vulnerable to the hazard and the severity of a hazard in a given location.
- **Loss & Damages:** Outlines the methods used for loss amounts (of deaths, injury and/or property damage depending on information available) and estimates based on historical information and vulnerable populations, structures, and infrastructure.
- **Previous Mitigation Efforts:** Identifies mitigation actions that officials or the public has established or implemented for risk reduction of that hazard.
- **Committee & Partner Input:** Describes instances where committee members voiced concerns about the hazard or talked about previous mitigation efforts.
- **Vulnerability Assessment:** Detailed methods of calculating probability and severity of each hazard.
- **Risk Map:** Graphically shows the geographic locations in the counties that are vulnerable to each hazard when appropriate.

The committee decided to rank the hazards by risk category. The following table illustrates the hazard ranking, according to calculations set forth in the profiles. If more than one hazard falls within a risk category, the committee decided to list them alphabetically; this is the order in which the hazards are presented in the plan document.

HAZARD RANKINGS				
High - 1	Medium High - 2	Medium - 3	Medium Low - 4	Low - 5
<ul style="list-style-type: none"> <li>Public Health Crisis</li> </ul>	<ul style="list-style-type: none"> <li>Extreme Temperatures</li> <li>Landslide</li> <li>Severe Wind and Tornadoes</li> <li></li> </ul>	<ul style="list-style-type: none"> <li>Flood</li> <li>Hazmat</li> <li>Invasive Species</li> <li>Land Subsidence</li> <li>Severe Thunderstorms</li> </ul>	<ul style="list-style-type: none"> <li>Earthquake</li> <li>Violent Disturbance</li> </ul>	<ul style="list-style-type: none"> <li>Drought</li> <li>Terrorism</li> <li>Severe Storm</li> <li>Winter</li> </ul>

DRAFT

## Public Health Crisis

Definition of the hazard			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	Risk	Period of Occurrence:	At any time
		Overall Hazard Ranking:	5
		Warning Time:	Weeks to months
		State Risk Ranking:	Not ranked
		Probability:	Frequent
		Severity:	Catastrophic
		Type of Hazard:	Human-Caused
		Disaster Declarations:	None

## HAZARD OVERVIEW

In this plan public health crisis includes two distinct types of public health concerns: pandemics or epidemics as well as the substance abuse crisis.

### Epidemics

According to the Centers for Disease Control and Prevention (CDC), there are various levels that refer to the amount or extent of a disease occurrence (CDC, 2012).

- **Endemic** refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area; it is the amount of a particular disease that is usually present in a community or baseline.
- **Sporadic** refers to a disease that occurs infrequently and irregularly.
- **Hyper endemic** refers to persistent, high levels of disease occurrence.
- **Cluster** refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.
- **Epidemic** refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area. Epidemics occur when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts. More specifically, an epidemic may result from:
  - a recent increase in amount or virulence of the agent,
  - the recent introduction of the agent into a setting where it has not been before,

- an enhanced mode of transmission so that more susceptible persons are exposed,
- a change in the susceptibility of the host response to the agent, and/or
- factors that increase host exposure or involve introduction through new portals of entry.
- **Outbreak** carries the same definition of epidemic, but is often used for a more limited geographic area.
- **Pandemic** refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

Some diseases are so rare in a given population that a single case warrants an epidemiologic investigation (e.g., rabies, plague, polio), other diseases occur more commonly so that only deviations from the norm warrant investigation.

For the purposes of this plan, diseases considered are limited to West Virginia Reportable Diseases according to the WV Code 16-3-1: 64 CSR 7.

### Substance Abuse

In the United States, what is commonly referred to as the 'opioid epidemic', not for being a spreadable or infectious disease, but by acting like one, has grown to alarming proportions. In 2015 alone, 12.5 million people misused prescription opioids. Opioids are drugs that are primarily used for pain relief; they include both legal and illegal substances. Legal, prescribed opioids include oxycodone, hydrocodone, and morphine. Illegal drugs include substances such as heroin and fentanyl. According to the Department of Health and Human Services, 2.1 million people misused prescription opioids for the first time, over 33K people died from overdosing on opioids, over 15,000 deaths were attributed to overdosing on commonly prescribed opioids. Around 828K people used heroin, 135,000 for the first time, and around 20k deaths were attributed to overdoses of synthetic opioids or heroin (HHS, 2017).

The Centers for Disease Control and Prevention conduct studies on prescribing rates. Some of the findings include the following.

- After a steady increase in the overall national opioid prescribing rate from 2006, the total number of prescriptions dispensed peaked in 2012 at more than 255 million and a prescribing rate of 81.3 prescriptions per 100 persons.
- The overall national opioid prescribing rate declined from 2012 to 2016, and in 2016, the prescribing rate had fallen to the lowest it had been in more than 10 years at 66.5 prescriptions per 100 persons (over 214 million total opioid prescriptions).

- However, in 2016, prescribing rates continue to remain very high in areas across the country.
  - In about a quarter of U.S. counties, enough opioid prescriptions were dispensed for every person to have one.
  - While the overall opioid prescribing rate in 2016 was 66.5 prescriptions per 100 people, some counties had rates that were seven times higher than that.
- Prescribing rates for opioids vary widely across different states and counties. Emerging hotspot areas are identified by the darker colors on the maps.

## POSSIBLE CAUSES

### Epidemics

Epidemics can develop with little or no warning and quickly erode the capacity of local medical care providers. A fast developing epidemic can last several days and extend into several weeks. In some extreme cases, they can last for several months. An epidemic can occur at any time of the year, but the warm summer months, when bacteria and microorganism growth are at their highest, present the greatest risk.

### Substance Abuse

In terms of the substance abuse crisis, there are a number of possible reasons why the population has increased their use of opioids. One simple explanation may be that it is easier to get high than it is to get help (Lopez, 2017). This is the culmination of various broken or dysfunctional systems in our society today. The following is a brief description of some of the reasons German Lopez identifies in his article *The opioid epidemic, explained* about why there has been an increase in the use of opioids in the U.S.

- Pharmaceutical companies market their drugs as safe and effective and spend large amounts of money on lobbyists in Washington.
- Doctors are pressured to treat pain more seriously and treat patients rapidly, often times resulting in overprescribing drugs, done with incentives from drug companies.
- Patients with chronic pain issues likely could benefit from alternative, non-opioid treatments but rarely do so due to high costs of or no coverage by health insurance.
- Losing access to legally prescribed painkillers, over time, contributed to the increase in use of illegal drugs such as heroin and fentanyl. A study by JAMA Psychiatry in 2014

found that 75% of heroin users in treatment started with painkillers, while the Centers for Disease Control (CDC) found in 2015 that people who are addicted to painkillers are 40 times more likely to be addicted to heroin.

- As the demand for painkillers increased, so did the demand for heroin; this allowed for people that were not addicted to painkillers before to have easier access. Painkillers at the same time have become less accessible due to the crack down on excessive prescriptions.
- Heroin is stronger (more addictive) than painkillers and fentanyl is stronger than heroin.

## HISTORICAL OCCURRENCES

### Epidemics

The regional epidemiologist provided information for the following table that includes reportable disease cases in Jefferson County from 2011 to 2016.

REPORTABLE DISEASE CASES IN JEFFERSON COUNTY						
<i>Disease</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>
Amebiasis	0	1	0	0	0	0
Animal Bites/Exposures	0	125	174	170	201	180
Botulism, Infant	0	0	0	0	0	1
Campylobacteriosis	<5	13	8	1	10	17
Carbapenem-resistant Enterobacteriaceae	0	0	0	0	0	5
Cholera	0	0	0	0	0	1
Cryptosporidiosis	0	0	1	0	0	0
E. coli shiga-toxin producing (STEC)	0	1	2	1	2	1
Ehrlichiosis/Anaplasmosis	0	0	2	0	0	0
Giardiasis	<5	5	4	2	3	1
Haemophilus influenzae, invasive	<5	3	2	1	2	1
Hepatitis A, Acute	0	1	0	0	0	4
Hepatitis B, Acute	<5	6	4	4	4	2
Hepatitis B, Chronic	0	3	13	13	5	9
Hepatitis C, Acute	<5	3	1	1	0	0
Hepatitis C, Chronic	0	51	57	113	132	86
Hepatitis E	0	0	1	0	0	0
Influenza-related death, under age 18	0	0	0	1	0	0
Legionellosis	0	1	3	0	0	1
Listeriosis	0	0	1	0	1	0
Lyme Disease	40	39	27	22	44	34
Pertussis	<5	0	1	1	0	0
Q Fever	0	0	0	1	0	0
Rabies, animal	<5	5	3	7	5	1
Rocky Mt. Spotted Fever	0	0	0	0	1	2
Salmonella	6	16	10	7	10	8
Shigella	<5	1	0	0	0	1

REPORTABLE DISEASE CASES IN JEFFERSON COUNTY						
<i>Disease</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>
Streptococcus, Group A invasive	<5	0	0	0	0	0
Streptococcus, Group B invasive	0	0	1	0	1	4
Streptococcus pneumoniae, invasive	8	9	6	6	5	4
Tularemia	0	0	0	1	0	0
<b>TOTAL</b>	<b>73</b>	<b>283</b>	<b>321</b>	<b>352</b>	<b>426</b>	<b>363</b>

Source: WV Public Health District 3 Regional Epidemiologist

### Substance Abuse

Although there are no accurate numbers regarding substance abuse in Jefferson County, the Jefferson County Sheriff's Office (JCSO) reports the amount of calls they receive every week on their social media. From the beginning of 2018 through the end of April 2018, they have received 98 calls for reports of suspected drug activity and 18 calls for overdoses (not all overdoses are deadly, but this information is not provided).

The WVU Jefferson Medical Center has seen an increase in patients coming to the hospital for substance abuse problems; typically the drug of choice is Heroin and they are seeing an increase in alcohol abuse among young people.

### COMMITTEE & PARTNER INPUT

During committee meetings members shared their experiences with recurrent and recent public health incidents. The table below outlines the event date, if available, what happened, and how it could possibly be avoided going forward.

COMMITTEE INPUT FOR PUBLIC HEALTH CRISIS		
<i>Event Date</i>	<i>What Happened</i>	<i>How This Can Be Avoided in the Future</i>
2015 to present	Overdose deaths overwhelm first responders, social disruption, lack of treatment resources	Follow WV Opioid Intervention Plan (Jan 2018). Public education, harm reduction, medical assisted treatment, recovery coach academy, training for peer recovery coaches, training for volunteer responders to support EMS, increase awareness/involvement to reduce stigma
November 2017	Bit by a tick contracted Lyme disease	Bug spray, kill all the deer (host for ticks)
Current	Increase in use of opioids, increases in call load on EMS with no increase in staffing	Education, rehab, enforcement, increase staffing, increase funding
2017-2018	Severity of predominant influenza strain caused many deaths and hospitalization throughout the state	Convince more people to get the flu shot early, increase education about how to reduce risk
Current	Severe overload on EMS and hospitals	
Current	Multiple deaths from substance abuse	Doctor heeded warning, public awareness, family education, intervention



## IMPACTS & VULNERABILITY

### Epidemics

Major concerns during an epidemic or outbreak include the ability of local health care providers to provide medical attention to everyone who becomes ill, and the ability to identify the source or what is causing the population to become ill.

Cascading effects of epidemics can include the following.

- Illness or death
- Civil disturbance
- Distrust of government
- Poor water quality
- Temporary loss of income

### Substance Abuse

This hazard is concentrated within the general population. Residents should be aware of higher crime and how to manage and handle people who exhibit addictive behavior. Having a loved one addicted to opioids may cause financial, physical, and emotional stress. First responders can be in danger when responding to overdose incidents due to the nature of unknown drugs and their side effects.

## LOCATION & EXTENT

### Epidemic

The statistics for disease and epidemics are gathered on a county basis, municipalities are included in the overall risk analysis performed by the state. An epidemic can affect all parts of Jefferson County, but is more probable to occur in densely populated areas, such as the City of Charles Town and Ranson, particularly large, multi-unit residential developments, and facilities at which a large workforce is employed.

### Substance Abuse

The opioid epidemic is one that has, in some way, reached into the lives of nearly every person in the U.S. This “disease” does not have a preference for age, class, economic status, or even gender. It is difficult to pinpoint a specific location of this epidemic.

## LOSS & DAMAGES

### Epidemic

Losses based on historical epidemic occurrences are difficult to estimate. According to a study by Molinari (2007), seasonal influenza results in a substantial economic impact, estimated, in part, at \$16.3 billion in lost earnings. By population, Jefferson County represents **PERCENT** of the United States. Since seasonal influenza primarily impacts the human population, using Jefferson County's composition of the U.S. as a multiplier and applying it to the potential economic impact, lost earnings in Jefferson County could reach a staggering **dollar [amount]** each year. Though that number appears high, it equates to approximately **AMOUNT** per year for each person in the county. Epidemics rarely affect structures. Epidemics may affect people and, at times, the operations of critical facilities, businesses, and other community assets.

### Substance Abuse

According to a Matrix Global Advisors report in 2015, the health care cost of the opioid epidemic in Maryland is of over \$451M, accounting for around 1.8% of the total health care costs in the state, and a per capita health care cost of \$75. These calculations accounted for the population, cost of health care in the state, and the rate of opioid abuse.

The Council of Economic Advisers estimated the cost of the opioid crisis in 2015 to be around \$504B which took healthcare bills, criminal justice costs, and lost productivity into consideration (LaMagna, 2017).

- **Hospitals:** The Beth Israel Deaconess Medical Center in Boston studied the average cost of treating an opioid overdose patient in intensive care units. They found that the cost between 2009 and 2015 rose 58%. The average cost was around \$92K per patient.
- **Criminal Justice:** state and local governments have incurred costs of nearly \$8B in criminal justice-related activities. Around 45% of addicts will become repeat offenders within three years from their prison release.
- **Businesses:** Absenteeism and decreased job performance due to drug use has cost companies around \$20B.
- **Unseen costs:** Other costs related to drug overdoses that are difficult to quantify include impact on the quality of life, the pain endured by the people affected, loss of tax revenue, etc.

## PREVIOUS MITIGATION EFFORTS

### Epidemic

The Jefferson County Health Department recently participated in the updating of the Eastern Public Health Response Team (EPHRT) All-Hazards Response Plan. In the Medical Counter Measures (MCM) portion of the plan, they detail emerging infectious disease and outbreaks that are of most concern to the county; these include general protocols for containing disease and specific information on anthrax, botulism, brucellosis, plague, smallpox, tularemia, viral hemorrhagic fever, and bioterrorism, all category I and II reportable diseases.

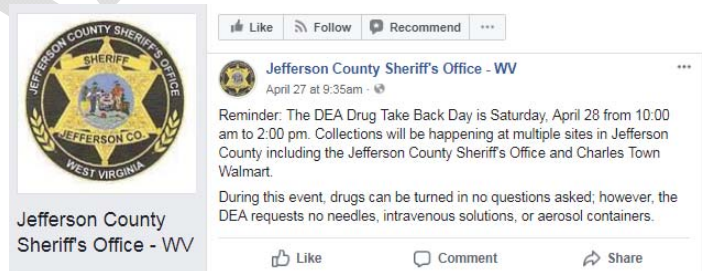
In West Virginia there are five categories of reportable infectious diseases; the categories refer to the amount of time health providers have to report diseases and to what agency.

- Category I: Report immediately to the local health department
- Category II: Report within 24 hours to the local health department
- Category III: Report within 72 hours to the local health department
- Category IV: Report within one week to the local health department
- Category V: Report within one week to the state health department

### Substance Abuse

In an effort to keep the population safe, the public health crisis requires partners to work together. For example, the WVU Jefferson Medical Center will call the police department if a patient presents to the emergency department with illicit drugs, and refers suspected child abuse due to drug use to child protective services.

The Jefferson County Sheriff's Office (JCSO) also attempts to keep the population safe from legal and illegal substances. As seen to the right, the JCSO has regularly scheduled DEA Drug Take Back Days where they take back drugs with no questions asked.




## VULNERABILITY ASSESSMENT

PUBLIC HEALTH CRISIS RISK CALCULATION				
<i>Probability</i>		<i>Severity</i>		<i>Risk</i>
FREQUENT		CATASTROPHIC		HIGH
There are several reports of overdoses and reportable disease cases throughout the year.	+	Because deaths are associated with substance abuse and epidemics, the severity of the public health crisis is catastrophic	=	The risk assessment matrix categorizes the public health crisis as a high risk to Jefferson County.

## RISK MAP

## Extreme Temperatures

Extreme temperatures are deviations of at least 10 degrees F above or below the average high and low temperatures.			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	Risk	Period of Occurrence:	At any time, typically during summer (hot) and winter (cold) months
		Warning Time:	Days or weeks
		Probability:	Frequent
		Type of Hazard:	Natural
		Overall Hazard Ranking:	2
		State Risk Ranking:	Not ranked for Jefferson County (Extreme heat) Low statewide
		Severity:	Marginal
		Disaster Declarations:	None

## HAZARD OVERVIEW

Temperature extremes (hot and cold) are a new hazard the committee included in this update cycle. Extreme temperatures, for the purpose of this profile will include both hot and cold temperature extremes.

### Heat

Temperatures vary widely over the course of a year, but each season has average temperature ranges associated with them. Summer and winter have, generally, the highest and lowest range of temperatures, respectively. When the temperature is consistently greater than the normal in summer, meteorologists refer to it as a heat wave, which means, “temperatures of ten or more degrees above the average high temperature persist across the geographic region for several days or weeks” (Haddow, Bullock, & Coppola, 2014, p.51). These conditions can be a contributor to drought conditions when combined with a lack of rainfall. Excessive heat has a history of being deadly. In the United States “more than 1,500 die from exposure to excessive heat” (Haddow, Bullock, & Coppola, 2014, p.52). These conditions can also have serious impacts on crops, causing below average harvests. Repeated years of extreme temperatures can easily cause significant economic impacts on agricultural industries.

The National Centers for Environmental Information (NCEI) tracks two types of extreme heat temperatures.

- **Heat:** A period of heat resulting from the combination of high temperatures (above normal) and relative humidity. A heat event occurs whenever heat index values meet or exceed locally/regionally established advisory thresholds or a directly-related fatality occurs due to the heat event.

- **Excessive Heat:** Excessive heat results from a combination of high temperatures (well above normal) and high humidity. An excessive heat event occurs when heat index values meet or exceed locally/regionally established excessive heat warning thresholds, on a widespread or localized basis (National Weather Service Instruction 10-1605, 2007).

### Cold

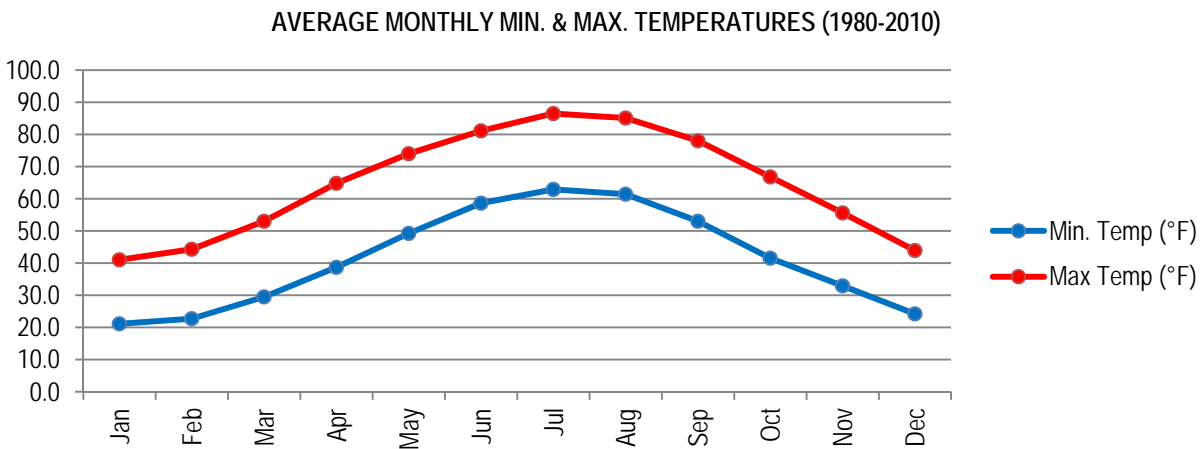
While there is no widely accepted definition of extremely cold temperatures, periods of colder than average conditions can cause an array of negative consequences depending on their duration (Haddow, Bullock, & Coppola, 2014, p.51). Extremely cold temperatures are immediately dangerous to both humans and livestock by causing frostbite and hypothermia, which can lead to permanent injury and death. The chart on the next page shows how quickly frostbite can occur at different temperatures and wind speeds. In unprotected structures cold temperatures can freeze water pipes causing them to burst upon thawing, leading to significant damage. Cold snaps during typically warmer weather during the growing season can damage and destroy some crops, depending on their sensitivity to temperature.

NCEI tracks two types of extreme cold temperatures.

- **Cold/Wind Chill:** Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typical value is -18° F or colder) conditions, on a widespread or localized basis. There can be situations where advisory criteria are not met, but the combination of seasonably cold temperatures and low wind chill values (roughly 15° F below normal) may result in a fatality.
- **Extreme Cold/Wind Chill:** A period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria (typical value around -35° F or colder), on a widespread or localized basis. Normally these conditions should cause significant human and/or economic impact.

To know what range of temperature is considered extreme for the region, it is necessary to know what the average temperatures are throughout any given year. The National Oceanic and Atmospheric Administration (NOAA) can generate reports of monthly “normals” at its different stations. The data chosen for the region is from the Martinsburg 2 station (the closest to Jefferson County in West Virginia). The following graphic shows average ranges of temperature from 1981 to 2010. Every month has a high and low average temperature in

degrees Fahrenheit. Extreme temperatures would be those either 10 degrees above or below the average high or low temperatures.



## POSSIBLE CAUSES

Weather patterns throughout the year naturally cause temperatures to rise and fall in the summer and winter months due to the inclination of the Earth towards the sun. However, the extreme temperatures that have been experienced in the last decade are attributable to climate change.

## HISTORICAL OCCURRENCES

NCEI reports a total of 24 heat events, 2 excessive heat events, 5 cold/wind chill events, and 5 extreme cold/wind chill events. Heat events are more prevalent historically with a total of 26 events, while cold events since 1997 have only amounted to 10. All combined, there have been a total of 37 extreme temperature events that NCEI has recorded.

EXTREME TEMPERATURE EVENTS	
<i>Event Date</i>	<i>Event Type</i>
8/16/1997	Heat
1/6/1998	Heat
3/11/1998	Cold/Wind Chill
3/27/1998	Heat
7/21/1998	Heat
6/7/1999	Heat
7/4/1999	Heat
1/2/2000	Excessive Heat
1/21/2000	Extreme Cold/Wind Chill
1/22/2000	Extreme Cold/Wind Chill
1/27/2000	Extreme Cold/Wind Chill
3/8/2000	Heat
5/6/2000	Heat

EXTREME TEMPERATURE EVENTS	
Event Date	Event Type
6/10/2000	Heat
6/25/2000	Heat
12/22/2000	Extreme Cold/Wind Chill
4/19/2001	Extreme Cold/Wind Chill
6/12/2001	Heat
6/27/2001	Heat
8/6/2001	Heat
7/2/2002	Heat
7/28/2002	Heat
8/1/2002	Heat
8/12/2002	Heat
8/22/2002	Heat
12/7/2002	Cold/Wind Chill
1/10/2004	Cold/Wind Chill
1/15/2004	Cold/Wind Chill
1/31/2004	Cold/Wind Chill
7/17/2006	Heat
8/1/2006	Heat
7/22/2011	Excessive Heat
7/7/2012	Heat
7/25/2016	Heat
8/13/2016	Heat
7/20/2017	Heat

Source: NCEI: 1997 - 2018

## COMMITTEE INPUT

One committee member mentioned extreme temperatures during the meetings, specifically with temperatures above 95 or 98°F every summer. The committee member suggested an increase in tree canopy to shade impervious surfaces and transpire water vapor into the air.

## IMPACTS & VULNERABILITY

The majority of the impacts of extreme temperatures affect the population's health rather than damage buildings. Some of the effects extreme temperatures could have on structures are minor compared to other hazards. Effects on buildings and infrastructure could include broken pipes, cracks in roads or bridges due to expansion and contraction, and power outages. In addition to impacts on health, extreme temperatures can also cause damages to transportation infrastructure, agriculture, energy, and water resources.



Extreme heat can cause a wide range of health problems or even make existing health problems worse. Some of the more mild symptoms include discomfort, skin eruptions and heat fatigue which can lead to heat cramps, heat exhaustion and heat stroke. Occasionally some people may require medical attention. Prolonged exposure to extreme heat can even cause death (CDC). Problems arising from prolonged exposure to the cold can include hypothermia, frostbite and non-freezing cold injuries such as chilblains and trench/immersion foot. Sunburn is also possible during extreme cold weather events (Army Public Health Center).

Although extreme temperatures affect everyone in the region, some people may be more vulnerable to their effects. For example, the homeless population could be more at risk simply for being exposed to the elements; children and the elderly population may be more susceptible to changes in temperature as well as the poor if they cannot afford to keep cool during an extreme heat event or to stay warm during an extreme cold event.

Approximately 400 people die each year from exposure to heat, according to the Centers for Disease Control and Prevention (CDC). Our bodies dissipate heat by varying the rate and depth of blood circulation, by losing water through the skin and sweat glands, and as a last resort, by panting, when blood is heated above 98.6°F.

Sweating cools the body through evaporation. However, high relative humidity retards evaporation, robbing the body of its ability to cool itself. When heat gain exceeds the level the body can remove, body temperature begins to rise, and heat-related illnesses and disorders may develop.

The tables below describe the risks to human health relating to extreme heat and cold temperatures. Every few degrees up or down can have a great impact on health.

HEAT RISKS	
<i>Heat Index</i>	<i>Possible heat disorders for people in higher risk groups</i>
130°F or higher	Heatstroke/sunstroke highly likely with continued exposure.
105-130°F	Sunstroke, heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.
90-105°F	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity.
80-90°F	Fatigue possible with prolonged exposure and/or physical activity.

COLD RISKS		
<i>Stage</i>	<i>Core Temperature</i>	<i>Signs and Symptoms</i>
Mild Hypothermia	99-97°F	Normal, shivering may begin.
	97-95°F	Cold sensation, goose bumps, unable to perform complex tasks with hands, shivering can be mild to severe, hands numb.
Moderate Hypothermia	95-93°F	Shivering, intense, muscles incoordination becomes apparent, movements slow and labored, stumbling pace, mild confusion, may appear alert. Use sobriety test, if unable to walk a 9 meter (30 foot) straight line, the person is hypothermic.

	93-90°F	Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, difficulty speaking, signs of depression, withdrawn.
Severe Hypothermia	90-86°F	Shivering stops, exposed skin blue or puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness
	86-82°F	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.
	82-78°F	Unconscious, a heartbeat and respiration erratic, a pulse may not be obvious.
	78-75°F	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.

Source: Canadian Centre for Occupational Health and Safety

## LOCATION & EXTENT

Extreme temperatures, hot and cold, affect each jurisdiction within Jefferson County equally. Though the temperatures may vary slightly from day to day, the overall average of all the county's temperatures and susceptibility to extremes is very similar.

## LOSS & DAMAGES

NCEI does not report any damages or injuries as a result of extreme temperatures.

## PREVIOUS MITIGATION EFFORTS


**DESCRIBE WHAT HAS BEEN DONE IN THE PAST TO ADDRESS THE IMPACTS OF THE HAZARD**

## VULNERABILITY ASSESSMENT

EXTREME TEMPERATURE RISK CALCULATION						
Probability			+	Severity	=	Risk
FREQUENT				MARGINAL		MEDIUM-HIGH
Events	37	= 1.76		Extreme temperatures can cause minor illness and infrastructure interruption.		The risk assessment matrix calculates the risk of extreme temperatures to be medium-high.
Years	21					
NCEI data between 1997 and 2018 indicates that there have been 37 events of extreme temperatures in Jefferson County						

DRAFT

## Landslide

A downward movement of a slope and materials under the force of gravity.			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	Risk	Period of Occurrence:	At any time. Could occur more frequently after a period of extended precipitation
		Warning Time:	None to days
		Probability:	Frequent
		Type of Hazard:	Natural
		Overall Hazard Ranking:	2
		State Risk Ranking:	Low for Jefferson County Medium high statewide
		Severity:	Marginal
		Disaster Declarations:	None

## HAZARD OVERVIEW

Landslides cause damage and loss of life through several processes including pushing, crushing or burying objects in their path and the damming of rivers and waterways (Haddow, Bullock, & Coppola, 2014, pg.46.) This section will profile the following: landslides, mudflows, and rock falls.

- **Landslides:** Landslides occur when areas of relatively dry rock, soil or debris move uncontrollably down a slope. Landslides may be localized or massive in size and can move at high rates of speed.
- **Mudflows:** Mudflows are water saturated rivers of earth, rock and debris. Mudflows develop when water rapidly accumulates in the material, such as during heavy rainfall or rapid snowmelt. Mudflows can develop and move quickly, giving little to no warning.
- **Rockfalls:** Rockfalls occur when rocks or other materials detach from a slope or cliff and descend in a freefall, rolling or bouncing manner. Rockfalls can occur naturally, through faults and seismic activity, or as a product of human activity, such as blasting.

## POSSIBLE CAUSES

Land movements can be secondary effects of heavy rainfall and earthquakes (WHO). Some of the causes attributed to land movements can include:

- intense deforestation and soil erosion,
- construction of human settlement in landslide prone areas,
- roads or communications lines in mountain areas,
- building with weak foundations,

- buried pipelines,
- mining, and
- lack of understanding of landslide hazards, and lack of warning systems.

## HISTORICAL OCCURRENCES

Landslides have been known to occur in West Virginia and adjoining states since 1850, but the damage caused by landslides has become increasingly expensive as development encroaches more and more on the area's hillsides. A large portion of Jefferson County's topography is that of mountainous and steep.

According to the United States Geological Survey (USGS), most of West Virginia is listed as having high percentages of landslide incidents. Specifically, the southeastern corner of Jefferson County has the highest landslide risk. The remainder of the county is characterized as either a medium or low landslide risk. The communities of Harpers Ferry, Bolivar, Charles Town, and Ranson fall in the medium landslide risk category, whereas Shepherdstown is considered a low landslide risk area.

In recent years, there have been problems with several rockslides along the area of Route 340 across from Harpers Ferry, just before the Virginia State line.

## COMMITTEE & PARTNER INPUT

During committee meetings members shared their experiences with recurrent and recent landslides. The table below outlines the event date, if available, what happened, and how it could possibly be avoided going forward.

COMMITTEE INPUT FOR LANDSLIDES		
<i>Event Date</i>	<i>What Happened</i>	<i>How This Can Be Avoided in the Future</i>
2018	Survey of rocks on mountain side Route 340 Harpers Ferry. Falling rocks on roadway	Possible netting along wall to protect Route 340 and travelers
2015	Unstable slope at US 340 and Chestnut Hill	Slope stabilization and transportation improvement
Any rain event	Roads within Shanondale & Mountain community erode during heavy rains	No answer

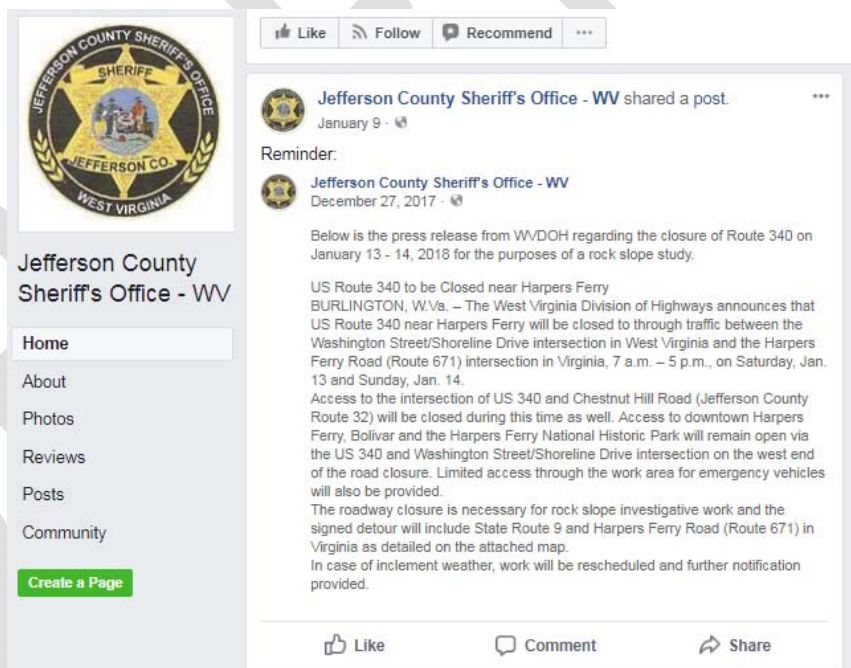
JCHSEM reached out to their neighboring jurisdictions to ask about hazards that originate in Jefferson County and affect the surrounding, and hazards that originate in surrounding counties and affect Jefferson County. The Loudoun County Office of Emergency Management (OEM) in Virginia expressed concern for rockslides occurring along U.S. 340 between the counties.

## IMPACTS & VULNERABILITY

Direct impact of landslides include trauma and suffocation by entrapment. Landslides usually have high mortality and few injuries. Short and long-term mental health effects are also not uncommon (WHO, 2017). Landslide morbidity is associated with untreated wounds, traumatic injuries, and disruption of water, sanitation shelter and food supply. Those with chronic medical conditions are also of concern as loss of healthcare infrastructure, in the path of the slide, means patients will go untreated (Luber & Lemery, 2015). Although there have not been any instances of large, catastrophic landslides in Region VII, the potential for damage is present. Landslides can cause death, injuries, trauma and suffocation from entrapment. Short and long-term mental health have been observed. Depending on the location, these events could cause loss or damage to homes, infrastructure and critical facilities and block whole communities off. There is a potential for loss of property value, livestock and crops (WHO).

Specifically in Jefferson County, the director of tourism for the county is concerned that closing U.S. 340, even for a couple of days, would negatively affect the area's tourist industry (Belisle, 2017).

The Jefferson County Sheriff's Office posts updates of road closures in the county. Road closures affect the residents and visitors of the county. The image above shows a typical announcement from the Sheriff's Office on their social media page.



## LOCATION & EXTENT

U.S. 340 is considered a major traffic corridor to and from West Virginia. The latest traffic counts conducted three years ago showed nearly 31,000 daily vehicle trips made on that

section of the highway, about half of the volume flowing on Interstate 81 at Martinsburg (Cook, 2018).

## LOSS & DAMAGES

Accurate loss and damages information is not available for landslides in Jefferson County. However, the West Virginia Department of Transportation's report on the U.S. 340 *Supplemental Draft Environmental Impact Statement* (2016) includes various options for rebuilding as well as the associated costs; the preferred build would cost close to \$50 million.

## PREVIOUS MITIGATION EFFORTS

Past mitigation efforts to reduce the effects of landslides in Jefferson County include reviews of all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas, and reviews of existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas.

According to the West Virginia Division of Highways (WVDOH), a project to avoid rock and soil slides at the intersection of Chestnut Hill Road with U.S. 340 is underway. Geologists who conducted a hands-on safety assessment of the rocky cliffs and hillsides above the busy two-lane highway passing below Loudoun Heights recommended a stabilization of the slope. After inserting the tubes into the steep slope, a strong mesh or concrete barrier might be added to the hillside to help further hold the precarious earth in place. The soil strengthening project could take place within a couple months or possibly sooner. State highway officials budgeted \$830,000 to conduct the rock-fall survey and begin designing the safety system (Cook, 2018).

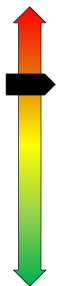
## VULNERABILITY ASSESSMENT

LANDSLIDE RISK CALCULATION				
<i>Probability</i>		<i>Severity</i>		<i>Risk</i>
FREQUENT		MARGINAL		MEDIUM-HIGH
Although there is only one example of landslide in Jefferson County,	+	The largest impact from landslides in Jefferson County is the cost of repair. Rarely have landslides caused injuries.	=	The risk assessment matrix places landslides at a medium-high risk for the county.

## RISK MAP



## Severe Wind and Tornado

Definition of the hazard			
	Risk		
	Period of Occurrence:	At any time, typically in summer months when associated with severe thunderstorms	Overall Hazard Ranking: 2
	Warning Time:	Days to hours	State Risk Ranking: High for Jefferson County Medium high (wind) and medium low (tornado) statewide
	Probability:	Frequent	Severity: Marginal
	Type of Hazard:	Natural	Disaster Declarations: DR-1769 DR-4071

### HAZARD OVERVIEW

This profile discusses two types of wind that stem from severe thunderstorms (see [Section X.X.X Severe Thunderstorms](#) for background information), severe wind and tornadoes.

- **Severe Wind:** Non-tornadic, damaging winds from thunderstorms include four common types (NWS & FEMA, 2001).
  - **Straight-Line Winds or Derechos:** Winds having little or no curvature or rotation, capable of affecting a larger geographic area than a tornado.
  - **Downbursts:** Localized downward gusts of air from a thunderstorm. These winds can be very damaging on and near the ground and tend to cover areas of just a few miles.
  - **Microbursts:** Minimized downbursts affecting areas less than 2.5 miles in diameter. Microbursts induce a strong wind shear and can produce winds over 150 mph.
  - **Gust Fronts:** Cool, gusty air that flows out of the base of a thunderstorm and spreads along the ground ahead of the thunderstorm cell.

One of the first scales to estimate wind speeds and the effects was created by Britain's Admiral Sir Francis Beaufort (1774-1857). He developed the scale in 1805 to help sailors estimate the winds via visual observations. The scale starts with 0 and goes to a force of 12. The Beaufort scale is still used today to estimate wind strengths (NOAA, n.d.).



Force	Wind Speed		Description	BEAUFORT WIND SCALLE	
	(mph)	(knots)		Appearance of Wind Effects	
				On the Water	On Land
0	0-1	0-1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-7	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	13-18	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	19-24	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	25-31	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	32-38	38-33	Near Gale	Sea heaps up, waves 13-19 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	39-46	34-40	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	47-54	41-47	Strong Gale	High waves (23-32 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	55-63	48-55	Storm	Very high waves (29-41 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	64-72	56-63	Violent Storm	Exceptionally high (37-52 ft) waves, foam patches cover sea, visibility more reduced	
12	72-83	64-71	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

- Tornado:** A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Normally thunderstorms and associated tornadoes develop in warm, moist air in advance of strong eastward moving cold fronts in late winter and early spring. Tornadoes can also occur along a "dryline" which separates very warm, moist air to the east from hot, dry air to the west. Both of these scenarios are common in the Central Plains. Another way that tornadoes can be created occurs when warm moist air flows upslope. Under the right temperature and moisture conditions, intense thunderstorms can produce tornadoes in higher terrain. Tornadoes can occur in every state, although the mid-west states have by far the greatest potential for this type of event. Tornadoes are ranked by intensity using the Enhanced Fujita (EF) Scale, replacing the original Fujita Scale devised by Dr. Theodore Fujita at the University of Chicago in 1971. This scale is an update to the original scale and is listed in Table 31. The EF scale is broken

into 6 categories from F-0 to F-5. F-0 relates to a tornado having a wind speed up to 72 miles per hour, while an F-5 tornado would have winds up to 318 mph.

ENHANCED FUJITA SCALE		
#	3-Second Gust (mph)	Examples of Possible Damage
0	45-78	<b>Light Damage.</b> Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
1	79-117	<b>Moderate Damage.</b> Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	118-161	<b>Considerable Damage.</b> Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
3	162-209	<b>Severe Damage.</b> Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
4	210-261	<b>Devastating Damage.</b> Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	262-317	<b>Incredible Damage.</b> Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked; incredible phenomena will occur.

## POSSIBLE CAUSES

The causes of thunderstorm strength winds and tornadoes are thunderstorms. Wind is caused by differences in atmospheric pressure; when there is a difference in pressure, air moves higher resulting in wind. See [Section X.X.X Severe Thunderstorms](#) for more information.

## HISTORICAL OCCURRENCES

According to Event Records from the National Climatic Data Center (NCDC) there have been five tornadoes in Jefferson County between 1955 and 2012. The most recent tornado occurred in September of 2004.

JEFFERSON COUNTY TORNADOES (1955 – 2018)			
Location	Date	Mag.	Description
Unknown	August 26, 1965	F1	Wind speeds ranged between 73 and 112 mph.
Unknown	November 16, 1989	F2	Wind speeds were between 113 and 206 mph, the damage path was four (4) miles long, and 100 yards wide. The tornado resulted in three (3) injuries, and the property damage was estimated at \$100,000.
Unknown	July 2,	F0	A severe thunderstorm and tornado event caused heavy rains and other

	1997		damages in the southwestern portion of the county that lead to four (4) injuries. The total damages from this event were \$250,000.
Summit Point	July 9, 2003	F0	Winds from the tornado estimated up to 70 mph downed several trees and a handful of power lines along its path as well as damaging an outbuilding and removing siding from a house.
Unknown	September 17, 2004	F1	Wind speeds were between 86 and 110 mph. The intermittent damage path was approximately two (2) miles long. Estimated property damage was \$250,000.
Charles Town	July 5, 2017	F0	A small tornado touched down at the entrance to the Jefferson Crossing Shopping Center on Flowing Springs Road just north of U.S. 340. The tornado damaged the sign at the entrance and damaged the roofing of three barns and the door to a fourth barn located at Hollywood Casino at Charles Town Races. Projectile impacts were also noted in nearby barn roofs from two- by-four pieces of wood that were lofted by the tornado.

Jefferson County has also experienced high windstorms not associated with tornado events in the past, and can expect wind-related problems in the future. According to the materials provided by the National Weather Service (NWS), the county experienced seven high wind event days since 1998 (with winds above 58 mph).

Two wind events have received presidential disaster declarations, the first in 2008 and the second in 2012, commonly known as the 2012 Derecho.

JEFFERSON COUNTY HIGH WIND EVENTS	
Event Date	Winds (mph)
7/21/1998	71
1/14/2006	60
6/4/2008*	74
7/25/2010	70
11/16/2010	61
7/11/2011	61
6/29/2012*	61

\* Events received disaster declaration  
Source: NCEI

## IMPACTS & VULNERABILITY

While tornadoes are relatively short lived in duration, they are intensely focused, making them one of the most destructive forces in nature. As previously discussed above, Jefferson County is located in the "Zone III" wind zone. This wind zone places Jefferson County in a category that could experience severe tornadoes with 160-200 mph wind speeds. Such winds would cause significant damage to structures, such as roofs torn off frame houses, mobile homes demolished, and boxcars pushed over.

Jefferson County has endured an F2 tornado in the past. An F2 tornado is considered a significant tornado with wind speeds well in excess of 110 mph, and these types of tornadoes leave behind significant destruction. Damages from F2 tornadoes can include the roofs of well-constructed houses blown off; trains overturned; trees uprooted; heavy cars lifted off the ground and thrown; structures with weak foundations can be badly damaged. Localized geographic conditions can exacerbate the damages from high winds and cause increases in wind intensity.

Severe wind events can cause a variety of secondary, or cascading, hazard events. For instance, wind may blow limbs from trees down knocking out electric power or blocking

roadways. Wind often results in damages to roofs and other home finishings (such as siding, etc.). Damage and loss of life could be severe and overwhelm the ability of local responders to address the emergency.

## LOCATION & EXTENT

In general, all areas in the county are equally at risk to severe wind and tornadoes even though tornadoes are localized events. Wind events typically span several counties and states at the same time, for varying durations.

## LOSS & DAMAGES

There have been two events specifically that have received presidential disaster declarations; the first in June of 2008 for which Jefferson County received individual assistance from the federal government, and the other in June of 2012, for which Jefferson County received public assistance.

FEMA publishes the total amounts for public and individual assistance in each state, but does not break down dollar amounts by county. However, based on the total amount of assistance (\$2,619,379.95 in 2008 and \$11,717,720.76 in 2012), one can assume that the damage from winds and tornadoes can be in the millions for the county alone.

## PREVIOUS MITIGATION EFFORTS


Past mitigation efforts to reduce losses associated with severe wind and tornadoes have included the development and distribution of public awareness materials utilizing social media (i.e., Facebook, Twitter, etc.) about natural hazard risks, preparedness, and mitigation, established a protocol for the sharing of annual shelter survey information between the local Red Cross Chapter and Jefferson County Homeland Security and Emergency Management, conducted a tabletop exercise with local law enforcement, emergency managers, city and county officials, and other disaster response agencies, and continued to conduct National Weather Service Storm Spotter classes.

## VULNERABILITY ASSESSMENT

SEVERE WIND AND TORNADO RISK CALCULATION					
<i>Probability</i>			<i>Severity</i>		<i>Risk</i>
FREQUENT			MARGINAL		MEDIUM HIGH
Events	11	= 2	+	=	The risk assessment matrix determines this hazard to me a medium-high risk to the county.
Years	22				
4 tornadoes and 7 high wind events since 1996					
			Damage from wind and tornadoes in Jefferson County can be expected to impact structures and infrastructure but cause little to no injury or deaths.		

## RISK MAP

## Flood

A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties from overflow of inland or tidal waters, unusual and rapid accumulation or runoff of surface waters from any source, or a mudflow.			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	Risk	Period of Occurrence:	At any time
		Overall Hazard Ranking:	3
		Warning Time:	Hours to days
		State Risk Ranking:	High for Jefferson County High statewide
		Probability:	Frequent
		Severity:	Negligible
		Type of Hazard:	Natural
		Disaster Declarations:	None

## HAZARD OVERVIEW

Flooding is one of the most frequent of the natural hazards faced by communities across the country as well as one of the most costly. West Virginia is no stranger to flooding; in fact, it is the number one natural hazard in the state. The topography of the region is mountainous with many valleys and gorges with rivers and streams, making the region prone to flooding activity. There are several types of flood, each with their own characteristics and related dangers.

- **River Floods** typically develop over a period of days and occur when a river gradually rises and overflows its banks. These floods can be attributed to large amounts of rain or snowmelt both in the region impacted and upstream. Due to their nature of gradually building up, these types of floods will typically have a warning period of a few days.
- **Flash Floods** are the most common severe weather emergency in the United States according to the National Flood Insurance Program (NFIP) (2016). The NFIP also states that a flash flood is defined as, “a rapid flooding of low-lying areas in less than six hours, which is caused by intense rainfall from a thunderstorm or several thunderstorms” (2016).
- **Dam Failures** are the third type of flooding; this is discussed in more detail in Section [x.x.x Dam Failure](#).
- **Nuisance Flooding** is a repetitive type of flooding that doesn’t cause much damage, but is an inconvenience because water levels rise and fall quickly. Nuisance flooding is typically localized and caused by old or inadequate infrastructure.

The NFIP is a governmental program administered through FEMA that, “aims to reduce impact on private and public structures... by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations” (FEMA). Each jurisdiction participating in the NFIP has a designated NFIP coordinator, sometimes referred to as the floodplain manager. This individual maintains the jurisdiction’s floodplain ordinance and ensures that development is compliant with that ordinance. Each local floodplain manager serves as the point of contact with FEMA regarding floodplain mapping. For more information on how each jurisdiction participates in the NFIP, refer to Appendix 2 Committee Meetings.

JURISDICTIONS PARTICIPATING IN NFIP				
<i>Jurisdiction</i>	<i>Initial FHBM Identified</i>	<i>Initial FIRM Identified</i>	<i>Current Effective Map Date</i>	<i>Reg-Emer Date</i>
Jefferson County	12/20/1974	10/15/1970	12/18/2009	10/15/1980
Bolivar	N/A	12/18/2009	12/18/2009	0707/2010
Charles Town	02/01/1974	12/04/1979	12/18/2009	12/07/1979
Harpers Ferry	02/26/1976	08/24/1984	12/18/2009	08/24/1984
Ranson	05/03/1974	06/15/1979	12/18/2009	06/15/1979
Shepherdstown	02/01/1974	03/18/1980	12/18/2009	03/18/1980

Source: FEMA NFIP

The Community Rating System (CRS) is an additional, voluntary program run by the NFIP to encourage additional community activities that exceed minimum NFIP requirements, with the goal of reducing flood risk. By participating in the CRS, a community can receive discounted flood insurance premiums. Jefferson County is one of the five counties in West Virginia that participate in the CRS.

Jefferson County entered into CRS in October of 2006. As of October of 2016 Jefferson County had a class 8 designation, which meant that flood insurance policy holders were eligible for a 10% discount on their rates. Jefferson County is currently a class 6.

## POSSIBLE CAUSES

According to NOAA, some of the possible causes for flooding include the following.

- **Excessive Rainfall:** This is the most common cause of flooding. Water accumulates quicker than the soil can absorb resulting in flooding.
- **Snowmelt:** It occurs when the major source of water involved is caused by melting snow. Unlike rainfall that can reach the soil almost immediately, the snowpack can store

- the water for an extended amount of time until temperatures rise above freezing and the snow melts.
- **Ice or Debris Jams:** Common during the winter and spring along rivers, streams and creeks. As ice or debris moves downstream, it may get caught on any sort of obstruction to the water flow. When this occurs, water can be held back, causing upstream flooding. When the jam finally breaks, flash flooding can occur downstream.
  - **Dam Breaks:** Dams can overtop, have excessive seepage or have structural failure. For more information on this topic see [Section X.X.X Dam Failure](#).

## HISTORICAL OCCURRENCES

Since 1996, the earliest available data from NCEI, Jefferson County has experienced 13 flash floods and 20 floods; roughly one event per year. The Spatial Hazard Events and Losses Database (SHELDUS) records flooding events prior to 1996; that data indicates that there has been approximately one flood every two years.

According to FEMA, there has been one disaster declaration for flooding in Jefferson County for events at the beginning of June of 2008. However, the NCEI database does not present any records for flooding during this period. This declaration is for thunderstorm wind in Jefferson County.

FLOOD EVENTS	
<i>Event Date</i>	<i>Event Type</i>
1/19/1996	Flood
1/19/1996	Flash Flood
9/6/1996	Flash Flood
9/10/1997	Flash Flood
11/7/1997	Flash Flood
1/8/1998	Flash Flood
2/4/1998	Flash Flood
3/20/1998	Flash Flood
6/15/2000	Flash Flood
1/2/2003	Flood
2/22/2003	Flood
3/7/2003	Flood
3/21/2003	Flood
5/11/2003	Flood
5/16/2003	Flood
6/13/2003	Flash Flood
9/19/2003	Flood



11/19/2003	Flood
2/6/2004	Flood
4/13/2004	Flood
9/28/2004	Flash Flood
11/29/2005	Flash Flood
6/27/2006	Flash Flood
3/2/2007	Flood
4/16/2007	Flood
3/13/2010	Flood
4/16/2011	Flood
4/16/2011	Flood
5/16/2014	Flood
6/1/2015	Flash Flood
2/4/2016	Flood
5/6/2017	Flood
5/26/2017	Flood

Source: NCEI 1996 - 2018

FLOOD EVENTS PRIOR TO 1996		
<i>Hazard</i>	<i>Year</i>	<i>Month</i>
Flooding	1967	3
Flooding	1968	5
Flooding	1978	1
Flooding	1978	12
Flooding	1979	9
Flooding	1980	5
Flooding	1980	8
Flooding	1981	6
Flooding	1985	11
Flooding	1987	4
Flooding	1994	3
Flooding	1994	8
Flooding	1996	1
Flooding	1996	9

Source: SHELUS

## COMMITTEE & PARTNER INPUT

During committee meetings members shared their experiences with recurrent and recent floods. The table below outlines the event date, if available, what happened, and how it could possibly be avoided going forward.

COMMITTEE INPUT FOR FLOOD		
<i>Event Date</i>	<i>What Happened</i>	<i>How This Can Be Avoided in the Future</i>
June 2016	Water main break flooded a building, no water.	Improve infrastructure
Various	Potential damage to historical treasures in Harpers Ferry	
	High water, volume impact	Proper drainage
Every year	Streets and land near RRs	Improve culverts and drainage near and under RRs
Every summer	¾- 1" less than 2 hours	Increase urban tree canopy percentages
2012	Potomac River overflow near Shepherdstown	Make public aware of situation, leave the area
2005?	Sudden river rise from a storm in Virginia, no warning. Multiple rescues below Millville Dam	Advanced warning systems

JCHSEM reached out to their neighboring jurisdictions to ask about hazards that originate in Jefferson County and affect the surrounding, and hazards that originate in surrounding counties and affect Jefferson County. According to comments from the Washington County Division of Emergency Services (DES) in Maryland, Jefferson and Washington Counties are separated by the Potomac River; when it floods it affects both counties. Additionally, Washington County extends further west of Jefferson County so if a flooding event occurs further up the Potomac i.e. Conococheague Ice Jam releasing ice and debris into the river to float downstream, it may impact Jefferson County.

## IMPACTS & VULNERABILITY

One of the main concerns with health and floods is that many times floods can cause power outages that affect people who are dependent on power to run life-sustaining equipment. During a flood, people and first responders run the risk of sustaining injuries related to saving people and property as well as the possibility of drowning. In rare circumstances, floodwater can carry bacteria that can be harmful.

Floods often disrupt many services including power, sewer, water, communications, and road access. Lacking these, it is difficult to continue critical services to the community. Damage to property, facilities, and infrastructure can range from minimal to total loss. The cost of recovery from floods can vary for everyone. Homeowners and businesses can claim insurance benefits if they have them, but may not be able to continue working due to devastation of the community or of their own property.

## LOCATION & EXTENT

### UTILIZE GIS MAPPING TO DETERMINE EXACT LOCATIONS AND EXTENT OF DAMAGES.

## LOSS & DAMAGES

The HAZUS-MH program (2013) estimates that approximately 36 buildings would be damaged by a 100-year flood. Twenty seven residential buildings would be at least moderately damaged; an estimated eight of those buildings would be completely destroyed. Residential occupancies accounted for 97.2% of the total loss HAZUS generated. The following tables summarize the HAZUS data.

EXPECTED BUILDING DAMAGE BY OCCUPANCY												
Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Ct.	%	Ct.	%	Ct.	%	Ct.	%	Ct.	%	Ct.	%
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	1	100.0	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	3	8.57	1	2.86	23	65.71	8	22.86
<b>Total (7,205)</b>	<b>0</b>		<b>1</b>		<b>3</b>		<b>1</b>		<b>23</b>		<b>8</b>	

EXPECTED BUILDING DAMAGE BY BUILDING TYPE												
Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Ct.	%	Ct.	%	Ct.	%	Ct.	%	Ct.	%	Ct.	%
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Manufactured Housing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.0
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	6	85.71	1	14.29
Steel	0	0.00	1	100.0	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	3	11.11	1	3.70	17	62.96	6	22.22

When buildings experience more than one loss due to flooding they can become repetitive or severe repetitive loss properties. There are two accepted definitions of repetitive loss and severe repetitive loss; one from the Flood Mitigation Assistance (FMA) grant and the other from the National Flood Insurance Program (NFIP). The following table describes these.

REPETITIVE LOSS AND SEVERE REPETITIVE LOSS DEFINITIONS		
Program	Repetitive Loss	Severe Repetitive Loss
Flood Mitigation Assistance (FMA) Grant	A Repetitive Loss (RL) property is a structure covered by a contract for flood insurance made available under the NFIP that: Has incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25% of the market value of the time of each such flood event; At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.	(a) Is covered under a contract for flood insurance made available under the NFIP; and (b) Has incurred flood related damage i. For which 4 or more separate claims payments (includes building and contents) have been made under flood insurance coverage with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claims payments exceeding \$20,000, or ii. For which at least 2 separate claims payments (includes only building) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.
National Flood Insurance Program (NFIP)	A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978.	A single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 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 amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

REPETITIVE LOSS PROPERTY DATA						
Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
Jefferson County	\$820,504.44	\$215,918.60	\$1,036,423.04	\$21,151.49	49	20
Ranson, City Of	\$13,654.32	\$6,261.12	\$19,915.44	\$3,983.09	5	2

Source: WVDHSEM

SEVERE REPETITIVE LOSS PROPERTY DATA						
Community Name	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
Jefferson County	\$134,298.10	\$79,788.31	\$214,086.41	\$30,583.73	7	2

Source: WVDHSEM

## PREVIOUS MITIGATION EFFORTS

Past mitigation efforts to reduce the effects of flooding throughout Jefferson County include the following:


- The distribution of public awareness materials concerning flood hazard risks, updating the county's website, and use of social media (i.e., facebook, twitter, etc.) to provide hazard related information that is easily accessible.
- The yearly distribution of letters to all property owners in or near a floodplain in the county regarding potential flood hazards as required for participation in the Community Rating System (CRS). Jefferson County is now a Class eight (8) in the CRS, resulting in a 10% reduction of flood insurance premiums for policies in the unincorporated areas of Jefferson County.
- Holding local courses on the National Flood Insurance Program (NFIP) for realtors, bankers, and insurers.
- Working with the municipalities to update all floodplain ordinances adopted prior to 1987, all have been updated.
- Providing additional training to county and municipal development officials on NFIP requirements.
- Providing training to municipalities on the CRS program and encouraging them to participate.
- Collecting updated information of the number and location of all repetitive loss properties throughout the county and the municipalities.
- Developing a database of information on all repetitive loss properties including maps.
- Identifying owners of repetitive loss properties who are interested in participating in future property acquisition and relocation projects.
- Conducted buyouts or property acquisition and relocation projects in several areas, and have conducted flood elevation adjustments to several facilities.
- Working with FEMA and the West Virginia Division of Homeland Security and Emergency Management (WVDHSEM) on the Map Modernization Program to improve FIRMs.
- Working with the West Virginia Department of Highways to identify areas of frequent roadways flooding and develop mitigation strategies.
- Working with National Weather Service (NWS) to evaluate the flood stage data for Millville on the Shenandoah River and as of March, 2012 adjusted the flood stage from 13 feet to 10 feet.
- Utilizing the media from the distribution and publication of flooding information.

- A large USDA funded storm water channeling mitigation project was conducted in the West side of the City of Ranson.
- Potomac Edison, the NWS, and USGS formed a partnership to keep the river gauge on the Shenandoah River.
- Several mitigation buyout projects have been completed by Jefferson County. Property on Bloomery Road and Riverside Drive were purchased and returned to open space. A property at Dam Four was purchased and worked with DNR to create a recreational use/open space area.
- Structural elevations have been conducted on two (2) residential properties.
- Jefferson County has been designated by the NWS as a StormReady community since 2004.
- Jefferson County is part of FEMA's RiskMAP Program.

## VULNERABILITY ASSESSMENT

FLOOD RISK CALCULATION						
Probability			+	Severity	=	Risk
FREQUENT				NEGLIGIBLE		MEDIUM
Events	33	= 1.5		Jefferson County has greatly reduced the severity of flood and flash flooding events through their participation in the NFIP and the CRS.		The risk assessment matrix categorizes the flood hazard as medium.
Years	22					
On average, there are more than one floods per year in Jefferson County.						

## Hazardous Materials Incident

A chemical or biological material that may pose a threat to life, health, property, or the environment.			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	Risk	Period of Occurrence:	At any time
		Warning Time:	None to hours
		Probability:	Frequent
		Type of Hazard:	Human-Caused
		Overall Hazard Ranking:	3
		State Risk Ranking:	Not ranked
		Severity:	Negligible
		Disaster Declarations:	None

## HAZARD OVERVIEW

A hazardous material may be defined as a substance or material which, because of its chemical, physical or biological nature, poses a threat to life, health, or property if released from a confined setting. A release may occur by spilling, leaking, emitting toxic vapors, or any other process that enables the material to escape its container, enter the environment, and create a potential hazard. Several common hazardous materials include those that are explosive, flammable or combustible, poisonous or radioactive. Related combustible hazardous materials include oxidizers and reactive materials, while toxins produced by etiological (biological) agents are types of poison that can cause disease.

A hazmat release while in transit is of great concern to the U. S. Department of Transportation. While most hazardous materials are stored and used at fixed sites, these materials are usually produced elsewhere and shipped to the fixed facility by rail car, truck, or onboard ships or barges. These vehicles are identified by signs or placards denoting the hazard, however, the possibility of release is present at any time. Hazardous materials are constantly being moved in West Virginia on interstate highways, the rail system and on shipping lanes in rivers and tributaries.

There are two major agencies that collect data as they relate to hazardous materials incidents the Pipeline and Hazardous Materials Safety Administration (PHMSA) governed by the U.S. Department of Transportation (DOT), and the National Response Center (NRC), governed by the U.S. Coast Guard (USCG).

The types of materials that can cause a hazmat release are wide ranging in nature and may include chlorine, sodium hydroxide, sulfuric acid, radioactive isotopes, anhydrous

ammonia, gasoline and other hydrocarbons, as well as medical/biological waste from hospitals or clinics. Hazardous materials subject to reporting under the Emergency Planning and Community Right-to-Know Act (EPCRA) or Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) include these four groups:

- Extremely Hazardous Substances (EHS) – These are materials with acutely toxic properties that may do irreversible damage or cause death to people or harm the environment when released or used outside their intended use. Examples include: ammonia, chlorine, and sulfuric acid.
- Hazardous Substances – These are any materials posing a threat to human health and/or the environment, or any substance designated by the Environmental Protection Agency (EPA) to be reported if a designated quantity of the substance is spilled into the waters of the United States or is otherwise released into the environment.
- Hazardous Chemicals – If present at a chemical facility in certain amounts, these substances require a Material Safety Data Sheet (MSDS) under the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard. Such substances are capable of producing fires and explosions or adverse health effects such as cancer, burns, or dermatitis.
- Toxic Chemicals – Chemicals or chemical categories that appear on the list because of their chronic or long-term toxicity.

In 2016, Jefferson County updated the county commodity flow study (CFS) and included information on highways, railways, and covered facilities. The following is a brief description of the findings of the CFS.

#### Highway

Approximately 49.2% of the total placarded vehicles recorded were carrying Class 3 (Flammable Liquids). Class 2 (Gases) were the second-most frequently-carried materials (30%), followed by Class 8 (Corrosives, 8.3%).

Conclusions drawn from the CFS regarding highways included the following.

- National hazardous material incident trends generally predicted the hazardous materials that would be seen locally.



- Class 3 Flammables are involved in the most incidents nationally and were the most frequently recorded materials in Jefferson County, making up nearly half of all observed placards.
- Class 8 materials were involved in the second most number of highway incidents nationally, but these materials represented only 5% of observed placards in Jefferson County.
- Class 2 materials are involved in the third most highway incidents nationally, and are the second most prevalent materials observed in Jefferson County.
- Gasoline (UN 1203) was the single-most recorded material in the study. Though a multitude of materials were observed during the study, the highway analysis alone suggests that local responders should primarily prepare for incidents involving flammable liquids, gases, and Class 9 materials.
- Commodity flow studies are significantly affected by the time of day, week, and even year in which they are conducted (i.e., monitoring the study area one week earlier or later could yield different results based on the shipping schedules and needs of covered facilities).

HIGHWAY RISK ANALYSIS SUMMARY		
<i>Roadway Name</i>	<i>Miles in Jefferson County</i>	<i>Accidents with Placarded Loads per Year</i>
U.S. Route 340	32.38	0.425
State Route 9	15.8	0.147
State Route 45	2.58	0.009
State Route 115	4.13	0.011
State Route 51	8.81	0.012

*Source: Jefferson County CFS (2016)*

### Railway

Due to the low probability of rail accidents involving hazardous materials and the past track record of very few hazmat rail accidents, Jefferson County is much more likely to experience a hazardous material event due to a roadway accident rather than to a rail accident. A significant number of materials transported by rail in Jefferson County are passing through the county, and not bound for a facility within the jurisdiction. Half of the materials listed are found only in the rail analysis.

### Covered Facilities

Materials reported as part of the covered facilities analysis represent all hazard classes. Further, given the frequency of shipment information provided by 12 covered facilities, it becomes clear that shipments of some materials could only be observed if field reconnaissance was completed for months or even up to a year. As such, it can be assumed that emergency responders should plan and prepare for hazardous material incidents from any hazard class.

## POSSIBLE CAUSES

The hauling, storage, and use of hazardous materials play a vital role in the economy of our nation. These materials are stored and handled at fixed facilities and are transported over highway, railway, and water transportation systems, as well as pipelines. It is estimated that over four billion tons of hazardous materials are transported annually and that 100,000 trucks haul hazardous materials on the country's highways each day. Almost half of all freight trains carry hazardous materials. The majority of the transportation infrastructure utilized to move hazardous materials through Jefferson County is located in the central portion of the county; this is also the most populated area of the county, and the location for the majority of the high hazard areas for natural hazards, thus increasing the chance of a release. An incident causing the accidental release of a hazardous material is spontaneous, with little time of warning. Further, the recovery and clean-up activities involved in a hazmat incident may require several hours, days, or even weeks to complete.

Hazardous materials can be released as a secondary result of a natural disaster like an earthquake or flood. In either case, buildings or vehicles can release their hazardous materials inventories when structurally compromised or involved in traffic accidents. Additional potential causes of hazardous material releases may include terrorist incident and illegal drug labs or dumping. Illegal drug labs present a special concern due to the fact that each must be treated as a chemical hazard site and decontaminated before the property can be used again. Illegal drug labs can be set up in homes, apartments, vacant buildings, shacks in the forest or even in a van parked on the street.

## HISTORICAL OCCURRENCES

Since 2009, PHMSA does not report any incidents occurring in Jefferson County. The National Response Center (NRC), by contrast, has reported 33 occurrences of hazmat incidents since 2010. The following table details the type of incident, its cause, the date and the location, when available.

NRC HAZMAT OCCURRENCES			
<i>Type of Incident</i>	<i>Incident Cause</i>	<i>Incident Date</i>	<i>Incident Location</i>
Fixed	Other/Unknown	3/4/2010	Harpers Ferry
Fixed	Other/Unknown	6/25/2010	Charles Town
Fixed	Dumping	11/5/2010	Charles Town
Storage Tank	Equipment Failure	4/29/2011	Shepherdstown
Mobile	Other/Unknown	11/29/2011	Morgan
Unknown Sheen	Other/Unknown	12/18/2011	Millville
Fixed	Other/Unknown	12/30/2011	Harpers Ferry
Storage Tank	Other/Unknown	6/10/2012	Shenandoah Junction
Railroad	Equipment Failure	8/26/2012	Shenandoah Junction
Mobile	Other/Unknown	11/1/2012	Charles Town
Unknown Sheen	Other/Unknown	3/7/2013	Shepherdstown
Fixed	Other/Unknown	1/4/2014	Ranson
Fixed	Natural Phenomenon	2/6/2014	Harpers Ferry
Fixed	Other/Unknown	3/1/2014	Charles Town
Railroad	Equipment Failure	5/2/2014	Shepherdstown
Railroad	Equipment Failure	6/15/2014	Charles Town
Fixed	Other/Unknown	7/30/2014	Charles Town
Fixed	Dumping	10/28/2014	Harpers Ferry
Fixed	Other/Unknown	2/9/2015	Kearneysville
Pipeline	Operator Error	6/9/2015	Charles Town
Fixed	Equipment Failure	11/11/2015	Charles Town
Aircraft	Other/Unknown	12/16/2015	Charles Town
Storage Tank	Other/Unknown	1/7/2016	Harpers Ferry
Railroad	Equipment Failure	10/13/2016	Charles Town
Railroad	Equipment Failure	2/13/2017	Harpers Ferry

Source: National Response Center 2010-2017

## COMMITTEE & PARTNER INPUT

JCHSEM reached out to their neighboring jurisdictions to ask about hazards that originate in Jefferson County and affect the surrounding, and hazards that originate in surrounding counties and affect Jefferson County. The Loudoun County Office of Emergency Management (OEM) in Virginia expressed concern for incidents originating in Jefferson County that affect Loudoun; a train derailment in Harpers Ferry could affect the county. The Washington County Division of Emergency Services (DES) in Maryland mentioned that there are numerous rail lines along the Sandy Hook area (South Washington County) where Washington and

Jefferson meet at the Potomac; if a train would derail or spill hazardous materials there would be a potential impact to both counties.

## IMPACTS & VULNERABILITY

Due to the wide variety of substances that are used, transported and stored in the area, it is difficult to assign an overall impact of these substances to public health, the environment, the economy and the infrastructure. There are some spills that cause minor if any damage to the area. For example, spilling a few gallons of gasoline on concrete during transfer causes minimal economic impact; rarely does the spilled substance cause any environmental impacts. This is not to say that all spills are minor, some can be very harmful to human health and the environment and costs thousands, if not millions of dollars to clean up.

Spills into waterways and those that reach the groundwater are of particular concern due to the threat they impose to drinking water and subsequently public health, the environment, and fauna in the area.

Additionally, transportation-based hazard incidents have the potential to result in cascading impacts. For example, a rail-based incident could isolate a community in Jefferson County as well as several other communities in the region. Officials from such operators as CSX Transportation concur. In a recent interview, the company's hazmat manager out of Pittsburgh noted that a significant problem associated with rail incidents, particularly those involving hazardous materials, is that a stopped train can block several roadway intersections, essentially cutting some areas off. These blocks not only hinder evacuation from those areas, but also emergency services access to those areas.

Hazardous materials incidents can occur rapidly over a large area. The chemical, physical, and biological properties of hazardous materials pose a potential risk to life, health, the environment, and property when not properly contained.

Many factors determine the impact of a potential incident including quick and solid decision-making by emergency officials, location and type of release, evacuation and shelter-in-place needs, public health concerns, and relevant economic considerations. Additionally, while most incidents are generally brief, the resulting recovery and cleanup may take time to exact.

If evacuation is necessary due to a chemical emergency, road closures and traffic jams may result. If a large-scale evacuation is deemed necessary, it can pose serious long term economic consequences to the involved population area. A delay in the resumption of industry commerce may cause economic losses for both business owners and employees. In addition,

an evacuation ordered on short-notice could cause serious problems for businesses requiring time to shut down specialized equipment.

There is also the monetary impact borne by responding public or private emergency response organizations. These agencies may be challenged by the expenses dictated by a hazardous material release, and may need to wait an uncomfortable length of time for the responsible party to reimburse any outstanding costs, further straining the economic resources of the region.

A major incident involving significant injuries may severely tax regional medical services, as medical facilities aren't generally designed to handle mass amounts of victims on short notice. Consequently, in the event of a major incident, hospitals and other medical facilities must still be able to provide their customary level of service to all patients, regardless of whether they were incident victims or not.

## LOCATION & EXTENT

Hazardous materials spills, leaks, or accidents can occur at any Jefferson County. More specifically, they are more likely to happen on transportation pathways such as roads and railways, and at facilities that routinely handle hazardous materials such as gas stations, chemical companies, and other Tier II reporting facilities.

The extent of the damage from hazmat can be localized to just a cleanup on the road, or widespread, to include hazardous materials reaching source water via storm drains, and the river.

## LOSS & DAMAGES


According to the NRC reports, no incidents were severe. Cost of cleanup for small spills is minimal and is responsibility of the owner of the facility or transportation.

## PREVIOUS MITIGATION EFFORTS

Several emergency preparedness and response plans have been developed with regards to hazardous materials incidents for Jefferson County, including the *Jefferson County Emergency Operations Plan* and *Annex L – Hazmat Response*, the *Jefferson County Commodity Flow Study, 2012 and 2016*, and the *Jefferson County Tier II Assessment, 2010*. Several Extremely Hazardous Substances (EHS) facilities have developed Off-Site Emergency Response Plans as well. Upon reviewing the information from the commodity flow study it was apparent that liquefied petroleum gas presented a risk to several areas in Jefferson County,



## INVASIVE SPECIES

<p>"The presence of an unusually large number of insects or animals in a place, typically so as to cause damage or disease" (Oxford Dictionary).</p>		
 <p>Risk</p> <p>HIGH</p> <p>MEDIUM HIGH</p> <p>MEDIUM</p> <p>MEDIUM LOW</p> <p>LOW</p>	<p>Period of Occurrence:</p> <p>At any time</p>	<p>Overall Hazard Ranking:</p> <p>3</p>
	<p>Warning Time:</p> <p>None</p>	<p>State Risk Ranking:</p> <p>Not ranked</p>
	<p>Probability:</p> <p>Frequent</p>	<p>Severity:</p> <p>Negligible</p>
	<p>Type of Hazard:</p> <p>Natural</p>	<p>Disaster Declarations:</p> <p>None</p>

## HAZARD OVERVIEW

The spread of non-native plant, insect, and animal species, known as invasive species, has increased as international trade, travel and tourism have grown. Only a small percentage of these invasive species thrive and infest their new environment. Presidential Executive Order 13112 defines an invasive species as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." There are four main types of invasive species: aquatic species, plants, animals, and microbes (USDA, 2018). There are approximately 500 invasive plant species and over 50 invasive animals or insects in West Virginia (WVDNR, 2014), with 236 documented in Jefferson County, 229 plant species, and seven insect species (UGA, 2018).

Some non-native species are beneficial and may provide sources of food and fiber. Invasive species harm or kill native species, alter the ecosystem, introduce diseases, limit crop production, and harm humans and animals. Invasive species affect both aquatic and terrestrial habitats (USDA, 2016). The tables below list the invasive species that have been documented in Jefferson County.

INVASIVE SPECIES DOCUMENTED IN JEFFERSON COUNTY	
Insects	
Brown Marmorated Stink Bug	Mile-a-Minute Weevil
Emeral Ash Borer	Southern Pine Beetle
Gypsy Moth	Spotted Wing Drosophila
Hemlock Woolly Adelgid	
Diseases	

INVASIVE SPECIES DOCUMENTED IN JEFFERSON COUNTY	
Butternut Cranker	Oak Wilt
Dogwood Anthracnose	White Pine Blister Rust
Plants	
Alfalfa	Kudzu
Allegheny Blackberry	Lambsquarters
American Burnweed	Large Aspen Tortrix
American Sycamore	Large Crabgrass
Amur Honeysuckle	Large Hop Clover
Annual Wormwood	Lemon Balm
Asiatic Dayflower	Lily of the Valley
Asparagus	Longspine Sandbur
Bald Brome	Longstalk Cranesbill
Bamboo	Marsh Dayflower
Birdsfoot Trefoil	Meadow Fescue
Birdrape Mustard	Meadow Salsify
Bittersweet Nightshade	Mexicantea
Black Locust	Mile-a-Minute Vine
Black Medic	Mimosa
Black Mustard	Morrow's Honeysuckle
Black Walnut	Motherwort
Bluegrass	Multiflora Rose
Border Privet	Musk Mallow
Bouncingbet	Musk Thistle
Boxelder	Nettleleaf Goosefoot
Bristlegrass	Nodding Star-of-Bethlehem
Bristly Foxtail	Northern Spicebush
Bulbous Buttercup	Northern White Cedar
Bull Thistle	Norway Maple
Bush Honeysuckles	Orchardgrass
Californis Privet	Oriental Bittersweet
Callery Pear	Oriental Lady's Thumb
Canada Bluegrass	Osage-Orange
Canada Thistle	Oxeye Daisy
Canadian Horseweed	Pale Smartweed
Catnip	Paper-Mulberry
Cheatgrass	Paradise Apple
Chicory	Perennial Ryegrass
Chinese Wisteria	Perilla Mint
Chinese Yam	Periwinkle
chocolate Vine	Pineapple-Weed
Coltsfoot	Plumeless Thistle



# INVASIVE SPECIES DOCUMENTED IN JEFFERSON COUNTY

Common Chickweed	Porcelain-Berry
Common Cocklebur	Poverty Brome
Common Cornsalad	Purple Crown-Vetch
Common Crupina	Purple Deadnettle
Common Duckweed	Purple Loosestrife
common Grape Hyacinth	Quackgrass
Common Lilac	Queen Anne's Lace
Common Mallow	Rabbitfoot Clover
Common Mullein	Rattail Fescue
Common Periwinkle	Red Clover
Common Pokeweed	Red Fescue
Common Ragweed	Red Mulberry
Common Salsify	Red Sorrel
Common Selfheal	Redstem Filaree
Common St. Johnswort	Redstem Stork's Bill
Common Velvetgrass	Redtop
Common Vetch	Reed Canarygrass
Common Viper's Bugloss	Roughstalk Bluegrass
Corn Chamomile	Scarlet Pimpernel
Corn Cockle	Seaside Rose
Corn Gromwell	Sericea Lespedeza
Cornflower	Shepherd's-Purse
Creeping Bellflower	Showy Baby's-Breath
Creeping Buttercup	Siberian Elm
Creeping Yellow Loosestrife	Sickleweed
Curly Plumeless Thistle	Silver Maple
Curly-Leaved Pondweed	Small Carpetgrass
Cutleaf Teasel	Small Hop Clover
Cypress Spurge	Southern Catalpa
Dames Rocket	Spiny Amaranth
Dandelion	Spotted Knapweed
Deptford Pink	Spreading Hedgeparsley
Devil's-Claw	Staghorn Sumac
Dotted Smartweed	Standish's Honeysuckle
Dyer's Woad	Star-of-Bethlehem
Eastern Poison-Ivy	Stinging Nettle
Eastern Redcedar	Sweet Alyssum
Eastern White Pine	Sweet Autumn Virginsbower
Eclipta	Sweet Cherry
English Ivy	Sweet Vernalgrass
European Common Reed	Tall Fescue

INVASIVE SPECIES DOCUMENTED IN JEFFERSON COUNTY	
European Privet	Tall Morning-Glory
European Speedwell	Tawny Daylily
European Stinging Nettle	Teasel
False Strawberry	Thoroughwort Pennycress
Field Brome	Thymeleaf Sandwort
Field Dodder	Timothy
Field Horsetail	Toothed Spurge
Field Pennycress	Trumpet Creeper
Field Pepperweed	Velvetleaf
Fiveangled Dodder	Virginia Pepperweed
Flixweed	Wallflower Mustard
Giant Foxtail	Water Knotweed
Giant Ragweed	Water Speedwell
Goldenrain Tree	Watercress
Ggoosegrass	Wavyleaf Basketgrass
Greater Celandine	Western Salsify
Green Bristlegrass	White Campion
Green Foxtail	White Clover
Ground Ivy	White Mulberry
Hairy Galinsoga	White Poplar
Hedge Bindweed	White Willow
Hedge Mustard	Wild Four-O'Clock
Hemp Dogbane	Wild Garlic
Henbit	Willowleaf Lettuce
Hollyhock	Wine Raspberry
Horsenettle	Winged Burning Bush
Ivyleaf Morning-Glory	Wisconsin Weeping Willow
Ivyleaf Speedwell	Yellow Alyssum
Japanese barberry	Yellow Fieldcress
Japanese Honeysuckle	Yellow Foxtail
Japanese Hop	Yellow Groove Bamboo
Japanese Knotweed	Yellow Nutsedge
Japanese Stiltgrass	Yellow Rocket
Jimsonweed	Yellow Sweet-Clover
Johnsongrass	Yello Toadflax
Kentucky Bluegrass	

## POSSIBLE CAUSES

The introduction of invasive species to a new environment may be either unintentional or deliberate. Vehicles, cargo, humans, and animals can all unintentionally transport these species, as “hitchhikers”, into new environments. However, most invasive species “are deliberately introduced as pets, ornamental plants, crops, food, or for recreation, pest control or other purposes” (USDA, 2016).

## HISTORICAL OCCURRENCES

- Descriptions of specific events since last plan update

## IMPACTS & VULNERABILITY

Invasive species can harm wildlife in several different ways. When a species enters an ecosystem, it can breed or spread quickly and take over an area if it has no natural predators. Native species may not be able to defend their habitats from the invasive species. Native species may also become prey or have to compete for food. Invasive species can carry disease, prevent native species from reproducing or kill native species offspring (National Wildlife Federation, 2018).

There are also indirect results of an alien species moving into a new habitat. Invasive species can change the food web in an ecosystem by destroying or replacing native food sources. Though a new species may become an optional food source, it may not produce enough to supply the wildlife around it. Some species can completely reconstruct an ecosystem; aggressive plant species can take over ecosystems and replace every plant with a form of itself (National Wildlife Federation, 2018).

## LOCATION & EXTENT

No area is immune to invasive species, and every area of the U.S. has an invasive species problem. Some regions have larger issues than others. Areas that are near large bodies of water are particularly vulnerable because of the number of transportation hubs those areas are known to have. Heavily wooded areas, fields, wetlands, streams, rivers, and bays are also identified as being invaded by invasive species because of the habitats and natural spread from pollution and water (U.S. Fish & Wildlife Service, 2018). Typically, because of the make-up of the flora and fauna of an area, entire counties are impacted equally by the invasive species present there.

## LOSS & DAMAGES

Invasive species can put human health and economies at risk. These organisms can threaten the livelihoods of people who depend on agriculture for financial stability by destroying crops and decreasing the availability of water. Insects can also carry disease that jeopardizes the sustainability of food and human health. A commonly-known occurrence in which an invasive species harmed society was the Zika virus that swept through the U.S. from 2007 to 2016 when mosquitoes spread the disease to humans causing symptoms similar to dengue fever (Invasivespecies.org, 2018).

## PREVIOUS MITIGATION EFFORTS


- Describe what has been done in the past to address the impacts of the hazard

## VULNERABILITY ASSESSMENT

INVASIVE SPECIES RISK CALCULATION				
<i>Probability</i>		<i>Severity</i>		<i>Risk</i>
<b>FREQUENT</b>		<b>NEGLIGIBLE</b>		<b>MEDIUM</b>
There is a constant presence of invasive species in Jefferson County	+	The damages from infestation are negligible.	=	The risk assessment matrix categorizes this risk as medium

## RISK MAP

## Land Subsidence

Subsidence is a type of ground failure characterized by nearly vertical deformation, or the downward sinking of earth materials (Keller, DeVecchio, 2015).			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	Risk	Period of Occurrence: At any time	Overall Hazard Ranking: 3
		Warning Time: None to weeks	State Risk Ranking: Low for Jefferson County (Karst) Medium low statewide
		Probability: Probable	Severity: Marginal
		Type of Hazard: Natural	Disaster Declarations: None

### HAZARD OVERVIEW

Land subsidence hazards involve ground movement in or on the earth's surface. Karst is a terrain, generally underlain by limestone or dolomite, in which the topography is formed chiefly by the dissolving of rock and which may be characterized by sinkholes, sinking streams, closed depressions, subterranean drainage, and caves (WVGES, 2016.)

### POSSIBLE CAUSES

There are a variety of factors that can cause land subsidence; some are naturally occurring events and others can be caused by human activities (Keller, DeVecchio, 2015, pp. 106 & 248 – 285).

- **Karst Topography:** Karst is the result of chemical weathering or the dissolution of rocks beneath the land surface that occurs when surface water or groundwater percolates through rock that is easily dissolved.
- **Sediment and Soil Compaction:** Fine sediment, soil, sediment with soluble minerals, or organic-rich soils may be susceptible to subsidence due to rapid deposit; as these soils collapse, they cause subsidence.
- **Earthquakes:** The Earth's tectonic plate movements could cause sinking and uplifting of land.
- **Changes in Groundwater Conditions:** Groundwater table fluctuations in karst areas due to drought conditions can affect the soil and cause springs to reduce or stop their flow making the soils susceptible to subsidence.

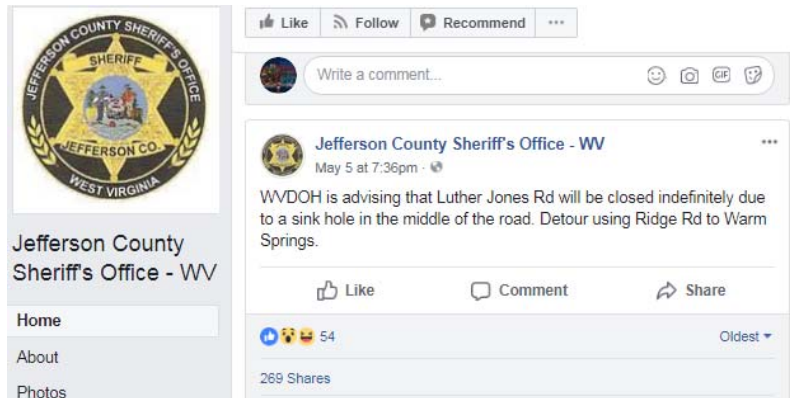
- **Melting Permafrost:** Permafrost is the ground that is continuously maintained below freezing temperatures, commonly cemented with ice. When the permafrost thaws or melts it causes damages to the structures on the surface. This condition does not affect this region.
- **Expansive Soils:** Soils change volume by shrinking significantly during dry periods and expanding or swelling during wet periods. The decrease or increase of the soil volume creates movements that affect structures and infrastructure. Some factors that contribute to the changes in soil volume include the climate, vegetation, topography and drainage.
- **Fluid Withdrawal:** Removing fluids such as oil, natural gas, and water can cause subsidence; as fluids are mined, the pressure is reduced, sediments are compacted, and the surface subsides.
- **Underground Mining:** Most subsidence in mining is caused by failure of pillars that are left behind to support the mine roof. With time, these pillars weather, weaken, and collapse, causing the roof to cave in and the land surface above the mine to subside.
- **Poor Landscaping Practices:** Planting trees and shrubs close to foundations may cause damage from soil shrinkage during dry periods as plant roots pull moisture from the soil. In contrast, gardens and grass that need frequent watering close to foundations can cause damage from soil swelling.

Natural resource extraction that includes oil and gas drilling and mining industries are examples of activities that can alter the subsoil causing environmental impacts such as erosion, sinkholes, soil, ground, and surface water contamination among many others. The West Virginia Geological and Economic Survey (WVGES) maintains an interactive map of oil and gas wells in the state; according to the map, there are no oil and gas wells in Jefferson County. Similarly, the maps do not show any surface or underground coal mining in the county, meaning that Jefferson County is not susceptible to the effects of land subsidence from mining and drilling (WVGES, n.d.).

## HISTORICAL OCCURRENCES

There have been ambiguous and very limited historical reports of land subsidence activity in Jefferson County. Extensive research indicates that there have been unspecified limited land subsidence events in the county since the county adopted this plan originally in 2003.

The Jefferson County Sheriff's Office posts updates of road closures in the county due to a variety of causes. Road closures affect the residents and visitors of the county. The image to the right shows a typical announcement from the Sheriff's Office on their social media page relating to sinkholes.



## COMMITTEE & PARTNER INPUT

During committee meetings members shared their experiences with recurrent and recent land subsidence events. The table below outlines the event date, if available, what happened, and how it could possibly be avoided going forward.

COMMITTEE INPUT FOR FLOOD		
<i>Event Date</i>	<i>What Happened</i>	<i>How This Can Be Avoided in the Future</i>
2015	Had karst sink holes appear and grow	Keep track of locations and educate key persons on monitoring and tendencies and how to treat and fill
2016-2017	Sinkhole opened up after heavy rain. No damage but raised concerns about runoff affecting water table	Sinkhole mitigation or just leave it alone.

The Jefferson County Development Authority (JCDA) shows property with sinkholes. It's hard to find large properties without them. Although the JCDA does not keep a record of sinkholes, they do find them on most of the properties in the county.

## IMPACTS & VULNERABILITY

Although there have not been any instances of large, catastrophic land subsidence in Jefferson County, the potential for damage is still present and small, localized subsidence has occurred. On a large scale, land subsidence can cause death, injuries, trauma and suffocation from entrapment as well as short and long-term mental health effects. Depending on the location, these events could cause loss or damage to homes, infrastructure and critical facilities and block whole communities off. There is potential for loss of property value, livestock and crops (WHO).

## LOCATION & EXTENT

Although the risk of land subsidence is widespread throughout the county, this hazard typically occurs in specific locations, regardless of the rest of the county.

## LOSS & DAMAGES

The loss estimation for land subsidence was developed using the asset inventory for the risk areas around the identified cave entrances. According to this assessment approximately **487 (VERIFY NUMBER THROUGH UPDATED GIS INFORMATION)** properties within Jefferson County are located in land subsidence hazard areas, the majority of which occur in the unincorporated county.

## PREVIOUS MITIGATION EFFORTS

Efforts to mitigate the effects of land subsidence in Jefferson County have included the review of existing regulations, comprehensive plans, and capital improvement plans, to ensure adequacy in reducing the amount of future development in areas identified as prone to land subsidence.

The Jefferson County Engineering Department does not investigate sinkholes and associated hazards on private property, nor do they have the resources and equipment to do so. Unfortunately, there is no efficient way to determine if a sinkhole is present and forming underground, but they do recommend a list of engineering firms who could help determine mitigation actions (JC Office of Engineering, n.d.).


## VULNERABILITY ASSESSMENT

LAND SUBSIDENCE RISK CALCULATION				
<i>Probability</i>		<i>Severity</i>		<i>Risk</i>
<b>PROBABLE</b>		<b>MARGINAL</b>		<b>MEDIUM</b>
Based on the type of soil Jefferson County has, the likelihood of land subsidence occurring is high.	+	Typically, the only damage associated with land subsidence in this area is structural.	=	The risk assessment matrix categorizes land subsidence as a medium risk to the area.

## RISK MAP



## Severe Thunderstorms

Severe thunderstorm is one that produces a tornado, winds in excess of 58 mph, or hail of 1" diameter or larger.				
	Risk	Period of Occurrence:	At any time, typically during the summer months	Overall Hazard Ranking: 3
	HIGH	Warning Time:	Days to hours	State Risk Ranking: Medium for Jefferson County (Hail and lightning)
	MEDIUM HIGH			Low (hail) and medium (lightning) statewide
	MEDIUM	Probability:	Frequent	Severity: Negligible
	MEDIUM LOW	Type of Hazard:	Natural	Disaster Declarations: DR-1769 DR-4071
	LOW			

## HAZARD OVERVIEW

A thunderstorm is a local storm that is produced by a cumulonimbus cloud, accompanied by lightning and thunder, often accompanied by gusty winds, heavy rain, and occasionally by hail, and sometimes is violent at the surface (NWS, FEMA, 2001).

TYPES OF THUNDERSTORMS				
Type	Description	Duration	Wind Speeds	Associated Hazards
Single Cell	Uncommon	20 - 30 minutes		<ul style="list-style-type: none"> <li>• Non-damaging hail</li> <li>• Microbursts</li> <li>• Weak tornadoes</li> </ul>
Multi Cell	Common, organized cluster of two or more single cells.	Each cell lasts approximately 20 minutes	Downbursts of up to 80 mph	<ul style="list-style-type: none"> <li>• Heavy rainfall</li> <li>• Downbursts</li> <li>• Hail</li> <li>• Weak tornadoes</li> </ul>
Mesoscale Convective System (MCS)	Well organized system of thunderstorms	Up to 12 hours or more	55 mph or more	<ul style="list-style-type: none"> <li>• Torrential rainfalls</li> <li>• Derechos</li> <li>• Tornadoes</li> </ul>
Squall Lines	May extend over 250 to 500 miles and 10 to 20 miles wide	Individual cells last from 30 to 60 minutes		<ul style="list-style-type: none"> <li>• Significant rain after the storm</li> <li>• Derechos</li> </ul>
Super Cells	Most dangerous storms, visible with Doppler radars	1 - 6 hours	Updrafts and downdrafts of more than 100 mph	<ul style="list-style-type: none"> <li>• Tornadoes</li> <li>• Hail</li> </ul>

Sources: IS-271 Anticipating Hazardous Weather and Community Risk  
Keller & DeVecchio, 2015  
National Weather Service, 2009

A thunderstorm that produces a tornado, winds of at least 58 mph (50knots), and/or hail at least 1" in diameter is a severe thunderstorm (NWS, 2009).

Thunderstorm associated natural hazards include lightning, hail, heavy rain, damaging winds, and tornadoes. This profile includes descriptions on lightning and hail; Section xxx describes severe winds and tornadoes associated with thunderstorms. Because the potential damage severe winds and tornadoes cause and the difference in mitigation actions relating to the hazard, this profile does not include a detailed description of them. Furthermore, the IS-271 FEMA course *Anticipating Hazardous Weather and Community Risk* describes thunderstorms and tornadoes separately.

- **Lightning:** Lightning is a giant spark of electricity between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground; however, when the differences in the charges becomes too great, this insulating capacity of the air breaks down and there is a rapid discharge of electricity known as lightning (NWS). Individual lightning strikes occur with no warning and kill between 75 and 100 Americans every year (Haddow, Bullock, & Coppola, 2014, p.51.) Lighting can reach a significant distance from a storm, up to 25 miles according to the National Severe Storms Library (NSSL). While lightning is a common occurrence and can be seen in most thunderstorms, only about 20% of the lighting observed in a storm will strike the ground.
- **Hail:** Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into balls of ice; the drops of ice can move upwards and downwards within the draft and become larger. When the hailstone is heavy enough, it will fall to the ground (NSSL, n.d.). In 1986, Jonathan Webb, a member of the Tornado and Storm Research Organization (TORRO) in England, developed the TORRO Hailstorm Intensity Scale as a way to measure and categorize hailstorms (Voss Law Firm, n.d.).

TORRO HAILSTORM INTENSITY SCALE					
	<i>Intensity</i>	<i>Typical Hail Diameter (mm)</i>	<i>Typical Hail Diameter (in)</i>	<i>Typical Damage</i>	<i>Example Size Description</i>
H0	Hard Hail	5	Up to 0.33	No damage.	Pea
H1	Potentially Damaging	5-15	0.33 – 0.60	Slight general damage to plants, crops.	Mothball
H2	Significant	10-20	0.60 – 0.80	Significant damage to fruit, crops, vegetation.	Marble, Grape, Dime
H3	Severe	20-30	0.80 – 1.2	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored.	Walnut, Nickel to Quarter

TORRO HAILSTORM INTENSITY SCALE					
	<i>Intensity</i>	<i>Typical Hail Diameter (mm)</i>	<i>Typical Hail Diameter (in)</i>	<i>Typical Damage</i>	<i>Example Size Description</i>
H4	Severe	25-40	1.2 – 1.6	Widespread glass damage, vehicle bodywork damage.	Pigeon's egg > squash ball
H5	Destructive	30-50	1.6 – 2.0	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries.	Golf ball > Pullet's egg
H6	Destructive	40-60	2.0 – 2.4	Bodywork of grounded aircraft dented, brick walls pitted.	Hen's egg
H7	Destructive	50-75	2.4 – 3.0	Severe roof damage, risk of serious injuries.	Tennis ball > Cricket ball
H8	Destructive	60-90	3.0 – 3.5	(Severest recorded in the British Isles) Severe damage to aircraft bodywork.	Large orange > Soft ball
H9	Super Hailstorms	75-100	3.5 – 4.0	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.	Grapefruit
H10	Super Hailstorms	>100	4.0+	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.	Melon

## POSSIBLE CAUSES

Hail forms when water droplets are carried upward into extremely cold areas of the atmosphere. Hailstones grow by colliding with supercooled water drops. Supercooled water will freeze on contact with ice crystals, frozen raindrops, or dust. Thunderstorms that have a strong updraft keep lifting hailstones up toward the top of the cloud where they continue to grow. The hail eventually falls when the updraft can no longer lift the weight of the hailstone. Hail cannot form without an extremely cold upper atmosphere (NSSL, 2018).

Lightning is an electrical currents that start from the clouds. When the ground is hot, it heats the air above it; as the warm air rises, water vapor cools and forms into a cloud. When the warm air continues to rise, the cloud will grow. The top of the cloud has a temperature below freezing, which means water vapor turns to ice. As the water vapor freezes, the cloud becomes a thundercloud, and the frozen particles collide with each other creating an electric charge. Positively charged particles will rise to the upper part of the cloud, and the negatively charged particle will sink to the lower portion of the cloud. When the charges grow large enough, a spark or lightning will occur. This process may vary. Cloud-to-ground lightning occurs where the cloud is negatively charged, and the ground is positively charged, thus making a spark (Plant-science.com, 2018).

## HISTORICAL OCCURRENCES

The following table lists the hail events in Jefferson County for any hail experienced of one inch or larger. Lightning is a typical element associated with thunderstorms and therefore is not quantified in this section of historical occurrences.

HAIL EVENTS IN JEFFERSON COUNTY			
<i>Event Date</i>	<i>Hail Size</i>	<i>Intensity</i>	<i>Damage Reported</i>
7/25/1999	1	H3	\$0
5/10/2000	1	H3	\$0
5/13/2000	1.25	H4	\$0
7/14/2000	1	H3	\$0
7/16/2000	1.75	H5	\$0
5/26/2002	2.75	H7	\$0
5/26/2002	1.75	H5	\$0
5/25/2004	1.75	H5	\$5,000
8/25/2007	1	H3	\$0
7/26/2008	1	H3	\$0
4/25/2010	1	H3	\$0
4/25/2010	1	H3	\$0
4/25/2010	1	H3	\$0
4/25/2010	1	H3	\$0
4/25/2010	1	H3	\$0
5/26/2011	1	H3	\$0
6/21/2011	1	H3	\$0
7/11/2011	1	H3	\$0
9/14/2011	1	H3	\$0
5/3/2012	1	H3	\$0
6/7/2012	1	H3	\$0
7/8/2012	1	H3	\$0
6/23/2015	1	H3	\$0
6/16/2016	1	H3	\$0
5/18/2017	1	H3	\$0

Source: NCEI

## IMPACTS & VULNERABILITY

There are many impacts of severe summer weather. Here are a few listed under each category.

- **Lightning:** Can cause injury and even death. In some cases, lightning is known to cause fires in structures and open land or forests.
- **Hailstorms:** Can cause injury to humans and animals if directly exposed, damage to vegetation and infrastructure.
- **Tornadoes:** Cause damage to trees, property; they can also cause severe injury and death.
- **Wind:** Causes respiratory illnesses, damage to the vegetation (fallen trees), and can cause damage to infrastructure due to flying debris.
- **Thunderstorms:** Include all of the above mentioned impacts.

As with all hazards, severe summer weather hazards can also have an effect on the mental health of the population causing anxiety, panic attacks and post-traumatic stress. Vulnerable populations can include those who are unable to evacuate during a severe weather event, those with health issues that may be exacerbated, as well as children and elderly adults. If poor populations are unable to obtain necessary shelter during an event, they will be at higher risk and may be more vulnerable to the effects of that event.

#### LOCATION & EXTENT

Severe weather is a hazard that can affect all areas and jurisdictions of the county. Jefferson, as well as surrounding counties and states are at similar risk of exposure to these types of severe summer weather events. Severe summer weather events have the potential of lasting seconds (i.e. lightning), a few minutes (i.e. tornadoes), several hours (i.e. thunderstorms, hailstorms, etc.), or even days (i.e., high winds).

#### LOSS & DAMAGES

NCEI reports that lightning has caused up to \$832500 in damages in Jefferson County, but hail has only caused up to \$5,000 in damages.

#### PREVIOUS MITIGATION EFFORTS

One of the most common impacts from severe weather is the loss of commercial power. Since many of the services rely on power for critical functions, providing backup power capabilities has long been a favored strategy for mitigating damages from severe thunderstorms. Jefferson County Homeland Security and Emergency Management (JCHSEM) have also developed a

countywide Continuity of Operations Plan (COOP) which includes specific COOP guidelines for nearly all of the county agencies.


Past mitigation efforts to reduce the effects of hail storms throughout Jefferson County include the following; the development and distribution of public awareness materials concerning hail storms, the utilization of local media and social media (i.e., facebook and twitter) for the distribution and publication of hazard information, and conducting National Weather Service Storm Spotter classes.

## VULNERABILITY ASSESSMENT

SEVERE THUNDERSTORM WITH HAIL RISK CALCULATION						
Probability				Severity		Risk
FREQUENT				NEGLIGIBLE		MEDIUM
Events	25	= 1.3	+	Minimal damage has been reported by sources such as NCEI. No injuries or deaths have been associated with hail.	=	The risk assessment matrix categorizes the risk of severe thunderstorms with hail as medium.
Years	19					
Hail events are frequent in Jefferson County. Roughly, the county will experience one severe thunderstorm with 1" or larger hail every year.						

## RISK MAP

## Earthquake

A sudden release of Earth's energy that shakes or displaces the ground.			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	Risk	Period of Occurrence:	At any time
		Warning Time:	None
		Probability:	Occasional
		Type of Hazard:	Natural
		Overall Hazard Ranking:	4
		State Risk Ranking:	Low for Jefferson County Low statewide
		Severity:	Marginal
		Disaster Declarations:	None

### HAZARD OVERVIEW

The Earth's sudden release of stored energy may manifest itself by the shaking or displacement of the ground, known as an earthquake. According to the U.S. Geological Society, based on historical trends, the frequency of an earthquake occurrence inversely relates to its magnitude. There are an estimated 1.3 million earthquakes every year with a magnitude between 2.0 and 2.9 while there is, on average, one magnitude 8.0 or higher earthquake annually.

Earthquakes move or shake the earth in three different directions depending on the plate movements: convergent, divergent, and transform generating primary and secondary waves. There are three common ways to measure an earthquake:

- **Richter Scale:** The Richter scale measures the scale and severity of an earthquake; the magnitude of an earthquake can range between 0 and 10. The effects of an earthquake can extend far beyond the site of its occurrence.
- **Modified Mercalli Scale:** The modified Mercalli scale measures earthquakes based on their intensity on the surface. This scale uses Roman numerals I through XII to denote detection and damage levels associated with an earthquake.
- **Peak Ground Acceleration (PGA):** PGA is "the maximum ground acceleration that occurred during earthquake shaking at a location. PGA is equal to the amplitude of the largest absolute acceleration recorded on an accelerogram at a site during a particular earthquake" (Douglas, 2003).

The table to the right compares the Modified Mercalli (MMI) scale and the Richter scale; typically, the magnitude and the MMI coincide with this comparison, but on occasions, it may differ (refer to *historical occurrences* below for an example).

#### POSSIBLE CAUSES

The Earth is made up of tectonic plates; the boundary lines where these tectonic plates meet are called faults. Friction along the boundaries or faults causes the rocks to stress and strain. “When the stress of the rocks exceed their strength, that is, their ability to withstand the force, the rock rupture and are permanently displaced along the fault plane” (Keller & Devecchio, 2015) causing earthquakes that reach and affect the infrastructure on the surface.

A common misconception is that hydraulic fracturing, or “fracking” is causing all of the induced earthquakes. In reality, fracking “is directly causing a small percentage of the felt-induced earthquakes observed in the United States...Most induced earthquakes in the United States are a result of the deep disposal of fluids (wastewater) related to oil and gas production” (Rubinstein and Mahani, 2015).

MODIFIED MERCALLI AND MAGNITUDE SCALE COMPARISON		
Modified Mercalli Scale		Magnitude Scale
I	Felt by few people under especially favorable conditions.	1.5
II	Felt by few persons at rest, especially on upper floors of buildings.	2.0
III	Felt quite noticeably indoors, especially on upper floors of buildings. Many do not recognize it as an earthquake. Standing vehicles may rock slightly. Vibration feels like passing truck.	2.5
IV	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation of a heavy truck striking building; standing vehicles rock noticeably.	3.0
V	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned.	3.5
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.	4.0
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by vehicle drivers.	4.5
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse; damage great in poorly built structures; fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned. Disturbs	5.0
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Underground pipes broken.	5.5
X	Some well-built wooden structures are destroyed; most masonry and frame structures with foundations destroyed; train rails bent.	6.0
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Underground pipelines taken out of service. Train rails bent greatly.	6.5
XII	Damage total. Waves seen on ground surfaces. Lines of sight and level are distorted. Objects thrown into the air.	7.0



## HISTORICAL OCCURRENCES

In 2016 Jefferson County experienced an earthquake of 3.0 magnitude, but according to the WVGES, the intensity measured a V, which is higher than the expected intensity for a 3.0 magnitude earthquake. The table to the right lists the epicenters of earthquakes within an 80-mile radius of Jefferson County. Since 2000, there have been five epicenters although the community has felt others originating from further away.

EPICENTERS WITHIN AN 80 MI RADIUS OF JEFFERSON COUNTY 2000-2018		
Magnitude	Location of Epicenter	Date
3.0	3km NE of Ranson, WV	1/17/2016
3.6	1 km NW of Germantown, MD	7/16/2010
3.0	Pennsylvania	6/3/2010
2.8	Pennsylvania	10/25/2009
2.9	Pennsylvania	4/24/2009

Source: USGS

The USGS has an earthquake hazards program in which they ask, ‘*did you feel it?*’ and anyone can record their answers. The USGS then takes that data and creates a map for every year. Since 2000, the maps show that there have been seven earthquakes that people have felt in 2003, 2010, 2011, 2012, 2014, 2016, and 2017. As data shows, there have been more earthquakes felt in the last six years than since 2000, which indicates that they are becoming a more common occurrence.

### August 23, 2011

In the Piedmont region of Virginia, a 5.8 magnitude earthquake had its epicenter in Louisa County, which is approximately 38 miles northwest of Richmond. The earthquake had a maximum perceived intensity of VII on the Mercalli Intensity Scale. Several aftershocks, ranging up to 4.5 in magnitude, occurred after the main tremor. The quake was felt across more than a dozen U.S. states and in several Canadian provinces and was felt by more people than any other quake in U.S. history. No deaths and only minor injuries were reported, and minor damage to buildings was widespread. In Martinsburg, several government buildings were evacuated, and multiple citizens reported feeling their homes shaking violently enough to rattle picture frames off the walls. In Charleston, the Kanawha County Courthouse, the West Virginia State Capitol campus, and several other downtown buildings were evacuated. In Philippi, part of a chimney collapsed at the Barbour County courthouse.

### January 17, 2016

The earthquake happened at 2:12 p.m., and its epicenter was about two miles south-southeast of Bolivar, which is next to Harpers Ferry. There were no reports of damages or

injuries. That day, 51 people in Charles Town reported feeling it, and 38 in the Bolivar and Harpers Ferry areas reported experiencing it. The earthquake had a 3.0 magnitude, which is weak (McMillion, 2016, Jan 17).

## COMMITTEE INPUT

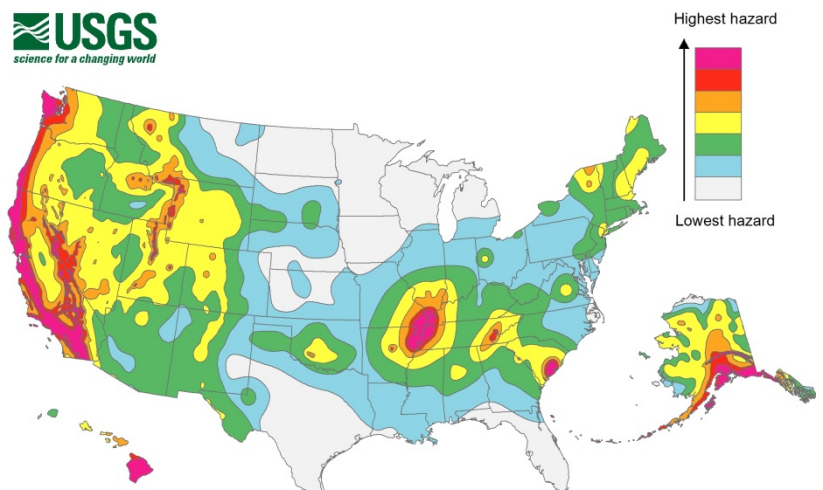
Committee members did not describe any instances of earthquakes in the past several years during the exercise that requested committee members describe hazard occurrences.

## IMPACTS & VULNERABILITY

Earthquakes can affect people and structures alike, although older structures may be more susceptible to cracks and damage. “With most earthquakes, trauma caused by the collapse of buildings is the cause of most deaths and injuries. However, a surprisingly large number of patients require acute care for non-surgical problems such as acute myocardial infraction, exacerbation of chronic diseases such as diabetes or hypertension, anxiety and other mental health problems, respiratory disease from exposure to dust and asbestos fibers from rubble, and near-drowning because of flooding from broken dams. An earthquake may precipitate a major technologic disaster by damaging or destroying nuclear power stations, hospitals with dangerous biologic products, hydrocarbon storage areas, and hazardous chemical plants. As with most natural disasters, the risk of secondary epidemics is minimal, and only mas vaccination campaigns based on results of epidemiological surveillance are appropriate following earthquakes” (Noji, 1999).

## LOCATION & EXTENT

The U.S. has areas that are prone to earthquakes; the coasts of California, Oregon and Washington are more vulnerable to seismic activity due to the presence of the Ballenas, Brothers, and the San Andreas Faults on the west coast. Also of note is the New Madrid Seismic Zone located in Arkansas, Missouri, and Tennessee. On the east coast, there is the Eastern Tennessee Seismic Zone that



stretches from Alabama to Virginia.

The USGS (2014) has a map of the US that identifies the highest and lowest hazard zones for earthquakes. In it, it shows the majority of the State of West Virginia as low risk; this includes Jefferson County. The southernmost part of the state has only a slightly higher risk of earthquake hazards. However, Jefferson County is near medium risk areas.

## LOSS & DAMAGES

The HAZUS-MH program from the Federal Emergency Management Agency analyzes the effects of a potential earthquake striking Jefferson County. The scenario depicts a 5.0 earthquake (the lowest possible magnitude to use in the program) located at the epicenter of the latest 2016 earthquake, just northeast of Ranson. The following tables describe the expected building damages by occupancy type and the building-related economic loss estimates.

JEFFERSON COUNTY EXPECTED BUILDING DAMAGE BY OCCUPANCY (HAZUS)										
	<i>None</i>		<i>Slight</i>		<i>Moderate</i>		<i>Extensive</i>		<i>Complete</i>	
	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>
Agriculture	25	0.30	22	0.41	25	0.62	10	0.71	3	0.79
Commercial	207	2.43	162	3.04	222	5.46	108	7.34	32	8.43
Education	9	0.10	6	0.12	9	0.22	4	0.28	1	0.32
Government	11	0.12	8	0.15	12	0.30	6	0.43	2	0.50
Industrial	68	0.80	51	0.95	79	1.95	42	2.84	13	3.27
Other Residential	1,655	19.46	1,173	21.92	1,269	31.29	602	41.00	138	35.93
Religion	31	0.37	20	0.37	19	0.47	9	0.58	2	0.61
Single Family	6,503	76.43	3,908	73.05	2,424	59.72	688	46.81	192	50.15
<b>TOTAL</b>	<b>8,509</b>		<b>5,350</b>		<b>4,060</b>		<b>1,469</b>		<b>383</b>	

JEFFERSON COUNTY HAZUS BUILDING-RELATED ECONOMIC LOSS ESTIMATES (MILLIONS OF DOLLARS)							
<i>Category</i>	<i>Area</i>	<i>Single Family</i>	<i>Other Residential</i>	<i>Commercial</i>	<i>Industrial</i>	<i>Others</i>	<i>Total</i>
Income Losses	Wage	0.00	3.53	13.25	0.68	1.27	18.74
	Capital Related	0.00	1.49	11.89	0.40	0.21	14.00
	Rental	6.43	4.67	5.16	0.25	0.58	17.10
	Relocation	23.77	4.14	8.40	1.30	3.65	41.26
	Subtotal	30.20	13.83	38.71	2.64	5.71	91.09
Capital Stock Losses	Structural	36.88	7.08	9.14	3.16	3.72	59.98
	Non Structural	126.40	26.92	27.66	10.10	9.61	200.70
	Content	46.66	6.78	14.58	6.86	5.42	80.30
	Inventory	0.00	0.00	0.36	1.57	0.13	2.06
	Subtotal	209.94	40.79	51.74	21.70	18.88	343.04
<b>TOTAL</b>		<b>240.14</b>	<b>54.61</b>	<b>90.45</b>	<b>24.33</b>	<b>24.59</b>	<b>434.13</b>

In addition to building losses, infrastructure and utilities would also suffer damages. The following are estimates that HAZUS generates for various types of damage.

- **Essential Facility Damage:** two hospitals, seven schools, three police stations, and two fire stations will have at least moderate damage.
- **Transportation and Utility Lifeline Damage:** two bridges and one light rail facility will have at least moderate damage; economic loss estimate is \$4.8 million.
- **Utility System Facility Damage:** one potable water, eleven wastewater, and three communications facilities will have at least moderate damage; economic loss estimate is \$203.10 million.
- **Utility System Pipeline Damage:** there will be 211 potable water, 106 wastewater, and 36 natural gas pipeline leaks, and 53 potable water, 26 wastewater, and nine natural gas pipeline breaks.
- **Casualties:** there will be 118 injuries that require medical attention, but not hospitalization, 28 injuries that require hospitalization but are not life-threatening, five injuries that require hospitalization that can become life-threatening if not promptly treated, and seven deaths.

#### PREVIOUS MITIGATION EFFORTS

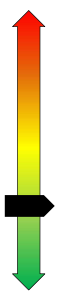
**DESCRIBE WHAT HAS BEEN DONE IN THE PAST TO ADDRESS THE IMPACTS OF THE HAZARD – PUBLIC AWARENESS, BUILDING CODE ENFORCEMENT, ETC.?**

#### VULNERABILITY ASSESSMENT

EARTHQUAKE RISK CALCULATION					
Probability		+	Severity	=	Risk
OCCASIONAL			MARGINAL		MEDIUM LOW
Events	7		= 0.41		
Years	17				
In the past 17 years, there have been seven occurrences of epicenters close to Jefferson County or earthquakes felt in the region.		The most likely damages to occur from an earthquake in Jefferson County are minor structural losses.	The risk assessment matrix categorizes the occasional probability and marginal severity as a medium low risk to the county.		

#### RISK MAP

## Violent Disturbance

"An intentional use of force or power, against oneself, another person, or against a group or community, which either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation" (WHO).			
	Risk	Period of Occurrence:	At any time throughout the year
		Overall Hazard Ranking:	4
		Warning Time:	None, days, or weeks
		State Risk Ranking:	Not ranked
		Probability:	Remote
		Severity:	Critical
		Type of Hazard:	Human-Caused, Chemical, Biological,
		Disaster Declarations:	None

## HAZARD OVERVIEW

As the nation has seen an upswing in violent acts (ABC, 2017), it is necessary to profile types of violence and the potential impacts they could have in Jefferson County. Violent disturbances, for the purpose of this plan, encompass those acts that law enforcement does not consider routine. In this plan, civil disturbance will include the following topics.

- Active Assailant: An individual actively engaged in killing or attempting to kill people in a confined and populated area (FBI, 2013).
- Bomb Threat: An actual or rumored threat of a bomb.
- Riots: Group protests that become or have the potential to become violent.

## POSSIBLE CAUSES

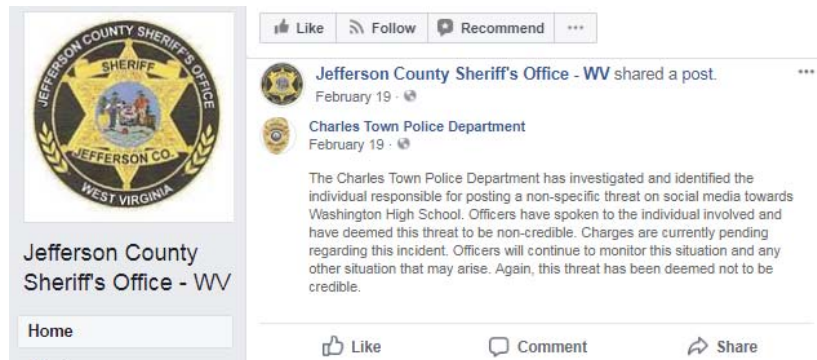
Not all protests end in violence, the majority of protesting is peaceful. Violence is usually caused by the "crowd psychology," when in a crowd an individual is more likely to act like others, which means a few looking to engage violent behavior can sway a large group to act violently (Sarkis, 2011). If a terrorist is seeking self-glory, executing a preacher, priest, or rabbi will bring more attention than executing an average civilian. Houses of worship including churches and synagogues, are more often than ever before, hiring security forces and/or training their members how to prepare for and survive an attack (Mauro, 2016).

## HISTORICAL OCCURRENCES

There is no database that tracks violent disturbance events in Jefferson County. However, the Jefferson County Sheriff's Office (JCSO) posts the amount and types of calls they

receive each week. Between the beginning of 2018 and April of 2018, there have been 59 calls involving threats (undetermined), 36 reports of gunshots heard, 1 reported armed suspect, and 277 disturbances.

In February of 2018, the Charles Town Police Department advised that there was a threat at the local high school. Out of precaution, the county cancelled classes that day.



## IMPACTS & VULNERABILITY

Survivors of violence will most likely experience common stress reactions lasting several days to a few weeks. These reactions can include the following:

- **Emotional Reactions:** Shock, fear, grief, anger, guilt, shame, helplessness, numbness, sadness.
- **Cognitive Reactions:** Confusion, indecisiveness, worry, shortened attention span, trouble concentrating.
- **Physical Reactions:** Tension, fatigue, edginess, insomnia, body aches, easily startled, tachycardia, nausea, loss of appetite.
- **Interpersonal Reactions:** distrust, conflict, withdrawal, irritability, loss of intimacy, feeling abandoned.

Deciding which groups are vulnerable is challenging. There will always be variation between groups and the people within them in relation to the risks they face (Brown, 2004). However, the elderly, children, homeless persons, people with disabilities, religious groups and members of the LGBT community experience higher rates of exposure to violence (Phillips, Thomas, Fothergill, Blinn-Pike, 2010).

Between 2003 and 2013, the elderly reported 56% of all violent crimes (USDOJ, 2014). A 2009 study showed that almost 40% of all American children were victims of two or more violent acts (DOJ, 2009). In 2010, there were 113 violent acts against the homeless reported; twenty-four of the attacks were fatal (National Coalition for the Homeless, 2012). An analysis of

the 2011 FBI hate-crime statistics show “LGBT people are more than twice as likely to be the target of a violent hate-crime as Jews or black people” (Potok, 2011).

#### COMMITTEE & PARTNER INPUT

During committee meetings members shared their experiences with recurrent and recent violent disturbance incidents. One member mentioned that on various occasions, threats have occurred to county high schools for bomb and gun violence.

#### LOCATION & EXTENT

Violent disturbance has the ability to affect a small area, such as a single business or government building or an entire city, county, or state. Due to the rise of workplace and school violence, drug manufacturing and use, “homegrown” and “lone-wolf” terrorists, and racially-motivated attacks, the entire region is at risk for acts of violence. The U.S. Department of Labor Statistics shows in 2015, nationwide, there were 417 workplace homicides, with 354 involving a firearm (DOL, 2015). A Centers for Disease Control study on school-associated violent death found between 14 and 34 school-age children are victims of homicide on school grounds annually in the U.S. (CDC, 2010).

#### LOSS & DAMAGES

Estimating the economic impact of a violent disturbance is a difficult task. Initial impact can be measured in immediate costs such as response to the event and closed businesses. The full economic impact would include long-term costs.

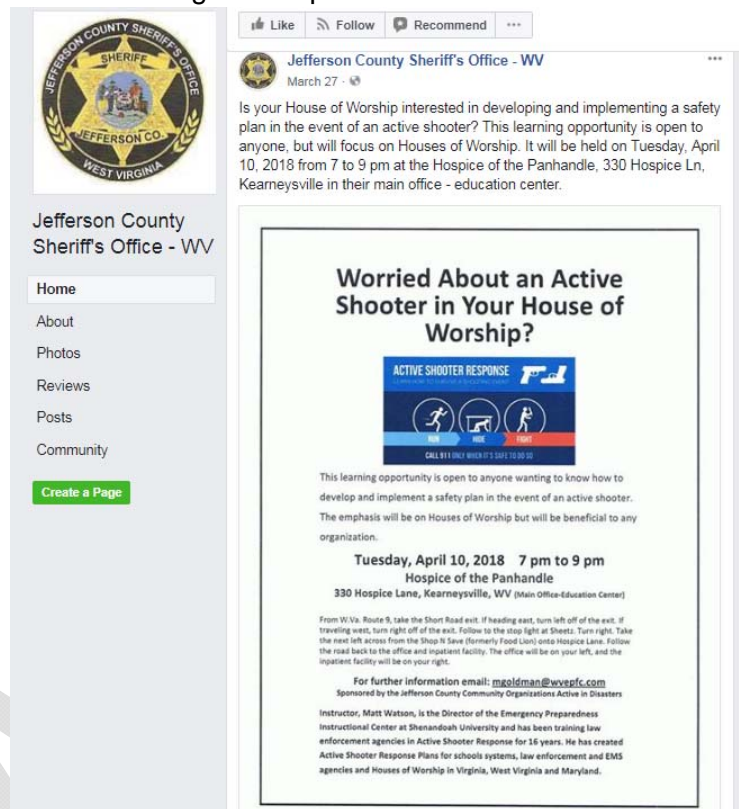
A large-scale event could significantly affect industry and/or government and privately owned infrastructure. An incident involving wastewater, drinking water or chemical facilities could have long term environmental effects. The potential losses due to these variables, makes it difficult to quantify the cost of repair or replacement of infrastructure.

#### PREVIOUS MITIGATION EFFORTS



The Jefferson County Sheriff's Office has promoted trainings in the past on active shooters. The illustration from their social media site to the right is an example of these types of trainings.

**DESCRIBE OTHER PREVIOUS  
MITIGATION EFFORTS HERE.**



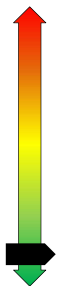
## VULNERABILITY ASSESSMENT

VIOLENT DISTURBANCE RISK CALCULATION				
Probability		Severity		Risk
REMOTE		CRITICAL		MEDIUM-LOW
Due to the amount of calls the JCSO receives and recent events at high schools across the country, the probability of an event would be remote.	+	Due to the nature of these types of events, it is possible that the severity of an event could be critical.	=	The risk assessment matrix categorizes this hazard as being a medium-low risk to the county.

## RISK MAP














## Drought

Drought is an extended period of deficient rainfall relative to the statistical mean for a region.			
	Risk	Period of Occurrence:	At any time, typically after a period of low precipitation and heat.
	HIGH	Warning Time:	Weeks to months.
	MEDIUM HIGH	Probability:	Remote
	MEDIUM	Type of Hazard:	Natural
	MEDIUM LOW	Overall Hazard Ranking:	5
	LOW	State Risk Ranking:	Low for Jefferson County Medium statewide
		Severity:	Negligible
		Disaster Declarations:	None

### HAZARD OVERVIEW

A drought is a deficiency of precipitation over a period of time resulting from a weather pattern that brings no moisture into an area. Droughts may be short term (a few weeks to a month) or long term (several months to several years). A long term drought may be interrupted by occasional precipitation without breaking the drought cycle. There are four different types of drought, which include the following.

- **Meteorological Drought:** A measure of departure from normal precipitation due to climatic differences. What is considered a drought in one location may not be in another location.
- **Agricultural Drought:** The amount of moisture in the soil no longer meets the needs of a particular crop.
- **Hydrological Drought:** Surface and subsurface water levels are below normal.
- **Socioeconomic Drought:** This occurs when physical water shortage begins to affect people.

PALMER DROUGHT SEVERITY INDEX		
	< -4.0	Extreme drought
	-3.99 to -3.0	Severe drought
	-2.99 to -2.0	Moderate drought
	-1.99 to -1.0	Mild drought
	-0.99 to -0.5	Incipient drought
	-0.49 to 0.49	Near normal
	0.50 to 0.99	Incipient moist spell
	1.0 to 1.99	Moist spell
	2.0 to 2.99	Unusual moist spell
	3.0 to 3.99	Very moist spell
	> 4.0	Extreme moist spell

W. C. Palmer developed the Palmer Drought Severity Index (PDSI) in 1965 that measures droughts by recording the departure of moisture from the norm. The index provides measurements of moisture conditions so that comparisons can be made between

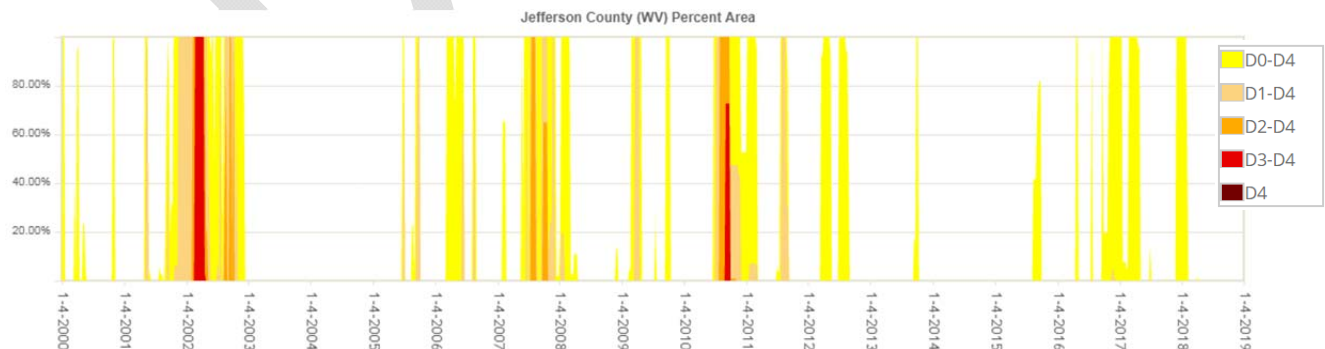
locations and between time periods in the same location. The index is actually a hydrological index rather than a meteorological index since it is based on moisture availability (precipitation, outflow, and storage) over time.

## POSSIBLE CAUSES

Precipitation in the form of rain or snow falls in uneven patterns across the country. The amount of precipitation at a particular location varies from year to year, but over a period of years, the average amount is fairly constant. The amount of rain and snow also varies with the seasons. In Jefferson County the average rainfall in a year is around 40 inches and snowfall is approximately 26 inches per year. Even if the total amount of rainfall for a year is about average, rainfall shortages can occur during a period when moisture is needed for plant growth, such as in the early summer. When little or no rain falls, soils can dry out and plants can die. When rainfall is less than normal for a period of time (several weeks, months, or years) the flow of streams and rivers declines, water levels in lakes and reservoirs fall, and the depth to water in wells increases. If dry weather persists and water-supply problems develop, the dry period can become a drought (USGS, 2016).

## HISTORICAL OCCURRENCES

U.S. Drought Monitor reports two periods of extreme drought (D3) between 2000 and 2018 whereas NCEI reports four droughts between 1997 and 2007. This roughly gives a total of six significant droughts between 1997 and 2018. NCEI does not have records for the drought of 2002 in Jefferson County, the year the majority of the country experienced droughts. As the map shows, in March of 2002 there was an extreme drought (D3) throughout the East Coast region. Other parts of the country experienced droughts at different times throughout the year.



According to data from the U.S. Drought Monitor, of the 953 weeks on record, 218 have experienced some type of drought; that is 22.8% of the time Jefferson County is experiencing a

drought condition. Drought conditions are not spread out evenly throughout the year, or even over a period of years. As the graph above indicates, there can be several years with no drought conditions, and then more than one year with consistent drought conditions.

DROUGHT EVENTS			
<i>Begin Date</i>	<i>Damage to Crops</i>	<i>Type of Drought</i>	<i>Description &amp; Source</i>
7/1/1997	\$2,150,000		NCEI: A very dry month, containing one 7-day heat wave, exacerbated drought-like conditions across much of the fertile farmland of eastern West Virginia. The weather in July proved to be the death knell for much of the crop yields, including corn, hay, and pasture. The West Virginia Farm Service Agency reported the following damage statistics: Corn, hay, and pasture yields were 40 to 50 percent of normal. Estimated damage to the corn crop included 2500 to 3000 acres per county in the Potomac Highlands but as much as 10,000 acres in the eastern panhandle. Hay damage was estimated to be 40,000 acres per county; pasture lands an additional 80,000 acres per county. No significant damage to alfalfa was noted. Though some summer fruit was damaged by the drought, most of what survived was excellent.
8/1/1998	\$0		NCEI: Drought conditions persisted for six months in a row across the Eastern Panhandle of West Virginia. Persistent high pressure over the Southeast U.S. forced most precipitation producing low pressure systems to steer north of the region. In addition, record high temperatures baked the region during the first week of the month. Monthly precipitation totals from counties in the region included 0.6 inches in Hampshire, 0.7 inches in Mineral, 0.8 inches in Morgan, 0.9 inches in Hardy, 1.0 inches in Pendleton, and 1.3 inches in Grant and Jefferson. Average precipitation for the month of December is around 3 inches. Most locations received less than half of their normal precipitation from July through December. A ban on open burning continued through mid-December in Berkeley, Grant, Hampshire, Jefferson, Mineral, Morgan, and Pendleton Counties due to extreme fire danger.
10/1/1998	\$0		
11/1/1998	\$0		
12/1/1998	\$0		
5/1/1999	\$0		NCEI: Rainfall from two tropical storms and a handful of low pressure systems made an impact in the drought that plagued the region since the summer of 1998. By the end of the month, conditions across the Eastern Panhandle were upgraded from an extreme to a moderate drought because rainfall was above average during September. Rainfall totals included 7.9 inches in Jefferson County. Effects of the drought still lingered in the agricultural community. Across the state by the end of the month, 81% of topsoil was reported short or very short of moisture. 32% of apples, 67% of corn, 69% of hay, 77% of pasture land, 30% of soybeans, and 33% of tobacco crops were in poor or very poor condition. By month's end, 28% of farmers were still hauling water for livestock, and 25% of wells were dry or had an extremely low water reserve.
6/1/1999	\$0		
7/1/1999	\$0		
8/1/1999	\$0		
9/1/1999	\$0		
2002		D3 Extreme Drought	U.S. Drought Monitor: Dryness and drought remained unchanged in the Northeast, and expanded or intensified in parts of the mid-Atlantic, Southeast, and the central and southern Appalachians. D3 conditions were extended to cover central North Carolina, the Virginia Blue Ridge and Northern Neck, eastern West Virginia, and the entire Delmarva Peninsula
7/24/2007	\$0	D2 Severe Drought	Severe drought conditions persisted through much of October in Jefferson County. Rainfall deficits reached a high of 10 inches below normal for the year, but a series of low pressure systems moving across the Mid Atlantic helped to decrease those deficits by a few inches.
8/1/2007	\$0		
10/1/2007	\$0		

DROUGHT EVENTS			
Begin Date	Damage to Crops	Type of Drought	Description & Source
2010		D3 Extreme Drought	U.S. Drought Monitor: Across the panhandle of West Virginia, northwest Maryland and extreme southwest Pennsylvania, extreme drought (D3) conditions were added. Precipitation for the most recent 30 and 90 days measure in at about 40% of normal, while the SPI, NLDAS soil moisture and stream flows are all below the 5% threshold for indicating extreme drought. Across northern Virginia, abnormal dryness was expanded from the west toward the District of Columbia to reflect the field reports of deciduous trees dropping leaves and fruit earlier than normal due to lack of recent rainfall.

Source: NCEI, U.S. Drought Monitor

#### COMMITTEE INPUT

The committee did not have any specific input regarding drought during the meetings in Jefferson County.

#### IMPACTS & VULNERABILITY

Some of the impacts of each type of drought include the following.

<b>D0</b>	Abnormally Dry	<p><u>Going into drought:</u></p> <ul style="list-style-type: none"> <li>• short-term dryness slowing planting, growth of crops or pastures</li> </ul> <p><u>Coming out of drought:</u></p> <ul style="list-style-type: none"> <li>• some lingering water deficits</li> <li>• pastures or crops not fully recovered</li> </ul>
<b>D1</b>	Moderate Drought	<ul style="list-style-type: none"> <li>• Some damage to crops, pastures streams, reservoirs, or wells low, some water shortages developing or imminent</li> <li>• Voluntary water-use restrictions requested</li> </ul>
<b>D2</b>	Severe Drought	<ul style="list-style-type: none"> <li>• Crop or pasture losses likely</li> <li>• Water shortages common</li> <li>• Water restrictions imposed</li> </ul>
<b>D3</b>	Extreme Drought	<ul style="list-style-type: none"> <li>• Major crop/pasture losses Widespread water shortages or restrictions</li> </ul>
<b>D4</b>	Exceptional Drought	<ul style="list-style-type: none"> <li>• Exceptional and widespread crop/pasture losses</li> <li>• Shortages of water in reservoirs, streams, and wells creating water emergencies</li> </ul>

## INCLUDE INFORMATION REGARDING WELLS AND AMOUNT OF WATER EXTRACTED IN JEFFERSON COUNTY.

### LOCATION & EXTENT

This hazard is a region-wide hazard that can affect all areas and jurisdictions within the region. Droughts are widespread events that may extend to several states in varying degrees of severity. In Jefferson County, the extent of a drought would be equal given the region's geography and environmental qualities.

A drought can vary in severity throughout the year; what starts out as a mild drought can reach severe or extreme drought status and then return to a mild drought. This process could take weeks or even months and the effects could be felt even months after the drought conditions are over.

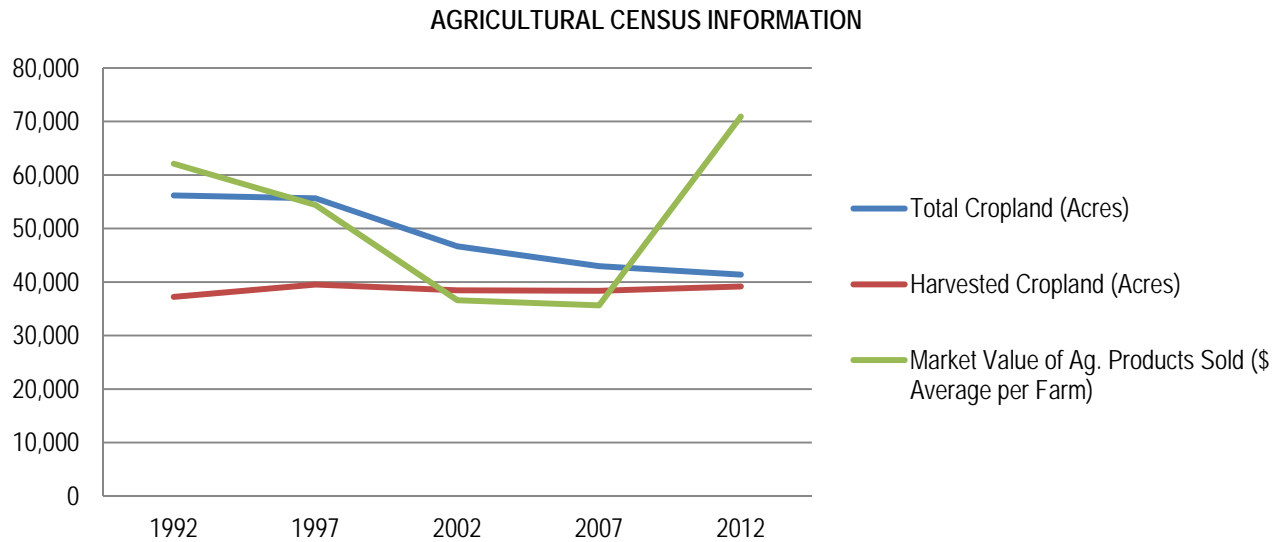
### LOSS & DAMAGES

Drought years in Jefferson County have been 1997, 1998, 1999, 2002, 2007, and 2010. Because droughts do not typically affect structures, other methods of determining loss should be examined. The U.S. Department of Agriculture (USDA) reports agriculture data every five years; census years include 1992, 1997, 2002, 2007, and 2012 (the 2017 census data is not yet available). Based on information from these reports, possible crop losses can be determined.

Because the latest drought in Jefferson County was in 2010, data from the latest 2012 census will suffice for loss calculations.

USDA CENSUS INFORMATION								
Year	Total Cropland (Acres)	Change from Previous Census	Total Farms with Cropland	Change from Previous Census	Harvested Cropland (Acres)	Change from Previous Census	Market Value of Ag. Products Sold (\$ Average per Farm)	Change from Previous Census
1992	56,180	N/A	300	N/A	37,226	N/A	\$62,088	N/A
1997	55,634	-546	323	+23	39,536	+2,310	\$54,375	-\$7,713
2002	46,677	-8,957	349	+26	38,458	-1,078	\$36,584	-\$17,791
2007	42,964	-3,713	396	+47	38,351	-107	\$35,639	-\$945
2012	41,372	-1,592	348	-48	39,164	+813	\$70,920	\$35,281

Source: US Department of Agriculture National Agriculture Statistics Survey 1992, 1997, 2007, 2012



As the graph above shows, harvested cropland acres have remained steady throughout the years, but the market value of the agricultural products plummeted during the period between 2002 and 2007 and recovered in 2012. Total crop land has decreased in the 20 years of the census data. Data shows that the 2002 and 2007 droughts affected the revenue in the county and therefore created losses.

On average, Jefferson County farms have lost an estimated value of agricultural products sold of \$5.8 million due to drought conditions.

## PREVIOUS MITIGATION EFFORTS

While the effects of drought on the environment cannot be avoided in many cases, the adverse effects of drought caused by human activities in drought-prone areas can be avoided. Efforts to mitigate the effects of drought conditions in Jefferson County include consistent vigilance of forecasted conditions like the prevalence of rainfall, the development and distribution of public awareness materials concerning natural hazard risks, displaying drought information at public events such as public awareness day, and the county fair. The county has updated their website to provide hazard related information that is easily accessible, and has added a Drought Annex to the Emergency Operations Plan (EOP).

## VULNERABILITY ASSESSMENT

DROUGHT RISK CALCULATION					
<i>Probability</i>			<i>Severity</i>		<i>Risk</i>
REMOTE			NEGLECTIBLE		LOW
Events	6	= 0.28	+	=	The risk assessment matrix calculates the risk of drought to be low.
Years	21				
The probability calculated based on the number of events in the amount of years categorizes the probability of drought at remote.			Although drought can have negative effects, because they do not affect structures or health in general, the severity of this hazard is negligible.		



## Terrorism

Terrorism is the use of force or violence, including threats of force or violence, against persons or property in violation of the criminal laws of the United States for the purposes of intimidate, coercion, or ransom.		
	<b>Risk</b> HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	<b>Period of Occurrence:</b> At any time <b>Overall Hazard Ranking:</b> 5
	<b>Warning Time:</b> None if random, but may possibly be reports of threats.	<b>State Risk Ranking:</b> Not ranked
	<b>Probability:</b> Improbable	<b>Severity:</b> Critical
	<b>Type of Hazard:</b> Human-Caused	<b>Disaster Declarations:</b> None

## HAZARD OVERVIEW

Terrorism is a form of violence aimed at a public audience. The Federal Bureau of Investigation (FBI) defines terrorism as “the unlawful use of force or violence against persons or property to intimidate or coerce a government, civilian population, or any segment thereof in furtherance of political or social objections.” More importantly, it is necessary to understand that the objective of terrorism is not destruction or death; it is the psychological impact to the targeted population and world opinion. Disruption to public services, economies, and social patterns, or a feeling of insecurity is the desired goal.

**This profile is intentionally generalized. Jefferson County Homeland Security and Emergency Management (JCHSEM) have identified a number of potential terrorist-related targets throughout the county and maintain files of such information separately from this document.**

Terrorism can be categorized as either domestic or international. Domestic terrorism incidents are acts conceived of and carried out by U.S. citizens within the U.S. borders. Examples of domestic terrorism include environmental groups like the Animal Liberation Front (ALF), groups opposing abortion, animal rights groups opposing the fur trade, or the Oklahoma City bombing of the Murrah Building. International terrorism originates from groups based outside the U.S. and may be perpetrated against U.S. interests abroad or within the territorial boundaries of the U.S. Examples would be Al-Qaeda and sympathizer groups.

Terrorism is not always accomplished on a “grand scale”, as is the case with international terrorists who are attempting to coerce the federal government. Such terrorism, while technically a hazard in Jefferson County, is more unlikely than what is known as “domestic



terrorism". Domestic terrorism can involve disgruntled employees (in the case of large industrial plants), angry parents (at schools), upset citizens (at government facilities), etc. Domestic terrorists may often only intend to harm a single individual or a small group of individuals, but the threat of their actions can be highly disruptive.

Terrorist targets tend to be located in urban areas such as the Washington D.C. metro area; seats of government, stadiums, and public meeting places are high-value targets that produce substantial news coverage. Contrary to this, there is some evidence that terrorist organizations prefer rural safe houses from which to operate that are similar to that of Jefferson County. The rural environment offers an environment for the terrorists that are more difficult to observe.

Biological terrorist incidents have a somewhat low probability of occurring in Jefferson County. These incidents include the release of diseases such as smallpox into the general population for destructive purposes. Biological events have an extremely high risk associated with them, as the effects of such an event can exceed the capabilities of the healthcare facilities located in Jefferson County and the loss of human life can be disastrous. While preparedness is improving, Jefferson County is not equipped on the local level to cope with a large-scale terrorist incident.

Chemical terrorist incidents are comparable to biological incidents in that they have a relatively low probability of occurring, yet are associated with an extremely high risk. Chemical incidents include the use of weapons that subject the general population to toxic chemicals similar to those that could be released during a hazardous materials incident. Chemical incidents are capable of subsequent losses to large percentages of the population. Jefferson County does contain public water systems, which makes the threat of small-scale biological and chemical attacks plausible.

Events involving explosive Weapons of Mass Destruction (WMDs) also have a relatively low probability of occurring in Jefferson County. However, in the event that a nuclear or other large explosive device was to discharge in or near the county, the inherent loss of life could be catastrophic. A WMD threat is ever present and the reduction of such threat is dependent upon the actions of other countries, which are unpredictable. As long as there are weapons, and the capability to deliver those weapons, the threat will remain. The Department of Defense estimates that as many as 26 nations may possess chemical agents and/or weapons and an additional 12 may be seeking to develop them.

Railroad facilities are another example of potential terrorist targets. Dams and water and sewage treatment facilities are likewise potential targets. Facilities in neighboring counties may also be susceptible to WMD-type attacks and may affect Jefferson County indirectly.

## POSSIBLE CAUSES

There is no single cause of acts of violence; it is typically a non-rational, complicated, intertwined, series of reasons that have the outcome of violence. In his article *Causes of Terrorism*, Nick Grothaus lays out the most common causes cited by leaders in the field of counterterrorism. These categories may apply to other types of violence not related to terrorism.

- **Ethno-Nationalism:** The desire of a population to break away from a government or ruling power and create a state of their own.
- **Alienation/Discrimination:** Individuals or groups face discrimination leading to further feelings of isolation. These people may become jaded towards society and feel excluded.
- **Religion:** Religion as a part of terrorism has been mainly attributed to Islamic fundamentalism although other religions have also had involvement in terrorist activities. For example, Christian Fundamentalists target abortion clinics, the Aryan Nation and the Church of Christ, Christians target the Jews and minorities (Post, 2007, pp. 211-212).
- **Socio-Economic Status:** Individuals and groups may be driven by a sense of relative deprivation and lack of upward mobility within society.
- **Political Grievances:** A lack of political inclusiveness or grievances against a certain political order may cause individuals to join or create terrorist groups.

## HISTORICAL OCCURRENCES

The U.S. population has largely been spared the impacts of international terrorism until recently. The devastation which occurred at the World Trade Center in New York City and the Alfred Murrah Building in Oklahoma City illustrates the need to plan for potential threats within our own communities. Domestically, the distribution of anthrax spores using the United States Postal System as a delivery mechanism caused concern nationwide for several weeks. The bomb detonated at the Atlanta Olympics in (1996) resulted in an investigation/manhunt that lasted years. Richard Reid (a.k.a., the shoe bomber) disrupted air travel and changed security measures in airports.

There have been no terrorist incidents or events in Jefferson County.

## IMPACTS & VULNERABILITY

Some individuals may experience severe stress symptoms following a violent incident. Individuals experiencing the following are at a higher risk for posttraumatic stress disorder:

- **Intrusive Re-Experiencing:** Terrifying memories, nightmares, and flashbacks.
- **Extreme Emotional Numbing:** Inability to feel emotions, feeling empty.
- **Extreme Attempts to Avoid Disturbing Memories:** Such as through substance abuse.
- **Hyperarousal:** Panic attacks, rage, extreme irritability, intense agitation, acting out with violence.
- **Severe Anxiety:** Debilitating worry, extreme helplessness, compulsions or obsessions.
- **Severe Depression:** Loss of ability to feel hope, pleasure, or interest; feeling worthless, suicidal ideations or intent.
- **Dissociation:** Fragmented thoughts, spaced out, unaware of surroundings, amnesia (Nation Center for PTSD, 2010).

Treatment and support are critical to recovery. For most, the memories will not go away, but survivors can learn to manage responses to their memories. There are several methods for that can be used to help survivors cope including, psychotherapy, medication, support groups and self-care (Riggs, 2017).

## LOCATION & EXTENT

Due to the high unpredictability of terrorism acts, any location could be a target of an attack. The extent of damages or impact from an attack is also unpredictable.

## LOSS & DAMAGES

A terrorist event would, at a minimum, cripple the region. The effects of a terrorist incident are not only monetary; they are often emotional and symbolic. The communities throughout the region are rural and small. Any mass loss of life would take an emotional toll on the affected and nearby communities. Recent technological hazard incidents in West Virginia (e.g. the Sago and Upper Big Branch mine disasters) have shown how these losses of life impact the entire state.

## PREVIOUS MITIGATION EFFORTS

While some legislation and operational countermeasures have existed for some time, the events of September 11, 2001 have accelerated terrorism mitigation efforts. Broadly, grants have been awarded to local first responders since 1998 for the purchase of important response equipment; national and local exercises of plans and procedures conducted; powers given or broadened for law enforcement regarding surveillance; and the consolidation of several agencies into the U.S. Department of Homeland Security have been completed.

Equipment grants for decontamination, detection, and protective gear for first responders have been available to local first responders since 1998. These grants and supplemental grants have provided millions of dollars in increased capabilities. As these capabilities have improved, the definition of first responder has been broadened from fire and police to now include hospital personnel and facilities, public works and emergency medical responders.

## VULNERABILITY ASSESSMENT

TERRORISM RISK CALCULATION				
<i>Probability</i>		<i>Severity</i>		<i>Risk</i>
IMPROBABLE		CRITICAL		LOW
Because this type of hazard is based on human conditions, it is extremely difficult to predict the probability of an attack. However, because there are potential targets, the possibility will always exist.	+	An attack in this region would most likely be localized or targeted towards a specific location rather than widespread.	=	The risk assessment matrix categorizes this hazard as a low risk.

## RISK MAP

## Severe Winter Storm

A combination of heavy snow, blowing snow and/or dangerous wind chills that could be threatening or life or property.			
	Risk	Period of Occurrence:	Typically during winter months
		Warning Time:	Days to hours
		Probability:	Improbable
		Type of Hazard:	Natural
Overall Hazard Ranking:		5	
State Risk Ranking:		High for Jefferson County High statewide	
Severity:		Critical	
Disaster Declarations:		DR-1881 DR-1903	

## HAZARD OVERVIEW

In the winter months, weather patterns continue throughout the area; these can generate storms. However, there are three elements that must be present to generate a winter storm (NSSL, n.d.).

- **Cold Air:** Below freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- **Lift:** Something to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountainside.
- **Moisture:** To form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture.

During the winter, there are many instances of cold weather, snow and storms. This profile considers only those winter storms that are damaging enough to be considered severe; these include blizzards and ice storms.

- **Blizzards:** Blizzards are severe winter storms that have low visibilities, also known as whiteouts, for an extended period of time due to high winds blowing falling snow or snow on the ground (ground blizzards) (Keller, DeVecchio, 2015). Ground blizzards are preceded by unseasonably warm air, which can cause people to let their guard down. People may venture outside without proper winter clothing. This relatively warm weather does not last long. The ground blizzard occurs when an Arctic cold front moves through

the region, causing temperatures to drop and winds to increase, often reaching gusts of 50 to 60 mph. If there are several inches of deep fresh snow on the ground, this strong wind will quickly pick up the snow and create whiteout conditions (NWS, n.d.). In the U.S. storms that produce blizzards typically come from the North Pacific and come onto land along the west coast. The different routes these storms can take are called storm tracks; storm tracks are named for geographic origin or the direction of the prevailing winds (e.g., Alberta Clipper, and Nor'easter). Sustained wind or frequent gusts to 35 mpg or greater and considerable falling and/or blowing snow reducing visibility to less than ¼ mile are the conditions for defining a blizzard (NWS & FEMA, 2001).

- **Alberta Clippers:** Alberta Clippers are winter “storms that often form over the providence of Alberta, Canada, east of the Rocky Mountains” (Rice, 2015). Typically, this type of storm moves quickly to the southeast across the northern Plains and finally to the Atlantic Coast. These storms usually are drier and have less snow but extremely cold temperatures.
- **Nor'easter:** A Nor'easter is a storm along the East Coast of the U.S., so called because the winds over the coastal area progressing generally northeastward and typically attain maximum intensity near New England and the Maritime Provinces of Canada. These storms may occur at any time of year but are most frequent and most violent between September and April. They nearly always bring precipitation in the form of heavy rain or snow, as well as winds of gale force, rough seas, and, occasionally, coastal flooding to the affected regions. The warm waters of the Gulf Stream help keep the coastal waters relatively mild during the winter, which in turn helps warm the cold winter air over the water. This difference in temperature between the warm air over the water and cold Arctic air over the land is the fuel that feeds Nor'easters (NWS, n.d.).
- **Ice Storms:** Ice storms are prolonged periods of freezing rain where ice can accumulate on cold surfaces (Keller, DeVecchio, 2015).

The Weather Channel (TWC) has named some severe winter storms, similar to the naming of hurricanes, since 2012. However, the National Weather Service (NWS) does not officially name winter storms and issued a statement requesting their offices and other news channels to refrain from naming storms (Panovich, 2012). Naming of hurricanes makes sense because they are well-defined storms which follow a path that can be tracked and predicted.

Hurricanes affect a specific area of impact in all four quadrants, located around the eye. By contrast, winter storms are often erratic, affecting different areas unevenly; they often develop, dissipate, and reform with two to three centers, often delivering snow in only one quadrant, while places not too far away from a blizzard may experience rain or fog, or nothing at all. As a result, the public will not know what action to take when there is a "named" storm, or may take the wrong action (AccuWeather, 2012).

While the Fujita and Saffir-Simpson Scales characterize tornadoes and hurricanes respectively, there is no widely used scale to classify snowstorms. Paul Kocin and Louis Uccellini of the National Weather Service developed the Northeast Snowfall Impact Scale (NESIS) that characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories (NOAA, n.d.).

NORTHEAST SNOWFALL IMPACT SCALE (NESIS)		
<i>Category</i>	<i>NESIS Value</i>	<i>Description</i>
1	1-2.499	Notable
2	2.5-3.99	Significant
3	4-5.99	Major
4	6-9.99	Crippling
5	10.0+	Extreme

## POSSIBLE CAUSES

Severe winter weather varies due to different aspects.

- **Cold Air:** Below-freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice (NSSL, 2018).
- **Lift:** The process of moist air being raised into the atmosphere and causing precipitation. This process of lifting happens by warm and cold air colliding, causing a front, or when air is lifted by flowing up a mountainside (NSSL, 2018).
- **Moisture:** Air traveling across bodies of water, such as lakes and oceans (NSSL, 2018). This cause associates with lake effect. Warm lake temperatures produce more moisture

in the air. This moisture mixed with cold atmospheric temperatures causes more potential for snow (Climaterealityproject.org, 2018). Though this is unlikely to occur in Meigs County due to the temperature of the water and the atmosphere not differing enough to mix with strong winds and produce snow (NOAA, 2018).

- **Extratropical Cyclone:** A low pressure area where rising warm air collects and mixes with cold air masses and strong winds (Weatherquestions.com, 2018).

## HISTORICAL OCCURRENCES

There are many winter weather events but not all of them are severe; for this profile, severe winter weather in both databases includes any events that have had disaster declarations, injuries, deaths, or property damage (above \$5,000 unless there was a disaster declaration) associated with the event. SHELDUS reports 25 winter weather events between 1960 and 1995 while NCEI reports 131 between 1996 and 2018. This adds up to a total of 156 winter weather events in a period of 58 years in Jefferson County; that is, on average, 2.6 winter weather events per year in the county. However, all these events do not meet the qualifications of severe; winter weather is normal, frequent, and expected in this region.

WINTER EVENTS	
<i>Event Type</i>	<i>Number of Events</i>
Heavy Snow	18
Ice Storm	1
Winter Storm	8
Winter Weather	11
<b>Total</b>	<b>38</b>

NCEI has more complete data available from 1996 on while the Spatial Hazard Events and Losses Database (SHELDUS) has data going back to 1960. The NCEI database has four events since 1998, three ice storms and one winter storm, which have had property damage. One of these, the winter storm in 2010 had a disaster declaration associated with it. There is one other disaster declaration in 2009 that does not register any damages on the NCEI database. It is registered in the database but has no damage associated with the storm.

NCEI SEVERE WINTER STORMS 1996 - 2018			SHELDUS SEVERE WINTER STORMS 1960-1995			
<i>Date</i>	<i>Event Type</i>	<i>Damage to Property</i>	<i>Event Type</i>	<i>Year</i>	<i>Month</i>	<i>Property Damage<sup>†</sup> (Adjusted 2016)</i>
1/15/1998	Ice Storm	\$8,000	Winter Weather	1979	10	\$14,000
1/14/1999	Ice Storm	\$10,000	Winter Weather	1987	2	\$10,000
2/1/2008	Ice Storm	\$5,000	Winter Weather	1994	1	\$123,000
12/18/2008	Winter Storm*	N/A	Winter Weather	1994	2	\$83,000
2/5/2010	Winter Storm*	\$2,000	Winter Weather	1995	11	\$58,000
			Winter Weather	1995	12	\$8,000
* Disaster Declarations			<sup>†</sup> Rounded to nearest \$1,000			

January 18, 1998



Warm moist air overrunning a shallow polar surface air mass produced winter weather; precipitation began as a mix of sleet and snow but quickly changed to rain and freezing rain across much of the area. Free standing structures such as trees, power poles/wires, and exposed bridges received between  $\frac{1}{4}$  and  $\frac{1}{2}$  inch of ice accretion. A strip of higher elevation areas (roughly between 500 and 1000 feet above sea level) in Jefferson County received the most icing. In this area, spotty power outages, and a few large limbs and small trees snapped under the weight of the ice.

#### January 17, 1999

A strong arctic cold front moved slowly southeast across the Mid-Atlantic region bringing a thin layer of sub-freezing air to the lowest levels of the atmosphere, but just off the surface warmer air moved in. A low pressure system developed over the Tennessee Valley. The low moved into the Mid-Atlantic region over the next few days, spreading precipitation region wide. The precipitation started as snow but melted into rain as it fell through the warm layer of air in the mid-levels of the atmosphere. Unfortunately the ground was below freezing during the period so the rain froze on every surface it came in contact with. This created ice accumulations of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch. The storm caused several car accidents, slip and fall injuries, downed trees, and power outages. Winds gusted over 40 mph after the precipitation ended and some trees weighed down by ice fell onto roads and power lines.

#### February 1, 2008

An area of low pressure over the Lower Mississippi River Valley moved up the Appalachians; warmer temperatures aloft combined with subfreezing temperatures at the surface to produce widespread freezing rain across the Mid Atlantic. A quarter of an inch of ice was reported across the eastern panhandle of West Virginia. Numerous traffic accidents and power outages were reported across the region. Rain continued as warmer temperatures slowly filtered across the region.

#### December 18, 2009

Two systems combined to develop a strong area of low pressure that slowly tracked up the Mid-Atlantic Coast. The low pressure system was able to tap into moisture from the Gulf of Mexico and the Atlantic Ocean causing copious amounts of precipitation to develop. High pressure to the north kept plenty of cold air in place causing the precipitation to fall in the form of snow.

### February 5, 2010

A potent area of low pressure strengthened over the central portion of the nation and slowly moved through the Mid-Atlantic before redeveloping off the Mid-Atlantic coast. Strong high pressure continued to pump in plenty of cold air across the region for the entire event. Due to the slow movement of the storm, there was a prolonged period of precipitation. The storm system ushered in copious amounts of moisture from the Gulf of Mexico and the Atlantic Ocean. The deep moisture combined with the forcing from the storm system to bring a period of heavy precipitation to the. Most of the precipitation fell in the form of snow due to the cold air that was already in place. West Virginia experienced major snow accumulations.

### January, 2016

Snowstorm Jonas caused closures and cancellations throughout Jefferson County and stretched resources. According to NOAA, the snowstorm was the fourth most impactful storm in the Northeastern U.S. since 1950. Jefferson County was ground zero for much of the heaviest snow patterns, receiving as much as 40.5 inches in some sections of the county. This storm was a category 4 (crippling) on the NESIS (Miller, 2018).

### COMMITTEE & PARTNER INPUT

During committee meetings members shared their experiences with recurrent and recent snow storms. The table below outlines the event date, if available, what happened, and how it could possibly be avoided going forward.

COMMITTEE INPUT FOR SEVERE WINTER STORM		
<i>Event Date</i>	<i>What Happened</i>	<i>How This Can Be Avoided in the Future</i>
Snowmageddon, February 2010	40+ inches of snow isolated communities, power outages, roof collapses, elderly and vulnerable cut off from care	Community networks, neighbors helping neighbors, communication to alert citizens of hazards
Winter 2016	4 feet of snow	Plans for snow removal
March 20-22, 2018	Caused closures and delays compromising access to airports, medical and supplies	Increase communication for remote areas. Increase snow removal capacity on Shepherd Grade Road
Snowmageddon, February 2010	40+ inches of snow	
	Street closures, government buildings closed, plans for street openings, power outage	Works and street plans
2016	Blizzard, extreme amount of snow increased workload and exhaustion of crews	Prepare to have person with equipment to move snow, up staff, increase funding
2016	Significant snowfall. EMS unable to get to patients	Snow removal resources assigned to fire/EMS agencies

COMMITTEE INPUT FOR SEVERE WINTER STORM		
<i>Event Date</i>	<i>What Happened</i>	<i>How This Can Be Avoided in the Future</i>
2016	Almost 4 feet of snow in 2-3 days	More plows, more shelters
February 2016	Some flooding from melting snow. "Jonas"	Prepare in advance
2015 or 2016	44 inches of snow "winter storm Jonas"	More plows and better road treatment
2010 and 2016	Over 48" of snow shut down of public facilities, roof collapse concern	

## IMPACTS & VULNERABILITY

According to the NSSL (n.d.), most deaths from winter storms are not directly related to the storm itself; people die in traffic accidents on icy roads, of heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold. During severe winter storms, everyone is potentially at risk; the actual threat depends on specific situations. Recent observations show that of injuries related to ice and snow, about 70% occur in automobiles, about 25% are people caught out in the storm, and the majority of victims are males over 40 years old. Of injuries related to exposure to cold, 50% are people over 60 years old, over 75% are males, and about 20% occur in the home.

Another reason these blizzards are dangerous is the cold temperatures that follow behind the Arctic front. Anyone stranded in their vehicle or forced to walk outside is at risk of frostbite or hypothermia (NWS, n.d.).

Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. Ice can disrupt communications and power for days while utility companies repair extensive damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NWS, n.d.).

## LOCATION & EXTENT

Generally, severe winter weather will affect several counties in a region at one time with varying intensities depending on temperature and moisture in the area. The heavily populated region between Washington D.C., Philadelphia, New York and Boston, the "I-95 Corridor," is especially impacted by Nor'easters (NWS, n.d.).

## LOSS & DAMAGES

There have been two events specifically that have received presidential disaster declarations; the first in December of 2009 for which Jefferson County received public

assistance from the federal government, and the other in February of 2010, for which Jefferson County received public assistance.

FEMA publishes the total amounts for public and individual assistance in each state, but does not break down dollar amounts by county. However, based on the total amount of assistance (\$2,944,843.15 in 2009 and \$3,302,658.43 in 2010), one can assume that the damage from winds and tornadoes can be in the hundreds of thousands or millions for the county alone.

## PREVIOUS MITIGATION EFFORTS

One of the most common impacts from severe weather is the loss of commercial power. Since many other services rely on power for critical functions, providing backup power capabilities has long been a favored strategy for mitigating damages from winter storms. Other mitigation efforts that have been conducted include the development and distribution of public awareness materials via social media about natural hazard risks, utilizing the media for the distribution and publication of hazard information, and updating the county website to provide hazard related information that is easily accessible.


Jefferson County Homeland Security and Emergency Management (JCHSEM) has actively been collecting Prime Power Surveys for critical infrastructure. These surveys have information about whether or not the facility has a generator, what size and kind of generator is needed, as well as whether the building is wired to have a generator hooked up, etc.

## VULNERABILITY ASSESSMENT

SEVERE WINTER STORM RISK CALCULATION						
Probability		+	Severity	=	Risk	
IMPROBABLE			CRITICAL		LOW	
Events	11		= 0.18		This region is accustomed to the impacts of large quantities of snow and are well prepared. However, damages to infrastructure can cause cascading effects lasting several days.	The risk assessment matrix categorizes the risk of severe winter storms to be low
Years	58					
Although the county experiences many winter storm events, the majority of them are not severe enough to be considered in this calculation.						

## RISK MAP

## Dam Failure

A dam is a barrier built across a waterway to control the flow or raise the level of water. A dam failure occurs when the barrier constructed across the waterway fails or otherwise does not obstruct or restrain the flow of water, which can rapidly result in a large area of completely inundated land.			
 HIGH MEDIUM HIGH MEDIUM MEDIUM LOW LOW	<b>Risk</b>	<b>Period of Occurrence:</b>	At any time, generally after a period of extended rain or drought.
		<b>Warning Time:</b>	Hours to months; depends on frequency of inspections and maintenance
		<b>Probability:</b>	
		<b>Type of Hazard:</b>	Technological
		<b>Overall Hazard Ranking:</b>	
		<b>State Risk Ranking:</b>	Low for Jefferson County Low statewide
		<b>Severity:</b>	
		<b>Disaster Declarations:</b>	None

## HAZARD OVERVIEW

The West Virginia Department of Environmental Protection (WVDEP) defines a dam as “an artificial barrier or obstruction that impounds, or will impound, water.” In West Virginia, for a dam to be regulated by the state, it must be equal to or greater than 25 feet in height and contain 15 or more acre feet of water volume or be greater or equal to 6 feet in height and contain 50 or more acre-feet of water volume. Some federally owned dams, dams that do not normally impound water (such as some culverts), and dams built for agricultural purposes that have been demonstrated to not cause loss of life if the dam were to fail, may be exempted from state regulation (WVDEP, 2009). The full regulation can be found in the Dam Control and Safety Act – W. Va. Code 22-14-3(f), and in the Dam Safety Rule (47CSR34-2.12).

The American Society of Civil Engineers (ASCE) (2013) defines three categories of dams, based on the hazard potential of the dam.

- **High Hazard** dams are defined as dams that would cause significant loss of life, and may cause significant economic loss, if the dam were to fail or be mis-operated.
- **Significant Hazard** would be expected to cause significant economic loss in the event of a failure or mis-operation, but would not be expected to cause a loss of life.
- **Low Hazard** dams are generally located in rural or agricultural areas where a failure would cause minor damage to nonresidential structures and rural/agricultural land.

The WVDEP is in charge of conducting inspections of existing dams and those under construction, and reviewing design plans to ensure that they are constructed, maintained, and operated or removed in a safe manner, as well as responding to emergencies (WVDEP, 2016).

The WVDEP classifies dams into four categories, including the following:

- **Class 1 (High Hazard):** Dams located where failure may cause loss of human life or major damage to dwellings, commercial or industrial buildings, main railroads, important public utilities, or where a high risk highway may be affected or damaged. All Class 1 - High Hazard dams must have an Emergency Action Plan as required by the West Virginia Department of Environmental Protection.
- **Class 2 (Significant Hazard):** Dams located where failure may cause minor damage to dwellings, commercial or industrial buildings, important public utilities, main railroads, or cause major damage to unoccupied buildings, or where a low risk highway may be affected or damaged. Loss of human life from a failure of a Class 2 dam is unlikely.
- **Class 3 (Low Hazard):** Dams located in rural or agricultural areas where failure may cause minor damage to non-residential and normally unoccupied buildings, or rural or agricultural land. Failure of a Class 3 dam would cause only a loss of the dam itself and a loss of property use, such as use of related roads, with little additional damage to adjacent property.
- **Class 4 (Negligible Hazard):** Dams where failure is expected to have no potential for loss of human life, no potential for property damage, and no potential for significant harm to the environment.

Dams are used for a variety of purposes (recreation, flood control, water storage, irrigation, mine tailings, electrical generation, debris control or navigation); described by FEMA.

- **Flood Control:** Prevent loss of life and property caused by flooding. They impound floodwaters and either release them under control to the river below or store or divert the water for other uses.
- **Recreation:** Facilities designed for boating, skiing, camping, picnic areas, and boat launches can all be supported by dams.
- **Navigation:** Provide a stable system of inland river transportation.

- **Mine Tailings:** Allow the mining and processing of coal and other minerals while protecting the environment.

## POSSIBLE CAUSES

Dam failure is often the result of prolonged rainfall or flooding or, during prolonged dry periods, erosion. The primary hazard surrounding dam failure is the swift, unpredictable flooding of those areas immediately downstream. While general inundation areas can be determined, it is often impossible to know exactly how and where water held back by a dam will flow during a rapid failure of the dam.

Generally, there are three types of dam failures: hydraulic, seepage, and structural.

- **Hydraulic Failure (Overtopping):** Hydraulic failures result from the uncontrolled flow of water over the dam, around and adjacent to the dam, and the erosive action of water on the dam and its foundation. Earthen dams are particularly vulnerable to hydraulic failure since earth erodes at relatively small velocities.
- **Seepage Failure (Piping):** All dams exhibit some seepage that must be controlled in velocity and amount. Seepage occurs both through the dam and the foundation. If uncontrolled, seepage can erode material from the foundation of an earthen dam to form a conduit through which water can pass. This passing of water often leads to a complete failure of the structure, known as piping.
- **Structural Failure:** Structural failures involve the rupture of the dam and/or its foundation. This is particularly a hazard for large dams and for dams built of low strength materials such as silts, slag, fly ash, etc.

Dam failures generally result from a complex interrelationship of several failure modes. Uncontrolled seepage may weaken the soils and lead to a structural failure. Structural failure may shorten the seepage path and lead to a piping failure. Surface erosion may lead to structural or piping failures.

## HISTORICAL OCCURRENCES

Several research methods to identify any past occurrences of dam failures in Jefferson County yielded no evidence of any historic or recent dam failures in the county.

## COMMITTEE INPUT

The committee did not have any specific information regarding dam failures in Jefferson County.

## IMPACTS & VULNERABILITY

Dam failures themselves do not pose a threat to public health; the cascading effects that occur after a failure are more concerning. When a dam fails it causes flooding downstream that can cause death, injury, and illnesses relating to water-borne diseases and standing water. As a result of flooding, people might have to evacuate and be displaced from their homes. In a large enough event, this can translate into economic loss for the area due to businesses closing and loss of workforce including the cost of clean-up activities after the event.

Cascading effects or consequences of dam failure can include the following.

- Flooding
- Power outages
- Damage to infrastructure and buildings
- Economic loss to businesses and loss of income
- Population displacement as a result of evacuation or damage to homes

## LOCATION & EXTENT

Jefferson County has one dam that could present the possibility of significant flood damage to the residents and businesses located near or downstream from the dams. Lakeside Properties, LLC privately owns the Lake Shannondale Dam which impounds a 50.5 acre lake, with a maximum depth of 86 feet. The dam was constructed in 1963. There are approximately 12 residential properties that could incur significant flooding if the dam were to catastrophically fail, all of which are located along Mission Road, and Riverside Drive.

According to the Army Corps of Engineers – Baltimore District a catastrophic failure of the Jennings Randolph Lake Dam on the border of Garrett County, Maryland and Mineral County, West Virginia which impounds a 952 acre lake, could create a hazard to life and property and could cause significant downstream river flooding along the Potomac River in small portions of the Corporation of Shepherdstown, and the lower town of Harpers Ferry. The amount of flooding would be dependent upon the level of the Potomac River when the dam fails.



DAMS AFFECTING JEFFERSON COUNTY			
<i>Name of Dam</i>	<i>Class</i>	<i>Type</i>	<i>Stream / Downstream Area</i>
Jennings Randolph Lake Dam	II	Rolled Earth & Rock Fill	North Branch Potomac River and Potomac River / Shepherdstown and Harpers Ferry.
Millville Hydroelectric-Dam	IV	Concrete	Shenandoah River / Areas along the river in the Millville area and potentially the lower town of Harpers Ferry.
Lake Shannondale Dam	II	Rolled Earth & Rock Fill	Furnace Run / Properties located along Mission Road and Riverside Drive

## LOSS & DAMAGES

There have been no losses of life or property in Jefferson County due to a dam failure. However, this does not mean that there will never be any losses due to this type of event.

“Dam safety risk assessment is like a stool that stands on three legs. These legs quantify the likelihood that various initiating events (hydrologic, seismic, structural/internal, mechanical, or human error) will occur; the likelihood that the dam would fail given these initiating events; and the likelihood that, given a failure, the resulting flood wave would result in various levels of damage. The meaningful quantification of risk depends on credible estimates of the damages that would result from each significant failure scenario. Loss of human life is generally accepted as the most important consequence so it often dominates dam-safety decisions. Unfortunately, the confidence with which life loss can currently be estimated is low. This high level of uncertainty applies to both statistical confidence limits and to expert opinion. As such, this single limitation is a critical hindrance to the credibility and value of dam-safety risk assessment results. Indeed, some would like to push the stool over on its weak leg and abandon probabilistic risk assessment altogether” (USACE, 2002).

**GET THIS INFORMATION FROM GIS CROSSREFERENCING PROPERTIES**

## PREVIOUS MITIGATION EFFORTS

Scenarios have been developed for Probable Maximum Flood (PMF) – without dam failure; and PMF – with dam failure, as well as sunny day failure. The worst case scenario was tested during a West Virginia Homeland Security Region 3 – Full Scale Regional Exercise in 2012. An EAP for the Jennings Randolph Lake Dam was completed by the US Army Corps of Engineers – Baltimore District in 2005.

The owner of the Lake Shannondale Dam indicated that the dam is inspected annually by the West Virginia Department of Environmental Protection – Dam Safety Division, and an Emergency Action Plan (EAP) was developed for the dam, that was updated in July 2011.

**HAS ANYTHING ELSE BEEN DONE?**

VULNERABILITY ASSESSMENT

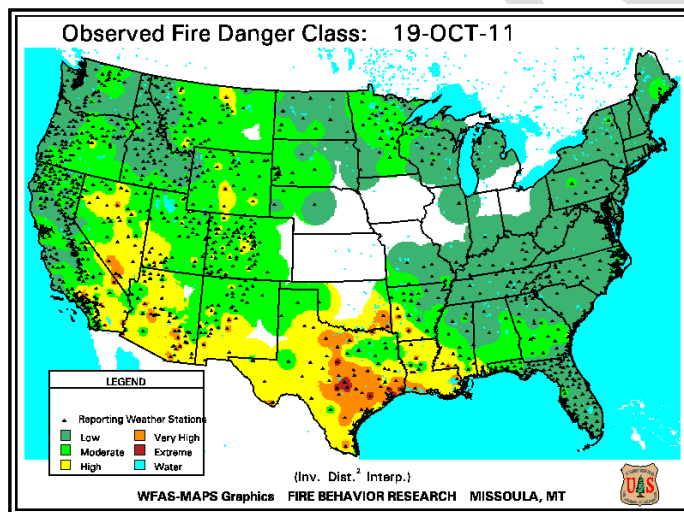
DAM FAILURE RISK CALCULATION				
<i>Probability</i>		<i>Severity</i>		<i>Risk</i>
LOW		[RESULT]		[RESULT]
There have been no historical events of dam failures in the past. The dams are inspected regularly.	+	[TO BE DETERMINED]	=	[TO BE DETERMINED]

## Wild and Urban Fire

Definition of the hazard			
<div style="display: flex; align-items: center;"> <div style="width: 10px; height: 100px; background: linear-gradient(to bottom, red, orange, yellow, green); border: 1px solid black; margin-right: 5px;"></div> <div style="text-align: center;"> <p>HIGH</p> <p>MEDIUM HIGH</p> <p>MEDIUM</p> <p>MEDIUM LOW</p> <p>LOW</p> </div> </div>	Period of Occurrence:	Overall Hazard Ranking:	
	Warning Time:	State Risk Ranking:	Low for Jefferson County (Wildfire) Medium statewide
	Probability:	Severity:	
	Type of Hazard:	Disaster Declarations:	

## HAZARD OVERVIEW

Wildfires often begin unnoticed and spread quickly. They are usually signaled by dense smoke that fills the area for miles around. Grasses, bushes, trees, and other vegetation supply fuel for the wildfire. The size of a wildfire is contingent on the amount of fuel available, weather conditions, and wind speed and direction. In a map from Wildland Fire Assessment System



(WFAS)-Maps, Fire Behavior Research (see left), the majority of West Virginia was labeled as being at low risk for wildfires. The National Interagency Fire Center also indicates that Jefferson County is at a low risk of wildfires.

Just because a single wildfire has been reported, one should not assume that vegetation fires do not occur frequently. Representatives from local fire departments throughout the

region confirm that brush fires, ranging in size from a single acre to hundreds of acres occur each year. Many of these fires are extinguished before becoming a major problem. Additionally, most of these events occur in rural areas rather than in areas of urban-wildland interface.

According to the U.S. Fire Administration (USFA), structure fires comprise 39.2% of all fires in the United States with residential structures making up 78.5% of structure fires.

Residential fires are also the leading property type for fire fatalities (75%), fire injuries (78%) and

financial loss (52%) (USFA, 2014). According to the National Fire Protection Association, due to increased synthetic fuel loads and new construction materials, failure time has decreased which can speed the rate of fire growth (2016).

## POSSIBLE CAUSES

Nationally, the National Park Service lists several possible causes of wildfires including human-caused and nature-caused. Human-caused fires “result from campfires left unattended, the burning of debris, negligently discarded cigarettes and intentional acts of arson”, which account for up to 90% of fires. Lightning or lava causes the remaining 10% of fires (NPS). This is also true in West Virginia where “in the spring of 2015, 43% of all forest fires were the result of escaped debris fires. Equipment use was the second highest cause of forest fires in W.Va. causing 29% of all wildfires. Fires set purposely accounted for 13% of forest fires in spring of 2015” (WV Division of Forestry, n.d.).

The National Fire Protection Association studied the causes and circumstances of home structure fires reported to local fire departments in the United States from 2011 through 2015. The study found that cooking equipment was the leading cause and accounted for 47% of home structure fires. Heating equipment caused 15% and electrical distribution and lighting equipment caused 9% of the studied fires. The study also found that while almost all home have at least one smoke alarm, homes with no smoke alarm accounted for 39% and homes with a smoke alarm that was not working accounted for 18% of all home structure fires (NFPA, 2017).

## HISTORICAL OCCURRENCES

WILDFIRES IN JEFFERSON COUNTY AND WV									
Year	Season	Number of Fires	Jefferson County			Total Acres Burned	West Virginia		JC % of WV Total
			Forest Acres	Non Forest Acres	Total Acres per Season		Number of Fires	Acres Burned	
2001	Spring	8	1	31	32	86.2	887	86,465	0.10%
	Fall	24	8.5	45.7	54.2				
2002	Spring	45	7.5	13.2	20.7	54.2	959	10,024	0.54%
	Fall	6	3	30.5	33.5				
2003	Spring	2	0.1	0.1	0.2	0.3	669	8,370	0.00%
	Fall	1	0	0.1	0.1				
2004	Spring	3	0.2	3.1	3.3	3.6	632	6,022	0.06%
	Fall	3	0.1	0.2	0.3				
2005	Spring	3	1.3	0.1	1.4	42.4	757	12,436	0.34%
	Fall	1	41	0	41				

WILDFIRES IN JEFFERSON COUNTY AND WV									
Year	Season	Number of Fires	Jefferson County			Total Acres Burned	West Virginia		JC % of WV Total
			Forest Acres	Non Forest Acres	Total Acres per Season		Number of Fires	Acres Burned	
2006	Spring	4	0.2	18	18.2	18.6	1,022	17,608	0.11%
	Fall	1	0.4	0	0.4				
2007	Spring	2	0	3.3	3.3	10.9	849	7,122	0.15%
	Fall	3	0	7.6	7.6				
2008	Spring	2	0	0.7	0.7	0.7	889	13,151	0.01%
	Fall	0	0	0	0				
2009	Spring	0	0	0	0	6.2	984	14,973	0.04%
	Fall	4	2	4.2	6.2				
2010	Spring	2	0	15.5	15.5	15.5	766	22,911	0.07%
	Fall	0	0	0	0				
2011	Spring	0	0	0	0	0	474	5,709	0.00%
	Fall	0	0	0	0				
2012	Spring	0	0	0	0	0.1	729	15,871	0.00%
	Fall	1	0.1	0	0.1				
2013	Spring	1	0	2	2	2	688	8,922	0.02%
	Fall	0	0	0	0				
2014	Spring	3	0	4.5	4.5	6.5	953	13,060	0.05%
	Fall	1	2	0	2				
2015	Spring	1	0	1	1	1	675	16,742	0.01%
	Fall	0	0	0	0				
2016	Spring	3	3	13	16	17	N/A	N/A	N/A
	Fall	1	1	0	1				
2017	Spring	3	1	2.5	3.5	3.5	N/A	N/A	N/A
<b>Totals</b>		<b>128.0</b>	<b>72.4</b>	<b>196.3</b>	<b>268.7</b>	<b>268.7</b>	<b>11,933.0</b>	<b>259,386.0</b>	<b>1.50%</b>

Source: WV Division of Forestry

JEFFERSON COUNTY WILDFIRES SUMMARY					
Years	Season	Number of Fires	Forest Acres Burned	Non-Forest Acres Burned	Total Acres Per Season
2001-2017	Spring	82	14.3	108	122.3
	Fall	46	58.1	88.3	146.4

### July 23, 2015

Fire destroyed several businesses in Harpers Ferry's historic area. The fire broke out around 3 a.m. and went to three alarms bringing in resources from Maryland and Virginia to help get the fire under control. The fire reached three buildings that contained two apartments and eight businesses. No tenants or responders were injured.

## COMMITTEE & PARTNER INPUT

JCHSEM reached out to their neighboring jurisdictions to ask about hazards that originate in Jefferson County and affect the surrounding, and hazards that originate in surrounding counties and affect Jefferson County. According to comments from the Loudoun County, VA Office of Emergency Management, mountain fires originating in either county would affect the other as well.

## IMPACTS & VULNERABILITY

Aside from the obvious effects on humans such as burns and injuries, the smoke from fires is of great concern. “The smoke produced by wildfires can produce effects ranging from airway and eye irritation to death, especially among individuals with conditions that make them more susceptible to inhalational exposures” (Clements, 2009, p.283). Wildfires cause more than just the direct damage to structures, vegetation or air quality; when a fire removes much or all of the vegetation in a watershed, subsequent rains will have much greater erosive potential, which in turn produces large quantities of sediment and plant debris that affect the water quality of streams and lakes (Keller, Devecchio, 2015, p.459).

However, wildfires can also have benefits to the soil; they “tend to leave an accumulation of carbon on the surface in the form of ash and increase the nutrient content of a soil. Under the right conditions, when erosion does not remove the ash from the environment, a nutrient reservoir may form that is beneficial to local plants” (Keller & Devecchio, 2015, p 159).

## LOCATION & EXTENT

Areas that are most vulnerable to wildfires include agricultural and forest lands in the county. As for urban fires, as the name suggests, areas that are more densely populated or have houses that are older and do not have up-to-code fire protection are more vulnerable.

## LOSS & DAMAGES

- General description of losses and damages
- Specific description of losses and damages

## PREVIOUS MITIGATION EFFORTS

- Describe what has been done in the past to address the impacts of the hazard

## VULNERABILITY ASSESSMENT

WILD AND URBAN FIRE RISK CALCULATION						
Probability		+	Severity		=	Risk
[RESULT]			[RESULT]			[RESULT]
Events	#		[DESCRIPTION]			[DESCRIPTION]
Years	#					
[DESCRIPTION]						

## RISK MAP

## 2.5 COMPLICATING VARIABLES

Direct consequences of disasters can include fatalities, injuries, and damages to humans, animals or property. However, disasters do not end there; there are a number of indirect effects, both tangible and intangible associated with disasters even before a disaster strikes. Some examples of these include loss of livelihood and income, loss of community and population, mental and psychosocial impacts, costs of rebuilding, repair or replacement, loss of inventory, wages and tax revenue, etc. (Coppola, 2015). All of these also have a cost associated with them but it is much more difficult to assign a specific dollar value and quantify accurately.

A number of situations could occur that would result in a disruption to a number of critical systems throughout Jefferson County. Some hazards are complicated by a series of loosely-related variables; these are often considered *cascading hazards*. For example, high winds may cause sporadic damage throughout the county, but often do not become a significant countywide concern until a large number of residents are without power.

A single event may not always reach all impacts described herein. However, it is important to understand that the impacts of hazards go beyond what is seen immediately before or after the event or incident. The effects of one event can be years or months in the making and last months or even years, especially where public health, social, economic, environmental and infrastructure impacts are concerned.

### 2.5.1 Natural Effects

#### Climate Change

Many natural hazards are related to climate such as droughts, severe weather, floods and wildfires. There is an important distinction between weather and climate. Weather refers to the atmospheric conditions of a geographical region over a short period of time, such as days or weeks. Climate, in contrast, refers to the atmospheric conditions of a geographical area over long periods of time, such as years, or even decades (Keller, Devecchio, 2015, pp. 406-407).

According to the U.S. Global Change Research Program (2016), there are several weather and climate changes that have already been observed in the United States.

- Since recordkeeping began in 1895, the average U.S. temperature has increased by 1.3°F to 1.9°F with most of the increase happening since 1970. In addition, the first decade of the 2000s has been the warmest on record.



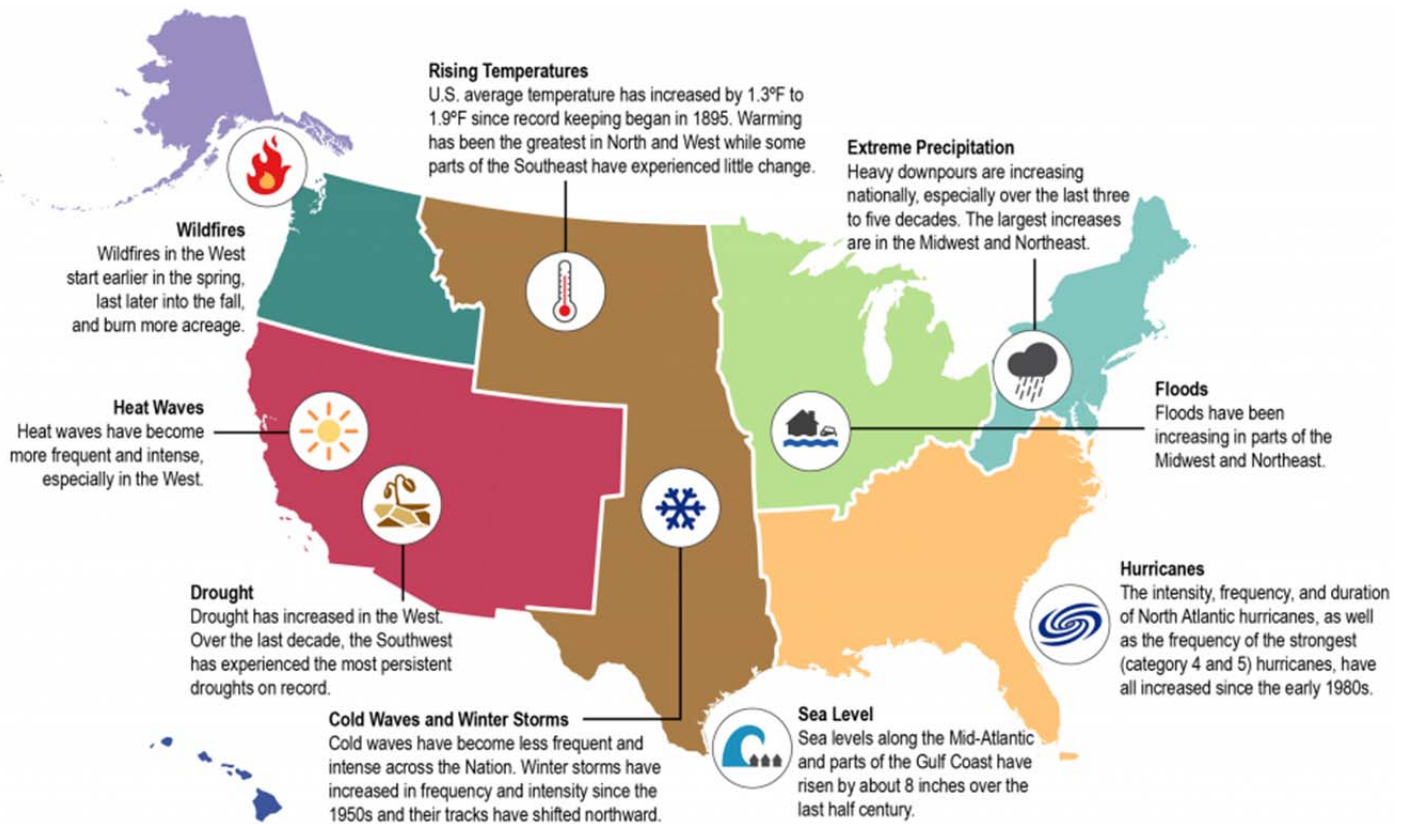
- The average precipitation across the U.S. has increased since 1900 with some areas experiencing higher than the national average and some lower. Heavy downpours are increasing, especially over the last 30-50 years.
- Drought events have increased in the west. Changes in precipitation and runoff, combined with changes in consumption and withdrawal, have reduced surface and groundwater supplies in many areas.
- Some types of severe weather events have experienced changes; heat waves are more frequent and intense, and cold waves have become less frequent and intense overall.
- The intensity, frequency, and duration of North Atlantic hurricanes have increased since the early 1980s.

Climate change can have a significant impact on human health and the environment. The changes mentioned above can affect the environment by leading to changes in land-use, ecosystems, infrastructure conditions, geography and agricultural production. Extreme heat, poor air quality, reduced food and water supply and quality, changes in infectious agents and population displacement can lead to public health concerns such as heat-related illnesses, cardiopulmonary illnesses, food, water and vector-borne diseases and have consequences on mental health and stress (USGCRP, 2016).

The National Climate Assessment (NCA) defined climate trends for national U.S. regions in 2014. The major trends are seen to be

- wildfires and heat waves on the west coast,
- rising temperatures and increased severity and frequency of winter storms in the middle of the country,
- more rain and flooding in the Midwest and northeastern parts of the country, and
- an increase in sea levels in the mid-Atlantic with an increase of hurricane activity in the southeastern states.

In West Virginia, the trend will be an increase in extreme precipitation which will lead to more events of hazards such as flooding, and possible dam failures or reportable disease epidemics. This is detailed in the on the following page.



## Flood

Flooding is a primary hazard in Jefferson County; however, rising waters can also result from several other hazards identified by this plan. For example, severe thunderstorms can include soaking rain that causes flooding. Long cold spells can cause the surface of rivers to freeze, leading to ice jams. A rise in the water level or a thaw breaks the ice into large chunks, which can become jammed at man-made (e.g., bridges) and natural obstructions, resulting in severe flooding. A midwinter or early spring thaw can produce large amounts of runoff in a short period of time. Because the ground is hard and frozen, water cannot penetrate it and be reabsorbed. The water then runs off the surface and flows into lakes, streams, and rivers, causing excess water to flood surrounding areas. After a wildfire, the charred ground where vegetation has burned away cannot easily absorb rainwater, increasing the risk of flooding and mudflows over a number of years.

Construction and development can change natural drainage paths and create or increase flood risks. New buildings, parking lots, and roads (i.e., impervious surfaces) mean less land to absorb excess precipitation forcing water onto land it previously would not reach. Industrial companies may impound water for their operations, causing land

disturbances. Timbering operations may alter natural drainage paths or change the vegetation that is available to absorb rainwater. Changes to wetlands and erosion are other land disturbances that impact the permeability of areas.

The most common hazard leading to flooding as a complicating variable is a dam failure. Dams can breach or overtop with little warning. Natural breaches can be triggered by flash floods, debris jams, the accumulation of melting snow, and the build-up of water pressure on a dam with unknown deficiencies after days of heavy rain, etc. Flooding can also occur when excess water is released downstream to relieve pressure from a dam. Similarly, levees are designed to reduce risk against a certain level of flooding. However, no levee provides full protection. Levees can be breached or overtopped when the water rises from heavy rains.

### Erosion

Dictionary.com defines “erosion” as “the process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves, etc.” Erosion is a natural process controlled by weather drivers such as rainfall, bedrock wear in rivers, flooding, wind abrasion, groundwater process, and other mass movements of soils. The rates at which these processes act control how fast a surface is eroded (Cheraghi, Jomaa, Sander, & Barry, 2016).

In Jefferson County, erosion may happen as a result of, or may otherwise complicate or worsen the impacts of a variety of hazards. Heavy rains or snow melt may swell creeks and streams, causing waters to rush through them at a much higher velocity than is normal. At extremely high flows, kolks or vortices form from large volumes of rapidly rushing water. Kolks cause extreme local erosion, plucking bedrock and creating pothole-type geographical features called rock-cut basins (Alt, 2001). Rushing waters may wash away part of stream banks, depositing the sediment and material in other areas, and the deposits may cause future occurrences of hazards such as flooding in areas previously unaffected by flooding. In areas where material erodes, residents may experience property damage if structures are built in close proximity to stream banks or may experience less tangible losses as parts of their properties are washed away.

High winds can also cause erosion, stripping lands of valuable minerals and other cover. Two varieties of wind erosion can occur. *Deflation* occurs when wind picks up loose particles and carries them away. *Abrasion* refers to instances when surfaces wear down after be struck by airborne particles in the wind (Blanco-Canqui & Rattan, 2008; Dewey,

Ryan, & Anderson, 1993; Balba, 1995). Wind erosion is more severe during times of drought (Wiggs, 2011). Unchecked erosion of soils could result in the types of subsidence discussed in the land subsidence hazard profile (see Section x.x.x Land Subsidence).

## **2.5.2 Technological Effects**

### **Power Outages**

Power outages may last seconds, hours or days depending upon the cause. The most common causes of power outages are: natural causes, human error and equipment failure. Natural causes include: strong storms, heat, and sometimes small animals. Strong storms may result in trees or branches falling on power lines. Lightning strikes can damage substations, power lines and equipment. High winds, heavy rains, salt, snow and ice can damage equipment as well. In terms of heat, there are several reasons why high temperatures can cause outages. For instance, equipment may overheat, cables may expand and stretch due to the demand for air conditioning resulting in high current and finally some equipment shuts down to protect itself from high temperatures.

Power outages can occur over widespread areas or a concentrated location and are one of the typical impacts of major disaster events. Therefore, depending on the severity of the disaster event coupled with mass power outage, significant public health and safety risk prompt local emergency management to coordinate resources such as, opening shelters and distributing food and water.

One utility company provides power to Jefferson County: First Energy (Potomac Edison). The municipalities in Jefferson County face the same threat from power outage as the overall county. In some cases, in older developed areas, inadequately updated power lines in residential areas could have a higher rate of power outage as compared to newly developed areas.

The most significant impact that a power outage can have is the inability of businesses and government offices to function properly. Because most power outages occur during severe weather storms, when the citizens of the county are depended upon public emergency services, it is extremely important that these buildings and offices be equipped with generators to ensure public safety.

### **Infrastructure Decay/Damage**

Hazard occurrences can impact critical infrastructure such as the power grid, water and sewer lines, communications systems, and transportation networks in various ways.

(See above for a discussion of power grid impacts.) Infrastructure issues can compound the impacts of hazards. For example, major transportation accidents can damage roadways, necessitating temporary detours. In some cases, accidents can damage the transportation system for longer periods of time, such as when bridges or intersection signals are damaged. Other hazards result in longer-term infrastructure impacts. Floods can wash out roadways, hampering the provision of emergency services in an impacted area. Land subsidence can have similar impacts.

The transportation network is not the only system that can be affected. Severe summer and winter weather can down telephone lines or damage communications towers. Wind, ice build-up, etc. can contribute to such problems. Droughts can impact available water supplies from which public and private systems draw. Earthquakes can damage in-ground infrastructure resources. Supplies may be contaminated by a variety of hazardous materials should an incident occur near a water source.

#### Hazmat Incidents

Section X Hazmat profiles hazardous material incidents as stand-alone incidents, yet these impacts can be complicating variables. As an example, flood waters may inundate areas where hazardous materials are used or stored, thereby becoming contaminated and carrying those materials elsewhere. Severe summer and winter weather can impact covered facilities the report using and storing hazardous materials. In some of these instances, hazardous materials may not be released, yet extra response measures may be necessary to keep them from releasing should a facility be damaged by a weather event. Major transportation accidents may involve a variety of hazardous materials.

### **2.5.3 Health and Social Effects**

#### Groundwater Pollution

There are concerns about groundwater pollution in areas where limestone formations are located and where wells and septic systems are concentrated. Groundwater depletion is also a concern in areas where quarrying activities have occurred or are being undertaken. Certain hazard events may increase the potential for groundwater pollution. Flood waters, for instance, can become contaminated as runoff picks up contaminants from paved surface areas. Hazardous materials involved in releases from covered facilities or transportation accidents can impact groundwater sources.

### Population Displacement

Numerous hazard occurrences may result in a displacement of the population, either temporary or long-term. Some displacements may involve a relatively small number of people, such as when a house or apartment fire occurs. Others, during floods or hazmat incidents, may displace entire communities. Mass care sheltering operations typically address short-term displacements. It should be noted that evacuation and sheltering are complex emergency operations and place strains on the emergency services tasked with carrying them out. Larger incidents, though, may require segments of the population to relocate. Relocation incidents can have drastic effects on individual residents, severely straining their personal resources available for recovery. Residents may choose not to rebuild. Relocation can have impacts on the tax base as impacted areas may take years to reach pre-relocation population levels.

Though population displacement itself is considered a complicating variable, numerous other complicating variables may affect the level and severity of a displacement. For example, should displacement from a community with a high percentage of socially and economically disadvantaged populations be necessary, those populations may be disproportionately impacted because of their ability to recovery. Some of the residents may not have access to adequate insurance to facilitate rebuilding. Some may be retired or otherwise not in the workforce, with a lack of disposable income available for rebuilding. Further, some risks, such as those associated with the opioid epidemic may further impact the ability for some residents to recover. Social services dedicated to helping homeless populations may be overwhelmed in the aftermath of these types of situations.

### Economic Loss

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) lists “economic recovery” as one of its 32 core capabilities for emergency preparedness. FEMA defines this core capability as the return of economic and business activities to a healthy state and the development of new business and employment opportunities that result in an economically viable community. Large-scale disasters can have dire impacts on local economies. Chain or franchise style businesses as well as regional or national corporations may be able to shift operations and otherwise dedicate resources to recovering following a major incident. However, small businesses often lack these resources. Many small businesses close after major emergency situations. Forbes

cites a FEMA report that 40% of businesses never reopen after a disaster and that of those that do; only 29% remain operational after two years (Scott, 2016).

The cascading effects of disaster-related economic impacts are sometimes subtle. In some cases, small businesses operate in close proximity to their owners' homes. When the business is impacted, the home may also be impacted, resulting a crippling blow to the owner. Going back to work is a key element of returning a community to a new normal following a large-scale incident. As businesses close and employees cannot return to work, the key piece of recovery becomes severely challenged. An altered economic outlook for a community may affect its ability to attract and retain residents.

### *Illness, Injury, and/or Death*

Hazard events often result in personal impacts for those that are affected, including a variety of illnesses, potential injury, and even death. Floods, fires, hazardous material incidents, and major transportation accidents frequently result in fatalities. Other hazards, such as severe weather and even temperature extremes, can also result in death. The direct impacts from disasters are often intuitive and obvious.

Other examples, though, are not. These include, but are not limited to the following. During severe summer and winter weather events resulting in power outages, some residents may turn to auxiliary power supplies such as generators. Though manufacturer specifications note the importance of utilizing these units in well-ventilated areas, residents may place them in basements, garages, etc. increasing their own susceptibility to carbon monoxide poisoning. Standing flood waters can become hazardous as bacteria grow and spread. These risks increase as residents begin clean-up or even attempt to recreate in flood waters. Extreme temperatures can be particularly problematic for very young and elderly populations. The residual effects of hazardous materials incidents may continue to compound for long periods after a hazard occurrence, sometimes evading post-incident monitoring.

### 3.0 MITIGATION STRATEGY

The mitigation strategy section contains information on goals that the steering committee decided upon and projects that the jurisdictions updated or created. This section explains in further detail the process by which the committee established the goals and how existing and new projects were prioritized.

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### 3.1 MITIGATION GOALS

§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.

Hazard mitigation goals are general guidelines that represent what the community wants to achieve through the implementation of mitigation projects. These goals work together to lessen loss of life, injury, and damage to property, the economy, and the environment from the identified hazards in [Section 2.4 Hazard Profiles](#).

The committee members discussed the existing 2012 plan's goals and objectives during the second meeting on February 23, 2018. The consultant posed two questions for discussion to the committee: why is mitigation important to you? And, how have your priorities for mitigation changed in the past five years? The attendees began giving examples of why mitigation is important to them. Among the answers were the following.

- To reduce loss of life and property
- To reduce flooding and flash flooding
- It is cheaper to mitigate some things in the long term than pay for the same thing repeatedly
- When a hazard is mitigated, such as a flood, first responders do not have to risk their lives to save people

As to the changes in plan priorities, attendees commented the following.

- It is important to know what the plan priorities were five years ago
- Resource (equipment and personnel) availability will affect what can be done in terms of mitigation, preparedness, and response
- Integrate municipal projects into county projects
- The opioid crisis is present now more than before
- Strategically look at how best to utilize the resources (i.e. purchase of new ambulances due to the wear and tear from the roads vs. finding a solution to fixing the repetitively damaged roads)

The committee transitioned to talking about the goals for the plan. The consultant presented a few examples of goals from the FEMA Local Mitigation Planning Handbook as a guide. The committee discussed the goals in three groups for approximately 20 minutes and

at the end presented their findings to the entire group. As the committee members were giving their presentations, the consultant pulled themes and commonalities amongst the three groups and wrote them on a whiteboard for all to see.

The hazards that the committee was most concerned with included aging population, floods and flash floods, opioid use, transportation issues (ingress and egress), communication (infrastructure and personal), winter weather effects, power outages, and water (either too much [floods] or too little [droughts]). These would mainly be the hazards that the goals would address. During the presentation, the spokespersons mentioned words that identified action goals such as: partner or build-up, educate or train, reduce, improve, mitigate, protect, and assess. These were then used to create goals that addressed the hazards.

The following are the goals the committee agreed upon and approved for this plan update.

**GOAL 1:** Improve communication resiliency through planning, partnerships, and infrastructure development.

**GOAL 2:** Enhance resiliency of water resources.

**GOAL 3:** Promote all-hazards awareness, education, and training.

### 3.2 ACTIVE MITIGATION ACTIONS

For a hazard mitigation plan to be successful, it must review the risk assessment and develop strategies or projects that, when implemented correctly, will reduce the vulnerability or impacts of hazards. During this plan update process, the committee and jurisdictions have added new mitigation projects and decided to continue to work on ongoing projects from the previous plan. For a complete list of projects from the previous plan and their status, refer to [Section 3.3 2013 Mitigation Actions Status](#).

FEMA (2013) describes four primary types of mitigation actions that reduce long-term vulnerability to the planning area.

- **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
- **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and Infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
- **Natural Systems Projection:** These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.
- **Education and Awareness Programs:** These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs.

During the third in-person meeting, the committee mentioned various methods by which they would like to prioritize existing and new projects for the hazard mitigation plan. The committee agreed to use a weighted scale that applied to items such as:

- the likelihood of occurrence of a hazard,
- if it addresses several hazards,
- ongoing or about to start projects, and
- low cost, high risk projects.

Based on the discussion with the committee from this and previous meetings, the consultant created a list of criteria by which the committee can score the projects. During the

last committee meeting each member ranked the criteria according to what they considered to be most or least important utilizing a score of 1-15. Fifteen means the criteria was the most important, and 1 meant the criteria had less importance. The consultant averaged the committee members' scores and the results are outlined in the following table. Each project must answer each criterion with a yes or no; if yes, then the project gets the appropriate score, if no, the project gets 0 points for the criteria. At the end, the scores are added and give the priority against all other projects.

PROJECT PRIORITIZATION CRITERIA				
<i>Criteria</i>	<i>Description</i>	<i>Sum</i>	<i>Averaged Result</i>	<i>Final Score</i>
High probability hazard	The project addresses a high probability hazard	216	12.71	15
High severity hazard	The project addresses a high severity hazard	211	12.41	14
More than one hazard	The project attempts to address more than one hazard	189	11.12	13
Vulnerable populations	The project attempts to lower risk for vulnerable populations (ageing population, children, disabled, etc.)	177	10.41	12
Cost effective	The benefit of the project outweighs the cost	159	9.35	11
Ease of implementation	The implementation of the project does not anticipate many challenges or is already well-supported	145	8.53	10
Ongoing project	The project is already in progress either from the previous hazard mitigation plan or from another plan	140	8.24	9
Encourages partnerships	The project brings two or more partners together to implement the project beyond regular operations	139	8.18	8
Scheduled to start	The project is already in the works to begin	120	7.06	7
In-county economic capability	The county has sufficient funds to implement the project on its own without having to apply for grants	118	6.94	6
Positive environmental impacts	The project does not affect the environment in a negative way	110	6.47	5
In-county technical capability	The county has sufficient capability (equipment and technical knowledge) to implement the project	100	5.88	4
One hazard	The project only addresses one hazard	87	5.12	3
In-county administrative capability	The county has sufficient personnel to implement the project	85	5.00	2
Politically feasible	The project is not controversial politically	46	2.71	1
<b>Total</b>	The highest score any project can receive is 120	N/A	N/A	<b>120</b>

The following pages outline the mitigation strategies or projects for this 2018 hazard mitigation plan cycle. The table identifies new or existing strategies, the estimated cost, the

coordinating and supporting agencies, an estimated timeline for completion, and possible funding sources. According the previous table of prioritization criteria and the score they receive, the projects are also prioritized for implementation.

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IMPLEMENTATION MITIGATION PROJECTS

Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Natural Systems Protection	Charles Town	Strategy B1.1.1: Target areas for recreation that is interconnected with trails and parkland, beyond the required floodplain and wetland areas, and layout a strategy for green space protection.	All hazards	3 years	No additional funding should be needed	N/A	Charles Town Council	Charles Town citizens	
Natural Systems Protection, Structure and Infrastructure Projects	Charles Town	Strategy B1.1.2: Encourage the use of natural drainage swales over engineered storm water management channels where practical.	Flood	4 years	No additional funding should be needed	N/A	Charles Town Council	Municipal Works Department	
Structure and Infrastructure Projects	Charles Town	Strategy B1.1.3: Work jointly with the City of Ranson on a storm water management project for Evitts Run Park.	Flood	2 years	CDBG, PDM, Local Funding	Up to \$400,000	Municipal Engineering	Contractors	
Structure and Infrastructure Projects	Charles Town	Strategy B1.1.4: Place utilities underground as part of a street-scaping project.	All hazards	3 years	CDBG, PDM, Local Funding	Up to \$250,000	Municipal Engineering	Contractors, utility providers	
Structure and Infrastructure Projects	Charles Town	Strategy B2.1.1: Require special geotechnical exploration when locating large facilities such as schools, hospitals, community buildings, and other institutions. Ground penetrating radar, seismic and, electrical resistance surveys, and exploratory drilling are a few of the techniques currently used.	Earthquake	As needed	HMGP, PDM, Local Funding	Up to \$25,000	Charles Town Council	Developers	
Local Plans and Regulations	Charles Town	Strategy B2.1.2: Establish a sinkhole management plan.	Land Subsidence	2 years	HMGP, PDM, Local Funding	Up to \$15,000	Charles Town Council	Consultant	
Structure and Infrastructure Projects	Harpers Ferry	Upgrade the Harpers Ferry and Bolivar areas water system infrastructure to provide clean drinking water and reliable service	All hazards			\$6.3M grant from US DOA	Harpers Ferry Water Commission		
Local Plans and Regulations	Harpers Ferry	Strategy 13.10.1: Establish a formal process for the Town of Harpers Ferry and the Park Service to coordinate disaster related efforts, which will include defining boundaries and establishing responsibilities.	All hazards	2 years	No additional funding should be needed	N/A	Town of Harpers Ferry	NPS	

IMPLEMENTATION MITIGATION PROJECTS

Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Structure and Infrastructure Projects	Harpers Ferry	Strategy C1.1.1: Reroute an eight inch (8") water main near Elk Run, as the line is currently exposed in two (2) locations where it crosses Elk Run. The line is in danger of being broken by large debris in Elk Run in a flooding situation.	Flood	5 years	CDBG, HMGP, PDM	Up to \$150,000 to \$325,000	Harpers Ferry Council	Contractor	
Education and Awareness	Jefferson County	Educate the public on the benefit of purchasing flood insurance and increase flood insurance users in Jefferson County.	Flood	Ongoing	No additional funding should be needed	N/A	JC HSEM		
Education and Awareness	Jefferson County	Research and implement successful programs for preventing sexual assault on college campuses.	Violent Disturbance	2 years	No additional funding should be needed	N/A	Shepherd University	Local Law Enforcement agencies	
Education and Awareness	Jefferson County	Form a partnership of agencies to implement an active shooter training program to be delivered to houses of worship, county agencies, volunteer organizations, etc.	Violent Disturbance	3 years			JC SO, WV SP, Local Law Enforcement Agencies	Houses of worship, Shepherd University, JC COAD, JC ESA	
Education and Awareness	Jefferson County	Form a partnership amongst county agencies to conduct periodic exercises for all hazards. Primary focus on school bus accident and MCI.	All hazards	3 years		Up to \$10,000 per exercise	JC HSEM	JC BOE, JC ESA, JC HD, JC COAD, Red Cross	
Education and Awareness	Jefferson County	Identify strengths and resources within the organization that can be utilized to implement mutual aid during emergencies. Create mutual aid agreements with identified partners.	All hazards	2 years	No additional funding should be needed	N/A	Good Shepherd IVC	JC COAD	
Education and Awareness	Jefferson County	Train instructors to deliver Stop the Bleed programs to partner agencies and the general public.	All hazards	1 year	Local Funding	Training has no cost. Up to \$950 per training kit	JC ESA	JC HSEM, JC BOE, Red Cross, JC COAD, JC HD	
Local Plans and Regulations	Jefferson County	Pre-identify caregivers or volunteers to partner them with vulnerable populations to ensure vulnerable populations are taken care of before, during, and after emergencies.	All hazards	1 year	No additional funding should be needed	N/A	Good Shepherd IVC		

IMPLEMENTATION MITIGATION PROJECTS									
Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Education and Awareness	Jefferson County	Create and implement programs that address actions to be taken before, during, and after natural and human-caused emergencies.	All hazards				JC HSEM	JC HSEM, JC BOE, Red Cross, JC COAD, JC HD	
Education and Awareness	Jefferson County	Implement the home fire campaign, Sound the Alarm, Save a Live, in homes throughout Jefferson County	Urban Fires	Annually	No additional funding should be needed	No cost, volunteer time	Red Cross	JC ESA, Houses of worship	
Education and Awareness	Jefferson County	Implement the Pillowcase Project in schools, libraries, etc. to teach children about disaster preparedness.	All hazards	Annually	No additional funding should be needed	N/A	Red Cross	JC BOE, JC Libraries, Houses of worship	
Education and Awareness	Jefferson County	Train peer recovery coaches to assist with addiction problems around the county	Public Health Crisis	3 years	No additional funding should be needed	No cost to become a coach.	JC HD	Red Cross, JC BOE, JC Community Ministries, JC COAD	
Education and Awareness	Jefferson County	Train first responders on the correct use of naloxone for overdoses and purchase for use.	Public Health Crisis	1 year	Local Funding	No cost for training. \$35 - \$55 per dose	JC ESA	JC HD, JC COAD	
Education and Awareness	Jefferson County	Recruit and train volunteers to support hospitals and medical offices during emergencies	Public Health Crisis	2 years	No additional funding should be needed	Recruitment has no associated cost.	JC HD		
Education and Awareness	Jefferson County	Develop drug education campaigns that focus on risks of drugs and resources available.	Public Health Crisis	2 years			JC HD	JC ESA, JC BOE, JC SO, Law Enforcement Agencies, JC COAD	
Structure and Infrastructure Projects	Jefferson County	Purchase and install generators at critical facilities within Jefferson County	All hazards				JC HSEM	Critical facilities	



IMPLEMENTATION MITIGATION PROJECTS

<i>Type of Project</i>	<i>Jurisdiction</i>	<i>Project</i>	<i>Hazard(s) Addressed</i>	<i>Timeline</i>	<i>Funding Source</i>	<i>Cost</i>	<i>Coordinating Agency(ies)</i>	<i>Partnering Agency(ies)</i>	<i>Priority</i>
Education and Awareness	Jefferson County	Ensure the public is aware of shelter locations in times of need through outreach campaigns that focus on shelter education	All hazards	Annually	No additional funding should be needed	N/A	Red Cross	JC ESA	
Structure and Infrastructure Projects	Jefferson County	Map hillside slopes utilizing GIS technology to ensure proper techniques are employed during development	Landslide	3 years			JC Planning	JC GIS	
	Jefferson County	Develop or participate in programs that will replace fire and EMS apparatus as needed.	All hazards	5 years			JC ESA	JC HSEM, JC Commission	
Education and Awareness	Jefferson County	Train personnel and create an in-county hazmat team to reduce the use of out-of-county resources and increase in-county capabilities	Hazmat	4 years			JC ESA	JC HSEM, VFDs	
Education and Awareness	Jefferson County	Conduct public awareness and education campaigns to target people living near dams and the implications of constructing dams.	Dam Failure	2 years			JC HSEM	WV DNR	
Natural Systems Protection	Jefferson County	Remove brush and vegetation around structures to reduce hazard fuel.	Wild and Urban Fires	As needed			JC ESA	National Park Service, WV DOF	
Structure and Infrastructure Projects	Jefferson County	Install dry wells in remote locations around the county where water infrastructure does not reach.	Wild and Urban Fires	5 years		\$750-1,000 per dry hydrant	JC ESA	JC HSEM, JC Commission	
Local Plans and Regulations	Jefferson County	Upgrade the E911 CAD map to allow dispatchers to update real-time information in the map.	All hazards	2 years			JC GIS	JC E911, JC HSEM	
Natural Systems Protection, Local Plans and Regulations	Jefferson County	Require riparian buffers of at least 35-50 feet with tree planting.	Hazmat						
Local Poans and Regulations	Jefferson County	Review and update plans regarding stream and river setbacks.	Flood						
Natural Systems Protection	Jefferson County	Implement appropriate natural resource management practices by removing or cutting back trees located close to power lines and placing or increasing vegetation in areas that could benefit from water absorption and shade from tree canopies.	Extreme Temperatures, Severe Wind and Tornado, Severe Winter Storms, Flood						

IMPLEMENTATION MITIGATION PROJECTS

Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Structure and Infrastructure Projects	Jefferson County	Strategy 2.1.1: Provide for an emergency backup power supply at all water treatment facilities in Jefferson County.	All hazards	5 years	USDA	\$3,000	WVDA, NRCS, Farm Bureau		
Natural Systems Protection, Local Plans and Regulations	Jefferson County	Strategy 2.2.2: Consider passing ordinances to prioritize or control water use, particularly for emergency situations such as firefighting.	Wild and Urban Fires	3 years	No additional funding should be needed	N/A	County Commission		
Education and Awareness	Jefferson County	Strategy 3.1.1: Develop a section of the website explaining the potential for earthquakes, as well as the potential damages from those earthquakes. This information should include measures to take to safe-proof homes and other structures from the potential effects of earthquakes.	Earthquake	Annually	PDM, Local Funding	N/A	JCHSEM		
Structure and Infrastructure Projects	Jefferson County	Strategy 3.2.1: Install sensory systems that immediately shut off the flow of gas to critical infrastructure throughout the county as soon as earth movements are felt.	Earthquake	5 years	HMGP, PDM, Local Funding	Up to \$10,000 per sensory	Jefferson County or Municipal Engineering Departments		
Education and Awareness	Jefferson County	Strategy 4.1.1: Distribute letters to all property owners in the county regarding potential flood hazards as required for participation in the Community Rating System (CRS).	Flood	Annually	Local Funding	\$3,000	JCHSEM		
Education and Awareness	Jefferson County	Strategy 4.1.2: Continue to hold local courses on National Flood Insurance Program (NFIP) for realtors, bankers, and insurers.	Flood	5 years	Local Funding	Up to \$250	JCHSEM	ISO	
Structure and Infrastructure Projects	Jefferson County	Strategy 4.3.2: Initiate storm water management projects that tie into the Chesapeake Bay Watershed initiatives.	Flood	3 years	CDBG, PDM, Local Funding	Up to \$250,000	JC Engineering	JC Commission, Chesapeake Bay Watershet	
Natural Systems Protection, Local Plans and Regulations	Jefferson County	Strategy 4.4.1: Support Jefferson County's efforts to continue the CRS program.	Flood	2 years	No additional funding should be needed	N/A	JCHSEM, JC Commission		
Education and Awareness	Jefferson County	Strategy 4.4.2: Provide training to municipalities on the CRS program and encourage them to participate.	Flood	2 years	HMGP, PDM, Local Funding	State NFIP Coordinator, JCHSEM			

IMPLEMENTATION MITIGATION PROJECTS									
Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Local Plans and Regulations	Jefferson County	Strategy 4.4.3: Obtain updated information on the number of NFIP policyholders in Jefferson County and its municipalities.	Flood	1 year	PDM, Local Funding	Up to \$3,000	JCHSEM	FEMA, WVDHSEM	
Structure and Infrastructure Projects	Jefferson County	Strategy 4.5.1: Collect updated information of the number and location of all repetitive loss properties throughout the county and the municipalities.	Flood	2 years	Local Funding	N/A	JCHSEM	FEMA, WVDHSEM, JC Commission, Property Owners	
Natural Systems Protection, Structure and Infrastructure Projects	Jefferson County	Strategy 4.5.3: Identify owners of repetitive loss properties who are interested in participating in future property acquisition and relocation projects.	Flood	2 years	PDM, Local Funding	Up to \$4,500	JCHSEM		
Local Plans and Regulations	Jefferson County	Strategy 4.6.1: Work with FEMA and WVDHSEM on the Map Modernization Program to improve FIRMS.	Flood	Ongoing	No additional funding should be needed	N/A	FEMA, WVDHSEM	JCHSEM	
Local Plans and Regulations	Jefferson County	Strategy 5.1.1: Apply for Hazardous Materials Emergency Preparedness (HMEP) grant from WVDHSEM to finance the development of a Commodity Flow Study to determine what hazardous materials are used, stored, and shipped through the county.	Hazmat	5 years	HMGP, PDM, Local Funding	Up to \$10,000	JCHSEM		
Education and Awareness	Jefferson County	Strategy 5.2.1: Increase education and awareness about shelter-in-place opportunities. Jefferson County LEPC to develop and deliver information to all county residents through community groups, publications on website, information on how to shelter in place and when it is appropriate to do so.	Hazmat	1 year	No additional funding should be needed	N/A	JC LEPC	JC BOE	
Structure and Infrastructure Projects	Jefferson County	Strategy 5.2.3: Install Uninterruptible Power Supply (UPS) systems on traffic signals.	All hazards	3 years	USDOT, HMGP, PDM	Up to \$10,000	WVDOT		
Education and Awareness	Jefferson County	Strategy 5.3.1: Teach Community Emergency Response Team (CERT) classes in Jefferson County.	All hazards	2 years	CERT Grant	N/A	JCHSEM	JC Commission	

IMPLEMENTATION MITIGATION PROJECTS

Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Education and Awareness	Jefferson County	Strategy 6.2.1: Develop and distribute educational materials concerning erosion and sediment control and slope stabilization to assets located in landslide prone areas, including the proper installation of erosion control blankets, turf reinforcement mats, silt fences, filter bags, channel dikes and dams and turbidity barriers.	Landslide	2 years	Local Funding	Up to \$3,000	USGS	JCHSEM	
Local Plans and Regulations	Jefferson County	Strategy 6.3.1: Consider implementing open space designations in landslide prone areas, to keep those areas undeveloped.	Landslide	1 year	No additional funding should be needed	N/A	Local government agencies	JC Planning	
Natural Systems Protection	Jefferson County	Strategy 6.4.1: Consider planting various types of vegetation in landslide prone areas to increase soil stability through root length and strength and by absorbing precipitation.	Landslide	2 years	HMGP, PDM, Local Funding	Up to \$2,500, depending on the number of trees	Local government agencies	Property owners	
Structure and Infrastructure Projects	Jefferson County	Strategy 7.1.1: Conduct a detailed vulnerability analysis on the county's infrastructure to see what losses could be incurred during a land subsidence event (in pertinent areas).	Land Subsidence	3 years	EMPG, PDM	\$20,000 depending on size of system	JC IT, JC Engineering, JC Maintenance		
Local Plans and Regulations	Jefferson County	Strategy 7.2.1: Consider implementing open space designations in land subsidence prone areas, to keep those areas undeveloped.	Land Subsidence	1 year	No additional funding should be needed	N/A	Local government agencies	JC Planning, JC Engineering	
Natural Systems Protection, Local Plans and Regulations	Jefferson County	Strategy 7.3.1: Develop a system to monitor groundwater levels in subsidence-prone areas, as groundwater levels directly influence karst topography, which may lead to sinkholes and subsidence issues.	Land Subsidence	3 years	HMGP, PDM, Local Funding	Up to \$30,000	JC Engineering	JC Commission, Water Advisory Groups	
Education and Awareness	Jefferson County	Strategy 8.1.1: Coordinate with the National Weather Service (NWS) to warn residents of impending severe thunderstorm and hailstorm conditions.	Severe Thunderstorm	As needed	No additional funding should be needed	N/A	NWS	JCHSEM	

IMPLEMENTATION MITIGATION PROJECTS

Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Education and Awareness	Jefferson County	Strategy 8.1.2: Encourage the use of NOAA Weather Radios that continuously broadcast NWS forecasts and provide direct warnings to the public.	All hazards	1 year	No additional funding should be needed	Up to \$2,000 to purchase and install radios	JCHSEM	JC Citizens	
Education and Awareness	Jefferson County	Strategy 8.1.3: Continue to conduct National Weather Service Storm Spotter classes.	All weather hazards	Annually	No additional funding should be needed	N/A	JCHSEM	NWS	
Structure and Infrastructure Projects	Jefferson County	Strategy 8.2.1: Coordinate with the power company to periodically trim trees near power lines to prevent limb breakage and power failures.	All weather hazards	Bi-annually	PDM, Local Funding	Up to \$25,000 to \$40,000	Power Company, Contractors	Local power companies	
Local Plans and Regulations	Jefferson County	Strategy 8.3.1: Encourage the use of laminated glass in window panes during all new construction.	All hazards	During new construction	No additional funding should be needed	N/A	JC Planning, JC Engineering	Facility owner	
Education and Awareness	Jefferson County	Strategy 9.1.1: Coordinate with the National Weather Service (NWS) to warn residents of impending severe winds and possible tornado conditions.	Severe Wind and Tornado	As needed	No additional funding should be needed	N/A	NWS	JCHSEM	
Structure and Infrastructure Projects	Jefferson County	Strategy 9.1.2: Conduct upgrades on the Sheriff's Mobile Command Center vehicle.	All hazards	2 years	HMGP, PDM, Local Funding	Up to \$5,000 to 100,000	JCHSEM	JCECC	
Local Plans and Regulations, Structure and Infrastructure Projects	Jefferson County	Strategy 9.2.1: Reduce the risk of mobile home damage by suggesting the use of tie-downs with ground anchors appropriate for the soil type.	Severe Wind and Tornado	1 year	No additional funding should be needed	Tie down kits cost approximately \$200 each	JC Planning, JC Engineering	Home owners	
Structure and Infrastructure Projects	Jefferson County	Strategy 9.3.1: Ensure that all shelters have adequate emergency power resources. Churches and other facilities that maybe used as shelters should consider installing backup generators.	All hazards	2 years	FEMA, Local Funding	\$5,000 to \$7,500	ARC	JC BOE, Local churches, other designated shelter owners	
Local Plans and Regulations	Jefferson County	Strategy 9.3.2: Establish a protocol for the sharing of annual shelter survey information between the local Red Cross Chapter and JCHSEM.	All hazards	3 years	No additional funding should be needed	N/A	JCHSEM, ARC		

IMPLEMENTATION MITIGATION PROJECTS

Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Local Plans and Regulations	Jefferson County	Strategy 10.1.1: Coordinate with local private contractors to develop mutual aid agreements for emergency snow removal, also develop a Debris Management Plan that can be implemented following a disaster occurrence.	All hazards	1 year	Coordinating requires no additional cost	Up to \$5,000 for a debris management plan	WVDOH, Contractors		
Education and Awareness	Jefferson County	Strategy 10.2.1: Develop a part of the website that describes the proper procedures to take to safeguard against and prepare for winter storms.	Severe Winter Storm	1 year	HMGP, PDM, Local Funding	\$6,000 for publication and distribution of materials	JCHSEM	WVDHSEM, NWS	
Local Plans and Regulations	Jefferson County	Strategy 10.2.2: Work with WVDHSEM and FEMA to develop a long term recovery plan.	All hazards	3 years	EMGP	Up to \$10,000	JCHSEM	WVDHSEM, FEMA	
Local Plans and Regulations, Structure and Infrastructure Projects	Jefferson County	Strategy 10.3.1: Encourage agricultural producers and dairies to plan for power outages and install backup power supplies. Conduct an assessment of the applicability of renewable energy sources as a potential backup power supply.	All hazards	3 years	HMGP, PDM, Local Funding	Up to \$8,000	Agricultural producers, WVU Extension Service, Farm Service		
Structure and Infrastructure Projects	Jefferson County	Strategy 10.3.2: Pre-wire critical facilities for generators, and provide backup generators for fire departments that do not yet have them.	All hazards	4 years	HMGP, PDM, Local Funding	Up to \$5,000 per facility	JCESA	Local fire departments	
Structure and Infrastructure Projects	Jefferson County	Strategy 10.3.3: Conduct prime power surveys for all critical infrastructure.	All hazards	5 years	No additional funding should be needed	N/A	JCHSEM	Critical facilities	
Education and Awareness	Jefferson County	Strategy 11.1.2: Increase the knowledge of the general public concerning preparedness through the preparation of informational brochures, town meetings, training seminars, etc.	All hazards	2 years	No additional funding should be needed	N/A	JCHSEM		
Education and Awareness	Jefferson County	Strategy 11.2.2: Continue education and training efforts of first responders and emergency personnel.	All hazards	As needed	FEMA, USDHS	Up to \$1,500 per training session	JCESA, Fire Association		
Local Plans and Regulations	Jefferson County	Strategy 11.2.3: Consider providing heightened security at public gatherings, special events, hazardous materials facilities and critical community facilities and industries.	Violent Disturbance	As needed	Local Funding	Up to \$1,000 to \$2,000 per event	Local Law Enforcement	Fusion Center, Facility owners	

IMPLEMENTATION MITIGATION PROJECTS									
Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Local Plans and Regulations	Jefferson County	Strategy 11.2.4: Make arrangements or otherwise establish mass morgue facilities to be used following potential mass casualty events.	All hazards	3 years	PDM, Local Funding	Up to \$30,000 to \$50,000	JC HD, Medical Examiner	WVU Jefferson Medical Center	
Education and Awareness	Jefferson County	Strategy 12.1.1: Create displays for children's programs that teach fire safety. Examples of information to be used would be similar to that on the FEMA for kids CD and/or the Sparky Fire Safety Program.	Wild and Urban Fires	As needed	Local Funding	Up to \$3,000	JCESA, Local Fire Departments, JC Fire Association		
Education and Awareness	Jefferson County	Strategy 12.1.2: Encourage residents in rural areas to inspect and clean their chimneys at least once a year.	Wild and Urban Fires	As needed	No additional funding should be needed	N/A	JCESA, Local Fire Departments, JC Fire Association	Home owners	
Education and Awareness	Jefferson County	Strategy 12.1.3: Encourage residents and businesses to maintain their property in or near forested areas (including short grass; thinned trees and removal of low hanging branches, cleaning of dead or dry leaves, needles, twigs, etc.), and to create a buffer zone (defensible space) between structures and adjacent forests.	Wild and Urban Fires	1 year	No additional funding should be needed	N/A	JCESA, Local Fire Departments, JC Fire Association	Home owners and business owners	
Education and Awareness	Jefferson County	Strategy 13.1.1: Create displays for use at public events (health fair, public awareness day, and county fair). This display would include pictures and information, such as that contained in FEMA's Retrofitting for Homeowners Guide, Elevating Your Flood Prone Home, Elevating Residential Structures, and information on the NFIP.	Flood	1 year	FEMA, PDM, Local Funding	Up to \$3,000 to \$7,000	JCHSEM	Local Fire and Police Departments, ARC	
Education and Awareness	Jefferson County	Strategy 13.1.2: Create materials that are targeted towards tourist populations. Work with the Jefferson County Convention and Visitors Bureau, the US Park Service and others to alert tourists to potential natural hazard areas and what to do if a natural or man-made hazard occurs during their visit to Jefferson County.	All hazards	3 years	FEMA, PDM, Local Funding	Up to \$3,000 to \$7,000	JCHSEM	JC Convention and Visitors Bureau, Park Service	

IMPLEMENTATION MITIGATION PROJECTS									
Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Education and Awareness	Jefferson County	Strategy 13.1.3: Send news releases to local newspapers, radio, TV stations, and social media outlets about pre-disaster information. Our media strategies are designed to reach all areas of Jefferson County	All hazards	As needed	No additional funding should be needed	N/A	JCHSEM	News Media Outlets, ARC	
Education and Awareness	Jefferson County	Strategy 13.1.4: Create a public speaking series to include topics such as types of natural disaster and risk, how to develop a family disaster plan, how to develop a family disaster supply kit, how to develop a business continuity plan, simple type of mitigation projects for homeowners, etc. These speaking engagements will be offered to civic groups such as Rotary and Kiwanis Clubs, the Chamber of Commerce, Church and interfaith groups, Boy and Girl Scouts, etc.	All hazards	1 year	PDM, Local Funding	Up to \$1,000 per speaker	JCHSEM	Civic groups, JC Chamber of Commerce	
Education and Awareness	Jefferson County	Strategy 13.1.5: Ensure that the Red Cross citizen's disaster course is held on a frequent basis.	All hazards	3 years	FMA	Up to \$1,000 to \$5,000 per course	ARC	JCHSEM	
Education and Awareness	Jefferson County	Strategy 13.1.6: Update the county website to provide hazard related information that is easily accessible. The JCHSEM website has information about disaster preparedness and related activities. The plan is to expand and update the website as needed and as appropriate in a timely manner to benefit all County residents	All hazards	As needed	No additional funding should be needed	N/A	JCHSEM	JC Commission	
Education and Awareness	Jefferson County	Strategy 13.1.7: Continue to work with the Jefferson County school system to promote hazard mitigation education and awareness and discuss ways to better integrate mitigation into the curriculum.	All hazards	As needed	No additional funding should be needed	N/A	JCHSEM	JC BOE	
Education and Awareness	Jefferson County	Strategy 13.1.8: Continue to work with non-governmental organizations (youth services, professional, religious) to promote mitigation education and awareness.	All hazards	As needed	No additional funding should be needed	n/a	JCHSEM	NGOs	



IMPLEMENTATION MITIGATION PROJECTS									
Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Education and Awareness	Jefferson County	Strategy 13.1.9: Establish all-hazard resource centers to be located in the main office of the county and cities. The centers will act as a repository for information on local hazard identification, preparedness, and mitigation strategies for use by citizens, realtors, and lenders.	All hazards	2 years	PDM, Local Funding	Up to \$4,000	JCHSEM	Local Libraries, Mayors	
Local Plans and Regulations	Jefferson County	Strategy 13.2.1: Develop adequate emergency shelter and evacuation plans for animals (domestic pets, livestock, and wildlife). Establish a committee representative of all areas of the county that will include veterinarians, pet store owners, the Humane Society, animal shelters, the WVU Extension Service and other interested parties to work on animal -specific evacuation and sheltering needs.	All hazards	Ongoing	PDM, Local Funding	Up to \$5,000	WVU Extension Service	Local veterinarians, pet store owners, Humane Society, animal shelters	
Education and Awareness	Jefferson County	Strategy 13.3.1: Meet with groups of potential volunteers to attempt to increase the number of trained responders. Groups will include all county fire departments, doctors, nurses and EMS personnel who may become first responders in a bio-terrorism event.	Violent Disturbance Terrorism	As needed	No additional funding should be needed	n/a	JCHSEM	Citizens, Fire Departments, Sheriff, JC HD, MRC ARC	
Education and Awareness	Jefferson County	Strategy 13.4.1: Conduct annual tabletop disaster exercises with local law enforcement, emergency managers, city and county officials, and other disaster response agencies.	All hazards	Annually	PDM, Local Funding	Up to \$10,000 per exercise	JCHSEM	Surrounding first response agencies, appropriate state and federal agencies	
Education and Awareness	Jefferson County	Strategy 13.4.2: Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders	All hazards	Ongoing	PDM, Local Funding	Up to \$7,000 for training	JCHSEM	WVDHSEM, FEMA, NWS	
Local Plans and Regulations	Jefferson County	Strategy 13.5.1: Review existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas.	All hazards	As needed	No additional funding should be needed	N/A	JC Planning	JC Commission, Municipal Planning Offices	

IMPLEMENTATION MITIGATION PROJECTS									
Type of Project	Jurisdiction	Project	Hazard(s) Addressed	Timeline	Funding Source	Cost	Coordinating Agency(ies)	Partnering Agency(ies)	Priority
Local Plans and Regulations	Jefferson County	Strategy 13.5.2: Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.	All hazards	As needed	No additional funding should be needed	N/A	JC Planning	JC Commission, Municipal Planning Offices	
Local Plans and Regulations	Jefferson County	Strategy 13.5.3: Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas.	All hazards	1 year	No additional funding should be needed	N/A	JC Planning	JC Commission, Municipal Planning Offices	
Local Plans and Regulations	Jefferson County	Strategy 13.6.1: Review the existing Jefferson County Emergency Operations Plan (EOP) and update where necessary based on the recommendations of the Jefferson County Hazard Mitigation Plan.	All hazards	Annually	HMEP	Up to \$10,000	JCHSEM	JC LEPC, WVDHSEM, appropriate agencies depending on annexes reviewed	
Local Plans and Regulations	Jefferson County	Strategy 13.8.1: Develop a plan to implement the Needs Assessment recommendations developed by the Public Safety System Consultant.	All hazards	3 years	PDM, Local Funding	Up to \$8,000	JCECC		
Natural Systems Protection	Jefferson County	Strategy 13.9.1: Continue to support initiatives established under Jefferson County Project Impact, and continue as a part of the RNN and participate in its activities.	All hazards	As needed	No additional funding should be needed	N/A	JCHSEM	JC Commission	
Local Plans and Regulations	Jefferson County	Strategy 13.12.1: Contact representatives of rail lines to collect information about emergency planning and risks associated with rail services in the county.	Hazmat	1 year	No additional funding should be needed	N/A	JCHSEM	Commercial and commuter rail lines	
Education and Awareness	Jefferson County	Strategy 13.13.1: Educate and inform local government and elected officials of the need to consider hazard mitigation in policy and budgetary planning and decision-making processes.	All hazards	2 years	No additional funding should be needed	N/A	JC Commission	WVDHSEM, Municipal governments	
Structure and Infrastructure Projects	Ranson	Strategy D1.1.2: Work jointly with the City of Charles Town on a storm water management project for Evitts Run Park.	Flood	2 years	CDBG, PDM, Local Funding	Up to \$400,000	Municipal Engineering	Contractors	

IMPLEMENTATION MITIGATION PROJECTS									
<i>Type of Project</i>	<i>Jurisdiction</i>	<i>Project</i>	<i>Hazard(s) Addressed</i>	<i>Timeline</i>	<i>Funding Source</i>	<i>Cost</i>	<i>Coordinating Agency(ies)</i>	<i>Partnering Agency(ies)</i>	<i>Priority</i>
Structure and Infrastructure Projects	Ranson	Strategy D2.1.2: Review the need for additional water towers.	Drought	2 years	No additional funding should be needed	N/A	Ranson Council	Local water distribution systems	
Structure and Infrastructure Projects	Shepherdstown	Strategy E1.1.3: Design and construct a new water plant with generator back-up power supply.	All hazards	5 years	CDBG, HMGP, PDM	Up to \$50,000 to \$245,000	Local water distribution systems		

### 3.3 2013 MITIGATION ACTIONS STATUS

The Jefferson County hazard mitigation plan committee met annually to review and update the status of each project from the 2013 plan. The committee met four times and each time they updated something new. The projects that they determined were completed or deleted no longer appear in this plan update; the projects that the committee determined was complete but ongoing or simply ongoing are included in this plan's active mitigation actions.

JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 1.1.1: During all new dam construction, encourage the completion of a critical flood engineering analysis by a professional engineer licensed in the State of West Virginia.	Complete	The State of West Virginia Dam Safety Office regulates dams and dam safety, construction rules, etc. Dam Safety engineers (From the West Virginia Dam Safety Office) inspect dams under construction and conduct safety review of existing dams.	No
Jefferson County	Strategy 1.1.2: Coordinate with the WVDEP – Dam Safety Division, to conduct regular safety inspections of existing dams in Jefferson County.	Complete	According to the WVDEP, public safety is accomplished by ensuring that dams are constructed, maintained, operated or removed in a safe manner. Program activities by the WVDEP include: inspections of existing dams, dams under construction, review of design plans, response to emergencies.	No
Jefferson County	Strategy 1.1.3: Develop a notification system that can be utilized to notify residents downstream of large dams, of actions to take before a dam failure, if lead time exists.	Complete	Notification procedures are outlined in the Dam Safety Monitoring and Emergency Action Plans that are required to be developed by the owners of the dam. Emergency Action Plan (EAP) review and approval is an important aspect of the Dam Safety program. Owners of High Hazard Potential Dams are required to develop an EAP. (Hazard potential is not related to the structural integrity of a dam, but strictly to the potential for downstream flooding.) The monitoring portion of the plan sets forth a frequency of owner inspections that varies according to weather conditions. As heavy rainfall occurs, the inspection frequency increases. If an imminent danger is identified, the emergency action portion of the plan is designed to notify downstream persons to evacuate to safe areas. Dam Safety provides an example EAP to dam owners for guidance in developing emergency procedures and assists the owners in coordinating with county authorities.	No

JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 2.1.1: Provide for an emergency backup power supply at all water treatment facilities in Jefferson County.	Ongoing	Generators have been installed at some of the water and wastewater treatment facilities. A Prime Power Survey was completed for all facilities within Jefferson County PSD, Charles Town Utilities, and the Corporation of Shepherdstown. Ms. Lawton reported in 2016 that the PSD has stationed extra propane in Glen Haven, and Cavaland now has a generator. The PSD has also stocked extra propane at Glen Haven. They need to complete a new Prime Power Survey for this site. Mr. Snyder reported that Jefferson Utilities has back up on their Meadowbrook system, part of the Walnut Grove system. They have portable generator that can run one system at a time on 480. Anticipate buying several more generators, but need funding. Ms. Miller explained the importance of having the Prime Power Surveys, as generators may be available from the state; they have generators from overseas that are being reworked. Additionally, Source Water Protection Plans are now required for all providers of water in the state.	Yes
Jefferson County	Strategy 2.2.1: Develop an informational brochure to distribute to local farmers and residents, encouraging citizens to take water saving measures.	Complete	NRCS, Farm Services and USDA distribute information regularly. Public service announcements are also made regularly on local radio stations.	No
Jefferson County	Strategy 2.2.2: Consider passing ordinances to prioritize or control water use, particularly for emergency situations such as firefighting.	Ongoing	A copy of the Extension Service's Drought Management Handbook was obtained. The Jefferson County Emergency Operations Plan now has a drought annex. Emily Wells indicated that the plan that we have is the current drought plan.	Yes
Jefferson County	Strategy 2.3.1: Develop interoperability and system interconnects between the water systems to ensure continuity of water distribution capabilities.	Complete	All of the water providers in the County have completed Source Water Protection Plans this year. These plans identify alternate sources of water in case of emergencies with their primary sources. Ms. Snavelly from Region 9 indicated that all of the Source Water Protection Plans are available to view on Region 9 Planning and Development Council's website at: <a href="http://www.region9wv.com/plans---studies.html">http://www.region9wv.com/plans---studies.html</a> . There are existing interconnections with the JUI owned and operated Briar Run and Meadowbrook WTPs. In the future, JUI may also develop an interconnection with the JUI owned and operated Burr Industrial Park. They have talked with Charles Town Utilities about interconnection.	No
Jefferson County	Strategy 3.1.1: Develop a section of the website explaining the potential for earthquakes, as well as the potential damages from those earthquakes. This information should include measures to take to safe-proof homes and other structures from the potential effects of earthquakes.	Complete & Ongoing	A link to FEMA's earthquake information has been added to the JCHSEM website. The 2017 EPA Exercise Series is an earthquake scenario	Yes

JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 3.1.2: Encourage the implementation of structural mitigation techniques such as wall bracing, reinforcing walls with fiber materials, the installation of dampers or vibration isolation bearings in new construction.	Deleted	The CPC has elected to remove this strategy	No
Jefferson County	Strategy 3.2.1: Install sensory systems that immediately shut off the flow of gas to critical infrastructure throughout the county as soon as earth movements are felt.	Ongoing	The development authorities located in the Region 9 Planning and Development Council counties are working to extend natural gas into Jefferson County. In 2015, Matthew Pennington of Region 9 sent JCHSEM a Gas Line Feasibility Study that was prepared by Thrasher Group. 2016 Update: Ms. Snively of Region 9 Planning and Development Council reported that the feasibility study referred to above was rejected. Now, however, there is a plan to bring the gas line across the Potomac River into U.S. Silica in Morgan County, through Berkeley County, and into Jefferson County. Mr. Blake indicated that this should be done by 2018.	Yes
Jefferson County	Strategy 3.2.2: Coordinate with WVDEP – Dam Safety to inspect all dams following an earthquake.	Complete	Required by DEP, but is the owner's responsibility.	No
Jefferson County	Strategy 4.1.1: Distribute letters to all property owners in the county regarding potential flood hazards as required for participation in the Community Rating System (CRS).	Complete & Ongoing	Completed yearly, the JCHSEM, as a part of their requirements for the CRS of the NFIP, mails letters of notice to residents within the floodplain on repetitive loss areas about property protection and flood insurance. 2016 Update: Mr. Allen reported that JCHSEM sent out over 500 letters to residents that live in or near a floodplain, including the properties that are repetitive loss properties, that gives them information about flood insurance, mitigation techniques, and contact information for floodplain permit information and ordinance information. Ms. Miller said that this is a part of the Community Rating System of the National Flood Insurance Program that the County is involved in.	Yes
Jefferson County	Strategy 4.1.2: Continue to hold local courses on National Flood Insurance Program (NFIP) for realtors, bankers, and insurers.	Complete & Ongoing	Held as often as the courses are available, Insurance Services Office (ISO) comes to the community, as requested and paid for by the County to teach courses about the NFIP to Insurance Agencies, Real Estate Agents and Banking institutions.	Yes
Jefferson County	Strategy 4.2.1: Work with the municipalities to update all floodplain ordinances adopted prior to 1987.	Complete	The county's new ordinance is being used as the model ordinance for the state. It was reported that new ordinances were adopted December 18, 2009 by the Jefferson County Commission, as well as, all municipalities. WVDHSEM's NFIP department, Richard reported that Bolivar updated—(exact date was not on the form), 2010; Charles Town, updated 12/18/09; Harpers Ferry, updated 12/18/09; Shepherdstown, updated 12/18/09; Ranson, updated 12/18/09.	No

JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 4.3.1: Provide additional training to county and municipal development officials on NFIP requirements.	Complete	A workshop for local officials was held in January, 2011, all County and Municipalities in Jefferson and the Eastern Panhandle were invited. A meeting was also held in January of 2010 regarding new digital maps on FEMA's website. A Risk Map Meeting was held In June, 2012, attended by JCHSEM, Engineering Department, Planning Department, municipal representatives, as well as FEMA. The State of WV now has state code requiring floodplain managers to have a certain number of training hours each year.	No

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JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 4.3.2: Initiate storm water management projects that tie into the Chesapeake Bay Watershed initiatives.	Ongoing	<p>Regulations require water quality regulations. Strengthen for a 1 inch capture to slow runoff down. Matt Pennington reported others in Harpers Ferry, Ranson, Charles Town, and Shepherdstown. Will do Phase 2, which is a 1 inch capture. Fairfax Blvd, green infrastructure. A few great programs involved-Cacapon Institute can increase trees with their CTREES program. Matthew Pennington of Region 9 Planning and Development Council has offered the following update to this project: Please find the link to all completed CTREE tree plantings.</p> <p><a href="http://cacaponinstitute.org/Forestry/CTreeProjects.htm">http://cacaponinstitute.org/Forestry/CTreeProjects.htm</a></p> <p>Please see the link to the current CTREE projects: <a href="http://cacaponinstitute.org/Forestry/CTree_Current_Projects.htm">http://cacaponinstitute.org/Forestry/CTree_Current_Projects.htm</a></p> <p>The Region 9 Coordinator provides technical and hands-on support to the CTREE Program to Jefferson County and the Region. Region 9 will continue to engage local communities on the program. Fall 2014 and Spring 2015, the Region 9 Coordinator assisted the Deerfield Village Community on two CTREE planting events. Fall 2015, the City of Charles Town and the Leetown Chapter of the Izaak Walton League planted a mix of 24 shade, flowering, and evergreen trees along the Craighill Walking Trail in Charles Town. Fall 2015, Page Jackson Elementary School planted a mix of 24 shade trees along the walking trails at their school in Charles Town. Ms. Miller said that Bill Polk, County Maintenance Director gave a report about planting trees in some of the open areas of County Property, including the Hunter House picnic area, and some of the Parks and Recreation areas. Ms. Brockman also reported that Mr. Fagan in GIS has also worked with Tanner Haid of the Cacapon Institute to identify places for tree plantings. Matt Pennington reported in 2016 that the tree program is continuing. Todd Wilt reported that Charles Town Parks &amp; Recreation did tree planting last year and is planning to plant additional kits at Jefferson Memorial Park. Andy Blake said that trees are a part of the Fairfax Street expansion in Ranson. Additionally, Matt Pennington reported that the following communities voluntarily, yet formally, adopted ordinances that include a 1" capture requirement. Completing objectives identified in the Chesapeake Bay Watershed Implementation Plan: page. 50-52: Harpers Ferry – Effective 2/1/15. Charles Town – Effective 8/3/15 Shepherdstown – Approved 5/10/16</p>	Yes



JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 4.4.1: Support Jefferson County's efforts to continue the CRS program.	Complete & Ongoing	Jefferson County submitted an application to enter the CRS Program in 2005. A letter was received, stating the County was being recommended to FEMA for entry into the program in 2006. County has been named a CRS Community as a Class 9. The Governor presented the County Commission with a plaque in the Spring of 2012 as a Class 8 CRS Community. In early 2017, Jefferson County was named as a Class 6 CRS Community.	Yes
Jefferson County	Strategy 4.4.2: Provide training to municipalities on the CRS program and encourage them to participate.	Complete & Ongoing	Jefferson County has been upgraded to a Class 8 Community, for a 10% reduction to flood insurance premiums. CRS was covered in a workshop that was held in January, 2011. Region 9 staff is working with municipalities to encourage them to become involved with the program.	Yes
Jefferson County	Strategy 4.4.3: Obtain updated information on the number of NFIP policyholders in Jefferson County and its municipalities.	Ongoing	This information is received yearly from the WV Division of Homeland Security and Emergency Management's Mitigation Recovery Branch. The report (AW-242 Form) is generated by the WVDHSEM.	Yes
Jefferson County	Strategy 4.4.4: Coordinate with the USGS on the installation of river gauges in the Potomac River near Shepherdstown.	Complete	USGS gauge was returned to the Potomac River in 2016!	No
Jefferson County	Strategy 4.5.1: Collect updated information of the number and location of all repetitive loss properties throughout the county and the municipalities.	Complete & Ongoing	Conducted yearly. An updated list repetitive loss properties was obtained from ISO (Insurance Services Office) for properties located in the unincorporated areas of the County: ISO operates the National Flood Insurance Program for FEMA. There are 20 properties identified as repetitive loss properties. Of these, two properties cannot be identified by their descriptions, one no longer has a structure on the property as it was destroyed in the last flood, four owners were offered mitigation, but were not interested, three are not primary residences, three were acquired under HMGP #DR-1168 and are now managed as open space, one was elevated to the Base Flood Elevation (BFE) under HMGP #DR-1168, one owner has shown no interest in mitigation efforts, another was elevated to the BFE, paid for by the property owner. The remaining properties are mostly second homes, the rest could be candidates for mitigation if the property owners are interested and if funding is available. Staff of JCHSEM visits each repetitive loss property to map them, take pictures, and gather additional information. Additionally, staff confirms open space compliance during these visits. Last completed in June, 2017	Yes
Jefferson County	Strategy 4.5.2: Develop a database of information on all repetitive loss properties including maps.	Complete	This project has been completed by the Jefferson County GIS/Addressing Office with information given to them by JCHSEM staff.	No

JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 4.5.3: Identify owners of repetitive loss properties who are interested in participating in future property acquisition and relocation projects.	Ongoing	HMGP funds could become available statewide for mitigation projects after each Federally-declared disaster. Properties would need to meet FEMA Cos/Benefit Ratio, and the owner would need to request mitigation. All considered projects must be approved by WVDHSEM, FEMA, and the local jurisdiction. New projects will need to be considered through the Engineering Department. One additional property was mitigation in 2011, the property was returned to its natural condition and will be managed as open space. The state prefers to not do buy outs. They would rather elevate, relocate.	Yes
Jefferson County	Strategy 4.6.1: Work with FEMA and WVDHSEM on the Map Modernization Program to improve FIRMS.	Complete & Ongoing	FEMA mapping has been completed. The Map Modernization Program as been replaced with the RiskMAP program at FEMA. This program provides communities with flood information and tools they can use to enhance their mitigation plans and better protect their citizens GIS Director, Todd Fagan spoke about having 3 CFMs in the County. 2015 Update: Jefferson County is a part of the Conococheague/Opequon Watershed Group with FEMA. Their next meeting is in early winter. Sandee Niles also discussed the NWS Hydrology Meeting that she attended recently in Sterling and that there are some updates that will be happening in the future. They also reported that USGS will be putting the gage back in on the Potomac in 2016. This gage is used for river forecasting.	Yes
Jefferson County	Strategy 4.7.1: Work with WV Division of Highways to identify areas of frequent roadway flooding and develop mitigation strategies.	Complete	No Comment	No
Jefferson County	Strategy 5.1.1: Apply for Hazardous Materials Emergency Preparedness (HMEP) grant from WVDHSEM to finance the development of a Commodity Flow Study to determine what hazardous materials are used, stored, and shipped through the county.	Complete & Ongoing	The Jefferson County LEPC conducted a countywide Commodity Flow Study in 2007 to identify all hazardous materials that are either stored or traveling through the county and its municipalities. That plan was updated in 2012 and was shared with the emergency responder community. A new Hazardous Materials Response Plan was developed and exercised by the LEPC in 2013. Jefferson County LEPC's project for 2016 was a revised Commodity Flow Study that included commodities by both highway and rail. The 2017 LEPC projects are to look at propane traveling through by rail and a hazardous waste commodity flow study.	Yes
Jefferson County	Strategy 5.1.2: Identify strategies to mitigate risks from the transportation and/or storage of hazardous materials in Jefferson County and the City of Ranson	Complete	The Jefferson County LEPC conducted a commodity flow study in 2007. Using the results of the study, the LEPC decided to develop a Propane Risk Assessment, which was completed in 2008 and 2009. The Commodity Flow Study was updated in 2012 and again in 2016. A new Hazardous Materials Response Plan was developed and exercised by the LEPC in 2013.	No

JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 5.2.1: Increase education and awareness about shelter-in-place opportunities. Jefferson County LEPC to develop and deliver information to all county residents through community groups, publications on website, information on how to shelter in place and when it is appropriate to do so.	Complete & Ongoing	The Jefferson County Board of Education has developed a School Crisis Plan for man-made or acts of God disaster events. Two new sections have been added to the Plan-Terrorism and Sheltering in Place. Additionally, they are training school personnel about sheltering in place and have ordered supplies to keep in the schools for such emergencies. An exercise for shelter in place is being held when the teachers and students get back to school in August. Exercises were held at the schools each year.	Yes
Jefferson County	Strategy 5.2.2: Consider the installation of a Dynamic Message Board on the new section of Route 9	Complete	2 Dynamic Message Boards have been installed. One is on Rt. 9; the other on Rt. 340.	No
Jefferson County	Strategy 5.2.3: Install Uninterruptible Power Supply (UPS) systems on traffic signals.	Ongoing	Mr. Wilt of Charles Town reported that they do not have these on any of their devices. They use portable stop signs if the lights are going to be out for a given period of time.	Yes
Jefferson County	Strategy 5.3.1: Teach Community Emergency Response Team (CERT) classes in Jefferson County.	Complete & Ongoing	Ms. Miller indicated that RESA offers many classes for local Emergency Responders and advertises them on their site. Additionally, each Homeland Security Region maintains their own training calendar. WVDHSEM maintains a calendar of the trainings that they offer, and WVDMAPS maintains the state's CourseMill program that includes an entire series on Floodplain Management Courses.	Yes
Jefferson County	Strategy 6.1.1: Develop ordinances requiring logging companies to clean and replant areas that they log. The ordinance should include the amount of replanting that is expected.	Complete	The Director of Planning and Zoning reported that there is a buffer requirement. Also there is an RFQ for stormwater management with the Chesapeake Bay requirements. This is covered in the Subdivision Ordinances. Division of Forestry regulates logging. <u>2016 Update</u> : Submitted by Jennifer Brockman, Jefferson County Planning Department. Sec. 20.302 Subdivision Plat General Review Standards4	No
Jefferson County	Strategy 6.2.1: Develop and distribute educational materials concerning erosion and sediment control and slope stabilization to assets located in landslide prone areas, including the proper installation of erosion control blankets, turf reinforcement mats, silt fences, filter bags, channel dikes and dams and turbidity barriers.	Ongoing	The Blue Ridge Watershed Coalition and the Elk Run Watershed Group have initiated this strategy. This issue is covered in the County's sub-division ordinance. The Watershed Coalition was set up at the Jefferson County Fair in Building #2 with quite a display with plenty of materials for educating the public.	Yes
Jefferson County	Strategy 6.3.1: Consider implementing open space designations in landslide prone areas, to keep those areas undeveloped.	Ongoing		Yes
Jefferson County	Strategy 6.4.1: Consider planting various types of vegetation in landslide prone areas to increase soil stability through root length and strength and by absorbing precipitation.	Ongoing	No progress, but it was noted at the annual meeting in 2014 that there are some funding opportunities through the Chesapeake Bay Program for this strategy. Most of these areas are in private ownership and the Chesapeake Bay money is only for public properties.	Yes

JEFFERSON COUNTY STATUS OF 2013 PROJECTS				
<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 7.1.1: Conduct a detailed vulnerability analysis on the county's infrastructure to see what losses could be incurred during a land subsidence event (in pertinent areas).	Ongoing	This strategy has not yet been initiated, as a funding source has not been identified.	Yes
Jefferson County	Strategy 7.1.2: Establish a long-term monitoring program to track the occurrence and distribution of subsidence. Even if groundwater withdrawals were reduced to the level of estimated annual recharge in the near future, primary and residual subsidence would continue for 5 to 10 years.	Deleted	THE CPC has decided to delete this strategy.	No
Jefferson County	Strategy 7.2.1: Consider implementing open space designations in land subsidence prone areas, to keep those areas undeveloped.	Ongoing	If anyone submits a plat, that is something that should be identified on the plat. Jennifer Brockman said that if you are submitting for new development, you have to show where floodplain and sinkholes, etc. as a part of the process.	Yes
Jefferson County	Strategy 7.3.1: Develop a system to monitor groundwater levels in subsidence-prone areas, as groundwater levels directly influence karst topography, which may lead to sinkholes and subsidence issues.	Ongoing		Yes
Jefferson County	Strategy 8.1.1: Coordinate with the National Weather Service (NWS) to warn residents of impending severe thunderstorm and hailstorm conditions.	Complete & Ongoing	The National Weather Service has a new program called Weather Ready Nation. Weather radios and local media are used to warn resident. JCECC went live with a new Computer Aided Dispatch system in September, 2014. JCHSEM uses NIXLE as a service that residents can sign up to receive emergency alerts via email and/or text message.	Yes
Jefferson County	Strategy 8.1.2: Encourage the use of NOAA Weather Radios that continuously broadcast NWS forecasts and provide direct warnings to the public.	Complete & Ongoing	Utilization of Weather Ready Nation and local media outlets. JCECC went live on a new CAD system and JCHSEM is utilizing NIXLE.	Yes
Jefferson County	Strategy 8.1.3: Continue to conduct National Weather Service Storm Spotter classes.	Complete & Ongoing	JCHSEM continues to sponsor storm spotter classes as often as the NWS can provide them. A Flood Storm Spotter Class was held in March, 2012. A Basic Storm Spotter Class was held in March of 2011, and a Winter Storm Spotter Class was held in November 2010. The was a Basic class held in February, 2014, and a Flood Class held in September, 2015.	Yes
Jefferson County	Strategy 8.1.4: Ensure that surge protection, such as surge protectors and grounding, has been installed on all critical electronic equipment owned by county government.	Complete	Surge protection has been installed. The County also added a generator onto the Mason Building, where their server and the back-up EOC is located.	No

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Jefferson County	Strategy 8.2.1: Coordinate with the power company to periodically trim trees near power lines to prevent limb breakage and power failures.	Ongoing	The power company continues to make efforts to clear right of ways	Yes
Jefferson County	Strategy 8.3.1: Encourage the use of laminated glass in window panes during all new construction.	Ongoing	During new construction.	Yes
Jefferson County	Strategy 9.1.1: Coordinate with the National Weather Service (NWS) to warn residents of impending severe winds and possible tornado conditions.	Complete & Ongoing	Jefferson County utilizes the NWS, NOAA, EAS, Nixle, Facebook, and Twitter to warn local residents.	Yes
Jefferson County	Strategy 9.1.2: Conduct upgrades on the Sheriff's Mobile Command Center vehicle.	Complete & Ongoing	Radio consoles and other equipment have been installed. A new roof was put on the vehicle in 2015. It is equipped with CAD, radios, and has dispatching capabilities. It will soon have a cache of SIRM radio batteries in it so that deputies can change out their radio batteries as needed.	Yes
Jefferson County	Strategy 9.2.1: Reduce the risk of mobile home damage by suggesting the use of tie-downs with ground anchors appropriate for the soil type.	Complete & Ongoing	Current building codes require tie downs for mobile homes.	Yes
Jefferson County	Strategy 9.3.1: Ensure that all shelters have adequate emergency power resources. Churches and other facilities that maybe used as shelters should consider installing backup generators.	Ongoing	The local chapter of the ARC and the Schools no longer have MOUs in place for the use of shelters. JCHSEM has MOUs in place with the School system for uses identified by the Emergency Manager. The ARC will be using churches as shelters as much as possible. There is a need to complete Prime Power Surveys for all ARC shelter facilities. It was reported that Prime Power Surveys have been completed on county schools. The Jefferson County Health Department has Point of Dispensing (POD) sites located throughout the county.	Yes
Jefferson County	Strategy 9.3.2: Establish a protocol for the sharing of annual shelter survey information between the local Red Cross Chapter and JCHSEM.	Ongoing	The American Red Cross maintains information on the site of each approved shelter. They also have information on how many people can be housed or fed at the site and availability of back-up power resources/available there. They are prepared to meet with the JCHSEM on an annual basis, if requested	Yes
Jefferson County	Strategy 10.1.1: Coordinate with local private contractors to develop mutual aid agreements for emergency snow removal, also develop a Debris Management Plan that can be implemented following a disaster occurrence.	Complete & Ongoing	During the December 2010 snowstorm, the EOC was able to gather a good list of private local contracts that were willing to move snow, no official MOUs are in place. These resources have also been added to the Jefferson County Resource Database. MOUs are the responsibility of each government (County or municipality), various agencies and private businesses.	Yes
Jefferson County	Strategy 10.2.1: Develop a part of the website that describes the proper procedures to take to safeguard against and prepare for winter storms.	Complete & Ongoing	Jefferson County included weather related preparedness brochures as well as Business Continuity Planning information in their display at the 2003-2016 Jefferson County Fairs and other public events. Information included the FEMA Business Disaster Planning Guide, a booklet that was prepared for the Business Continuity Planning Workshops locally and information from the Institute for Business and Home Safety.	Yes

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<i>Jurisdiction</i>	<i>2013 Plan Strategies</i>	<i>Status as of 2017</i>	<i>Description</i>	<i>Included 2018 Plan</i>
Jefferson County	Strategy 10.2.2: Work with WVDHSEM and FEMA to develop a long term recovery plan.	Ongoing	There is still no state plan or standards have been developed by the state	Yes
Jefferson County	Strategy 10.3.1: Encourage agricultural producers and dairies to plan for power outages and install backup power supplies. Conduct an assessment of the applicability of renewable energy sources as a potential backup power supply.	Ongoing	No updates	Yes
Jefferson County	Strategy 10.3.2: Pre-wire critical facilities for generators, and provide backup generators for fire departments that do not yet have them.	Ongoing	All Fire Departments and the ESA, now have generators.	Yes
Jefferson County	Strategy 10.3.3: Conduct prime power surveys for all critical infrastructure.	Complete & Ongoing	61 completed, the rest are on-going.	Yes
Jefferson County	Strategy 11.1.1: Develop and/or enhance terrorist incident response annexes in the county Emergency Operations Plan (EOP).	Complete	The EOP is updated annually and each annex is updated at least every 5 years.	No
Jefferson County	Strategy 11.1.2: Increase the knowledge of the general public concerning preparedness through the preparation of informational brochures, town meetings, training seminars, etc.	Complete & Ongoing	Informational brochures are distributed at fairs, festivals, public speaking engagements, and during National Preparedness Month in September.	Yes
Jefferson County	Strategy 11.1.3: Coordinate with local media to alert the public as to the current hazard level.	Deleted	2012: This strategy had to do with the old Color Codes used by US Homeland Security. They do not use these any longer. The CPG decided to delete this strategy	No
Jefferson County	Strategy 11.2.1: Establish trauma centers to offer medical attention and counseling to affected populations in the event of a terrorist event.	Complete	WVU Healthcare-Jefferson Medical Center has a level 4 trauma center, which can be utilized to stabilize patients and divert. The hospital can keep 25 people daily, and a surge plan has been developed by them	No
Jefferson County	Strategy 11.2.2: Continue education and training efforts of first responders and emergency personnel.	Ongoing	This is conducted countywide on an ongoing schedule through RESA. There are also additional classes available through the WVDMAAPS CourseMill and other opportunities on various websites. Regional Exercises are held.	Yes
Jefferson County	Strategy 11.2.3: Consider providing heightened security at public gatherings, special events, hazardous materials facilities and critical community facilities and industries.	Ongoing	A discussion about the PCII-Protected Critical Information on Schools was had amongst CPC members, and how information becomes PCII and is protected.	Yes
Jefferson County	Strategy 11.2.4: Make arrangements or otherwise establish mass morgue facilities to be used following potential mass casualty events.	Ongoing	The Health Department is currently in the process of developing a mass fatality plan and a GAP analysis. A Mass Fatality Planning Committee has also been established, spearheaded by the Jefferson County Health Department. The LEPC held a Mass Fatalities Conference in October, 2013 where classes were offered in several areas surrounding mass fatalities.	Yes

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Jefferson County	Strategy 12.1.1: Create displays for children's programs that teach fire safety. Examples of information to be used would be similar to that on the FEMA for kids CD and/or the Sparky Fire Safety Program.	Complete & Ongoing	The JCHSEM booth at the Jefferson County Fairs has included information on Fire Safety (NFPA Sparky the Fire Dog Coloring and Activity Books). Disaster Preparedness Coloring Books, and coloring books from the Home Safety Council.	Yes
Jefferson County	Strategy 12.1.2: Encourage residents in rural areas to inspect and clean their chimneys at least once a year.	Ongoing	Woodburning air quality with using dry wood. Encourage updating your woodstove to EPA compliant.	Yes
Jefferson County	Strategy 12.1.3: Encourage residents and businesses to maintain their property in or near forested areas (including short grass; thinned trees and removal of low hanging branches, cleaning of dead or dry leaves, needles, twigs, etc.), and to create a buffer zone (defensible space) between structures and adjacent forests.	Complete & Ongoing	A Property Safety Ordinance was adopted on January 7, 1999 and amended on May 20, 2010.	Yes

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Jefferson County	Strategy 13.1.1: Create displays for use at public events (health fair, public awareness day, and county fair). This display would include pictures and information, such as that contained in FEMA's Retrofitting for Homeowners Guide, Elevating Your Flood Prone Home, Elevating Residential Structures, and information on the NFIP.	Complete & Ongoing	JCHSEM's display at the Jefferson County Fair includes mitigation information. The display highlights the Jefferson County Risk Assessment and Mitigation Plan, flood homeowner's and business mitigation information, information about elevating homes, retrofitting information, and National Flood Insurance Information. Flooding handouts include: Are You Protected from the Next Flood? Coping a Flood- Before, During and After, Answers to Questions about the NFIP, Avoiding Flood Damage: A checklist for homeowners, Top 10 Facts about Flood Insurance, What you need to know about Federal Disaster Assistance and National Flood Insurance, Myths and Facts about the NFIP, How the NFIP works, NFIP Insurance Agent's Lowest Floor Guide, NFIP Increased Cost of Compliance Coverage, things you should know about flood insurance, An Ounce of Prevention is Worth a Pound of Cure, Floods, The Awesome power, Tropical Cyclones and Inland Flooding, Homeowners Guide to Retrofitting. The JCHSEM has a 10'X10' display and two tabletop display boards that are used for events. Flood Mitigation materials are available any time that the display is up, as well as from the Homeland Security Office. An Animal in Disaster Display was developed and used at the Jefferson County Fair. It includes information about domestic pets, agricultural animals and horses. In addition to the display board, brochures were available, including: The American Red Cross/The Humane Society of the United States, "Pets and Disasters-GET PREPARED"; The Humane Society of the United States, "Disaster Preparedness for Pets"; The Humane Society of the United States, "Disaster Preparedness for Horses"; The Humane Society of the United States, "Disaster Preparedness for Livestock"; The National Humane Education Society's, "Disaster and Your Pets"; The Veterinary Medical Association's, "Saving the Whole Family" and the Jefferson County Animals in Disaster Plan. The new table top display was used at the Jefferson County Fair and at Furry Fun Fest at Briggs Animal Adoption Center in 2004. In addition to the information booth at the fairs and festivals, the JCHSEM also conducts lunch and learn sessions during national preparedness month. The county won the "United We Stand" award from FEMA Region III in 2010.	Yes



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Jefferson County	Strategy 13.1.2: Create materials that are targeted towards tourist populations. Work with the Jefferson County Convention and Visitors Bureau, the US Park Service and others to alert tourists to potential natural hazard areas and what to do if a natural or man-made hazard occurs during their visit to Jefferson County.	Ongoing	This strategy has been initiated, however; is still a work in progress.	Yes
Jefferson County	Strategy 13.1.3: Send news releases to local newspapers, radio, TV stations, and social media outlets about pre-disaster information. Our media strategies are designed to reach all areas of Jefferson County	Complete & Ongoing	The following media is used for distribution of information/press releases: a. Radio – WVEP (88.9 FM), WSHC (89.7 FM), WINC (92.5 FM), WKMZ (95.9 FM – EAS), WLTF (97.5 FM – EAS), KISS (98.3 FM), WUSQ (102.5 FM), WRNR (106.5 FM), WWEG (106.9 FM), WRNR (740 AM), WEPM (1340 AM – EAS), WMRE (1550 AM) b. Television – WHAG (Channel 11), WWPB (Channel 31), WWPX (Channel 60) – Note: These are Comcast stations. c. Newspapers – The Shepherdstown Chronicle, The Spirit of Jefferson, The Journal (Martinsburg), The Shepherdstown Observer d. Social Media – Nixle, Facebook, Twitter	Yes
Jefferson County	Strategy 13.1.4: Create a public speaking series to include topics such as types of natural disaster and risk, how to develop a family disaster plan, how to develop a family disaster supply kit, how to develop a business continuity plan, simple type of mitigation projects for homeowners, etc. These speaking engagements will be offered to civic groups such as Rotary and Kiwanis Clubs, the Chamber of Commerce, Church and interfaith groups, Boy and Girl Scouts, etc.	Complete & Ongoing	There are several program topics available to groups.	Yes
Jefferson County	Strategy 13.1.5: Ensure that the Red Cross citizen's disaster course is held on a frequent basis.	Complete & Ongoing	Red Cross Classes are now available on-line. Additionally, a shelter training and exercise was held in Berkeley County for the region in July, 2014. The ARC holds a variety of courses, including Adult, infant, and child CPR, AED, Basic First Aid. Most Red Cross courses are now on-line.	Yes
Jefferson County	Strategy 13.1.6: Update the county website to provide hazard related information that is easily accessible. The JCHSEM website has information about disaster preparedness and related activities. The plan is to expand and update the website as needed and as appropriate in a timely manner to benefit all County residents	Complete & Ongoing	The County Website is at <a href="http://www.jeffersoncountywv.org">www.jeffersoncountywv.org</a> . A new website was launched in the fall of 2015.	Yes

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Jefferson County	Strategy 13.1.7: Continue to work with the Jefferson County school system to promote hazard mitigation education and awareness and discuss ways to better integrate mitigation into the curriculum.	Complete & Ongoing	This strategy is ongoing through the Disaster Ready Kids Program in the Summer months.	Yes
Jefferson County	Strategy 13.1.8: Continue to work with non-governmental organizations (youth services, professional, religious) to promote mitigation education and awareness.	Complete & Ongoing	These programs and workshops have been held in a variety of settings (i.e. Resilient Neighbors Network). Most recently they have focused on Whole of Community; Whole of Nation initiative that DHS/FEMA is promoting. Jefferson County was named as a Pilot Community of the Resilient Neighbors Network.	Yes
Jefferson County	Strategy 13.1.9: Establish all-hazard resource centers to be located in the main office of the county and cities. The centers will act as a repository for information on local hazard identification, preparedness, and mitigation strategies for use by citizens, realtors, and lenders.	Complete & Ongoing	These resource centers have been established in the local libraries as a requirement for the Community Rating System activities. Additionally, there is a media center within the Homeland Security and Emergency Management office that contains a section on flooding, with additional sections on Disaster Preparedness, Fire and Fire Safety, Weather, a Children's section, Counter Terrorism and other mitigation.	Yes
Jefferson County	Strategy 13.2.1: Develop adequate emergency shelter and evacuation plans for animals (domestic pets, livestock, and wildlife). Establish a committee representative of all areas of the county that will include veterinarians, pet store owners, the Humane Society, animal shelters, the WVU Extension Service and other interested parties to work on animal - specific evacuation and sheltering needs.	Ongoing	The County purchased an Animals in Disaster Trailer with supplies that is for use in WVHS Region 3 as a Rapid Response Trailer for pets. A training was held for the region in Jefferson County in 2013 to teach how to set up an Emergency Animal Shelter for disasters. It was taught by Florida SARC. A regional Animals in Disaster Plan was developed within WV Homeland Security Region 3.	Yes
Jefferson County	Strategy 13.3.1: Meet with groups of potential volunteers to attempt to increase the number of trained responders. Groups will include all county fire departments, doctors, nurses and EMS personnel who may become first responders in a bio-terrorism event.	Complete & Ongoing	JCHSEM has encouraged volunteers to take training from the ARC and MRC. CERT classes are taught by JCHSEM to local residents. The Sheriff's Department has a volunteer Reserve Unit. All of Jefferson County's Fire Companies are Volunteer Agencies.	Yes
Jefferson County	Strategy 13.3.2: Incorporate Light Detection and Ranging (LIDAR) mapping into current GIS mapping.	Complete	In 2012 FEMA developed LIDAR. We have the data available, but we struggle with time to be able to use it.	No
Jefferson County	Strategy 13.4.1: Conduct annual tabletop disaster exercises with local law enforcement, emergency managers, city and county officials, and other disaster response agencies.	Complete & Ongoing	JCHSEM has been involved with numerous exercises over the years. The most recent include: Cold As Ice Series, A Train Kept A Rollin'. Jefferson participated in an exercise with WV Hospital Association Region 8 and 9 Exercise in December, 2014., Cold as Ice, 2014, Something in the Air, 2015, and Clandestine Chaos TTX, Functional and Full Scale exercises in 2015. 2016 Update: The TTX, Functional, and Full Scale Exercise, Dark Grid in 2016.	Yes

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Jefferson County	Strategy 13.4.2: Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders	Complete & Ongoing	A list of all known training was developed and is listed in the JCHSEM Public Awareness, Education and Training Strategies, as well as the county website. Training for first responders is available through RESA.	Yes
Jefferson County	Strategy 13.5.1: Review existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas.	Ongoing	Ordinances continue to be reviewed and revised.	Yes
Jefferson County	Strategy 13.5.2: Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.	Ongoing	Jennie Brockman, JC Planning Director reported that the Comprehensive Plan was finalized and adopted in January, 2015. It includes protection of sink holes, steep slopes. Charles Town's Comprehensive Plan was last updated in 2006.	Yes
Jefferson County	Strategy 13.5.3: Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas.	Ongoing	Ordinances continue to be reviewed and revised. The only CAP plans are for County Government Buildings. The County doesn't own any roads or utilities.	Yes
Jefferson County	Strategy 13.6.1: Review the existing Jefferson County Emergency Operations Plan (EOP) and update where necessary based on the recommendations of the Jefferson County Hazard Mitigation Plan.	Ongoing	One annex is reviewed, updated, or developed each year.	Yes
Jefferson County	Strategy 13.6.2: Coordinate with the Eastern Panhandle Homeowners Association (HOAs) for their inclusion into the 911 addressing compliance program.	Complete	GIS Department coordinated this.	No
Jefferson County	Strategy 13.7.1: Expand the mission and membership of the Jefferson County Local Emergency Planning Committee (LEPC) to act as a countywide disaster task force.	Deleted	The CPC decided to delete this strategy.	No
Jefferson County	Strategy 13.8.1: Develop a plan to implement the Needs Assessment recommendations developed by the Public Safety System Consultant.	Ongoing	Jefferson County constructed a new Emergency Operations Center and Emergency Communications Center in 2008. CAD went live in September, 2014.	Yes
Jefferson County	Strategy 13.9.1: Continue to support initiatives established under Jefferson County Project Impact, and continue as a part of the RNN and participate in its activities.	Complete & Ongoing	Jefferson County was recently named as one of the pilot communities for the Resilient Neighbors Network, which works well with the concept of the Project Impact Program and the Whole of Community efforts.	Yes
Jefferson County	Strategy 13.9.2: Evaluate the feasibility of the continuation of a funded Project Impact Coordinator position in Jefferson County.	Deleted	THE CPC has decided to delete this strategy.	No

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Jefferson County	Strategy 13.10.1: Establish a formal process for the Town of Harpers Ferry and the Park Service to coordinate disaster related efforts, which will include defining boundaries and establishing responsibilities.	Ongoing	The Town and the National Park Service worked well during the 2012 June Derecho to get the Harpers Ferry Water Plant back up and operational after the storm.	Yes
Jefferson County	Strategy 13.10.2: Conduct training exercises that include representatives from the Town of Harpers Ferry and the Park Service to facilitate increased coordination.	Complete	CSX Railroad held training and exercise in early part of 2007; the park service has participated in several exercises over the past 10 years.	No
Jefferson County	Strategy 13.11.1: Conduct a survey of all historic sites that are located in hazard areas and develop mitigation strategies to protect any at-risk historic properties	Complete	This strategy was completed in 2010 by the Jefferson County GIS/Addressing Office.	No
Jefferson County	Strategy 13.12.1: Contact representatives of rail lines to collect information about emergency planning and risks associated with rail services in the county.	Complete & Ongoing	The JCHSEM Director indicated that this strategy has been completed and is considered to be on-going.	Yes
Jefferson County	Strategy 13.13.1: Educate and inform local government and elected officials of the need to consider hazard mitigation in policy and budgetary planning and decision-making processes.	Ongoing	The group reviewed the projects for the local municipalities. Please note that none of the municipalities are CRS (Community Rating System of the National Flood Insurance Program) Communities.	Yes
Bolivar	Strategy A1.1.1: Create new sidewalks and rain gardens to assist with storm water runoff as part of the Chesapeake Bay Watershed Initiative.	Complete	Rain Garden was installed in community park to capture runoff from pavilion. Training conducted and project was completed in September, 2013. A full report can be provided upon request from Matt Pennington, Region 9 Planning and Development Council. Following the demonstration project in the Bolivar park, the West Virginia Conservation District initiated a Rain Garden Rebate Program <a href="http://www.elksrunwatershed.org/residential-community-rain-garden-rebates/">http://www.elksrunwatershed.org/residential-community-rain-garden-rebates/</a> 2016 Update: Rachel Snively, Region 9, reported that the Rain Garden has been removed.	No
Charles Town	Strategy B1.1.1: Target areas for recreation that is interconnected with trails and parkland, beyond the required floodplain and wetland areas, and layout a strategy for green space protection.	Ongoing	West End plan was developed fall, 2014 that talks about a greenway for floodplain area. There is on-going discussion about parks and trails. Seth said that he is interested in finding out about the state's mitigation projects. More land has been acquired within the floodplain. A large swath of those lands are now in the possession of the city.	Yes
Charles Town	Strategy B1.1.2: Encourage the use of natural drainage swales over engineered storm water management channels where practical.	Ongoing	Charles Town is incorporating LID and capturing the first 1 inch rain event has included in the storm water ordinance. Ordinance was adopted July, 2015.	Yes

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Charles Town	Strategy B1.1.3: Work jointly with the City of Ranson on a storm water management project for Evitts Run Park.	Ongoing	Grant funding has been secured for this project and it is progressing.	Yes
Charles Town	Strategy B1.1.4: Place utilities underground as part of a street-scaping project.	Ongoing	2016 Update: Not able to achieve that on the Fairfax/George Street Project.	Yes
Charles Town	Strategy B2.1.1: Require special geotechnical exploration when locating large facilities such as schools, hospitals, community buildings, and other institutions. Ground penetrating radar, seismic and, electrical resistance surveys, and exploratory drilling are a few of the techniques currently used.	Ongoing	Acknowledged the technologies, but no progress.	Yes
Charles Town	Strategy B2.1.2: Establish a sinkhole management plan.	Ongoing	No progress on this strategy	Yes
Charles Town	Strategy B3.1.1: Cleanup SuperFund site located in or near the City of Charles Town.	Complete	Status: 2016 Update by Seth Revard-The Brownfield site is now remediated	No
Harpers Ferry	Strategy C1.1.1: Reroute an eight inch (8") water main near Elk Run, as the line is currently exposed in two (2) locations where it crosses Elk Run. The line is in danger of being broken by large debris in Elk Run in a flooding situation.	Ongoing	In 2016, Josh Carter, Harpers Ferry Water reported that this project is a part of the projected \$6.2 Million upgrade. Awaiting funding approval from USDA (first needs approval of Harpers Ferry National Park Service). Estimated time frame of at least 18 months from 2015. Harpers Ferry Water only uses the Potomac as a Back-up water source. Their main water source is the Elk Run.	Yes
Ranson	Strategy D1.1.1: Maintain green space to protect Flowing Springs and its floodplain.	Complete	reported by Andy Blake, 2016.	No
Ranson	Strategy D1.1.2: Work jointly with the City of Charles Town on a storm water management project for Evitts Run Park.	Complete & Ongoing	The two cities are collaborating and jointly applied for a grant.	Yes
Ranson	Strategy D2.1.1: Replace and upgrade water lines along Fairfax Boulevard as part of its upgrade and extension to Fairfax Crossing.	Complete	2015	No
Ranson	Strategy D2.1.2: Review the need for additional water towers.	Ongoing	2016-The city doesn't have water. They are looking at Jefferson Utilities and Charles Town to do an interconnection for emergencies.	Yes
Ranson	Strategy D3.1.1: Install fixed in place generators at City Hall and the police department that will power all computer systems	Complete	2015	No
Ranson	Strategy D4.1.1: Cleanup Brownfield site at the Kidde Plant.	Complete	2015	No
Shepherdstown	Strategy E1.1.1: Construct water tanks to increase water storage capabilities.	Complete	This project was completed in August, 2013.	No

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Shepherdstown	Strategy E1.1.2: Consider installing high service pumps at new water storage tanks.	Complete	This project was completed in September, 2012.	No
Shepherdstown	Strategy E1.1.3: Design and construct a new water plant with generator back-up power supply.	Complete & Ongoing	The bids are complete and the contractor will begin work in September, 2017.	Yes
Shepherdstown	Strategy E1.1.4: Expand sewage collection system.	Complete	Status: 2016 Update provided by Frank Welch: On Hold. Not Started. The Town is looking for a funding source for the project. E1.1.5 They are currently bidding out the replacement of water meters. (Approximately 1700), and will be installing meters that can be read from a truck. COMPLETE E. 1.1.6 Installing a replacement Pump Station at Cress Creek. COMPLETE	No

#### **4.0 THE 5-YEAR CYCLE**

This section describes how the custodial agency and the committee will monitor, evaluate, and update the plan. It describes the procedures by which they will keep the plan current. In addition, this section outlines the methods by which other plans can be integrated into hazard mitigation and vice versa.

Continued public involvement in the process of updating this plan is crucial, for this reason, the plan outlines how the committee will reach out to the public for their opinions and for education of hazard mitigation.

DRAFT

## 4.1 PLAN MAINTENANCE

§201.6(c)(4)(i)	[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.
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Jefferson County Homeland Security and Emergency Management and the steering committee have established a method for the systematic and periodic review of this document. JCHSEM, as the custodial agency, assumes responsibility for scheduling committee meetings, as necessary, and also serves as the point of contact for the committee and WVDHSEM during the 5-year cycle of this plan.

Jefferson County Homeland Security and Emergency Management (JCHSEM), the Core Planning Committee (CPC), and jurisdictions adopting this plan have established a method for the systematic and periodic review of this document. JCHSEM and the CPC will monitor the performance of the plan in several ways, such as analyzing social, technical, administrative, economic, and environmental criteria. Participating jurisdictions will also evaluate mitigation strategies as the chance to implement them arises. As part of the completion of the plan update, copies of the plan will be provided to all adjacent counties.

JCHSEM and the CPC will review the plan following major hazard events or substantial changes in land use planning or regulations that would impact the recommended mitigation projects. Such a meeting will be to determine the plan's effectiveness at determining hazard susceptibility areas. Finally, the team will discuss new mitigation strategies, quite possibly based on the most recent hazard event that could have lessened losses from the event. JCHSEM will be responsible for contacting all committee members prior to the updating process. During the intervals between meetings, JCHSEM will maintain a file of comments, questions, suggestions, etc. concerning the plan. JCHSEM and the CPC have decided to formally update this plan at five year intervals, as a result of this update, the plan will be resubmitted in 2023, 2028, etc.

JCHSEM shall meet on an annual basis to track the progress of the mitigation plan. The County Commission and JCHSEM will be responsible for tracking the progress of the implementing agencies and ensuring that the plan timeline is adhered to.

JCHSEM will serve as the coordinator of the updates. As such, JCHSEM will contact participating jurisdictions to schedule meetings, facilitate virtual or other discussions, obtain lists of completed projects, collect updated asset inventory data, etc. It is also significant to note that a number of meetings may be held as, and if, mitigation strategies are implemented, but such meetings would only anecdotally discuss this document (to ensure that projects to be implemented are included within). Further, such sections as [2.0 Risk Assessment](#) may be



reviewed and utilized for other planning processes, as it contains a comprehensive overview of hazard risks in Jefferson County at a macro level.

As mentioned above, the CPC will monitor the performance of the plan based on several criteria. For instance, the committee should consider revising mitigation strategies if it appears that the plan is failing according to one of the following measures (again, roughly corresponding to the STAPLEE method).

- **Social:** Has the public perceived that the project has positively lessened hazard-related losses? Has implementing the project adversely affected any segment of the population?
- **Technical:** Are the mitigation strategies proving to be technically feasible? Are the mitigation strategies eliminating problems rather than creating new, different problems?
- **Administrative/Legal:** Do the mitigation strategies conform to local, state, and federal policies as they are implemented?
- **Economic:** Has the cost/benefit ratio of implementing the project been acceptable? Has implementing a project adversely affected a particular segment of the local economy?
- **Environmental:** Does implementing mitigation strategies create any adverse environmental conditions? Do mitigation strategies represent sound environmental practices?

Other measures may be used to guide the discussions on the primary measures listed above. These measures include the following.

- **Ease of Implementation:** How smoothly has implementing the project (or similar types of projects) been? Have programs been readily available to assist in funding the implementation of the project (or similar types of projects)?
- **Cost Effectiveness:** Have sufficient funding sources been available to implement the project at a cost manageable by the local government? Have the costs of implementing the project been significantly less than the cumulative future costs potentially incurred by an un-corrected situation?
- **Political Impacts:** Has implementing a particular project (or type of project) been delayed due to the political consequences of its implementation?
- **Overall Positive Impacts:** Have local leaders generally agreed that implementing a particular project was beneficial to the community?

## 4.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS

§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.

To date, local policies have not hindered hazard mitigation efforts. The jurisdictions participating in this planning process have used a variety of funding to complete mitigation projects in the past, including the Hazard Mitigation Grant Program, Homeland Security Grant Program, Emergency Management Performance Grant, Community Development Block Grant, and local funding. Local government policies and programs have supported the use of this funding and, thus, the implementation of mitigation projects. Further, all participating government jurisdictions have demonstrated a capability to successfully implement and administer mitigation projects.

Certain departments of local government within the structures of the participating jurisdictions can offer valuable insight on hazard mitigation in a number of ways. For example, Jefferson County Planning not only supports updates to the county's comprehensive plan, it can serve as a technical resource for zoning and other similar issues. Further, it can ensure that the goals of the hazard mitigation plan, where appropriate, align with comprehensive planning goals.

There are a variety of plans that can serve as conduits through which mitigation actions can be implemented. During a committee meeting, members discussed the types of plans their agencies kept and how they could include mitigation actions or how the plans inform mitigation.

JEFFERSON COUNTY PLAN INTEGRATION		
<i>Agency/Plan Owner</i>	<i>Plan</i>	<i>Incorporation of Mitigation</i>
JC Planning and Zoning	Envision Jefferson 2035 Comprehensive Plan, 2015	
JC Health Department	Eastern Panhandle, 2016	
LEPC	Hazardous Materials Response Plan	
LEPC	Emergency Operations Plan	
LEPC	Commodity Flow Study, 2016	
LEPC	Propane Risk Assessment, 2012	
LEPC	Advanced Commodity Flow Study, 2017	
Various	Source Water Protection Plan	
Ranson	Comprehensive Plan	
Harpers Ferry	Comprehensive Plan, 2013	
Shepherdstown	Comprehensive Plan	
Bolivar	Comprehensive Plan, 2013	
LEPC	Tier II Assessment	
Charles Town	Comprehensive Plan, 2006	
JC Board of Education	Emergency Operations Plan	
Shepherd University	Emergency Operations Plan	

JEFFERSON COUNTY PLAN INTEGRATION		
<i>Agency/Plan Owner</i>	<i>Plan</i>	<i>Incorporation of Mitigation</i>
Hagerstown Eastern Panhandle Metropolitan Planning Organization	Long Range Transportation Plan, 2018	
Eastern Panhandle Transit Authority	Transit Development Plan, 2015	
Shepherdstown Fire	Community Risk Reduction Plan	
JC GIS	Address Compliance Program, 2017	
LEPC	Threat and Hazard Identification Risk Assessment	
HIDTA	HIDTA Baltimore-Washington Mapping	
JC Health Department & JC Ministries	Peer Recovery Coaches Program	

#### 4.3 CONTINUED PUBLIC INVOLVEMENT

§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.
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**DESCRIBE HOW THE PUBLIC WILL CONTINUE TO BE INVOLVED IN THE PLAN  
ACCORDING TO THE MAY 1, 2018 MEETING.**

DRAFT