Belmont County

2020 Hazard Mitigation Plan

Prepared By

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INTERNATIONAL

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SECTION 1. INTRODUCTION

The safety of Belmont County is a top priority, and planning for natural, technological, and man-made disasters is an important part of being proactive. Disasters can result in death, injuries, as well as significant damage to our communities, businesses, public infrastructure, and environment. The impacts of these damages result in the displacement of people and tremendous costs due to response and recovery dollars, economic loss, and burden. Belmont County Hazard Mitigation Plan (HMP) is an effort to mitigate the effects of hazards and return to normal operating status sooner with fewer impacts to people and infrastructure.

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. While disasters cannot be prevented from occurring, the effects can be reduced or eliminated through a well-organized public education and awareness effort, preparedness activities and mitigation actions.

After disasters, repairs and reconstruction are often completed in such a way as to simply restore to pre-disaster conditions. Such efforts expedite a return to normalcy; however, the replication of pre-disaster conditions results in a cycle of damage, reconstruction, and repeated damage. Hazard mitigation ensures that such cycles are broken and that post-disaster repairs and reconstruction result in increased resiliency for the County.

BACKGROUND AND PURPOSE

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more, as well as destroy or severely damage existing buildings, structures, infrastructure, and other facilities. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. Many disasters cause extreme burden to city governments, small communities and institutions throughout Ohio.

To reduce the community burden from the effects of all hazards, Belmont County, in partnership with an HMP consultant, developed the 2020 Hazard Mitigation Plan. This plan was developed in accordance with the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 provides the legislative basis for the Federal Emergency Management Agency (FEMA) hazard mitigation planning requirements and funding before and after a hazard event. FEMA requires that an HMP be updated every five years.

There have been 17 federal disaster declarations and 20 gubernatorial declarations documented in Belmont County since 1965, due to: severe storms, high winds, blizzards, snow storms and flooding. These recorded natural hazard events provide a hazard footprint across the region which helps mitigation planners understand hazards that could occur in and around Belmont County, and their associated risks to life and property. Understanding hazard risks provides a foundation for developing solutions to mitigate or eliminate potential impacts through public education and outreach, preparedness activities, and mitigation actions.

For those hazards that can be mitigated, the County must be prepared to implement efficient and effective short- and long-term actions where needed. The purpose of the 2020 HMP is to provide the County with a blueprint for hazard mitigation action planning. The plan identifies resources, information, and strategies for risk reduction, and acts as a tool to measure the success of mitigation implementation on a continual basis. The strategies identified in the updated HMP are developed with the following intentions:

- Risk reduction, through an all-hazards approach, creating a set of defined mitigation actions.
- Establishment of a basis for coordination and collaboration among participating agencies and public.
- Assisting in meeting the requirements of federal assistance programs.

The HMP does not supersede current plans and strategies, but rather enhances the community's ability to communicate and mitigate natural, technological, and manmade hazard risk. Information in this plan will be used to help guide and coordinate mitigation activities and decisions for staff and citizens. Proactive mitigation planning will help reduce the risk and cost of disaster response and recovery to the County and its residents, workers, and visitors by protecting critical facilities, reducing liability exposure, and minimizing overall impacts and disruptions from all hazards.

AUTHORITY

This plan was prepared pursuant to the requirements of the DMA 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act (DMA) or DMA 2000.)

While the DMA emphasizes the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations establish the requirements local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). As described in this plan, Belmont County is subject to many kinds of hazards; thus, access to these federal disaster assistance and hazard mitigation funding is vital to ensure a more resilient community.

PLAN ORGANIZATION

The HMP is organized into six sections to reflect the logical procession of activities undertaken to develop the plan and includes all relevant documentation required to meet the necessary criteria for FEMA approval. Each section is briefly described below.

- **Section 1.** Introduction describes the background and purpose of the plan, as well as the authority for development of the plan.

- **Section 2.** Community Profile describes Belmont County's history, geography, topography, climate, population, economy, housing, and land use and development trends.
- **Section 3.** The Planning Process describes the 10-Step HMP Planning Process, as well as the meetings and outreach activities undertaken to engage stakeholders.
- **Section 4.** Hazard Risk Assessment identifies and prioritizes all hazards affecting the County, and assesses the vulnerability from the identified hazards.
- **Section 5.** Mitigation Strategy identifies mitigation goals and objectives and identifies and prioritizes new mitigation actions.
- **Section 6.** Plan Implementation and Maintenance discusses plan adoption and implementation, as well as the process to monitor, evaluate, update, and maintain the HMP. This section also includes a discussion on continued public involvement.

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SECTION 2. COMMUNITY PROFILE

The Community Profile summarizes the County's history and existing environmental and socioeconomic conditions. Environmental and socioeconomic factors include geography, topography, climate, population, economic, land use and development trends.

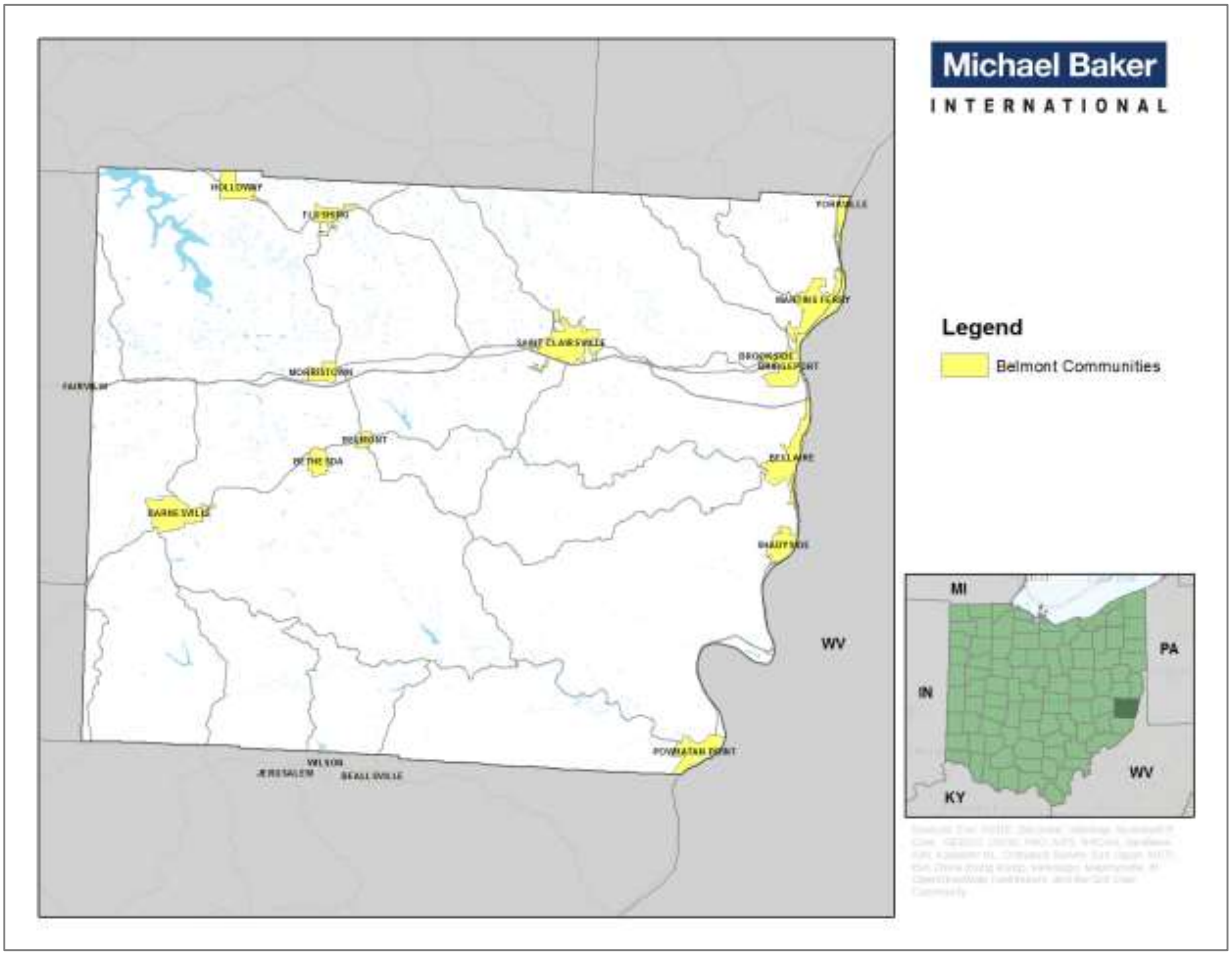
1. HISTORY OF BELMONT COUNTY

Belmont County was formed on September 1, 1801 with a population of only 11,097. The population peaked in the 1940s, with a total of 95,614.-Belmont County was one of Ohio's earliest counties. It originally was a county in the Northwest Territory. Residents named the county Belmont after the French term for "beautiful mountain." Thousands of settlers migrated westward through Belmont County along Zane's Trace. The National Road also passed through the county. Quakers were among the county's first residents and many of these people became outspoken critics of slavery, among them was the famous abolitionist Benjamin Lundy. Geography, Topography, and Climate

1.1 GEOGRAPHY

Belmont County is located on the eastern border of the state, with the Ohio River acting as the boundary between Ohio and West Virginia. The County covers approximately 541 square miles, 9.1 of which are water-based. Adjacent counties in Ohio include Harrison County, Jefferson County, Monroe County, Noble County, and Guernsey County. There are two bordering West Virginian counties: Ohio County and Marshall County.

FIGURE 1 BELMONT COUNTY, OHIO



1.2 TOPOGRAPHY

Belmont County is an area of Ohio that has numerous hills. Small streams run through the many valleys, draining to the Ohio River in the east. Because of the steep terrain in many places, agriculture is not as common as in other areas of the state, leaving a fair amount of forest cover. The number of hills leaves the County more susceptible to the effects of winter storms that can hinder transportation, geologic hazards such as landslides, and wildfires in the forested areas.

1.3 CLIMATE

The comfort index provides a general idea for how comfortable your time outdoors will be. The index is calculated on a number of weather factors, including temperature, probability of precipitation, humidity, wind speed, and cloud cover. The higher the comfort index, the more comfortable the climate is perceived by general populations across the U.S. One would expect to see a higher index with shirt-sleeve temperatures, minimal chances of rainfall, relatively low humidity, light winds, and fair skies. On the contrary, the lower the index values one would see cool, damp, and windy conditions.

TABLE 2-1 BELMONT COUNTY CLIMATE SUMMARY

Climate Measurements	Belmont County	United States
Avg. Annual Rainfall (in.)	42.5	39.2
Avg. Annual Snowfall (in.)	32.6	25.8
Avg. Annual Precipitation Days	88.9	102
Avg. Annual Sunny Days	163	205
Avg. Annual July High	82	86.1°F
Avg. Annual Jan. Low	19.5	22.6°F
Comfort Index (higher=better)	51	54
UV Index	3.4	4.3
Avg. Elevation FT.	1,107	1,443

2. POPULATION, OCCUPANCY, AND DEMOGRAPHICS

Population and demographic information provide baseline data about Belmont County. Maintaining and reviewing up-to-date data on demographics allows the County to better assess hazard magnitudes and develop more specific mitigation plans.

TABLE 2-2 COUNTY BASELINE DEMOGRAPHICS

Demographic Information	Total Count
Male	34,495
Female	33,010
Total Population	**67,505**
Race and ethnicity	**Residents**
White/Caucasian	63,050
Black or African American	2,903
Asian American	338
Hispanic	675
Two or More Races	1080
American Indian/ Alaskan Native	135
Native Hawaiian / Pacific Islander	0
Total	63,050
Previous Years' Populations	**Residents**
2017	68,889
2010	70,400
2000	70,226
1990	71,074
1980	82,569
1970	80,917
1960	83,864
1950	87,740

The County's residential population is 67,505 (US Census ACS Survey 2018). With a land total of 541 square miles, the population density is 125 people per square mile. The racial makeup of the County is approximately 93% White/Caucasian, 4% Black or African-American, 1% Hispanic or Latino, and 2% other races.

The following chart is a comprehensive list that details the actual population of the County in 2010, the American Community Survey estimate for 2018, the estimated change in population between 2010 and 2017, the total number of housing units, the number of housing units occupied, and the area (in square miles) for the municipality.

TABLE 2-3 COUNTY DEMOGRAPHIC PROFILE

Municipality	Total Count
2010 Population	70,400
2017 Population Estimate	67,505
Population Change 2010 – 2015	-4.1%
Total Housing Units	32,155
Occupied Housing Units	20,414
Vacant Housing Units	6,496

TABLE 2-4 INCORPORATED POPULATION

Community	Population
City of Martins Ferry	6,747
City of St. Clairsville	5,092
Barnesville	3,806
Bellaire	4,170
Belmont	393
Bethesda	1,293
Bridgeport	1,831
Brookside	695
Flushing	790
Holloway	306
Morristown	251
Powhatan Point	1,565
Shadyside	3,674
Yorkville	1,140
Total Incorporated Population	31,753
Unincorporated Belmont County	37,136

2.1 EFFECTS OF POPULATION CHANGE ON MITIGATION

Housing occupancy impacts the community's overall resilience during and following a disaster. Well-maintained homes are less likely to contribute to damage and debris during hazard events. Vacant homes are more like to sustain heavy damage during events such as thunderstorms, high winds, tornadoes, and winter storms.

When vacant homes deteriorate, they become more easily damaged or destroyed during hazard events (specifically high winds, thunderstorms, and tornadoes). The building materials from the homes can become projectiles and wind-borne debris, injuring people and damaging vehicles and structures, and causing a more difficult response and recovery. As communities within the planning area experience a population decline, blighted properties become a more and more significant issue.

Because the population has been decreasing for several decades, there would appear to be fewer people who are susceptible to hazards. However, that is not how it works out in reality. Belmont County has an increasingly-aging population, which leaves those in the county *more* susceptible to hazard events, particularly when additional shelter is required. Hazards such as extreme temperatures, tornadoes, severe winter storms, and severe summer storms can cause power outages that can cause the losses of heating and cooling, putting the elderly and the very young most at risk.

2.2 EMPLOYMENT

According to the United States Census Bureau Longitudinal Employer-Household Dynamics (LEHD), there are a total of 23,021 persons employed in the County workforce as of 2015. The North American Industry Classification Systems keeps track of jobs based on census blocks. Retail trade makes up 16.6% of the jobs in the County, followed closely by Health Care and Social Assistance at 16.3%. The next closest is Mining, Quarrying, and Oil and Gas Extraction at 11.2%.

It is expected that commercial development will continue to saturate more urban areas like the City of Martins Ferry and the villages throughout the next 25 years. One reason is that the retail and service market is far from being saturated in the City of Martins Ferry and in the villages. Another reason is that high transportation costs which are expected to continue to rise are keeping more travelers closer to home and in their search for goods and services

TABLE 2-5 NAICS JOB INVENTORY

Industry	Count	Share
Agriculture, Forestry, Fishing and Hunting	30	0.10%
Mining, Quarrying, and Oil and Gas Extraction	2,572	11.20%
Utilities	166	0.70%
Construction	1,154	5.00%
Manufacturing	931	4.00%
Wholesale Trade	744	3.20%
Retail Trade	3,825	16.60%
Transportation and Warehousing	738	3.20%
Information	369	1.60%
Finance and Insurance	753	3.30%
Real Estate and Rental and Leasing	325	1.40%
Professional, Scientific, and Technical Services	525	2.30%
Management of Companies and Enterprises	13	0.10%
Administration & Support, Waste Management and Remediation	1,020	4.40%
Educational Services	1,776	7.70%
Health Care and Social Assistance	3,744	16.30%
Arts, Entertainment, and Recreation	110	0.50%
Accommodation and Food Services	2,516	10.90%
Other Services (excluding Public Administration)	710	3.10%
Public Administration	1,000	4.30%
TOTAL	**23,021**	**100%**

2.3 EFFECTS OF EMPLOYMENT ON MITIGATION PLANNING

Employment, like housing, can influence mitigation planning and disaster events. This is because employment is tied directly to housing and community stability. Many small towns in rural areas are heavily reliant on a particular company or industry. When these disappear or take on a reduced role, the effects can be an economic downturn, resulting in blighted properties.

2.4 LAND USE AND FUTURE DEVELOPMENT AREAS

Very little new development or redevelopment has taken place in the County since the previous HMP. Members of the community completed a Risk Evaluation to determine how they perceived their change in vulnerability to each hazard in comparison to development trends and larger factors. Each community’s future development form is available in Appendix D.

SECTION 3. THE PLANNING PROCESS

This section describes each stage of the planning process used to develop the 2020 HMP. The planning process provides a framework for document development and follows the FEMA recommended steps. The 2020 HMP follows a prescribed series of planning steps which includes organizing resources, assessing risk, developing the mitigation plan, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan for approval. Each is described in this section.

1. PLANNING PROCESS

Hazard mitigation planning in the United States is guided by the statutory regulations described in the DMA 2000 and implemented through 44 Code of Federal Regulations (CFR) Part 201 and 206. FEMA's HMP guidelines outline a four-step planning process for the development and approval of HMPs. Table 3-1 lists the specific CFR excerpts that identify the requirements for approval.

TABLE 3-1 DMA 2000 CFR PLANNING PROCESS

DMA 2000 (44 CFR 201.6)	HMP Plan Section
(1) Organize Resources	**Section 3**
201.6(c)(1)	Organize to prepare the plan
201.6(b)(1)	Involve the public
201.6(b)(2) and (3)	Coordinate with other agencies
(2) Assess Risks	**Section 4**
201.6(c)(2)(i)	Assess the hazard
201.6(c)(2)(ii) and (iii)	Assess the problem
(3) Develop the Mitigation Plan	**Section 5**
201.6(c)(3)(i)	Set goals
201.6(c)(3)(ii)	Review possible activities (actions)
201.6(c)(3)(iii)	Draft an action plan
(4) Plan Maintenance	**Section 6**
201.6(c)(5)	Adopt the plan
201.6(c)(4)	Implement, evaluate, and revise

For the development of the 2020 HMP, a planning process was customized to address the unique population and demographic. All basic federal guidance documents and regulations are met through the customized process. As shown in Figure 2, the HMP planning process (and documented in the corresponding sections) included organizing resources, assessing risk, developing the mitigation action strategy, drafting the plan, reviewing and revising the plan, and adopting and submitting the plan.

FIGURE 2 MITIGATION PLANNING PROCESS

2. ORGANIZE RESOURCES

Organizing the resources consists of planning team development and document review tasks.

3. BUILDING THE PLANNING TEAM

The Planning Team, key to the back bone of the planning process, was critical for the development of the 2020 HMP. The planning team was built by Belmont County, who invited private and non-profit agencies, as well as members of the consultant team. This group was known as the Hazard Mitigation Planning Committee (HMPC).

4. HAZARD MITIGATION PLANNING COMMITTEE

The 2020 HMPC consisted of key decision makers in specific County functions. The committee included stakeholders who actively participated in the planning process. Planning processes included:

- A series of structured coordination meetings
- Collection of valuable local information and other requested data
- Decisions on plan process and content
- Development of mitigation actions for the HMP

- Review and comment on plan drafts
- Coordination of the public input process

The preparation of the 2020 HMP required a series of meetings and workshops intended to facilitate discussion and initiate data collection efforts with local community officials. More importantly, the meetings and workshops prompted continuous input and feedback from local officials throughout the update process.

A range of stakeholders, including neighboring communities, businesses, nonprofits, and other interested parties were invited and encouraged to participate in the development of the Plan. These stakeholders included the adjacent counties of Harrison, Jefferson, Ohio, Marshall, Monroe, Noble, and Guernsey, the Red Cross, Ohio University, Belmont College, and local businesses. Stakeholder involvement was encouraged through the County's invitations to agencies and individuals to participate in Mitigation Planning Committee meetings and the Mitigation Solutions Workshop. Table 3-2 provides a list of the 2020 HMP Planning Committee members.

TABLE 3-2 2020 HMP PLANNING COMMITTEE

Name	Department	Title / Role	Meeting(s) Attended
Allan Ketzell	Brookside Council	Council President	1, 2, 3
Roger Deal	Barnesville	Village Administrator	2
Angela Hannahs	Barnesville EVSD	Supervisor	1
Megan Phillips	Barnesville PD	Police Officer	1
Vince DiFabrizio	Bellaire	Mayor	3
Stanley Sobel	Belmont	Mayor	3
David Kurucz	Belmont College	Maintenance Supervisor	1
John Koucoumaris	Belmont College	V.P. Admin. Affairs	1
Jack Regis	Belmont County	Facilities Manager	1
Jerry Echemann	Belmont County	Commissioner	2
Dave Ivan	Belmont County EMA	Director	1, 2, 3
Glenn Trudo	Belmont County EMA	Deputy Director	1, 2, 3
Daniel Boltz	Belmont County Engineers Office	Asst. Belmont Co. Engineer	1
Dirk Davis	Bethesda	Administrator	3
Mike Slaga	Bridgeport	Street/Sanitation Supervisor	3
Angelo Vincenzo	Flushing	Mayor	2
Bryan Clark	Flushing	Village Administrator	Individually
Robert Krajnyak	Martins Ferry	Mayor	2
Scott Porter	Martins Ferry	Service Director	2, 3
Matt Merryman	Mead Township	Trustee	2
Phil Keevert	Monroe County EMA	Emergency Manager	1
Heather Stitt	Morristown	Mayor	3
Chasity Schmelzeubal	Noble County EMA	Director	1
Halley Rossiter	Noble County EMA	Administrative Asst.	1

Name	Department	Title / Role	Meeting(s) Attended
Jill Harris	Ohio University	Emergency Manager	1
Warren Galbraith	Ohio University Eastern	Interim Associate Director	1
Jeff Haught	Powhatan Point	Mayor	3
James Zucal	St. Clairsville	Service Director	1
Robert Newhart	Shadyside	Mayor	3
Ronald Duvall	Smith Township	Trustee	2
Rich Schoene	Belmont Harrison Vocational School District	Superintendent	1
Paul Kceuzig	Washington Twp	Trustee	1
Curtis Wisvari	York Township	Trustee	2
Karen Vargo	Yorkville	Mayor	3

4.1 PLANNING COMMITTEE MEETINGS

The HMPC met throughout the development of the updated HMP document. Table 3-3 provides a summary of the meetings conducted throughout the planning process, including meeting date, type, and topics discussed.

TABLE 3-3 MEETING SUMMARY

Date	Meeting Type	Topics
March 8, 2019	Internal Kickoff (Steering Committee)	• Review of Mitigation Planning Standards • Schedule & Meetings • Participation • Relevant Data and Documentation • Questions and Next Steps
May 7, 2019	Planning Committee Meeting #1	• Planning Committee Introductions • Hazard Mitigation Planning Process • Hazard Identification & Risk Assessment (HIRA) Exercise • Develop Mitigation Goals & Objectives
July 23, 2019	Planning Committee Meeting #2	• Review of Planning Process • Review of HIRA • Review Mitigation Techniques ○ Categories of Action • Develop Mitigation Actions • Develop Mitigation Actions Plan
September 24, 2019	Open House	• Communities came in on an as-needed basis to provide required material

TABLE 3-4 JURISDICTIONAL PARTICIPATION

Jurisdiction	Meeting Participants					Documentation Provided				2019 Status
	Meeting 1	*Meeting 2*	*Open House*	*Ind. Meeting*	*Any Meeting*	*Risk Evaluation*	*Capability Assessment*	*Update on Previous Action*	*New Action*	*COMPLETE*
Belmont County	O	O	O	-	O	O	O	O	O	O
Martins Ferry	X	O	O	-	O	O	O	O	O	O
St. Clairsville	O	O	O	-	O	O	O	O	O	O
Barnesville	O	O	O	-	O	O	O	O	O	O
Bellaire	X	X	O	-	O	O	O	O	O	O
Belmont	X	X	O	-	O	O	O	O	O	O
Bethesda	X	X	O	-	O	O	O	O	O	O
Bridgeport	X	X	O	-	O	O	O	O	O	O
Brookside	O	O	O	-	O	O	O	O	O	O
Flushing	X	O	-	O	O	O	O	O	O	O
Holloway	X	O	-	-	O	O	O	O	O	O
Morristown	X	X	O	-	O	O	O	O	O	O
Powhatan Point	X	X	O	-	O	O	O	O	O	O
Shadyside	X	X	O	-	O	O	O	O	O	O
Yorkville	X	X	O	-	O	O	O	O	O	O

4.2 PUBLIC OUTREACH STRATEGY

Public outreach is a major component of the 2020 HMP. Participation from the public, including the general citizenry, is necessary in order to gain a full picture of the potential issues and hazards that affect the County.

Outreach Media

The Outreach Strategy used several methods for communicating information about the planning process to the public.

May 5, 2019: The first was an advertisement placed in the Times Leader on May 5, 2019. Stakeholders also received emails and phone calls directly from the County representatives. Direct emails to communities were the most common and effective form of communication for the County.

July 15, 2019: The County EMA sent out a message to all communities encouraging them to send in their materials as soon as possible to the contractors and that another meeting would be taking place to go over the Mitigation Strategy.

September 24, 2019: Belmont County held an 8-hour Open House to garner additional jurisdictional participation. This allowed communities to come in throughout the day to learn about the mitigation process and to provide input. Prior to the Open House, an email was sent to all communities letting them know this was their final opportunity for input. Numerous phone calls were made by the County EMA director on the day to ensure that all needed participants were coming.

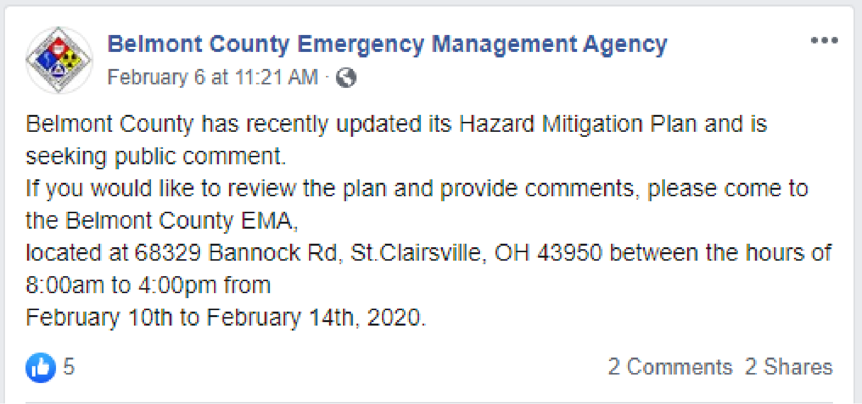
4.3 DRAFT PLAN COMMENTS RECEIVED

The plan was posted at the Belmont County EMA between February 10 and 14, 2020 for public review. A Facebook post was made informing the public of this timeframe and if they would like to provide comments. A public notice was also placed in the Times Leader newspaper.

No comments were received from the public.

Comments were provided by EMA staff throughout the plan, consisting of grammatical, format, and minor content changes. These were incorporated into the final plan.

FIGURE 3 FEBRUARY 6, 2020 PUBLIC PARTICIPATION NOTIFICATION



Belmont County Emergency Management Agency
February 6 at 11:21 AM ·

Belmont County has recently updated its Hazard Mitigation Plan and is seeking public comment.
If you would like to review the plan and provide comments, please come to the Belmont County EMA,
located at 68329 Bannock Rd, St.Clairsville, OH 43950 between the hours of 8:00am to 4:00pm from
February 10th to February 14th, 2020.

4.4 REVIEW AND INCORPORATE EXISTING INFORMATION

The HMP Planning Committee reviewed and assessed existing plans, studies, and data available from local, state, and federal sources. Documents reviewed and incorporated as part of the HMP planning process are shown in Table 3-5.

TABLE 3-5 EXISTING PLANS, STUDIES, REPORTS, AND TECHNICAL DATA

Existing Plans, Studies, Reports, and Other Technical Data/Information	Planning Process / Area of Document Inclusion
2012 Belmont County Hazard Mitigation Plan	Used to assist with problem identification, mitigation goals, strategies and actions. Information from the previous plan was used for past data
Ohio Enhanced Mitigation Plan	This plan was consulted to assist with background information and hazard identification
FEMA Hazard Mitigation How-to Guides	2012 Hazard Mitigation Plan Development
FEMA Local Mitigation Planning Handbook	Local Plan Integration Methods
FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013	Mitigation Strategy Development
NOAA Record Storm Events	Death and Injuries Report for past storm and disaster events
Department of Homeland Security GIS Hub	Spatial Data for critical facilities

4.5 ASSESS RISKS

In accordance with FEMA requirements, the 2020 HMP Planning Committee identified and prioritized the natural, technological, and man-made hazards affecting the County and assessed the vulnerability from them. Results from this phase of the HMP planning process aided subsequent identification of appropriate mitigation actions to reduce risk in specific locations from hazards. This phase of the HMP planning process is detailed in Section 4.

Identify/Profile Hazards

Based on a review of past hazards, as well as a review of the existing plans, reports, and other technical studies/data/information, the 2020 HMPC developed and identified a list of hazards that could affect the County. Content for each hazard profile is provided in Section 4.

Assess Vulnerabilities

Hazard profiling exposes the unique characteristics of individual hazards and begins the process of determining which areas within the County are vulnerable to specific hazard events. Using these methodologies, vulnerable populations, infrastructure, and potential loss estimates impacted by each hazard were determined. Detailed information on vulnerability assessment for each hazard is provided in Section 4.

4.6 DEVELOP MITIGATION PLAN

The 2020 HMP was prepared in accordance with DMA 2000 and FEMA's HMP guidance documents. This document provides an explicit strategy and blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and the County's ability to expand on and improve these existing tools. Developing the mitigation plan involved identifying goals, assessing existing capabilities, and identifying mitigation actions. This step of the HMP planning process is detailed in Section 5 and summarized below.

Identify Goals

The HMPC developed goals and objectives for the 2020 HMP based on current information. The Goals and Objectives that were developed are presented in Section 5.

Develop Capability Assessment

A Capability Assessment is a comprehensive review of all the various mitigation capabilities and tools currently available to the County to implement the mitigation actions that are prescribed in the 2020 HMP. The HMPC identified the technical, financial, and administrative capabilities to implement mitigation actions, as detailed in Section 5.

Identify Mitigation Actions

As part of the 2020 HMP planning process, the HMPC worked to identify and develop mitigation actions with implementation elements. Mitigation actions were prioritized and detailed implementation strategies were developed during Planning Committee Meeting #2, as well as after the meeting. A detailed approach of the review of the existing mitigation actions, identification, and prioritization of new mitigation actions, and the creation of the implementation strategy is provided in Section 5.

Draft HMP

Once the risk assessment and mitigation strategy were completed, information, data, and associated narratives were compiled into the 2020 HMP.

Plan Review and Revision

The plan was reviewed both internally by the County and by external stakeholders. All comments were incorporated into the final version of the plan.

Regional Approval

[This section will be completed after approval by FEMA Region V]

Plan Maintenance

Plan maintenance procedures, found in Section 6, include the measures the County will take to ensure the HMP's continuous long-term implementation. The procedures also include the way the HMP will be regularly monitored, reported upon, evaluated, and updated to remain a current and meaningful planning document.

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SECTION 4. HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)

Hazard Identification and Risk Assessment is the process of measuring the potential impact to life, property and the economy resulting from natural, technological, and man-made hazards. The intent of the risk assessment is to identify, as much as practical given existing/available data, the qualitative and quantitative vulnerabilities of a community. The results of the risk assessment provide a framework for a better understanding of potential impacts to the community and a foundation on which to develop and prioritize mitigation actions (see Section 5). Mitigation actions can reduce damage from all disasters and an implementation strategy can direct scarce resources to areas of greatest vulnerability described in this section.

This risk assessment follows the methodology described in FEMA publication, *Understanding Your Risks—Identifying Hazards and Estimating Losses (FEMA 386-2, 2002),* which outlines a four-step process:

1) Identify Hazards

2) Profile Hazard Events

3) Inventory Assets

4) Estimate Losses

Information gathered during the planning process related to the above four steps are incorporated into the following discussions in this chapter.

This section identifies and prioritizes the identified natural, technological, and man-made hazards that threaten the County. The reasoning for omitting some hazards from further consideration is also provided in this discussion.

Section 4, Sub-sections 1 through 14 The Hazard Profiles describe each of the hazards that pose a threat to the County. Information includes the location, extent/magnitude/severity, previous occurrences, and the likelihood of future occurrences.

Each hazard profile includes a Vulnerability Assessment, which presents the County’s exposure to natural and man-made hazards, identifying at-risk populations and assets, including critical facilities. Where the information was available, potential dollar loss estimates for facilities are provided to show a partial representation of the financial cost of a disaster.

IDENTIFYING THE HAZARDS

Per FEMA Guidance, the first step in developing the Risk Assessment is identifying the hazards. The HMP Planning Committee reviewed several previously prepared hazard mitigation plans and other relevant documents to determine the universe of all-hazards planning with respect to the County.

Hazards were ranked in order to provide structure and prioritize the mitigation goals and actions discussed in this plan. Ranking was both quantitative and qualitative. The quantitative analysis considered all the information available, including GIS data and official government records. Then, a qualitative approach, the Risk Factor (RF) approach, was used to provide a ranking on the specific risks associated with each hazard. This process can also be a valuable cross-check or validation of the quantitative analysis performed.

The RF approach combines historical data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. During the planning process, the HMPC compared the results of the hazard profile against their local and historical knowledge to generate a set of ranking criteria. These criteria were used to evaluate hazards and identify the highest risk hazard.

RF values are obtained by assigning varying degrees of risk to five categories for each hazard: probability, impact, spatial extent, warning time, and duration. Each degree of risk is assigned a value ranging from 1 to 4 and a weighing factor for each category was agreed upon by the HMPC. To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation below:

TABLE 4-1 RISK FACTOR CRITERIA

Risk Assessment Category	Level	Degree of Risk Level	Index	Weight
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	**Unlikely**	Less Than 1% Annual Probability	**1**	**30%**
	Possible	Between 1 & 10% Annual Probability	**2**	
	Likely	Between 10 &100% Annual Probability	**3**	
	Highly Likely	100% Annual Probability	**4**	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	**Minor**	Very few injuries, if any. Only minor property damage & minimal disruption of quality of life. Temporary shutdown of critical facilities.	**1**	**30%**
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	**2**	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	**3**	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	**4**	
Geographic Location *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	**Negligible**	Less Than 1% Of Area Affected	**1**	**20%**
	Small	Between 1 & 10% Of Area Affected	**2**	
	Moderate	Between 10 & 50% Of Area Affected	**3**	
	Large	Between 50 & 100% Of Area Affected	**4**	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**More than 24 HRS**	Self-Defined	**1**	**10%**
	12 to 24 HRS	Self-Defined	**2**	
	6 to 12 HRS	Self-Defined	**3**	
	Less than 6 HRS	Self-Defined	**4**	
DURATION *How long does the hazard event usually last?*	**Less than 6 HRS**	Self-Defined	**1**	**10%**
	Less than 24 HRS	Self-Defined	**2**	
	Less than 1 week	Self-Defined	**3**	
	More than 1 week	Self-Defined	**4**	

RF Value = [(Probability x .30) + (Impact x .30) + (Geographic Location x .20) + (Warning Time x .10) + (Duration x .10)]

According to the default weighting scheme applied, the highest possible RF value is 4.0. The methodology illustrated above lists categories that are used to calculate the variables for the RF value.

Table 4-2 provides the risk factor that details the hazards profiled in this plan, as well as the numerical value assigned to that hazard. That Risk Factor is developed through assessing the probability, impact, spatial extent, warning time, and duration of each hazard type.

TABLE 4-2 BELMONT COUNTY RISK FACTOR HAZARDS

Natural Hazards		Probability		Impact		Spatial Extent		Warning Time		Duration		RF Factor
1	Landslide	**4**	1.2	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**3.5**
2	Extreme Temperatures	**4**	1.2	**3**	0.9	**4**	0.8	**1**	0.1	**4**	0.4	**3.4**
3	Flooding	**4**	1.2	**3**	0.9	**2**	0.4	**3**	0.3	**4**	0.4	**3.2**
4	Severe Winter Storms	**4**	1.2	**2**	0.6	**4**	0.8	**1**	0.1	**3**	0.3	**3**
5	Severe Thunderstorms	**4**	1.2	**2**	0.6	**4**	0.8	**1**	0.1	**2**	0.2	**2.9**
6	Drought	**2**	0.6	**1**	0.3	**4**	0.8	**4**	0.4	**4**	0.4	**2.5**
7	Tornado	**2**	0.6	**1**	0.3	**1**	0.2	**4**	0.4	**4**	0.4	**1.9**
8	Wildfire	**2**	0.6	**1**	0.3	**1**	0.2	**4**	0.4	**2**	0.2	**1.7**
9	Seismic Activity	**1**	0.3	**1**	0.3	**2**	0.4	**4**	0.4	**2**	0.2	**1.6**
Technological Hazards		**Probability**		**Impact**		**Spatial Extent**		**Warning Time**		**Duration**		**RF Factor**
1	Hazardous Materials	**4**	1.2	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**3.5**
2	Dam Failure	**2**	0.6	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**2.9**
3	Epidemic	**2**	0.6	**2**	0.6	**4**	0.8	**4**	0.4	**4**	0.4	**2.8**
4	Terrorism	**1**	0.3	**4**	1.2	**2**	0.4	**4**	0.4	**4**	0.4	**2.7**
5	Mine Subsidence	**2**	0.6	**1**	0.3	**4**	0.8	**4**	0.4	**3**	0.3	**2.4**

Table 4-3 shows the hazards that are included in the State of Ohio's HMP, and those hazards covered in the previous version of the plan, implemented in 2013. For this plan update, several hazards are combined.

TABLE 4-3 HAZARDS INCLUDED IN THE 2020 PLAN UPDATE

Hazard Addressed	Ohio HMP	Belmont 2013	Belmont 2020	Notes
Coastal Erosion	O	X	X	There are no coastal areas in Belmont County
Dam Failure	O	O	O	
Levee Failure	O	O	X	The previous plan discussed dams and levees as one unit. This plan separates them. There are no levees in Belmont County.
Drought	O	O	O	
Earthquake	O	O	O	Now called "Seismic Activity"
Extreme Temperatures	X	O	O	

Hazard Addressed	Ohio HMP	Belmont 2013	Belmont 2020	Notes
Flood	O	O	O	
Infestations	O	O	X	Infestations are not a primary concern for Belmont County
Land Subsidence	O	O	O	
Landslide	O	O	O	
Mine Subsidence	X	X	O	
Seiche/Coastal Flooding	O	X	X	There are no coastal areas in the County
Terrorism	X	X	O	
Thunderstorm / Winds	O	O	O	Changed name to “Severe Thunderstorms”
Tornado	O	O	O	
Wildfire	O	O	X	
Severe Winter Storm	O	O	O	
Severe Thunderstorms	O	O	O	

Previous hazard occurrences were used to validate existing hazards and identify new hazard risks. Previous hazard occurrences provide a historical view of hazard risk, and a window into potential hazards that can affect Belmont County and its population in the future. Information about Federal and State disaster declarations in the County was compiled from FEMA and Ohio databases, as shown in the table below. According to the OEMA, to date Belmont County has been a part of 19 disaster declarations, 13 of which received public assistance dollars; 6 have received individual assistance.

TABLE 4-4 DECLARED DISASTERS AFFECTING BELMONT COUNTY (OEMA, FEMA)

Disaster Number	Declaration Date	Title	Public Assistance	Individual Assistance
DR-4424	4/8/2019	Severe Storms, Flooding, and Landslides	$7,222,396 obligated to date	-
DR-4360	4/17/2018	Severe Storms, Landslides, And Mudslides	$5,115,719 awarded to date	-
DR-4077	8/20/2012	Severe Storms and Straight-Line Winds	$128,533	-
EM-3346	6/30/2012	Severe Storms	-	-
DR-4002	7/13/2011	Severe Storms and Flooding	$1,143,503	-
DR-1580	2/15/2005	Severe Winter Storms, Flooding, And Mudslides	$5,867,974	$252,029
DR-1556	9/19/2004	Severe Storms and Flooding	$9,851,192	$6,236,004
DR-1507	1/26/2004	Severe Storms, Flooding, Mudslides, And Landslides	$4,577,700	$112,880
DR-1453	3/14/2003	Severe Winter Storm and Record/Near Record Snow	$933,571	-
DR-1227	6/30/1998	Severe Storms, Flooding, And Tornadoes	$715,963	$446,153
DR-1122	6/24/1996	Flooding	$365,096	-

Disaster Number	Declaration Date	Title	Public Assistance	Individual Assistance
DR-1097	1/27/1996	Severe Storms and Flooding	$891,632	$539,841
DR-951	8/4/1992	Severe Storms, Tornadoes & Flooding	$458,072	-
DR-870	6/6/1990	Severe Storms, Tornadoes & Flooding	$2,276,532	25 Counties total received $4,331,497. Belmont's total unavailable.
DR-630	8/23/1980	Severe Storms & Flooding	-	-
EM-3055	1/26/1978	Blizzards & Snowstorms	-	-
EM-3029	2/2/1977	Snowstorms	-	-
DR-480	9/11/1975	Winds, Tornadoes, Heavy Rains & Flooding	-	-
DR-345	7/19/1972	Tropical Storm Agnes	-	-

Based on the review of hazards identified in similar and relevant documents, previous incidents, historical knowledge of localized events, and hazard trends, the HMPC identified a total of 14 hazards. There were 9 natural hazards which included, Landslide, Extreme Temperatures, Flooding, Severe Winter Storms, Severe Thunderstorms, Drought, Tornado, Wildfire, and Seismic Activity. There were 4 technological or man-made hazards including terrorism, dam failure, mine subsidence, and hazardous materials incidents. Stream erosion was combined with flooding.

HAZARD EVENT DATA

A variety of information sources were consulted in developing the hazard profiles within this plan, including data from the National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC), and the regional National Weather Service (NWS) locations. Data is largely available at a countywide scale, but often have jurisdictional-level detail, as well.

EVENT NARRATIVES

Within each hazard's section there are a series of narratives that provide greater detail into specific events that have impacted the County. This section (Historical Occurrences or in some cases Hazard Events/Historical Occurrences) is not meant to be a comprehensive list of events that have occurred in Belmont County. Rather, these incidents are included to provide context as to why this hazard was included in the plan.

HAZARD PROFILES

Hazards are profiled individually in this section in order of priority. The profiles in this section provide a baseline definition and description in relation to Belmont County. Hazard profiles are used to develop a vulnerability assessment, where hazard vulnerability to the community is quantified in terms of population and assets affected for each hazard deemed significant by the Planning Committee.

For those hazards that are technological or man-made, additional details within each profile's summary have been included that briefly discuss mitigation best practices, as these hazards are not included in standard mitigation handbooks.

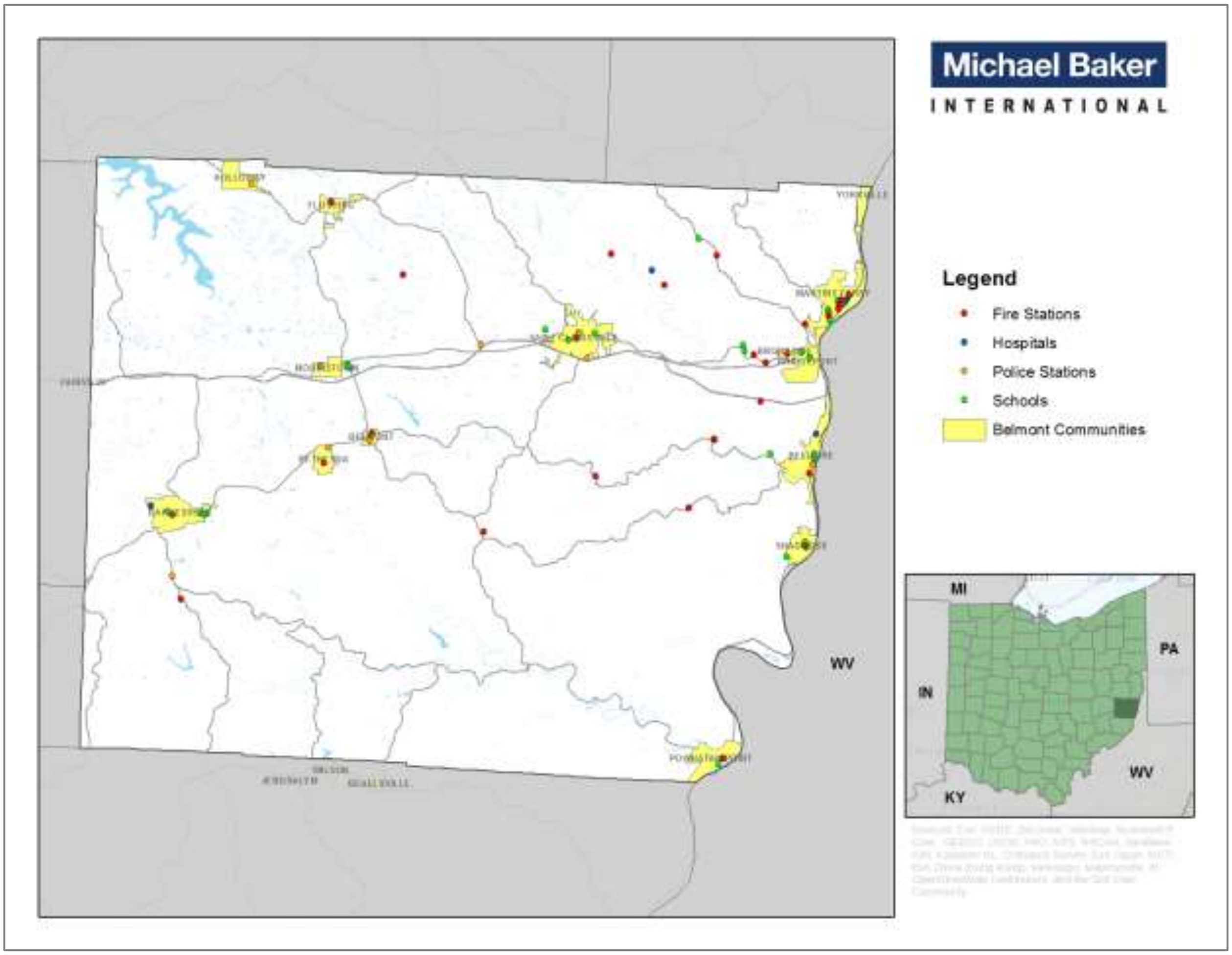
CRITICAL FACILITIES

The Planning Committee identified the types of structures that they consider to be "critical" to the day-to-day operations of the County. This includes educational centers, fire stations, medical facilities, and law enforcement stations. There is a total of 83 critical facilities in Belmont County. A map of County critical facilities can be found in Figure 4.

TABLE 4-5 COUNTY CRITICAL FACILITIES COST ESTIMATES (BELMONT CONTY AUDITOR)

Category	Number	Total Cost	1% Loss	5% Loss
Education	35	$161,507,837	$1,615,078	$8,075,391
Fire Station	27	$39,000,000	$390,000	$1,950,000
Medical	4	$36,750,000	$367,500	$1,837,500
Police	17	$24,990,000	$249,900	$1,249,500
CRIT. FACILITY TOTAL	83	$262,247,837	$2,622,478	$13,112,391

FIGURE 4 COUNTY CRITICAL FACILITIES



Natural Hazards

1. LANDSLIDES

1.1 LANDSLIDE CHARACTERISTICS

"Landslide" refers to a sudden movement of landmass downhill. This movement is typically sudden and unexpected. Landslides can occur with little to no warning, though oftentimes, they are coupled with other hazard events such as heavy rains or earthquakes. Landslides rarely happen on their own without a primary cause.

FIGURE 5 LANDSLIDE IN BELMONT COUNTY, 2018

1.2 LOCATION

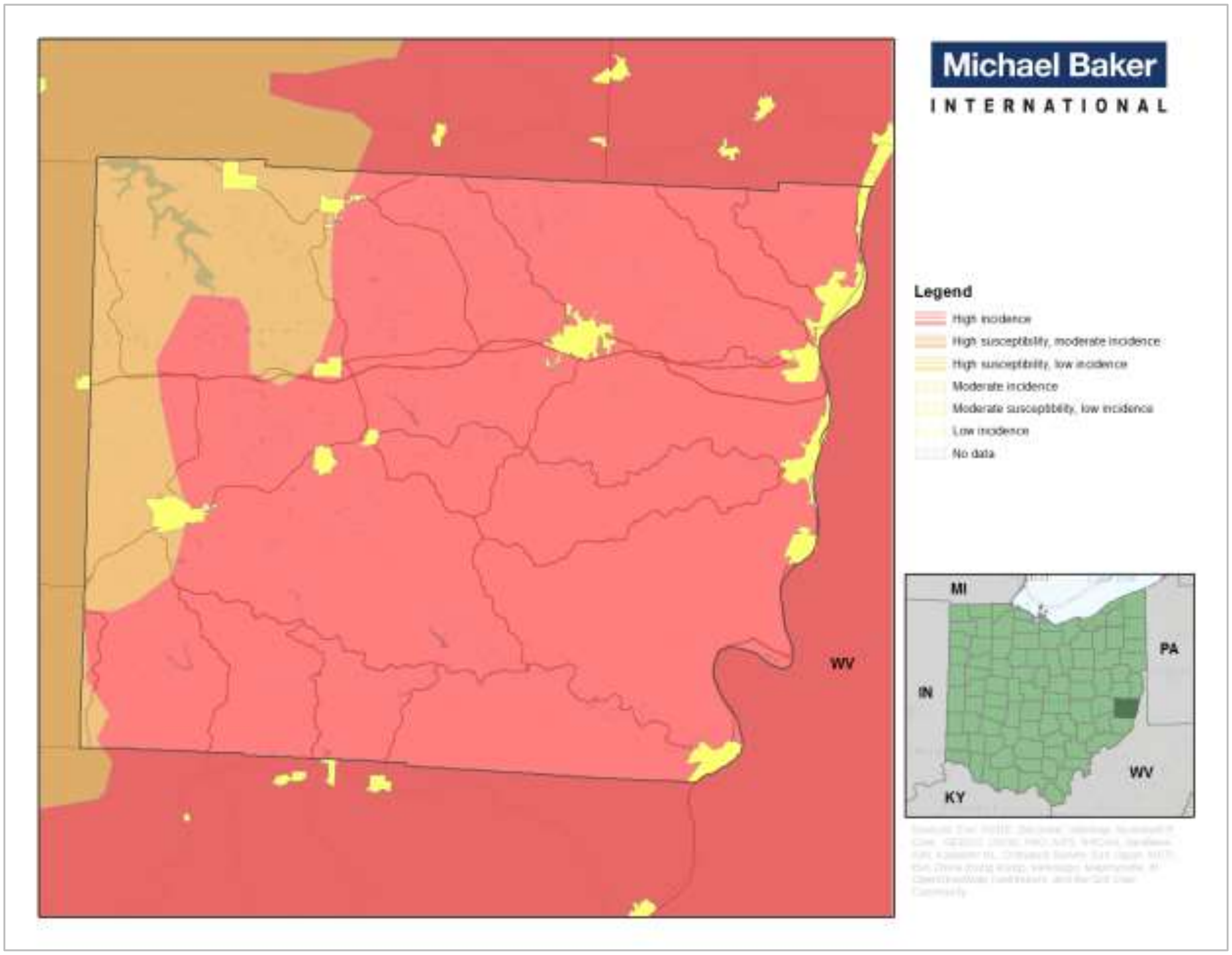
Belmont County, located in Eastern Ohio, has high susceptibility to the landslide hazard. However, Southeast Ohio has by far the highest concentration of landslides throughout the state. Landslides occur primarily in colluvial (loose) soil and old landslide debris on steep slopes. Most major and minor highways have sections cut in rock or soil that can fail. Steep mountain slopes across the state have experienced debris avalanches associated with extreme rainfall or rain-on-snow events. Glacial and glacial-lake sediments underlie stream bank and lake bluff slumps and other failure areas across the much of the northern part of the state.

Urban and rural land development is increasing both the number of landslides and the economic effects of natural slides. Major highway construction with large excavations and fills located in mountainous areas creates potential for many landslides.

Landslides cause damage to transportation routes, utilities, and buildings, create travel delays and other side effects. Fortunately, deaths and injuries due to landslides are rare in Ohio. Almost all of the known deaths due to landslides have occurred when boulders/rocks fall along highways and involve vehicles. Storm induced debris flows are the only other type of landslide likely to cause death and injury. Most landslides that do occur in Ohio are moderate to slow moving and damage infrastructure rather than people. The Ohio Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra construction costs for new roads in known landslide-prone areas.

Due to Belmont County's hilly and varied terrain, virtually all of the County and its communities are at risk from landslides. According to mapping data obtained by the USGS, most of the County lies in a High Incidence zone for landslides. The community of Holloway is the only one in the County that is not in this zone, though it is still in a Moderate Incidence zone.

Roadways that run through valleys or alongside ridgeways are the most easily-susceptible to landslides. This includes but is not limited to U.S. Route 250, County Road 20, E. Captina Highway, Pipe Creek Road, Ramsey Ridge Road, and Key Bellaire Road. These are located in rural areas where there are not other easily-accessible roadways. A closure at any of these locations would result in significant delays for those living in those communities, especially during emergency events.



1.3 LANDSLIDE EXTENT

Approximately 75% of Belmont County lies within a High Incidence zone.

1.4 HISTORICAL OCCURRENCES

There is no singular record of historical occurrences for landslides. However, it was noted by the HMPC that landslides tend to occur after large rainfall events.

February 2018: Heavy flooding occurred throughout the County. This led to severe road slips that required critical repair. Over the course of the next year, some of these landslides had not yet been fixed, and were only getting worse as the County and municipalities awaited funding. In many places where a slip had occurred on a road, traffic was reduced to a single lane, leading to heavy congestion.

February 17, 2019: A landslide closed both southbound lanes of Route 7 south of Shadyside. Later that day, one lane was reopened.

January 14, 2020: County Road 20, Blaine-Chermont Road was closed due to a slip that had occurred. It was originally expected to be repaired in November 2019.

1.5 PROBABILITY OF FUTURE OCCURRENCES

The HMPC determined that it is “highly likely” that Landslides will continue to occur in Belmont County, meaning that they will remain as an annual event.

1.6 IMPACTS FROM LANDSLIDES

Impact	Description
People	While it is unlikely for people to be directly impacted by a landslide, it is possible for them to be in danger due to a lack of emergency services being able to reach them in a timely manner.
Infrastructure	Roadways will bear the brunt of landslides as they are the most likely to be near these locations. Homes may also be damaged by some slips.
Economy	The economy is unlikely to be affected by landslides, barring one happened along a major interstate.
Natural Systems	Trees and outcroppings are most likely to be damaged in landslides. If trees are moved significantly, they will likely die in the process.
Transportation	Transportation systems are most likely to be adversely affected in the process. Large slips can result in significant delays and road closures that can force changes to the transportation network.

1.7 COMMUNITY VULNERABILITY

Incorporated communities within the County have zoning codes that have regulations based on slope and terrain. These communities account for almost half the population in Belmont County, for a total of 31,753 people. However, this leaves 37,136 in unincorporated areas of the County, which are more susceptible to landslides.

TABLE 4-6 INCORPORATED COMMUNITY POPULATIONS

Community	Population
City of Martins Ferry	6,747
City of St. Clairsville	5,092
Barnesville	3,806
Bellaire	4,170
Belmont	393
Bethesda	1,293
Bridgeport	1,831

Brookside	695
Flushing	790
Holloway	306
Morristown	251
Powhatan Point	1,565
Shadyside	3,674
Yorkville	1,140
Total Incorporated Population	31,753
Unincorporated Belmont County	37,136

1.8 LAND USE AND DEVELOPMENT TRENDS

Much of the land in Belmont County is sloped due to the hilly terrain. Development tends to occur on top of hills or within the many valleys, making buildings vulnerable from slippage, either undermining the foundation, or otherwise weakening the underlying foundation.

Regulatory Environment

Belmont County does not have zoning codes that regulate the types of land that can be built upon, making it difficult to manage construction of buildings in the unincorporated parts of the County. Only the incorporated communities have zoning and development codes based on terrain and slope.

1.9 LANDSLIDE SUMMARY

Landslides can impact almost every part of Belmont County. Where they do not have direct impacts, they can still be felt through road closures and long detours. Landslides can occur any time of year, particularly after heavy rainfall or during snowmelt events. They are considered likely to occur due to the County’s varied terrain.

2. EXTREME TEMPERATURES

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Extreme Temperatures	**4**	1.2	**3**	0.9	**4**	0.8	**1**	0.1	**4**	0.4	**3.4**
High Risk Hazard (3.0-3.9)											

Climate change may exacerbate the impact of hazardous extreme temperatures. According to the State Hazard Mitigation Plan, extreme heat and heat waves are existing hazards that will be exacerbated by climate change. Heat is one of the leading weather-related killers in the United States, resulting in hundreds of fatalities each year. Extreme Cold can cause hazardous driving conditions, communications and electrical power failure, community isolation and can adversely affect business continuity. This section provides definitions and profiles for the hazard of extreme heat and extreme cold.

2.1 EXTREME TEMPERATURE CHARACTERISTICS

Extreme Heat

Temperatures that remain at 10 degrees or more above the average high temperature for the area are defined as extreme heat. The National Weather Service (NWS) issues an Excessive Heat Warning/Advisory when an extreme heat event (a "heat wave") is expected within 36 hours. The NWS issues these warnings based on a "Heat Index" - a combination of heat and humidity - that is predicted to be 105 degrees or greater for two or more consecutive days. Local weather forecast offices may use different criteria for Excessive Heat Warning/Advisories based on maximum temperatures, nighttime temperatures, and other methods.

Extreme Heat is the number one weather-related killer in the United States. It causes more fatalities each year than floods, lightning, tornadoes and hurricanes combined. In the Midwest, summers tend to combine both high temperature and high humidity. Heat disorders generally have to do with a reduction or collapse of the body’s ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When the body heats too quickly, to cool itself safely, or when too much fluid is lost through dehydration or sweating, the body temperature rises, and heat-related illnesses may develop.

Extreme temperatures can result in elevated utility costs to consumers and also can cause human risks. Extremely high temperatures cause heat stress which can be divided into four categories (see Table 4-7). Each category is defined by apparent temperature which is associated with a heat index value that captures the combined effects of dry air temperature and relative humidity on humans and animals. Major human risks for these temperatures include heat cramps, heat syncope, heat exhaustion, heatstroke, and death.

Extreme Cold

Extreme Cold, in extended periods, although infrequent, could occur throughout the winter months in the County. Heating systems compensate for the cold outside. Most people limit their time outside during extreme cold conditions, but common complaints usually include pipes freezing and cars refusing to start. When cold temperatures and wind combine, dangerous wind chills can develop.

Wind chill is how cold it “feels” and is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually, internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill, exposed skin can freeze in 30 minutes. Wind chill does not affect inanimate objects. (National Weather Service)

Extreme Cold is also responsible for several fatalities each year. Threats, such as hypothermia and frostbite, can lead to loss of fingers and toes or cause permanent kidney, pancreas and liver injury and even death. Major winter storms can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall and cold temperatures. Fifty percent of cold-related injuries happen to people over 60 years of age. More than 75 percent of injuries happen to males, and almost 20 percent occur within the home.

The dangers associated with extreme cold include frostbite and hypothermia. Frostbite is damage to body tissue caused by that tissue being frozen. Frostbite causes a loss of feeling in extremities, such as fingers, toes, ear lobes, or the tip of the nose. Hypothermia, or low body temperature can lead to uncontrollable shivering, memory loss, disorientation, slurred speech, drowsiness, and apparent exhaustion.

2.2 LOCATION

Extreme Temperature events are region-wide events that affect the entirety of Belmont County. All communities are affected during these occurrences.

2.3 EXTREME TEMPERATURE EXTENT

While cold temperatures and power losses can render a structure uninhabitable for a time, they are unlikely to cause structural damages. Those people living in these older homes are more likely to need services offered in response to extreme cold.

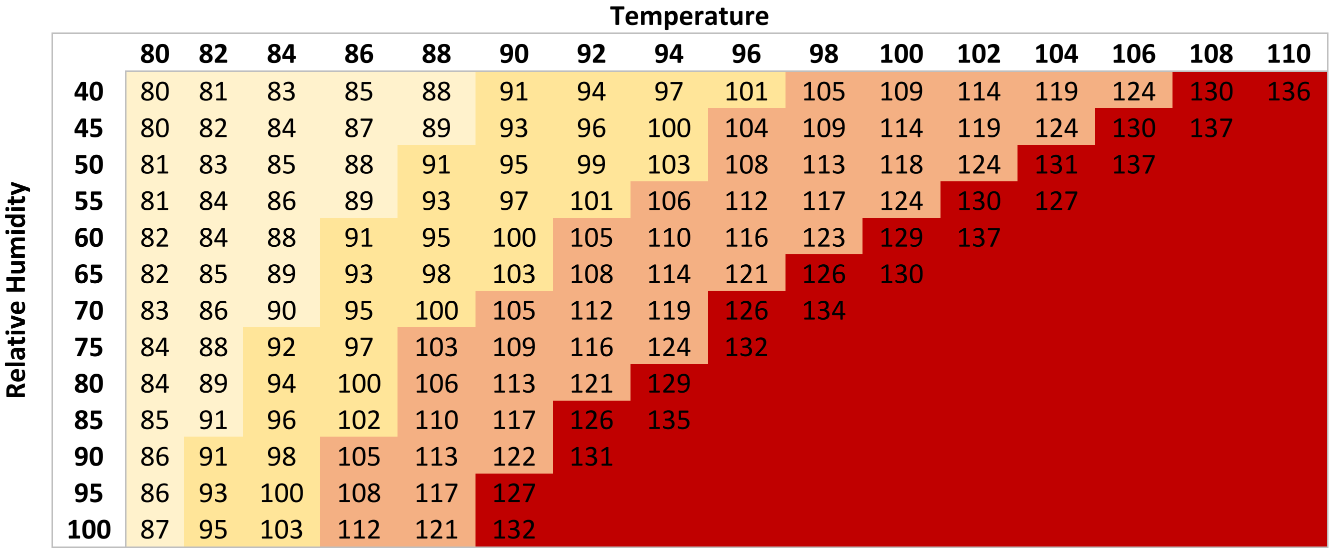
Extremely high temperatures cause heat stress which can be divided into four categories. Each category is defined by apparent temperature. Apparent temperature is the general term for the perceived outdoor temperature, caused by the combined effects of air temperature, relative humidity, and wind speed. Apparent temperature is associated with a heat index value that captures the combined effects of dry air temperature and relative humidity on humans and animals. Major human risks for these temperatures include heat cramps, fainting, heat exhaustion, heatstroke, and death. Note that while the temperatures in Table 4-7 serve as a guide for various danger categories, the impacts of high temperatures will vary from person to person based on individual age, health, and other factors.

Temperature advisories, watches, and warnings are issued by the National Weather Service relating the above impacts to the range of temperatures typically experienced in Ohio. Exact thresholds vary across the State, but in general Heat Advisories are issued when the heat index will be equal to or greater than 100°F, but less than 105°F, Excessive Heat Warnings are issued when heat indices will attain or exceed 105°F, and Excessive Heat Watches are issued when there is a possibility that excessive heat warning criteria may be experienced within twelve to forty-eight hours.

TABLE 4-7 FOUR CATEGORIES OF HEAT STRESS

Danger Category	Heat Disorders	Apparent Temperature (°F)
I (Caution)	Fatigue possible with prolonged exposure and physical activity.	80 to 90
II (Extreme Caution)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity.	90 to 105
III (Danger)	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity.	105 to 130
IV (Extreme Danger)	Heatstroke or sunstroke imminent.	>130

FIGURE 6 NWS SEVERE HEAT INDEX



Temperature

Relative Humidity

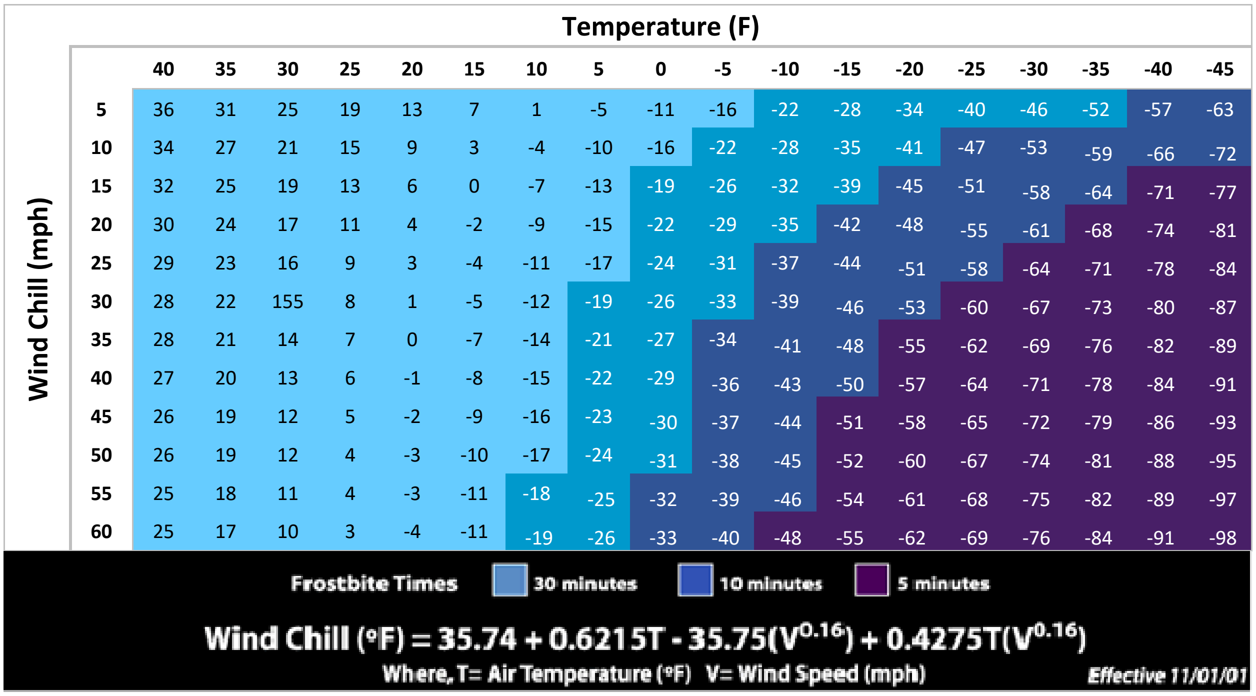
	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	127			
60	82	84	88	91	95	100	105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

TABLE 4-8 EXTREME COLD TEMPERATURE AND ASSOCIATED THREAT

Excessive Cold Threat Level	Threat Level Descriptions
Non-Threatening	**"No Discernable Threat to Life and Property from Excessive Cold."** Cold season weather conditions are non-threatening.
Very Low	**"A Very Low Threat to Life and Property from Excessive Cold."** It is likely that that wind chill values will drop to -10º F to -15 º F or below for 3 hours or more. Or, lowest air temperature zero to -5º F.
Low	**"A Low Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -15º F to -20 º F or below for 3 hours or more. Or, lowest air temperature -5º to -10º F.

Moderate	**"A Moderate Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -20º F to -28 º F or below for 3 hours or more. Or, lowest air temperature -10º to -15º F.
High	**"A High Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -28º F to -35 º F for 3 hours or more. Or, lowest air temperature -15º to -20º F.
Extreme	**"An Extreme Threat to Life and Property from Excessive Cold."** It is likely that wind chill values will drop to -35º F or below for 3 hours or more. Or, lowest air temperature less than or equal to -20º F.

FIGURE 7 NWS WINDCHILL CHART



Temperature (F)

Wind Chill (mph)

	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	155	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times 🟦 30 minutes 🟦 10 minutes 🟪 5 minutes

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

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

2.4 HISTORICAL OCCURRENCES

Extreme temperatures are hazards that affect areas as large as an entire state or region. As such, all Belmont County, Ohio instances of these events were looked at as previous hazard events.

According to the NCDC, there have been no documented cases of Extreme Heat in Belmont County.

- Cold – **January 6-7, 2014:** Brutal cold weather settled over the area on January 6th and 7th. This event was categorized as a polar vortex. This is a whirling and persistent large area of low pressure, found typically over both North and South poles. The northern polar vortex was pushing southward over western Wisconsin and eastern Minnesota on Monday, Jan. 6, 2014, and brought frigid temperatures to half of the continental United States. Extreme temperatures were reported for much of the US.

- Cold – **January 30, 2019:** In late January, bitter cold dipped down from the Arctic, plunging the Midwest into a deep freeze. Belmont County saw temperatures as low as the negative single digits. The front brought high winds which put the wind chill at -20 degrees.

FIGURE 8 JANUARY 2014 POLAR VORTEX

2.5 PROBABILITY OF FUTURE OCCURRENCES

The probability of Belmont County experiencing an extreme temperature can be difficult to quantify. Climate models suggest summer global temperatures are likely to increase while changes between temperature extremes would be more pronounced. The length of days above 100 degrees may also extend significantly.

There have not been a sufficient number of events catalogued by the NCDC or other sources to be able to make an accurate numerical estimate on how often these events occur.

However, the HMPC, based on their own knowledge, concluded that Extreme Temperature events are “possible” each year. This means that they have between at 1% and 10% chance of happening annually.

2.6 IMPACTS FROM EXTREME TEMPERATURES

Impact	Description
People	**Heat:** Heat stroke and dehydration **Cold:** Frostbite or hypothermia
Infrastructure	**Heat:** Power outages and brownouts. Water may become scarce. **Cold:** Burst pipes from freezing temperatures.

Economy	Extreme temperatures can discourage people from traveling and shopping, causing local economic slowdowns. Loss of crops may damage the agricultural sector.
Natural Systems	**Heat:** Vegetation can die and dry out, making areas susceptible to wildfires. **Cold:** Crops may be lost if cold occurs during growing season.
Transportation	**Heat:** Hot vehicles may break down, causing delays. **Cold:** Extreme cold temperatures can cause ice to form on roads. Cars may not start.

Vulnerability for extreme heat was classified as areas having a maximum average temperature over 85 degrees, according to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) study. This range falls within the upper limits of FEMA's heat stress index, Caution Category 1. Extreme heat does not generally impact buildings; instead, they primarily impact people. Nonetheless, facilities need to be maintained to ensure that they operate in appropriate conditions for people.

Additionally, vulnerability for extreme cold was classified as areas having minimum average temperature less than 14 degrees, according to the USDA NRCS study. Extreme cold does not generally impact buildings; instead, they primarily impact people. Nonetheless, facilities need to be maintained to ensure that they operate in appropriate conditions for people.

2.7 COMMUNITY VULNERABILITY

It is evident that extreme temperatures are dangerous and can be potentially life-threatening. Therefore it is important to understand how many people are exposed to such conditions, and how many buildings exist, where potential problems could arise should power be lost. Extreme cold can cause damage to structures; for example, burst pipes will damage buildings and will necessitate repairs.

All property located within the County is susceptible to the effects of extreme temperatures. While temperature extremes are not usually thought of as damaging to structures, they can make structures unusable. The age of a structure is also important to consider when discussing temperature extremes. Older homes are more susceptible to the effects of temperature extremes, due to the prevalent construction methods used at the time.

According to the 2018 American Community Survey, there were approximately 3,240 children under the age of 5, which is equal to about 4.8% of the total population. There were an estimated 14,041 people above the age of 65, equating to about 20.8% of the population.

TABLE 4-9 POPULAGE AGE ESTIMATES, 2018

Total	Population	Percent
Under 5 years	3,240	4.8%
65 and up	14,041	20.8%

TABLE 4-10 DATE OF BUILDING CONSTRUCTION

Year Built	Percent	Number
Built 1939 or earlier	32%	10,265
Built 1940 to 1949	8%	2,530
Built 1950 to 1959	11%	3,647
Built 1960 to 1969	10%	3,080
Built 1970 to 1979	16%	5,009
Built 1980 to 1989	7%	2,330
Built 1990 to 1999	9%	2,874
Built 2000 to 2009	6%	2,038
Built 2010 to 2013	1%	398
Built 2014 or later	0%	116
Total:	100%	32,287

2.8 LAND USE & DEVELOPMENT TRENDS

Belmont County as a whole is subject to temperature extremes. These extremes affect entire regions, making them a countywide hazard. The effect temperature extremes will have on the County will vary due to population density, age of population, and the age of structures.

The elderly, just like small children, are more susceptible to temperature extremes. Additionally, buildings of significant age may be more susceptible to temperature extremes. Older homes are generally less insulated than newer construction. In addition, the use of modern windows and doors can improve a structure's ability to resist extreme temperatures. Older structures and infrastructure are likely to be more susceptible to both heat waves and freezes. It is important to identify building stock and special needs populations so that those who have to respond to an emergency will be better prepared.

Regulatory Environment

There are negligible formal regulations that pertain to generalized extreme temperature events.

2.9 TEMPERATURE EXTREME SUMMARY

Temporary periods of extreme hot or cold temperatures typically do not have significant environmental impact. However, prolonged periods of hot temperatures may be associated with drought conditions and can damage or destroy vegetation, dry up rivers and streams, and reduce water quality. Prolonged exposure to extremely cold temperatures can kill wildlife and vegetation, and poses a potentially-grave danger to the residents of Belmont County.

3. FLOODING

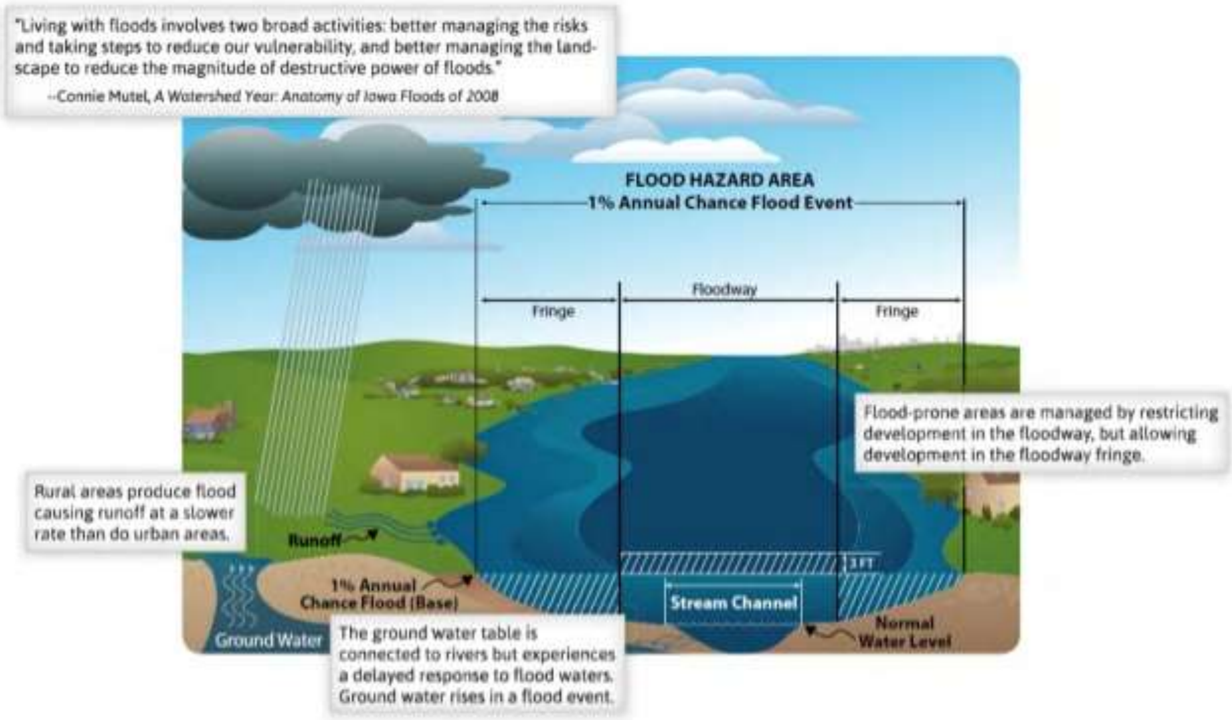
Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Flooding	**4**	1.2	**3**	0.9	**2**	0.4	**3**	0.3	**4**	0.4	**3.2**
High Risk Hazard (3.0-3.9)											

3.1 FLOODING CHARACTERISTICS

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers, streams, and creeks that are subject to recurring floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban areas. Extreme cold temperatures can cause streams and rivers to freeze, causing ice jams, and creating flood conditions.

FEMA develops Flood Insurance Rate Maps (FIRMs) to identify the 1% annual chance flood zone for land use planning and the National Flood Insurance Program (NFIP). This 1% annual chance flood zone is used to delineate the Special Flood Hazard Area (SFHA) and identify Base Flood Elevations. The figure below illustrates these terms. Belmont County's FIRM was updated effective April 2006.

FIGURE 9 DIAGRAM IDENTIFYING THE SPECIAL HAZARD FLOOD AREA


"Living with floods involves two broad activities: better managing the risks and taking steps to reduce our vulnerability, and better managing the landscape to reduce the magnitude of destructive power of floods."
--Connie Mutel, *A Watershed Year: Anatomy of Iowa Floods of 2008*

Flood-prone areas are managed by restricting development in the floodway, but allowing development in the floodway fringe.

Rural areas produce flood causing runoff at a slower rate than do urban areas.

The ground water table is connected to rivers but experiences a delayed response to flood waters. Ground water rises in a flood event.

Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. In Ohio, flooding occurs commonly and can occur during any season of the year from a variety of sources. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. Fast-moving water can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of livestock. Several factors determine the severity of floods, including rainfall intensity and duration, topography and ground cover.

- **Riverine flooding** originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks into adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snow packs, heavy spring rains, or a combination of the two.

- **Flash floods** can occur anywhere when a large volume of water flows or melts over a short time period, usually from slow moving thunderstorms or rapid snowmelt. Because of the localized nature of flash floods, clear definitions of hazard areas do not exist. These types of floods often occur rapidly with significant impacts. Rapidly moving water only a few inches deep can lift people off their feet, and only a depth of a foot or two is needed to sweep cars away. Most flood deaths result from flash floods.

- **Urban flooding** is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain (National Oceanic and Atmospheric Administration, 1992). Flooding in developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

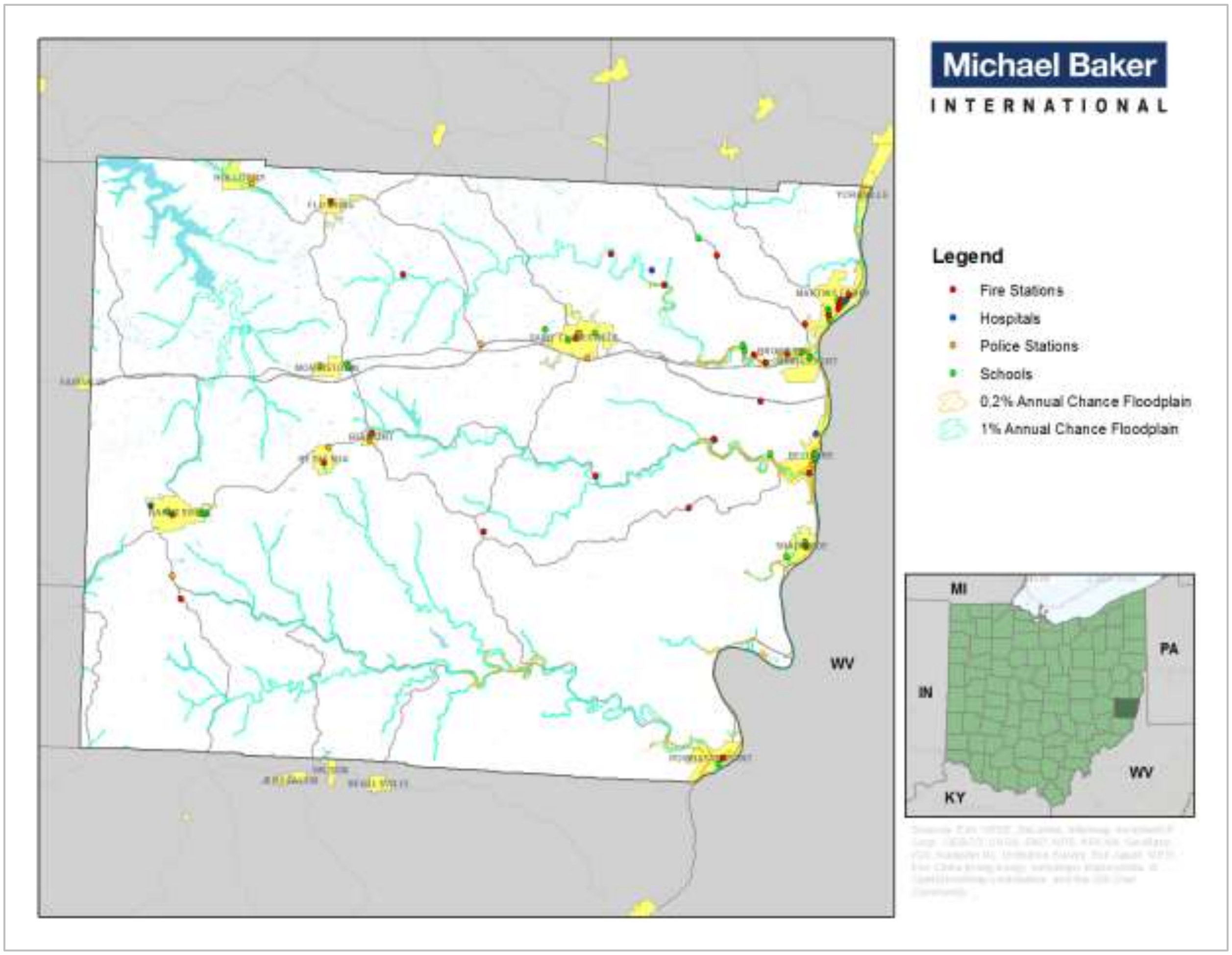
- **Stream Bank Erosion** is measured as the rate of the change in the position or horizontal displacement of a stream bank over a period of time. It is generally associated with riverine flooding and discharge, and may be exacerbated by human activities such as bank hardening and dredging.

- **Ice Jams** are stationary accumulations of ice that restrict river flow. Ice jams can cause considerable increases in upstream water levels, while at the same time, downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. When an ice jam releases, the effects downstream can be similar to that of a flash flood or dam failure. Ice jam flooding generally occurs in the late winter or spring.

Flood reduction, prevention, and mitigation are major challenges to Belmont County residents and its floodplain manager. Many areas of the County are at risk of flooding, especially properties near creeks. Heavy seasonal rainfall, which typically occurs from late October through April, can result in stream overflows.

3.2 FLOODING LOCATION

FIGURE 10 BELMONT COUNTY 100-YEAR FLOODPLAIN



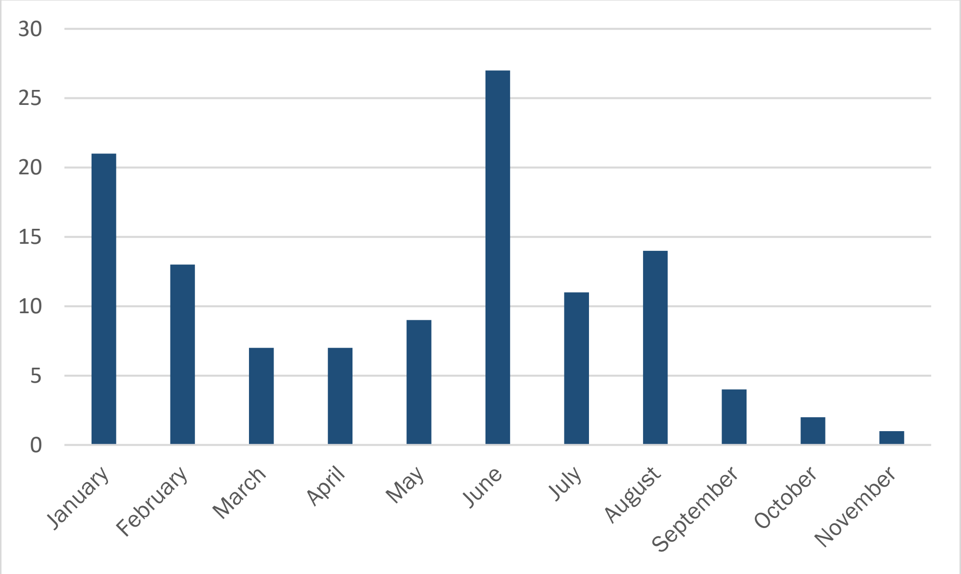
3.3 FLOODING EXTENT

Magnitude and severity of flooding generally results from prolonged heavy rainfall and are characterized by high intensity, short duration events. Floods usually occur during the season of highest precipitations or during heavy rainfalls after long dry spells. Widespread storms over the region can occur anytime from September through April. Flooding is more severe when the ground is frozen and infiltration is minimal due to saturated ground conditions, or when rain-on-snow in the higher elevations adds snowmelt to rainfall runoff, resulting in intensified flood conditions.

Cloudburst storms, sometimes lasting as long as 3 hours, can occur over the region anytime from late spring to early fall. They also may occur as extremely severe sequences within general winter rainstorms or during unseasonable rains. The intensity of cloudburst storms is very high, and the storms can produce enough precipitation to result in significant runoff.

Surface flooding, including some street flooding, can occur during severe storms. Reports of minor flooding to garages and outbuildings, landscape erosion, and flooded streets have occurred in and around the County. Trash and other debris can also be found obstructing culvert and pipe openings during even moderate flows in smaller channels, which can lead to clogging, obstruction, and eventual flooding of nearby properties.

FIGURE 11 TOTAL FLOOD EVENTS BY MONTH



Flood Warning and Notification

The magnitude and severity of flood damage can be reduced with longer periods of warning time and proper notification before flood waters arrive. Warning times of 12 hours or more have proven adequate for preparing communities for flooding and reducing flood damages. More than 12 hours advance warning of a flood can reduce a community's flood damage by approximately 40% in comparison with unprepared communities (Read Sturgess and Associates 2000). In addition, seasonal notification for flooding can enhance awareness for residents at risk, and when communicated effectively advance notification can reach target audiences on a large scale. The Belmont County EMA coordinates with the National Weather Service.

Ohio River Characteristics

Information on historical floods along the Ohio River was obtained from stream gauging stations maintained by NOAA. Table 4-13 shows the flood stage categories as determined by the National Oceanic and Atmospheric Administration and the National Weather Service (NWS).

3.4 HISTORICAL OCCURRENCES

General Trends

According to the NCDC, since 1996, there have been 116 flood or flash flood events in Belmont County, which have resulted in two deaths. These events have caused a total of $31.4 million in property damage, and $5 million in crop damage.

TABLE 4-11 FLOOD EVENTS SINCE 1996

Row Labels	County	Deaths	Injuries	Property Damage	Crop Damage
Flash Flood	72	1	0	$ 7,288,000	$ 5,001,000
Flood	44	1	0	$ 24,108,000	$ -
Grand Total	**116**	**2**	**0**	**$ 31,396,000**	**$ 5,001,000**

Belmont County has been a part of 11 Federal Disaster Declarations that included flooding. Nine resulted in public assistance, and six have resulted in Individual Assistance.

TABLE 4-12 DECLARED DISASTERS AFFECTING BELMONT COUNTY

Disaster Number	Declaration Date	Title	Public Assistance	Individual Assistance
DR-4002	7/13/2011	Severe Storms and Flooding	$1,143,503	-
DR-1580	2/15/2005	Severe Winter Storms, Flooding, And Mudslides	$5,867,974	$252,029
DR-1556	9/19/2004	Severe Storms and Flooding	$9,851,192	$6,236,004
DR-1507	1/26/2004	Severe Storms, Flooding, Mudslides, And Landslides	$4,577,700	$112,880
DR-1227	6/30/1998	Severe Storms, Flooding, And Tornadoes	$715,963	$446,153
DR-1122	6/24/1996	Flooding	$365,096	-
DR-1097	1/27/1996	Severe Storms and Flooding	$891,632	$539,841
DR-951	8/4/1992	Severe Storms, Tornadoes & Flooding	$458,072	-
DR-870	6/6/1990	Severe Storms, Tornadoes & Flooding	$2,276,532	25 Counties total received $4,331,497. Belmont’s total unavailable.
DR-630	8/23/1980	Severe Storms & Flooding	-	-
DR-480	9/11/1975	Winds, Tornadoes, Heavy Rains & Flooding	-	-

Event Narratives

- **January 19, 1996 – Flooding:** Flood waters from the Allegheny and the Monongahela Rivers crested in phase at the Point in Pittsburgh. Water from these two mainstem rivers flow into the Ohio River. Major flooding to communities along the Ohio River occurred in Columbiana, Jefferson, Belmont, and Monroe Counties in east-central Ohio. The Ohio River at East Liverpool went above its 14 foot flood stage on the 19th at 10 pm EST. The river crested at 24.8 feet (10.8 feet above flood stage) on the 20th at 7 pm. Crests downstream were not as high, Hannibal, Ohio crested at 39.4 feet (4.4 feet above flood stage) on the 21st at 1 pm. Nonetheless, damages to homes and businesses and their contents, public facilities, bridges and roads along the river were enormous. In Belmont County, 318 residences were effected, 14 minimally, 107 minor damage, 136 major damage, and 61 were destroyed.

- **June 29, 1998 – Flooding:** Additional thunderstorm rains on the 28th produced flash flooding across the entire county, forcing the closure of several county and state roads across the area. Some of the harder hit areas included Powhatan Point, Shadyside, Barton, and the Colerain area where several evacuations and rescues were necessary starting on the evening of the 28th. One death occurred in the Barton area around 830 PM on the 28th when a 41-year-old woman's vehicle was swept from County Road 4 and into the Steep Run Creek.

- **June 20, 2011 – Flooding:** A stalled frontal boundary was the focus for showers and thunderstorms to develop and train across portions of eastern Ohio, the northern West Virginia panhandle, and western Pennsylvania producing flash flooding and flooding. The worst flash flooding occurred in Belmont County, Ohio in Willow Grove, which is near Neffs. 97 homes and businesses were damaged, with other damage to roads and bridges. The estimated total damage was near 1.3 million dollars. Emergency Management reported flash flooding near Neffs. 97 homes and businesses were damaged, with other damage to roads and bridges. The estimated total damage was near $1.3 million. 6 people were evacuated from homes. However, there were no injuries.

- **July 28, 2017 – Flooding:** Unusually strong upper low for July dropped from the Great Lakes into western PA. A trowal/deformation zone set up over most of the area outside of southeast Ohio, producing torrential rainfall. Storm totals of 2 to 5 inches were common, with isolated higher totals over West Virginia. Hardest hit areas included Washington County, PA and Marion County, WV. Wheeling and Hundred WV also had major issues. Several water rescues took place in the aforementioned counties with disaster declarations in the city of Uniontown in Fayette county, PA and a federal disaster declaration in for most of northern West Virginia. Damage estimates for West Virginia alone approached $6 million dollars.

TABLE 4-13 HIGHEST HISTORICAL CRESTS ON THE OHIO RIVER AT WHEELING

Crest Feet	Date of Crest
38.93	2/17/2018
37.22	3/12/2011
33.83	2/8/2008
33.16	3/16/2007
31.47	3/15/2010

There is a USGS river gage located near where the Ohio River runs by Wheeling. This gage provides discharge information, historic crests, recent crests, flood categories, as well as river height, in feet. Historical Crests for the five largest floods of record for the Ohio River at Wheeling are shown below. To date, the highest crest reached 55.2 feet during the spring of 1936.

(1) 55.20 ft on 03/19/1936

(2) 51.50 ft on 12/31/1942

(3) 51.20 ft on 03/28/1913

(4) 50.10 ft on 03/15/1907

(5) 48.70 ft on 01/26/1937

3.5 PROBABILITY OF FUTURE OCCURRENCES

Reported flood events over the past 22 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County experiencing a flood event can be difficult to quantify, but based on historical record of 116 flood events since 1996, this type of event has occurred once every 0.19 years from 1996 through 2018.

(**2018** CY) - (**1996** HY) = **22 Years on Record**

(**22 Years**) / (**116 Events**) = **.19 Years Between Events**

Furthermore, the historic frequency calculates that there is an 100% chance of this type of event occurring each year.

The HMPC, based on their knowledge, determined that flood events are “Highly Likely,” meaning that there is a 100% annual chance of occurring.

3.6 COMMUNITY VULNERABILITY

Inventory of Assets Exposed to Flooding

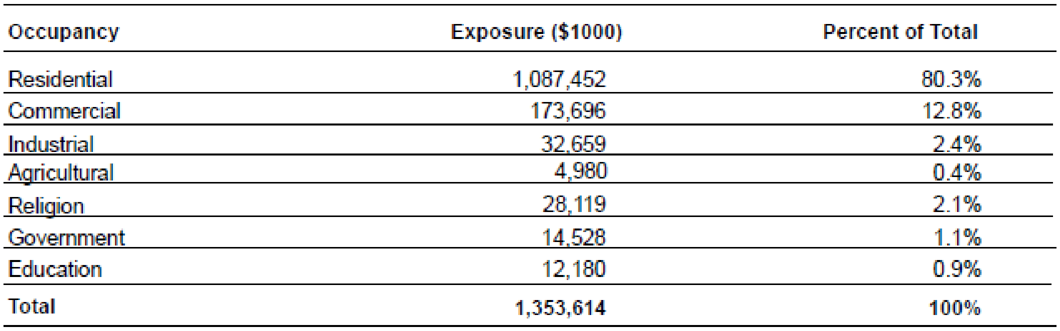
The method used in determining the types and numbers of potential assets exposed to flooding was conducted using a loss estimation model called HAZUS-MH. HAZUS-MH is a regional multi-hazard loss estimation model that was developed by the FEMA and the National Institute of Building Sciences (NIBS). For this Plan, a 100-year flood scenario was modeled and the results are presented below.

Hazus-MH 100-Year Flood Scenario

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 367. There are 35 schools, 27 fire stations, 17 law enforcement stations, and as well as the County's Emergency Management Agency.

TABLE 4-14 BUILDING EXPOSURE BY OCCUPANCY TYPE FOR THE SCENARIO



Occupancy	Exposure ($1000)	Percent of Total
Residential	1,087,452	80.3%
Commercial	173,696	12.8%
Industrial	32,659	2.4%
Agricultural	4,980	0.4%
Religion	28,119	2.1%
Government	14,528	1.1%
Education	12,180	0.9%
Total	**1,353,614**	**100%**

Potential Losses from Flooding

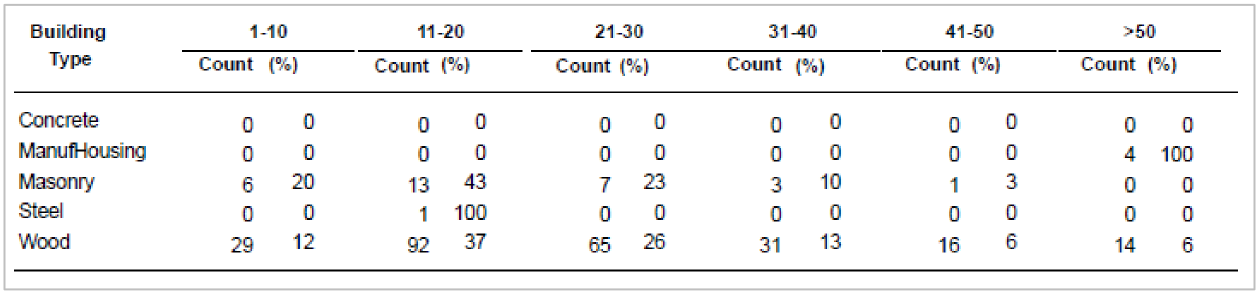
TABLE 4-15 IMPACTS FROM FLOODING

Impact	Description
People	Severe floods can kill those caught in their way. Injuries may also result. Illnesses from water-borne viruses, bacteria, or parasites if contact is made with floodwaters.
Infrastructure	Buildings can be severely damaged or destroyed. Mold can occur after flooding.
Economy	Local economies can sustain the most damage. If enough disruption is caused by damage or transportation shortages, effects may be felt at a larger scale.
Natural Systems	Land may be waterlogged, destroying crops. Vegetation may be uprooted and displaced. Animals can lose habitats.
Transportation	Roadways may become impassable. Affected railways can halt movement of goods.

General Building Stock Damage

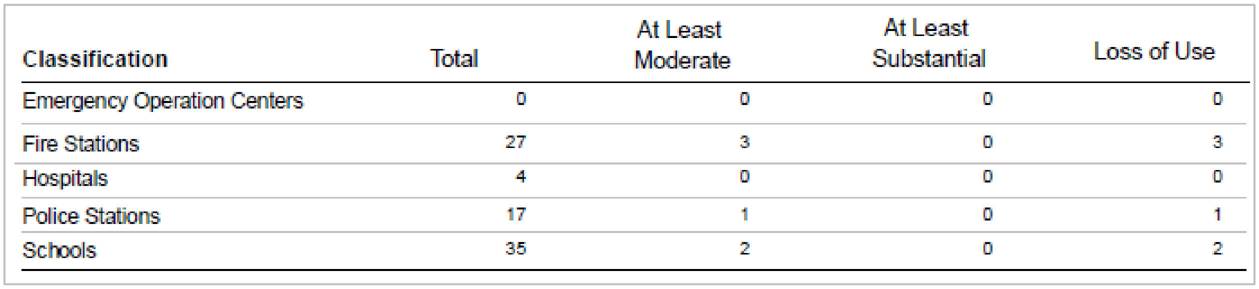
Hazus estimates that about 249 buildings will be at least moderately damaged. This is over 73% of the total number of buildings in the scenario. There are an estimated 18 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

TABLE 4-16 EXPECTED BUILDING DAMAGE BY TYPE



Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	4	100
Masonry	6	20	13	43	7	23	3	10	1	3	0	0
Steel	0	0	1	100	0	0	0	0	0	0	0	0
Wood	29	12	92	37	65	26	31	13	16	6	14	6

TABLE 4-17 EXPECTED DAMAGE TO ESSENTIAL FACILITIES



Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	0	0	0	0
Fire Stations	27	3	0	3
Hospitals	4	0	0	0
Police Stations	17	1	0	1
Schools	35	2	0	2

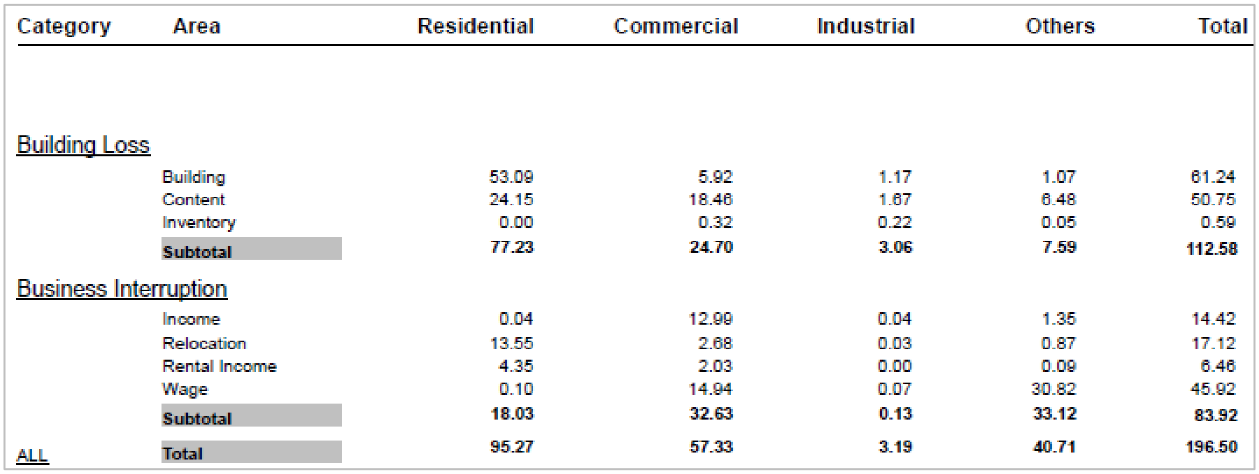
Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 760 households (or 2,279 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 76 people (out of a total population of 70,400) will seek temporary shelter in public shelters.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood. The total building-related losses were 112.58 million dollars. 43% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 48.48% of the total loss. The table below provides a summary of the losses associated with the building damage.

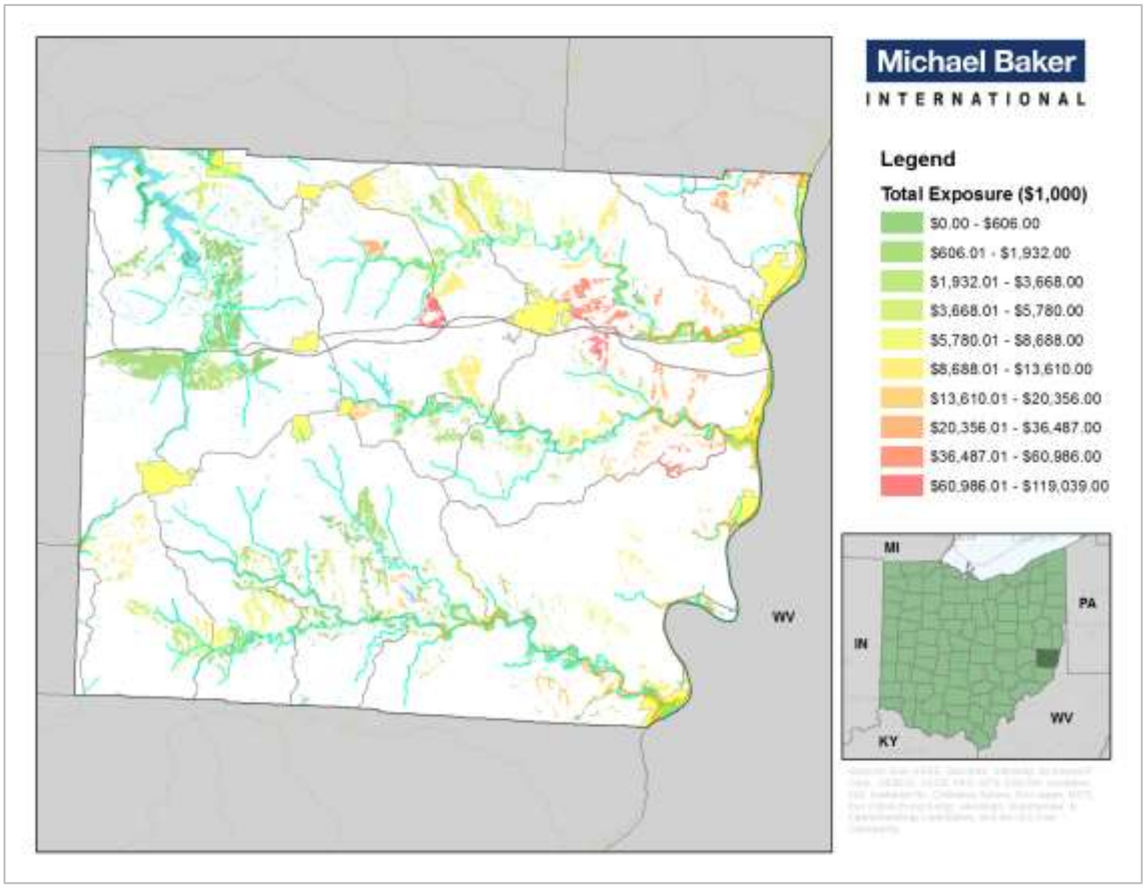
TABLE 4-18 BUILDING-RELATED ECONOMIC LOSS ESTIMATES



Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	53.09	5.92	1.17	1.07	61.24
	Content	24.15	18.46	1.67	6.48	50.75
	Inventory	0.00	0.32	0.22	0.05	0.59
	Subtotal	**77.23**	**24.70**	**3.06**	**7.59**	**112.58**
Business Interruption						
	Income	0.04	12.99	0.04	1.35	14.42
	Relocation	13.55	2.68	0.03	0.87	17.12
	Rental Income	4.35	2.03	0.00	0.09	6.46
	Wage	0.10	14.94	0.07	30.82	45.92
	Subtotal	**18.03**	**32.63**	**0.13**	**33.12**	**83.92**
ALL	**Total**	**95.27**	**57.33**	**3.19**	**40.71**	**196.50**

The entire County is susceptible to flooding, either directly or through cleanup efforts and lasting economic impacts. Those closest to the Ohio River as well as the numerous small streams throughout the County, will be actual river waters. It is still possible for the rest of the County to be affected by localized flash flooding.

FIGURE 12 BUILDING EXPOSURE FROM FLOODING



3.7 LAND USE & DEVELOPMENT TRENDS

Belmont County is mostly rural. Much of the existing development, as well as trends, tend to place new development along the I-70 corridor, and along the Ohio River. Localized flooding continues to remain a possibility throughout the County, especially in the many low-lying areas. It is essential that land use plans consider not only the dollar amount of damage that buildings near waterways could incur, but also the added risk of flood debris and narrowing the floodplains by building close to the rivers.

Regulatory Environment

There are numerous laws at the federal, state, and local levels throughout the country regarding floodplain management. Belmont County continues to work to enforce the local floodplain management ordinance requirements set forth by all flooding programs, including the National Flood Insurance Program.

Belmont County Building and Floodplain Codes

These regulations authorize a Floodplain Manager/Administrator and duties to be performed. Duties include, but are not limited to, routine monitoring of the floodplains, enforcing floodplain regulations, and providing community assistance, such as encouraging owners to maintain flood insurance. Flood regulations are codified in the Special Purpose Flood Damage Reduction Resolution.

RiskMAP

Belmont County had an FIS study done and FIRMs completed in 2006.

National Flood Insurance Program (NFIP)

The NFIP makes federally-backed flood insurance available to homeowners, renters, and business owners in participating communities. As a participating member of the NFIP, Belmont County is dedicated to protecting homes, with 529 NFIP policies currently in force.

TABLE 4-19 BELMONT COUNTY NFIP STATUS SUMMARY

Community	Initial FHBM	Initial FIRM	Current Effective Map Date	Reg-Emerg Date	Losses	Total Payment	Policies in Force
Bellaire	2/8/1974	11/2/1983	4/5/2006	11/2/1983	50	$ 457,834.86	27
Belmont Co.	4/14/1978	2/4/1988	4/5/2006	2/4/1988	290	$ 3,983,705.15	175
Bethesda	2/7/1975	09/18/87	04/05/06	7/13/1990	1	$ 5,693.09	0
Bridgeport	2/8/1974	2/1/1979	(NSFHA)	2/1/1979	40	$ 216,430.61	15
Brookside	2/8/1974	2/4/1988	4/5/2006	2/4/1988	38	$ 519,115.87	20
Holloway	8/23/1974	9/18/1985	4/5/2006	9/18/1985	0	$ 0	0
Martins Ferry	2/8/1974	7/5/1983	4/5/2006	7/5/1983	22	$ 862,211.38	23
Powhatan Point	2/15/1974	7/5/1983	4/5/2006	7/5/1983	70	$ 1,131,852.58	46
Shadyside	11/23/1973	7/18/1983	4/5/2006	7/18/1983	8	$ 45,279.33	18
St. Clairsville	6/7/1974	4/5/2006	(NSFHA)	1/30/1984	0	$ 0	0
Yorkville	2/8/1974	10/15/1982	4/5/2006	10/15/1982	10	$ 43,014.78	12
Total	-	-	-	-	**529**	**$ 7,265,138**	**336**

Belmont County entered the NFIP on April 14, 1978, following all incorporated cities and villages in the County, which joined in 1973 and 1974. As a participant in the NFIP, the County is dedicated to regulating development in the FEMA floodplain areas in accordance with NFIP criteria. Structures permitted or built in the County before the NFIP regulatory requirements were incorporated into the ordinances (before the effective date of the County's FIRM) and are called "pre-FIRM" structures.

A RL property is a FEMA designation defined as an insured property that has made two or more claims of more than $1,000 in any rolling 10-year period since 1978. The term "rolling 10-year period" means that a claim of $1,000 can be made in 1991 and another claim for $2,500 in 2000; or one claim in 2001 and another in 2007, as long as both qualifying claims happen within ten years of each other. Claims must be at least ten days apart but within ten years of each other. RL properties may be classified as a Severe Repetitive Loss (SRL) property under certain conditions. A SRL property has had four or more claims of at least $5,000, or at least two claims that cumulatively exceed the building's reported value. A property that sustains repetitive flooding may or may not be on the County's RL property list for a number of reasons:

- Not everyone is required to carry flood insurance. Structures carrying federally-backed mortgages that are in a SFHA are required to carry flood insurance in the County;
- Owners who have completed the terms of the mortgage or who purchased their property outright may not choose to carry flood insurance and instead bear the costs of recovery on their own;
- The owner of a flooded property that does carry flood insurance may choose not to file a claim;
- Even insured properties that are flooded regularly with filed claims may not meet the $1,000 minimum threshold to be recognized as an RL property; or
- The owner adopted mitigation measures that reduce the impact of flooding on the structure, removing it from the RL threat, and the RL list (in accordance with FEMA's mitigation reporting requirements).

TABLE 4-20 REPETITIVE LOSS PROPERTIES

Community	Type	Bldg. Payment	Cont. Payment	Losses	# of RL Properties
Belmont County	Residential	$625,721.58	$84,617.68	66	27
	Non-Residential	$37,699.65	$1,474.08	6	3
Bellaire	Residential	$58,317.71	$ -	4	2
	Non-Residential	$47,577.41	$ -	2	1
Bridgeport	Residential	$27,879.08	$3,589.35	3	1
	Non-Residential	$ -	$ -	0	0
Brookside	Residential	$57,057.93	$ -	6	2
	Non-Residential	$151045.27	$30,853.62	9	4
Powhatan	Residential	$412,670.27	$59,817.97	27	12
	Non-Residential	$266,424.58	$20,384.89	8	4
Yorkville	Residential	$ -	$ -	0	0
	Non-Residential	$25714.92	0	2	1

Extensive FEMA NFIP databases are used to track claims for every participating community. FEMA databases maintain all NFIP claims which allow for the examination of single-loss (SL) properties and RL properties. There are no Severe Repetitive Loss properties in the County.

3.8 FLOODING SUMMARY

Severe flooding has the potential to cause significant damage along the river and small creeks that run throughout the County. Assessing flood damage requires residents throughout the County to remain alert and notify local officials of potential flood prone areas near infrastructure such as roads, bridges, and buildings. While flooding remains a highly likely occurrence for the County, smaller floods caused by heavy rains and inadequate drainage capacity will be more frequent, but not as costly as the large-scale floods which may occur at much less frequent intervals.

4. SEVERE WINTER STORMS

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Severe Winter Storms	**4**	1.2	**2**	0.6	**4**	0.8	**1**	0.1	**3**	0.3	**3**
High Risk Hazard (3.0-3.9)											

4.1 SEVERE WINTER STORM CHARACTERISTICS

Belmont County has been impacted by varying degrees of winter weather over the last century. However, the occurrence of severe winter weather in the County is relatively infrequent, even during winter months. Severe winter weather can cause hazardous driving conditions, communications and electrical power failure, community isolation and can adversely affect business continuity. This type of severe weather may include one or more of the following winter factors:

Blizzards, as defined by the National Weather Service, are a combination of sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling or blowing snow for 3 hours or more. A blizzard, by definition, does not indicate heavy amounts of snow, although they can happen together. Falling or blowing snow usually creates large drifts from the strong winds. The reduced visibilities make travel, even on foot, particularly treacherous. The strong winds may also support dangerous wind chills. Ground blizzards can develop when strong winds lift snow off the ground and severely reduce visibilities.

Heavy snow, in large quantities, may fall during winter storms. Six inches or more in 12 hours or eight inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. Heavy wet snow before the leaves fall from the trees in the fall or after the trees have leafed out in the spring may cause problems with broken tree branches and power outages.

Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into the warm layer of air, it melts to rain, and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating a smooth layer of ice. This phenomenon is called freezing rain. Similarly, sleet occurs when the rain in the warm layer subsequently freezes into pellets while falling through a cold layer of air at or near the Earth’s surface. Extended periods of freezing rain can lead to accumulations of ice on roadways, walkways, power lines, trees, and buildings. Almost any accumulation can make driving and walking hazardous. Thick accumulations can bring down trees and power lines.

Heavy Snow Storms can immobilize a region and paralyze the County. These events can strand commuters, close airports, stop supplies from reaching their destinations and disrupt emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Homes and farms may be isolated and unprotected livestock may be lost. The cost of snow removal, repairing damages, and the loss of business can have economic impacts on cities and towns.

Extreme Cold, in extended periods, although infrequent, could occur throughout the winter months in the County. While heating systems are mostly able to compensate for the cold outside, people limit their time outside during extreme cold conditions. Common complaints usually include pipes freezing and cars refusing to start. When cold temperatures and wind combine, dangerous wind chills can develop.

Wind chill is how cold it "feels" and is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually, internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill, exposed skin can freeze in 30 minutes. Wind chill does not affect inanimate objects. (National Weather Service)

The science of meteorology and records of severe weather are not quite sophisticated enough to identify what areas of the County are at greater risk for damages. Therefore, all areas of the County are assumed to have the same winter weather risk.

Severe winter weather can result in the closing of primary and secondary roads, particularly in rural locations, loss of utility services, and depletion of heating supplies. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up, and/or high winds which can break limbs or even bring down large trees. Gradual melting of snow and ice provides excellent groundwater recharge; however, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flash flooding.

The State of Ohio has an extensive history of severe winter weather. In the winter of 2005, the state was hit by a series of winter storms. These storms included ice storms, followed by unseasonably high temperatures and high rainfall totals, all of which resulted in extensive flooding and mudslides. This series of storms resulted in Presidential Declaration FEMA-DR-1580-OH. This declaration provided over $140 million dollars in recovery funds. These funds included Individual assistance, Public assistance, Hazard Mitigation Grant Funds, and a state match to the federal hazard mitigation funds.

Winter storms are extremely difficult to predict in advance, but they can be monitored and tracked once they develop. Understanding the historical frequency, duration, and spatial extent of winter weather assists in determining the likelihood and potential severity of future occurrences. The characteristics of past severe winter events provide benchmarks for projecting similar conditions into the future.

4.2 WINTER STORM EXTENT

The National Weather Service uses different terminology for winter weather events, depending on the situation.

- **Outlook** - Winter weather that may cause significant impact in the day 3 to 7 forecast time period and eventually lead to the issuance of a watch or warning is contained in the Hazardous Weather Outlook. More scientific discussion on the event can also be found in the Area Forecast Discussion. Forecasts in the day 3 to 7-time period typically have a lot of forecast uncertainty. Uncertainty is generally in the 30 to 50% range that the event will occur and reach warning criteria. It is intended to provide information to those who need considerable lead time to prepare for the event.

- **Watch** - A watch is generally issued in the 24 to 72-hour forecast time frame when the risk of a hazardous winter weather event has increased (50 to 80% certainty that warning thresholds will be met). It is intended to provide enough lead time so those who need to set their plans in motion can do so. A watch is issued using the WSW Winter Weather Message product and will appear as a headline in some text products such as the Zone Forecast. It will change the color, as shown in the table below, of the counties on the NWS front page map according to what type of watch has been issued.

TABLE 4-21 WINTER STORM WATCH DEFINITIONS

Watch Type	Description
Blizzard Watch	Conditions are favorable for a blizzard event in the next 24 to 72 hours. Sustained wind or frequent gusts greater than or equal to 35 mph will accompany falling and/or blowing snow to frequently reduce visibility to less than 1/4 mile for three or more hours.
Lake Effect Snow Watch	Conditions are favorable for a lake effect snow event to meet or exceed local lake effect snow warning criteria in the next 24 to 72 hours. Widespread or localized lake induced snow squalls or heavy snow showers which produce snowfall accumulation to 7 or more inches in 12 hours or less. Lake effect snow usually develops in narrow bands and impacts a limited area within a county or forecast zone. Use "mid-point" of snowfall range to trigger a watch (i.e. 5 to 8 inches of snow = watch).
Wind Chill Watch	Conditions are favorable for wind chill temperatures to meet or exceed local wind chill warning criteria in the next 24 to 72 hours. Wind chill temperatures may reach or exceed -25°F.
Winter Storm Watch	Conditions are favorable for a winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow or a combination of events) to meet or exceed local winter storm warning criteria in the next 24 to 72 hours. Criteria for snow is 7 inches or more in 12 hours or less; or 9 inches or more in 24 hours covering at least 50 percent of the zone or encompassing most of the population. Use "mid-point" of snowfall range to trigger a watch (i.e. 5 to 8 inches of snow = watch). Criteria for ice is 1/2 inch or more over at least 50 percent of the zone or encompassing most of the population.

- **Advisory** - Advisories are issued when a hazardous winter weather event is occurring, is imminent, or has a very high probability of occurrence (generally greater than 80%). An advisory is for less serious conditions that cause significant inconvenience and, if caution is not exercised, could lead to situations that may threaten life and/or property. Advisories are issued using the WSW Winter Weather Message product and will appear as a headline in some text products such as the Zone Forecast. Table 4-22 shows the different type of winter weather advisories and the conditions that it takes for them to be met.

TABLE 4-22 WINTER WEATHER ADVISORY DEFINITIONS

Advisory Type	Description
Winter Weather Advisory	A winter storm event (sleet, snow, freezing rain, snow and blowing snow, or a combination of events) is expected to meet or exceed local winter weather advisory criteria in the next 12 to 36 hours but stay below warning criteria. Criteria for snow is 4 inches or more in 12 hours or less covering at least 50 percent of the zone or encompassing most of the population. Use "mid-point" of snowfall range to trigger advisory (i.e. 2 to 5 inches of snow = advisory). Criteria for ice is any ice accumulation less than 1/2 inch over at least 50 percent of the zone or encompassing most of the population. Winter Weather Advisory can also be issued for black ice. This is optional.
Freezing Rain Advisory	Any accumulation of freezing rain is expected in the next 12 to 36 hours (but will remain below 1/2 inch) for at least 50 percent of the zone or encompassing most of the population.
Lake Effect Snow Advisory	A lake effect snow event is expected to meet or exceed local lake effect snow advisory criteria in the next 12 to 36 hours. Widespread or localized lake induced snow squalls or heavy snow showers which produce snowfall accumulating to 4 or more inches in 12 hours or less, but remain less than 7 inches. Lake effect snow usually develops in narrow bands and impacts a limited area within a county or forecast zone. Use "mid-point" of snowfall range to trigger advisory (i.e. 2 to 5 inches of snow = advisory).
Wind Chill Advisory	Wind chill temperatures are expected to meet or exceed local wind chill advisory criteria in the next 12 to 36 hours. Wind chill temperatures may reach or exceed -15°F.

- **Warning** - Warnings are issued when a hazardous winter weather event is occurring, is imminent, or has a very high probability of occurrence (generally greater than 80%). A warning is used for conditions posing a threat to life or property. Warnings are issued using the WSW Winter Weather Message product and will appear as a headline in some text products such as the Zone Forecast. Table 4-23 discusses the various winter weather storm warnings that can occur and the conditions of each that are required for them to be posted.

TABLE 4-23 WINTER WEATHER WARNING DEFINITIONS

Warning Type	Description
Blizzard Warning	Blizzard event is imminent or expected in the next 12 to 36 hours. Sustained wind or frequent gusts greater than or equal to 35 mph will accompany falling and/or blowing snow to frequently reduce visibility to less than 1/4 mile for three or more hours.
Ice Storm Warning	An ice storm event is expected to meet or exceed local ice storm warning criteria in the next 12 to 36 hours. Criteria for ice is 1/2 inch or more over at least 50 percent of the zone or encompassing most of the population.
Lake Effect Snow Warning	A lake effect snow event is expected to meet or exceed local lake effect snow warning criteria in the next 12 to 36 hours. Widespread or localized lake induced snow squalls or heavy snow showers which produce snowfall accumulation to 7 or more inches in 12 hours or less. Lake effect snow usually develops in narrow bands and impacts a limited area within a county or forecast zone. Use "mid-point" of snowfall range to trigger warning (i.e. 5 to 8 inches of snow = warning).
Wind Chill Warning	Wind chill temperatures are expected to meet or exceed local wind chill warning criteria in the next 12 to 36 hours. Wind chill temperatures may reach or exceed -25°F.

Warning Type	Description
Winter Storm Warning	A winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow or a combination of events) is expected to meet or exceed local winter storm warning criteria in the next 12 to 36 hours. Criteria for snow is 7 inches or more in 12 hours or less; or 9 inches or more in 24 hours covering at least 50 percent of the zone or encompassing most of the population. Use "mid-point" of snowfall range to trigger warning (i.e. 5 to 8 inches of snow = warning). Criteria for ice is 1/2 inch or more over at least 50 percent of the zone or encompassing most of the population.

4.3 HISTORICAL OCCURRENCES

General Trends

Since 1996, there have been 26 winter weather events according to NOAA, most of which have caused significant damage to property. According to NOAA, there have been no injuries and no deaths. The total amount of property damage done by winter storm events equals $22,000 throughout Belmont County.

TABLE 4-24 WINTER WEATHER EVENTS IN BELMONT COUNTY (1996-2018)

Row Labels	Count	Property Damage
Heavy Snow	7	$ 0
Ice Storm	6	$ 2,000
Winter Storm	7	$ 20,000
Winter Weather	6	$ 0
Total	**26**	**$ 22,000**

Since 1978, four federally or state declared severe winter weather events has occurred in Belmont County, as shown in Table 4-25. According to FEMA Declarations and Ohio Emergency and Disaster Proclamations (1956 to present), these events include blizzards and snowstorms.

TABLE 4-25 DECLARED WINTER DISASTERS

Disaster Number	Declaration Date	Title	Public Assistance	Individual Assistance
DR-1580	2/15/2005	Severe Winter Storms, Flooding, and Mudslides	$5,867,974	$252,029
DR-1453	3/14/2003	Severe Winter Storm and Record/Near Record Snow	$933,571	-
EM-3055	1/26/1978	Blizzards & Snowstorms	-	-
EM-3029	2/2/1977	Snowstorms	-	-

Event Narratives

- 1999-01-13 Winter Storm: A powerful winter storm brought another combination of snow and freezing rain to east central Ohio. The precipitation began as snow, with between 1 and 3 inches of accumulation reported before the snow turned to freezing rain. All portions of east central Ohio reported at least 1/4 inch of ice accumulation, with some areas in Belmont and Harrison counties reporting over 1 inch of ice. The ice accumulation brought numerous power lines and large tree branches down, resulting in power outages to over 10,000 homes across the area.

- **2014-01-05 Extreme Cold**: An arctic cold front crossed the Upper Ohio Valley on the 6th, bringing record low temperatures and extreme wind chills the morning of the 7th. It was the coldest January 7th on record in Pittsburgh with a low temperature of 9 below zero, and a high temperature of 4 above zero. Across eastern Ohio, western Pennsylvania, northern West Virginia, and Garrett County Maryland, low temperatures ranged from 5 to 15 degrees below zero the morning of the 7th, with the lowest wind chill readings from 25 to 55 degrees below zero.
- **2017-01-05 Winter Weather:** Fast-moving low pressure, with enhancement from mid level frontogenesis and the exit region of an upper level jet, supported a period of snow in the afternoon of the 5th through the early morning hours of the 6th. A general 2-4 inches of snow fell across eastern Ohio and western Pennsylvania, south of I-70. Amounts were slightly higher, in the 3-6 range over the mountains of West Virginia, Maryland, and Pennsylvania.
- **2018-02-07 Winter Storm** Low pressure moved up the western side of the Appalachians Tuesday night, February 6th into the morning hours of Wednesday, February 7th. Initially the precipitation started as snow across the upper Ohio Valley. As the warm air surged north, precipitation type changed to a wintry mix of sleet and freezing rain. Locations in northern West Virginia and southwestern Pennsylvania changed over to rain with temperatures climbing into the upper 30s to lower 40s. Eastern Ohio, the northern West Virginia Panhandle, and locations from central Beaver County, northeast into southern Jefferson County, Pennsylvania switched over to freezing rain. Ice accumulation was around a quarter of an inch for these places. Farther north along the I-80 corridor and parts of interior southeastern Ohio, cold air remained socked in, keeping the precipitation all snow. Several inches of snow fell with the highest amounts located across parts of northern Butler county northeast into Clarion, Jefferson, and Forest counties. For eastern Ohio, Columbiana, Carroll, southwest into Coshocton County around six inches of snow fell.

4.4 PROBABILITY OF FUTURE OCCURRENCES

Reported winter events over the past 20 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. Winter storms have been recorded 56 times in the past 22 years (since 1996), a frequency of 2.5 times per year.

(**2018** CY) - (**1996** HY) = **22 Years on Record**

(**56 Events**) / (**22 Years**) = **2.5 Events per Year**

Furthermore, the historic frequency indicates that there is a 100% chance of this type of event occurring each year.

The HMPC, based on their knowledge, determined that Severe Winter Storms are "Highly Likely," meaning they have nearly 100% chance of occurring each year.

4.5 COMMUNITY VULNERABILITY

TABLE 4-26 POTENTIAL IMPACTS FROM WINTER STORMS

Impact	Description
People	Winter storms can bring with them severely cold temperatures, which can cause frostbite. Slips and falls resulting from ice can cause injuries, particularly to older populations. Community isolation with little power, water, or food.
Infrastructure	Power outages can result from heavy snow on power lines. Roof collapses may also occur. Burst pipes may also result, damaging homes and businesses.
Economy	As transportation becomes dangerous, local shops lose customers. Some are forced to close during storms.
Natural Systems	Rivers may freeze and cause flooding. Trees and other vegetation may be killed by ice or brought down from high winds.
Transportation	Roads can become either dangerously traversable, or completely impassable.

All County assets can be considered at risk from severe winter storms. This includes 100 percent of the County population and all buildings and infrastructure. Damages primarily occur as a result of cold temperatures, heavy snow or ice and sometimes strong winds. Due to their regular occurrence, these storms are considered hazards only when they result in damage to specific structures or cause disruption to traffic, communications, electric power, or other utilities.

A winter storm can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite and freezing conditions. They can result in the closing of secondary roads, particularly in rural locations, loss of utility services and depletion of heating supplies. Most structures, including the County's critical facilities, could suffer damage from snow load on rooftops and large deposits of ice. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out, even if only certain systems are powered by that generator.

Winter weather and related storms do not generally have a negative impact on structures. While cold temperatures and power losses can render a structure uninhabitable for a time, they are unlikely to cause structural damages. However, snow and ice accumulation can impact structures and infrastructure. Older structures, in particular are more susceptible to the impacts from winter weather due to older construction and insulation methods.

In addition to the infrastructure of the County, the population needs to be taken into consideration. The County is home to an estimated 67,505 people. At particular risk are elderly individuals. The US Census Bureau estimates that approximately 20.8% of the County's population, or more than 14,000 individuals, are above the age of 65 and at risk of severe winter weather.

Inventory Assets Exposed to Winter Storms

Winter storms affect the entirety of Belmont County, as well as all communities and jurisdictions, and all above-ground structures and infrastructure. Although losses to structures are typically minimal and covered by insurance, there can be impacts with lost time, maintenance costs, and contents within structures.

A timely forecast may not be able to mitigate property loss but could reduce the casualties and associated injury. In severe winter storm events, buildings are vulnerable to widespread utility disruptions, including loss of heat and electricity, as well as building collapse or damage from downed trees. Belmont County is also subject to outages resulting from damages to the electrical grid in other parts of the state. Over 50% of the County's buildings were built prior to 1970, making them vulnerable to the issues brought on by winter storms.

Similar to Extreme Cold, older and younger populations are particularly susceptible to these types of storms. According to the 2018 American Community Survey, there were approximately 3,240 children under the age of 5, which is equal to about 4.8% of the total population. There were an estimated 14,041 people above the age of 65, equating to about 20.8% of the population.

TABLE 4-27 POPULAGE AGE ESTIMATES, 2018

Total	Population	Percent
Under 5 years	3,240	4.8%
65 and up	14,041	20.8%

TABLE 4-28 DATE OF BUILDING CONSTRUCTION

Year Built	Percent	Number
Built 1939 or earlier	32%	10,265
Built 1940 to 1949	8%	2,530
Built 1950 to 1959	11%	3,647
Built 1960 to 1969	10%	3,080
Built 1970 to 1979	16%	5,009
Built 1980 to 1989	7%	2,330
Built 1990 to 1999	9%	2,874
Built 2000 to 2009	6%	2,038
Built 2010 to 2013	1%	398
Built 2014 or later	0%	116
Total:	100%	32,287

4.6 LAND USE & DEVELOPMENT TRENDS

As stated above, in severe winter storm events, buildings are vulnerable to widespread utility disruptions, including loss of heat and electricity, as well as building collapse or damage from downed trees. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up and/or high winds which can break limbs or even bring down large trees.

An indirect effect of winter storms is the treatment of roadway surfaces with salt, chemicals, and other de-icing materials which can impair adjacent surface and ground waters. This is particularly a concern in urban areas. Another important secondary impact for winter storms is building or structure collapses; if there is a heavy snowfall or a significant accumulation over time, the weight of the snow may cause building damage or even collapse.

Winter storms have a positive environmental impact as well; gradual melting of snow and ice provides excellent groundwater recharge. However, abrupt high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding.

4.7 WINTER STORM SUMMARY

Belmont County is subject to severe winter storms which have the potential to be hazard as a result of cold temperatures, heavy snow or ice and sometimes strong winds. Severe winter storm hazards can cause a range of damage to structures that will depend on the magnitude and duration of storm events. Losses may be as small as lost productivity and wages when workers are unable to travel or as large as sustained roof damage or building collapse. The severe winter storms profile is primarily concerned with past and future damages from cold temperatures, heavy snow or ice and sometimes strong winds.

5. SEVERE THUNDERSTORMS

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Severe Thunderstorms	**4**	1.2	**2**	0.6	**4**	0.8	**1**	0.1	**2**	0.2	**2.9**
Medium Risk Hazard (2.0 – 2.9)											

5.1 SEVERE THUNDERSTORM CHARACTERISTICS

Extreme weather conditions can exist during any season in Ohio. Thunderstorms, associated with strong winds, heavy precipitation, and lightning strikes can all be hazardous under the right conditions and locations. Strong winds and tornadoes can take down trees, damage structures, tip high profile vehicles, and create high velocity flying debris. Large hail can damage crops, dent vehicles, break windows, and injure or kill livestock, pets, and people. Even the remnants of tropical storms and hurricanes have been known to bring severe wind damage and flooding to the state.

- **Thunderstorms** affect relatively small areas when compared with hurricanes and winter storms. Despite their small size, thunderstorms are dangerous. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe. The National Weather Service considers a thunderstorm severe if it produces hail at least 3/4 inch in diameter, winds of 58 MPH or stronger, or a tornado. Every thunderstorm needs three basic components: (1) moisture to form clouds and rain (2) unstable air which is warm air that rises rapidly and (3) lift, which is a cold or warm front capable of lifting air to help form thunderstorms.

- **Downburst winds**, which can cause more widespread damage than a tornado, occur when air is carried into a storm's updraft, cools rapidly, and comes rushing to the ground. Cold air is denser than warm air, and therefore, wants to fall to the surface. On warm summer days, when the cold air can no longer be supported up by the storm's updraft, or an exceptional downdraft develops, the air crashes to the ground in the form of strong winds. These winds are forced horizontally when they reach the ground and can cause significant damage. These types of strong winds can also be referred to as straight-line winds. Downbursts with a diameter of less than 2.5 miles are called microbursts and those with a diameter of 2.5 miles or greater are called macrobursts. A derecho, or bow echo, is a series of downbursts associated with a line of thunderstorms. This type of phenomenon can extend for hundreds of miles and contain wind speeds in excess of 100 mph.

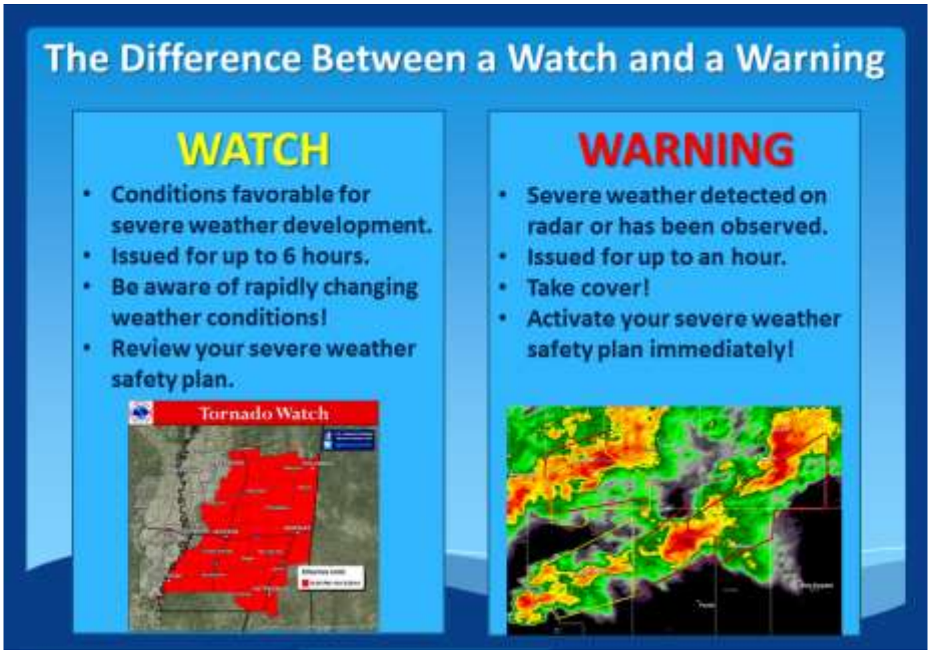
- **Lightning**, although not considered severe by the National Weather Service definition, can accompany heavy rain during thunderstorms. Lightning develops when ice particles in a cloud move around, colliding with other particles. These collisions cause a separation of electrical charges. Positively charged ice particles rise to the top of the cloud and negatively charged ones fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge called a stepped leader toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder.

- **Hail** develops when a super cooled droplet collects a layer of ice and continues to grow, sustained by the updraft. Once the hail stone cannot be held up any longer by the updraft, it falls to the ground. Nationally, hailstorms cause nearly $1 billion in property and crop damage annually, as peak activity coincides with peak agricultural seasons. Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph), which can be destructive to roofs, buildings, automobiles, vegetation, and crops.

5.2 SEVERE THUNDERSTORM EXTENT

Thunderstorm watches and warnings are issued by the National Weather Service. There are no watches or warnings for lightning. Figure 13 explains the difference between watches and warnings, as used by the NWS.

FIGURE 13 NWS WATCH VS. WARNING



The Difference Between a Watch and a Warning

WATCH

- Conditions favorable for severe weather development.
- Issued for up to 6 hours.
- Be aware of rapidly changing weather conditions!
- Review your severe weather safety plan.

WARNING

- Severe weather detected on radar or has been observed.
- Issued for up to an hour.
- Take cover!
- Activate your severe weather safety plan immediately!

The Beaufort scale is a scale for measuring wind speeds. It is based on observation rather than accurate measurement. It is the most widely used system to measure wind speed today. There are twelve levels, plus 0 for "no wind."

TABLE 4-29 BEAUFORT SCALE

Beaufort number	MPH	Description	Observation
0	<1	Calm	Calm. Smoke rises vertically.
1	1-3	Light air	Wind motion visible in smoke
2	3-7	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-17	Moderate breeze	Dust and loose paper raised. Small branches begin to move.
5	18-24	Fresh breeze	Branches of a moderate size move. Small trees begin to sway.
6	25-30	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	31-38	High wind, Moderate Gale, Near Gale	Whole trees in motion. Effort needed to walk against the wind. Swaying of skyscrapers may be felt, especially by people on upper floors.
8	39-46	Fresh Gale	Twigs broken from trees. Cars veer on road.
9	47-54	Strong Gale	Larger branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over. Damage to circus tents and canopies.
10	55-63	Whole Gale/Storm	Trees are broken off or uprooted, saplings bent and deformed, poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	64-72	Violent storm	Widespread vegetation damage. More damage to most roofing surfaces, asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	≥73	Hurricane-force	Considerable and widespread damage to vegetation, a few windows broken, structural damage to mobile homes and poorly constructed sheds and barns. Debris may be hurled about.

TABLE 4-30 HAIL SIZE COMPARISON CHART

Common Object	Size in Diameter
Pea	0.25 Inch
Penny or Dime	0.75 Inch
Quarter	1.00 Inch
Half Dollar	1.25 Inch
Golf Ball	1.75 Inch
Tennis Ball	2.50 Inch
Baseball	2.75 Inch
Grapefruit	4.00 Inch

Hail sizes can differ greatly from one storm to another depending on the strength of the storm's updraft. Stronger updrafts can create larger hailstones, which in turn causes more damage. This makes reporting the size of hail important for public safety. The preferred hail measurement method is to use a ruler to measure the diameter of the hail stone along its longest axis. However, various coins and balls are often used when reporting hail size.

5.3 HISTORICAL OCCURRENCES

General Trends

Dangerous and damaging aspects of a severe storm are tornadoes, hail, lightning strikes, flash flooding, and winds associated with downbursts and microbursts. Reported severe weather events over the past 60 years provides an acceptable framework for determining the magnitude of such storms that can be expected and planned for accordingly. FEMA places this region in Zone IV (250 MPH) for structural wind design (Federal Emergency Management Agency, 2004b).

FIGURE 14 SUMMARY OF HISTORICAL SEVERE THUNDERSTORMS

Type	Count	Injuries	Deaths	Property Damage	Crop Damage
Hail	68	0	0	$ 0	$ 0
Heavy Rain	83	0	0	$ 0	$ 0
Lightning	2	5	2	$ 0	$ 0
Strong Wind	1	0	0	$ 10,000	$ 0
Thunderstorm Wind	137	0	0	$ 1,761,000	$ 0
Grand Total	**291**	**5**	**2**	**$ 1,771,000**	$ 0

Thunderstorm Wind Events

Non-tornadic, thunderstorm and non-thunderstorm winds over 100 mph should also be considered in future planning initiatives. These types of winds can remove roofs, move mobile homes, topple trees, take down utility lines, and destroy poorly-built or weak structures. There have been 137 recorded severe wind events associated with thunderstorms since 1996.

Hail Events

Large hail can damage structures, break windows, dent vehicles, ruin crops, and kill or injure people and livestock. Based on past occurrences, hail sizes greater than 3 inches in diameter are possible and should be included in future planning activities.

There have been 70 recorded hail events associated with thunderstorms that have either directly or indirectly impacted the County and the immediately surrounding jurisdictions since 1950. A full list of events by date, and with additional detail, can be found at the end of this hazard profile.

Furthermore, the historic frequency calculates that there is a 100% chance of this type of event occurring each year.

Lightning Events

Except in cases where significant forest or range fires are ignited, lightning generally does not result in disasters. There have been no recorded instances of lightning-related incidents in Belmont County.

Since 1956, 13 federally or state declared severe thunderstorm weather events have occurred in Belmont County as shown in the table below. According to FEMA Declarations (1956 to present), these events include: severe storms, straight-line winds, flooding, and tornadoes.

TABLE 4-31 SEVERE STORM DISASTER DECLARATIONS

Disaster Number	Declaration Date	Title	Public Assistance	Individual Assistance
DR-4360	4/17/2018	Severe Storms, Landslides, And Mudslides	$5,115,719 awarded to date	-
DR-4077	8/20/2012	Severe Storms and Straight-Line Winds	$128,533	-
EM-3346	6/30/2012	Severe Storms	-	-
DR-4002	7/13/2011	Severe Storms and Flooding	$1,143,503	-
DR-1556	9/19/2004	Severe Storms and Flooding	$9,851,192	$6,236,004
DR-1507	1/26/2004	Severe Storms, Flooding, Mudslides, And Landslides	$4,577,700	$112,880
DR-1227	6/30/1998	Severe Storms, Flooding, And Tornadoes	$715,963	$446,153
DR-1097	1/27/1996	Severe Storms and Flooding	$891,632	$539,841
DR-951	8/4/1992	Severe Storms, Tornadoes & Flooding	$458,072	-
DR-870	6/6/1990	Severe Storms, Tornadoes & Flooding	$2,276,532	25 Counties total received $4,331,497. Belmont’s total unavailable.
DR-630	8/23/1980	Severe Storms & Flooding	-	-
DR-480	9/11/1975	Winds, Tornadoes, Heavy Rains & Flooding	-	-
DR-345	7/19/1972	Tropical Storm Agnes	-	-

Event Narratives

- **February 12, 2009 – High Wind:** A powerful cold front moved across the Ohio Valley on the evening of the 11th as strong low pressure moved north across the Great Lakes. A convective line along the cold front produced widespread damage across eastern Ohio, western Pennsylvania, northern West Virginia, and Garrett County Maryland with thunderstorm wind gusts of 60 to 70 MPH and a peak wind gust of 92 MPH at Allegheny County Airport near Pittsburgh. High winds gusting over 60 MPH behind the front in a strong pressure gradient produced wind damage across the entire region into midday on the 12th. In all across eastern Ohio, western Pennsylvania, northern West Virginia and Garrett County Maryland over one half million homes and businesses were without power at some point during the storm.

- **May 31, 2010 – Lightning:** Scattered severe thunderstorms developed across eastern Ohio and western Pennsylvania as a warm front slowly pushed north across the region. Heavy rainfall with the storms also caused minor flooding. An inmate was killed and five others injured after a lightning strike at the Belmont Correctional Institute while prisoners were in the recreational yard. Three of the injured were taken to the hospital for treatment.

- **August 4, 2010 – Thunderstorm:** A mesoscale convective system moved along a boundary situated over east central Ohio, southern Pennsylvania and Northern West Virginia. Severe thunderstorms across eastern Ohio, southwest Pennsylvania, northern West Virginia, and Garrett County Maryland produced widespread wind damage with 50 thousand homes left without power. The counties that were hardest hit were Belmont and Jefferson counties in Ohio, where numerous large trees blocked roadways and three large radio station towers collapsed. Emergency Management reported that three 370-foot WWVA radio station towers were blown over and destroyed near Barton.

- **November 17, 2013 – Thunderstorm**: A line of showers and isolated thunderstorms along a cold front swept east across the region the evening of November 17th. This produced severe thunderstorm wind damage across eastern Ohio, western Pennsylvania, northern West Virginia and Garrett County Maryland. Around 25,000 homes were without power across the region due to downed trees and power lines.

- **June 20, 2018 – Thunderstorm**: Thunderstorms were able to form along a stationary front in a tropical environment. Moisture was plentiful, with precipitable water values of over 2 inches. One storm in Belmont County was able to generate severe winds, ripping a roof off of a barn along US 250.

5.4 PROBABILITY OF FUTURE OCCURRENCES

The HMPC, based on their knowledge and experience, decided that Severe Thunderstorm events are “Highly Likely,” meaning that they have a 100% chance of occurring each year.

Thunderstorm Probability

Reported thunderstorm winds over the past 22 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of experiencing thunderstorm winds associated with damages or injury can be difficult to predict. Based on the historical record of 219 thunderstorm events 1996 through 2018 (13.2 thunderstorms per year), it can reasonably be assumed that this type of event will occur multiple times per year.

(2018 CY) - (1996 HY) = 22 Years on Record

(291 Events) / (22 Years) = 13.2 Events each Year

Thunderstorms have occurred on a regular basis every year. Due to climate change, it is expected that thunderstorms will grow increasingly frequent and intensify in severity.

5.5 COMMUNITY VULNERABILITY

TABLE 4-32 IMPACTS FROM THUNDERSTORMS

Impact	Description
People	Loss of life or severe injuries can occur, especially to those outside. Lightning will strike outdoors. Hail can cause lacerations, concussions, and even death if large enough.
Infrastructure	Roofs and building siding severely damaged by high winds or hail. Power outages may result from lightning strikes or downed power lines.
Economy	Mostly localized disruptions. Large-scale storms such as hurricanes or derechos can temporarily affect businesses.
Natural Systems	Lightning can cause wildfires and urban fires. Wind can down trees.
Transportation	Fallen trees can hinder transportation. High winds and heavy rain can temporarily make driving conditions dangerous.

Inventory Assets Exposed

Damage to inventory assets exposed to severe thunderstorms is dependent on the age of the building, type, construction material used, and condition of the structure. Heavy wind loads on structures can cause poorly constructed roofs to fail, and hail is known to damage roofs and siding of structures, rendering the building more susceptible to water damage.

All County assets can be considered at risk from severe thunderstorms. This includes 100% of the County population and all buildings and infrastructure. Damages primarily occur as a result of high winds, lightning strikes, hail, and flooding. Most structures, including critical facilities, should be able to provide adequate protection from hail but the structures could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

Potential Losses

A timely forecast may not be able to mitigate the property loss, but could reduce the casualties and associated injury. It appears possible to forecast these extreme events with some skill, but further research needs to be done to test the existing hypothesis about the interaction between the convective storm and its environment that produces the extensive swath of high winds. Severe thunderstorms will remain a highly likely occurrence for the County. Lightning and hail may also be experienced in the area due to such storms.

There is no way to predict the area that will be impacted by thunderstorm winds, hailstorms or lightning strikes. An individual thunderstorm is unlikely to damage large numbers of structures on its own. However, the side effects of a thunderstorm (hail, winds and lightning), can cause damage to structures and property throughout the County.

A March 2017 report by Willis Re found that the average annual loss for severe storms is $11.23 billion for the United States in comparison to the $11.28 billion in damages caused annually by hurricanes. Though this is a national estimate, it shows that these smallers storms are still capable of significant damages.

5.6 LAND USE & DEVELOPMENT TRENDS

All future structures built in the County will likely be exposed to severe thunderstorm damage. The County needs to adhere to building codes so that new development can be built to current standards.

Regulatory Environment

There are negligible formal regulations that pertain to thunderstorm events. All structures in the County are meant to be wind-resistant as recommended by the International Building Code.

5.7 THUNDERSTORM SUMMARY

Belmont County is subject to severe storms ranging from thunderstorms to tropical storms which have the potential to cause flash flooding, tornadoes, downbursts, and debris. The Severe Thunderstorms profile is primarily concerned with past and future damages from high winds, lightning, and hail. Flooding is covered as a separate hazard, including flooding that occurs from a heavy precipitation event.

Mitigation of building damage has been most successful where strict building codes for high-wind influence areas and designated special flood hazard areas have been adopted and enforced by local governments, and the builders have complied. Proven techniques are available to reduce lightning damage by grounding techniques for buildings.

Mitigation efforts include buyout programs, relocations, structural elevations, improved open-space preservation, and land use planning within high-risk areas. Due to the significant risk from severe storms, the County will remain proactive in its mitigation efforts to help build sustainability.

6. DROUGHT

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Drought	**2**	0.6	**1**	0.3	**4**	0.8	**4**	0.4	**4**	0.4	**2.5**
Medium Risk Hazard (2.0 – 2.9)											

6.1 DROUGHT CHARACTERISTICS

Drought is a normal, recurrent, feature of climate and originates from a deficiency of precipitation over an extended period, usually one or more seasons. Drought can result in a water shortage for some activity, group, or environmental sector. Drought is a complex natural hazard, which is reflected in the following four definitions commonly used to describe it:

- **Agricultural:** Defined principally in terms of naturally occurring soil moisture deficiencies relative to water demands of plant life, usually arid crops.
- **Hydrological:** Related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- **Meteorological:** Defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
- **Socio-economic:** Associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall. It may also be called a water management drought.

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use (e.g., deforestation), land degradation, and the construction of dams all affect the hydrological characteristics of a particular region. Since regions are interconnected by natural systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Changes in land use upstream may alter hydrologic characteristics such as infiltration and runoff rates, resulting in more variable stream flow and a higher incidence of hydrologic drought downstream. Land use change is one way human actions alter the frequency of water shortage even when no change in precipitation has been observed.

Drought risk is assessed based on a combination of the frequency, severity, and spatial extent (the physical nature of drought) and the degree to which a population or activity is vulnerable to the effects of drought. The degree of the County's vulnerability to drought depends on the environmental and social characteristics of the region and is measured by its ability to anticipate, cope with, resist, and recover from drought.

Because drought is usually considered a regional hazard, it is not enhanced or analyzed by County-level mapping. Mapping of the current drought status is published by the National Integrated Drought Information System (NIDIS).

6.2 DROUGHT EXTENT

The Palmer Drought Severity Index (PDSI) was developed by Wayne Palmer in the 1960s and uses temperature and rainfall information in a formula to determine dryness. It has become the semi-official drought index. The Palmer Index is most effective in determining long term drought—a matter of several months—and is not as good with short-term forecasts (a matter of weeks). It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought.

TABLE 4-33 PALMER DROUGHT SEVERITY INDEX

Drought Severity	Return Period (Years)	Description of Possible Impacts	Drought Monitoring Indices		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44 +	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies	Less than -2	D4	-5.0 or less

Drought severity depends on numerous factors, including duration, intensity, and geographic extent, as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity. The magnitude of drought is usually measured in time and the severity of the hydrologic deficit.

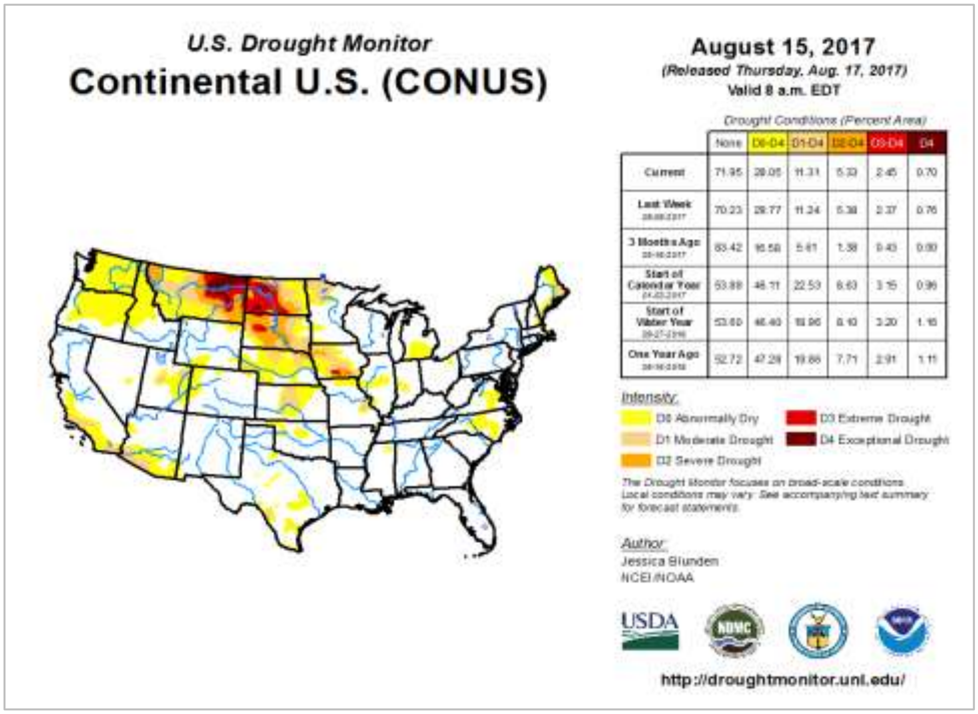
Several resources are available to evaluate drought status and estimate future expected conditions. The National Integrated Drought Information System (NIDIS) Act of 2006 (Public Law 109-430) prescribes an interagency approach for drought monitoring, forecasting, and early warning. The NIDIS maintains the U.S. Drought Portal (www.drought.gov), a web-based access point to several drought related resources. Resources include the U.S. Drought Monitor (USDM) and the U.S. Seasonal Drought Outlook (USSDO).

6.3 HISTORICAL OCCURENCES

Belmont County as a whole, have been in 3 notable droughts in recent years:

- **Drought of 1999:** The dry conditions that actually began in July 1998 continued through the month of August. On August 10th, the U.S. Department of Agriculture declared all of Eastern Ohio an agricultural disaster area. Precipitation deficits for the period of May through August show the area to be anywhere between 2 and 8 inches below normal. Dry conditions continued through September.
- **Drought of 2012:** While NOAA's National Climactic Database does not list a drought in 2012, there were nationwide drought conditions observed that year. The 2012-2013 North American droughts began in the spring of 2012, when the lack of snow in the continental United States resulted in very little melt water being absorbed into the soil. Drought conditions were experienced almost nationwide. Multiple Ohio counties were designated as being in a moderate drought condition by June. The Governor of Ohio sent a memorandum to the USDA State Executive Director requesting primary county natural disaster designations for eligible counties due to agricultural losses caused by drought. The USDA reviewed this memorandum and determined that there were sufficient production losses in eighty-five counties to warrant a Secretarial disaster designation.

FIGURE 15 EXAMPLE US DROUGHT MONITOR MAP



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	71.95	28.05	11.31	5.33	2.45	0.70
Last Week 08-08-2017	70.23	29.77	11.24	5.38	2.37	0.76
3 Months Ago 05-16-2017	83.42	16.58	5.61	1.38	0.43	0.00
Start of Calendar Year 01-03-2017	53.89	46.11	22.53	8.63	3.15	0.96
Start of Water Year 09-27-2016	53.60	46.40	18.96	8.10	3.20	1.16
One Year Ago 08-16-2016	52.72	47.28	19.86	7.71	2.91	1.11

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Jessica Blunden
NCEI/NOAA

http://droughtmonitor.unl.edu/

- **Drought of 2016:** During July and August 2016, there was little rain, and approximately 15% of the state was labeled as being in “severe drought” status. As a result of the drought in the early summer months, only 45% of corn and 54% of soybeans rated good or better. The drought ended in August, which, after heavy rains, ended up being a wetter than normal month.

6.4 PROBABILITY OF FUTURE OCCURRENCES

Drought conditions are likely to become more frequent and persistent over the 21st century due to climate change. Drought related to climate change will increase pressure on Ohio water resources. Decreasing snowmelt and spring stream flows coupled with increasing populations, anticipated hotter climate, and demand for water in southern portions of Ohio may lead to water shortages for residents.

Drought is difficult to predict, but warning indicators can be tracked and monitored. Understanding the historical frequency, duration, and spatial extent of drought assists in determining the likelihood and potential severity of future droughts. The characteristics of past droughts provide benchmarks for projecting similar conditions into the future. The probability of the County experiencing a drought event in any given year can be difficult to predict. However, the County has experienced three droughts in past 18 years, or one every six years.

(**2017** CY) - (**1999** HY) = **18 Years on Record**

(**18 Years**) / (**3 Events**) = **6 Years Between Events**

The historic frequency indicates that there is a 16% chance of this type of event occurring each year.

The National Oceanic and Atmospheric Administration Paleoclimatology Program studies drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, “…paleoclimatic data suggest that droughts as severe as the 1950’s drought have occurred in central North America several times a century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago.” Based on this research, the 1950’s drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930’s “Dust Bowl,” has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade. (NOAA, 2003) A 500-year drought with a magnitude similar to that of the 1930’s that destroys the agricultural economy and leads to wildfires is an example of a high magnitude event.

Impacts to vegetation and wildlife can include death from dehydration and spread of invasive species or disease because of stressed conditions. However, drought is a natural part of the environment in Ohio and native species are likely to be adapted to surviving periodic drought conditions. It is unlikely that drought would jeopardize the existence of rare species or vegetative communities.

Environmental impacts are more likely at the interface of the human and natural world. The loss of crops or livestock due to drought can have far-reaching economic effects. Wind and water erosion can alter the visual landscape and dust can damage property. Water-based recreational resources are affected by drought conditions. Indirect impacts from drought arise from wildfire, which may have additional effects on the landscape and sensitive resources such as historic or archeological sites.

6.5 DROUGHT IMPACT CATEGORIES

Agriculture: Impacts associated with agriculture, farming, and ranching. Examples of drought-induced agricultural impacts include: damage to crop quality; income loss for farmers due to reduced crop yields; reduced productivity of cropland (due to wind erosion, long-term loss of organic matter, etc.); insect infestation; plant disease; increased irrigation costs; costs of new or supplemental water resource development (wells, dams, pipelines); reduced productivity of rangeland; forced reduction of foundation stock; closure/limitation of public lands to grazing; high cost/unavailability of water for livestock; and range fires.

Water/Energy: Impacts associated with surface or subsurface water supplies (i.e., reservoirs or aquifers), stream levels or stream flow, hydropower generation, or navigation. Examples of drought-induced water/energy impacts include: lower water levels in reservoirs, lakes, and ponds; reduced flow from springs; reduced stream flow; loss of wetlands; estuarine impacts (e.g., changes in salinity levels); increased groundwater depletion, land subsidence, reduced recharge; water quality effects (e.g., salt concentration, increased water temperature, pH, dissolved oxygen, turbidity); revenue shortfalls and/or windfall profits; cost of water transport or transfer; cost of new or supplemental water resource development; loss from impaired navigability of streams, rivers, and canals.

Environment: Impacts associated with wildlife, fisheries, forests, and other fauna. Examples of drought-induced environment impacts include: loss of biodiversity of plants or wildlife; loss of trees from urban landscapes, shelterbelts, wooded conservation areas; reduction and degradation of fish and wildlife habitat; lack of feed and drinking water; greater mortality due to increased contact with agricultural producers, as animals seek food from farms and producers are less tolerant of the intrusion; disease; increased vulnerability to predation (from species concentrated near water); migration and concentration (loss of wildlife in some areas and too many wildlife in other areas); and increased stress to endangered species.

Fire: Impacts associated with forest and range fires that occur during drought events. The relationship between fires and droughts is very complex. Not all fires are caused by droughts and serious fires can result when droughts are not taking place.

Social: Impacts associated with the public, or the recreation/tourism sector. Examples of drought-induced social impacts include: health-related low-flow problems (e.g., cross-connection contamination, diminished sewage flows, increased pollutant concentrations, reduced firefighting capability, etc.); loss of human life (e.g., from heat stress, suicides); public safety from forest and range fires; increased respiratory ailments; increased disease caused by wildlife concentrations; population migrations (rural to urban areas, migrants into the United States); loss of aesthetic values; reduction or modification of recreational activities; losses to manufacturers and sellers of recreational equipment; losses related to curtailed activities (hunting and fishing, bird watching, boating, etc.).

6.6 VULNERABILITY FROM DROUGHT

TABLE 4-34 IMPACTS FROM DROUGHT

Impact	Description
People	Dehydration can occur during drought if water reserves run out.
Infrastructure	Lack of moisture in the ground can cause roadways to crack after long periods of time. Water reservoirs can dry up.
Economy	Rural areas that rely on crops will suffer the most damage economically. Farmers will lose large amounts of money during extended drought.
Natural Systems	Vegetation severely damaged. Rivers and streams can dry up.
Transportation	Cracks in roads can cause delays or detours.

Inventory Assets and Potential Losses Due to Drought

Drought typically does not have a direct impact on critical facilities or structures. However, possible losses/impacts to critical facilities include the loss of critical function due to low water supplies. Severe droughts can negatively affect drinking water supplies. Should a public water system be affected, the losses could total into the millions of dollars if outside water is shipped in. Private springs/wells could also dry up. Possible losses to infrastructure include the loss of potable water.

Droughts evolve slowly over time and the population typically has ample time to prepare for its effects. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

Droughts are not likely to impact structures or infrastructure. The prolonged absence of precipitation is more likely to have an impact on agricultural operations than on more urban settings. While the County's infrastructure may not be susceptible to the effects of a drought, the agricultural program's various project areas may be impacted.

Potential Losses from Drought

Due to the nature of drought, all property in the County is expected to be impacted equally due to drought conditions. Agricultural land throughout the County would be affected the most. No injuries, death, or property damage has been recorded as a result of drought in Belmont County.

There is an estimated $56.6 million in agriculture product within the County. A 1% loss would result in $566,000 in lost crops, and a 5% loss would be $2.83 million.

6.7 LAND USE & DEVELOPMENT TRENDS

Society's vulnerability to drought is affected by (among other things) population growth and shifts, urbanization, demographic characteristics, technology, water use trends, government policy, social behavior, and environmental awareness. These factors are continually changing, and society's vulnerability to drought may rise or fall in response to these changes. For example, increasing and shifting populations put increasing pressure on water and other natural resources - more people need more water.

Future development's greatest impact on drought hazards would possibly be to ground water resources. New water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Public water systems are monitored, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on the drought vulnerabilities.

Regulatory Environment

There are negligible formal regulations that pertain to drought events.

6.8 DROUGHT SUMMARY

Drought is extremely difficult to predict, but drought indicators can be identified and monitored. Several mitigation measures will be reviewed and considered by the County for incorporation into future Plan updates.

- Assessment programs
- Water supply augmentation and development of new supplies
- Public awareness and education programs
- Technical assistance on water conservation
- Reduction and water conservation programs
- Emergency response programs
- Drought contingency plans

Some of these actions can have long-term impacts, such as contingency plan development, and the development of water conservation and public awareness programs. As Belmont County gains more experience assessing and responding to drought, future actions will undoubtedly become more timely, effective, and proactive.

7. TORNADO

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Tornado	**2**	0.6	**1**	0.3	**1**	0.2	**4**	0.4	**4**	0.4	**1.9**
Medium Risk Hazard (2.0 – 2.9)											

7.1 TORNADO CHARACTERISTICS

A **tornado** is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service, tornado wind speeds can range between 30 to more than 300 miles per hour.

FIGURE 16 EXAMPLE OF A TORNADO

They are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touchdown briefly, but even small, short-lived tornadoes can inflict tremendous damage. Destruction ranges from minor to catastrophic depending on the intensity, size, and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries.

Strong winds can also occur outside of tornadoes, severe thunderstorms, and winter storms. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems (one high pressure, one low pressure) are, the stronger the pressure gradient, and therefore, the stronger the winds are.

7.2 TORNADO EXTENT

The Enhanced Fujita Scale, also known as the "EF-Scale," measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita scale that was published in 1971. It classifies United States tornadoes into six intensity categories, as shown in Table 4-35 below, based upon the estimated maximum winds occurring within the wind vortex. The EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures since it was implemented through the National Weather Service in 2007.

TABLE 4-35 ENHANCED FUJITA SCALE AND ASSOCIATED DAMAGE

EF-Scale Number	Wind Speed (MPH)	Type of Damage Possible
EFO	**65-85**	**Minor damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	**86-110**	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	**111-135**	**Considerable damage**: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	**136-165**	**Severe damage**: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	**166-200**	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	**>200**	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

The Storm Prediction Center (SPC) has developed damage indicators to be used with the Enhanced Fujita Scale for different types of buildings but can be also be used to classify any high wind event. Some of the indicators for different building types are shown in tables below.

TABLE 4-36 SPC INSTITUTIONAL BUILDING DAMAGE INDICATORS

Damage Description	Wind Speed Range (Expected, in Parentheses)
Threshold of visible damage	59-88 MPH (72 MPH)
Loss of roof covering (<20%)	72-109 MPH (86 MPH)
Damage to penthouse roof & walls, loss of rooftop HVAC equipment	75-111 MPH (92 MPH)
Broken glass in windows or doors	78-115 MPH (95 MPH)
Uplift of lightweight roof deck & insulation, significant loss of roofing material (>20%)	95-136 MPH (114 MPH)
Façade components torn from structure	97-140 MPH (118 MPH)
Damage to curtain walls or other wall cladding	110-152 MPH (131 MPH)
Uplift of pre-cast concrete roof slabs	119-163 MPH (142 MPH)
Uplift of metal deck with concrete fill slab	118-170 MPH (146 MPH)
Collapse of some top building envelope	127-172 MPH (148 MPH)
Significant damage to building envelope	178-268 MPH (210 MPH)

Source: Storm Prediction Center, 2009

TABLE 4-37 SPC EDUCATIONAL INSTITUTIONS (ELEMENTARY) DAMAGE INDICATORS

Damage Description	Wind Speed Range (Expected, in Parentheses)
Threshold of visible damage	55-83 MPH (68 MPH)
Loss of roof covering (<20%)	66-99 MPH (79 MPH)
Broken windows	71-106 MPH (87 MPH)
Exterior door failures	83-121 MPH (101 MPH)
Uplift of metal roof decking; significant loss of roofing material (>20%); loss of rooftop HVAC	85-119 MPH (101 MPH)
Damage to or loss of wall cladding	92-127 MPH (108 MPH)
Collapse of tall masonry walls at gym, cafeteria, or auditorium	94-136 MPH (114 MPH)
Uplift or collapse of light steel roof structure	108-148 MPH (125 MPH)
Collapse of exterior walls in top floor	121-153 MPH (139 MPH)
Most interior walls of top floor collapsed	133-186 MPH (158 MPH)
Total destruction of a large section of building envelope	163-224 MPH (192 MPH)

Source: Storm Prediction Center, 2009

TABLE 4-38 SPC METAL BUILDING SYSTEMS DAMAGE INDICATORS

Damage Description	Wind Speed Range (Expected, in Parentheses)
Threshold of visible damage	54-83 MPH (67 MPH)
Inward or outward collapsed of overhead doors	75-108 MPH (89 MPH)
Metal roof or wall panels pulled from the building	78-120 MPH (95 MPH)
Column anchorage failed	96-135 MPH (117 MPH)
Buckling of roof purlins	95-138 MPH (118 MPH)
Failure of X-braces in the lateral load resisting system	118-158 MPH (138 MPH)
Progressive collapse of rigid frames	120-168 MPH (143 MPH)
Total destruction of building	132-178 MPH (155 MPH)

Source: Storm Prediction Center, 2009

TABLE 4-39 SPC ELECTRIC TRANSMISSION LINES DAMAGE INDICATORS

Damage Description	Wind Speed Range (Expected, in Parentheses)
Threshold of visible damage	70-98 MPH (83 MPH)
Broken wood cross member	80-114 MPH (99 MPH)
Wood poles leaning	85-130 MPH (108 MPH)
Broken wood poles	98-142 MPH (118 MPH)

Source: Storm Prediction Center, 2009

Improved and consistent building codes have been considered as a key measure to mitigate life and property losses associated with tornadoes and wind events. All of Belmont County is equally at risk from tornado damage.

7.3 HISTORICAL OCCURRENCES

General Trends

The County may experience intense winds from thunderstorms, tornadoes, and even the remnants of hurricanes and tropical storms. Tornadoes can occur any time of the year, though, peak tornado occurrences are in March through October as past county records indicate.

TABLE 4-40 TORNADO EVENTS IN BELMONT COUNTY (1951-2018)

Location	Date	Time	Mag	Deaths	Injuries	Property Damage	Crop Damage
Belmont Co.	6/22/1985	7:00:00 PM	F1	0	0	$ 25,000	$ -
St. Clairsville	7/10/1993	2:31:00 PM	F0	0	0	$5,000	$ -
Belmont Co.	6/29/1987	6:10:00 PM	F0	0	0	$ 25,000	$ -
Crescent	8/14/2016	12:58:00 PM	Unknown	0	0	$ -	$ -

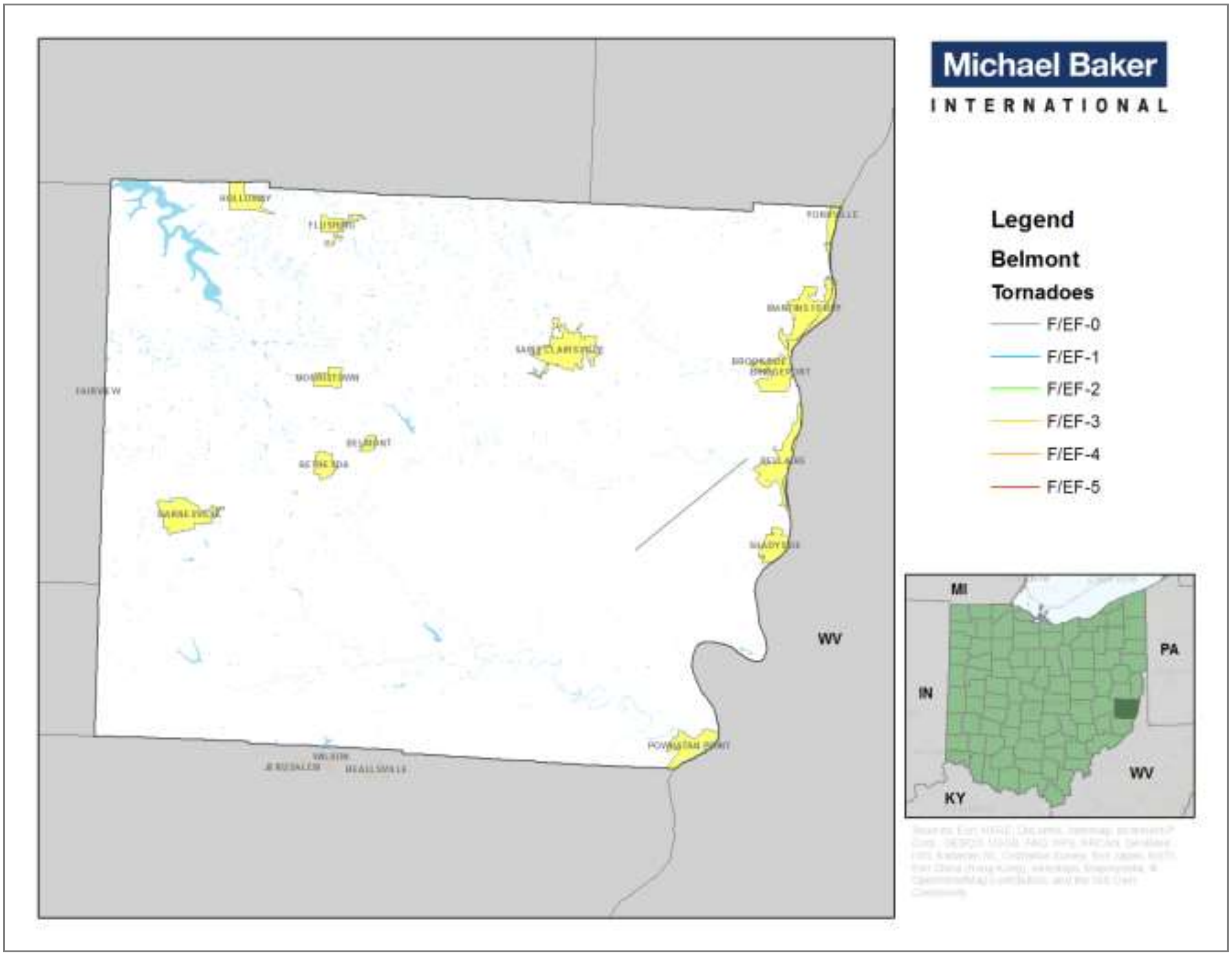
Historical Occurrences

Belmont County has been directly impacted by 3 tornadoes that did damage and 1 that had no noticeable impacts. In this last case, although the tornadoes themselves had no noticeable impacts, severe storms and flooding provided cause to receive public assistance funding. The County has been a part of 4 disaster declarations where Tornadoes were a factor in the overall emergency.

TABLE 4-41 DECLARED DISASTERS AFFECTING BELMONT COUNTY

Disaster Number	Declaration Date	Title	Public Assistance	Individual Assistance
DR-1227	6/30/1998	Severe Storms, Flooding, And Tornadoes	$715,963	$446,153
DR-951	8/4/1992	Severe Storms, Tornadoes & Flooding	$458,072	-
DR-870	6/6/1990	Severe Storms, Tornadoes & Flooding	$2,276,532	25 Counties total received $4,331,497. Belmont's total unavailable.
DR-480	9/11/1975	Winds, Tornadoes, Heavy Rains & Flooding	-	-

FIGURE 17 HISTORICAL TORNADOES IN BELMONT COUNTIES



7.4 PROBABILITY OF FUTURE OCCURRENCES

Reported tornado events over the past 61 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of experiencing a tornado event, although infrequent, can be difficult to quantify, but based on historical record of 3 tornado events since 1996, it can reasonably be assumed that this type of event has occurred once every 7 years from 1996 through 2015.

(2018 CY) - (1996 HY) = 22 Years on Record

(22 Years) / (3 Events) = 7 Years Between Events

The historic frequency indicates that there is a 14% chance of this type of event occurring each year.

The HMPC, based on their knowledge, determined that Tornadoes are “Likely,” meaning there is between a 10% and 100% of these events occurring each year.

7.5 VULNERABILITY TO TORNADOES

TABLE 4-42 POTENTIAL IMPACTS FROM TORNADOES

Impact	Description
People	Severe injuries or death may occur, particularly to those outside or in their vehicles. Large enough tornadoes can kill those even in moderately sturdy structures.
Infrastructure	Damaged or completely destroyed. Weak tornadoes may only rip shingles off a roof, while the strongest can level buildings completely. Power lines can be ripped off their poles, creating power outages for large areas.
Economy	Small town will often be the most affected from significant events. Large tornadoes can hinder transportation, delaying or cutting off supplies to towns.
Natural Systems	Small trees completely uprooted, large trees could have significant branches missing. Crops destroyed or heavily damaged.
Transportation	Transportation can be severely disrupted by debris strewn across roadways.

Inventory Assets Exposed to Tornadoes

All assets located in Belmont County can be considered at risk from tornadoes and wind events. This includes 100% of the County's population and all critical facilities, structures, and infrastructure.

Of particular concern are the 20,414 occupied housing units, as well as the 6,496 vacant units. Occupied housing units are actively home to the residents of the County. Damages could result in significant injuries or loss of life. Vacant units, while unoccupied, can be damaged or destroyed, leading to shrapnel or projectiles that damage other buildings and homes.

The direct path and strength of tornadoes is unpredictable, so a GIS analysis of this hazard was not performed. All assets in Belmont County must be considered equally at risk.

Potential Losses from Tornadoes

While all County assets are considered at risk from this hazard, a particular tornado would only cause damages along its specific track. A high-magnitude tornado sweeping through densely-populated portions of the County would have extensive injuries, deaths, and economic losses. There is no way to be sure how many people would be injured or killed due to the differences in time of day and path, but property values can provide an estimate of economic losses.

The communities of St. Clairsville, Villages of Belmont and Barnesville, as well as Belmont County, all noted that there has been a significant increase in temporary lodging for oil and gas workers, primarily in the form of RVs and trailers. These types of structures are particularly vulnerable to tornadoes and wind events.

7.6 LAND USE & DEVELOPMENT TRENDS

Improved and consistent building codes have been considered as a key measure to mitigate life and property losses associated with tornadoes and wind events. All Belmont County property is equally at risk to tornado damage, and there are no locations of high-risk exposure.

Regulatory Environment

There are negligible formal regulations that pertain to tornadoes. While there are suggested protective measures, especially for mobile/modular homes, these are generally not required in local codes.

7.7 TORNADOES SUMMARY

It’s difficult to separate the various wind components that cause damage from other wind-related natural events that often occur to generate tornadoes. For example, hurricanes with intense winds often spawn numerous tornadoes or generate severe thunderstorms producing strong, localized downdrafts. Due to this difficulty, tornadoes are difficult to predict and the entire County is subject to all categories of windstorms.

In addition to improved construction standards, retrofitting to enhance design standards of infrastructure can limit exposure. Examples include structural cladding, shuttering systems, and materials that are resistant to the penetration of wind-blown debris and projectiles.

8. WILDFIRE

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Wildfire	**2**	0.6	**1**	0.3	**1**	0.2	**4**	0.4	**2**	0.2	**1.7**
Low Risk Hazard (1.0-1.9)											

8.1 WILDFIRE CHARACTERISTICS

Wildfire events are unwanted wildland fires, including unauthorized human-caused fires, escaped debris burns, and other ignition sources that lead to fire over wildland areas. Throughout Ohio, communities are increasingly concerned about wildfire safety as increased development and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brush lands, as well as any structures located within them. Human access to wildland areas, such as urban development in forested areas, increases the risk of fire due to a greater chance for human carelessness.

Generally, there are three major factors that sustain wildfires and predict a given area’s potential to burn. These factors are fuel, topography, and weather.

- **Fuel:** The material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and volume. Fuel sources are diverse and include everything from dead tree leaves, twigs, and branches, to dead standing trees, live trees, brush, and cured grasses. Manmade structures are also considered a fuel source, such as homes and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Fuel is the only factor that is under human control.

- **Topography:** An area’s terrain and slope affect its susceptibility to wildfire spread. Both fire intensity and rate of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes.

- **Weather:** Components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out fuels that feed wildfires, creating a situation where fuel will ignite more readily and burn more intensely. Thus, during periods of drought the threat of wildfire increases. Wind is the most treacherous weather factor. The greater the wind, the faster a fire can spread and the more intense it can be. Wind shifts, in addition to wind speed, can occur suddenly due to temperature changes or the interaction of wind with topographical features such as slopes or steep hillsides. As part of a weather system, lightning also ignites wildfires, often in terrain difficult to reach by firefighters.

Wildfires can be classified as either a wildland fire or a wildland-urban interface (WUI) fire. A wildland fire occurs in an area that is relatively undeveloped except for the possible existence of basic infrastructure such as roads and power lines. A WUI fire occurs in an area that is developed with structures and other human developments. In WUI fires, the fire is fueled by both naturally occurring vegetation and the urban structural elements themselves. According to the National Fire Plan issued by the U.S. Departments of Agriculture and Interior, the wildland-urban interface is defined “as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.”

8.2 WILDFIRE EXTENT

The magnitude and severity of a wildfire event is measured by calculating the number of acres burned in a specific wildfire event and the severity of the burn classification. The below burn severity classifications have been adapted from USDA NRCS.

- Low Fire Severity (Type III)
    - General statements:
        - Primarily occur on rangeland
        - No sediment delivery
        - Natural recovery likely
    - Indicators:
        - Duff (decaying leaves and branches covering a forest floor) and debris are partly burned
        - Soil is a normal color
        - Hydrophobicity is low to absent
        - Standing trees may have some brown needles
    - Interpretations:
        - Root crowns and surface roots will re-sprout quickly
        - Infiltration and erosion potential are not significantly changed

- Medium Fire Severity (Type II)
    - General statements:
        - Primarily occur on steep, lightly timbered slopes with grass
        - Some sediment delivery
    - Indicators:
        - Duff is consumed
        - Burned needles are still evident
        - Ash is generally dark colored
        - Hydrophobicity is low to medium on surface soil up to 1 inch deep
        - Soil is brown to reddish-brown and up to 2 inches of soil is darkened from burning (below ash)
        - Roots are alive below 1 inch
        - Shrub stumps and small fuels are charred but present

        - Standing trees are blackened but not charcoal
    - **Interpretations:**
        - Root crowns will usually re-sprout
        - Roots and rhizomes below 1 inch will re-sprout
        - Most perennial grasses will re-sprout
        - Vegetative recovery (non-tree), depending on conditions, could be one to five years
        - Soil erosion potential will increase due to the lack of ground cover and moderate hydrophobicity

- High Fire Severity (Type I)
    - **General statements:**
        - Primarily occurs in unprotected drainages on steep, timbered, north or east slopes with dense forest canopy
        - Sediment delivery likely
        - Natural recovery limited
    - **Indicators:**
        - Duff consumed
        - Uniformly gray or white ash (in severe cases ash is thin and white or light)
        - No shrub stumps or small fuels remain
        - Hydrophobicity medium to high – up to 2 inches deep
        - 2 to 4 inches of soil is darkened (soil color often reddish orange)
        - Roots burned 2 to 4 inches
        - Soil physically affected (crusting, crystallization, agglomeration)
        - Standing trees charcoal up to 1 inch deep
    - **Interpretations:**
        - Soil productivity is significantly reduced
        - Some roots and rhizomes will re-sprout but only those deep in soil
        - Vegetative recovery (non-tree), depending on conditions, could be five to 10 years
        - Soil erosion potential can be significantly increased

8.3 HISTORICAL OCCURRENCES

There is no recorded history of wildfires occurring within Belmont County. However, smaller fires occur on a regular basis.

8.4 PROBABILITY OF FUTURE OCCURRENCES

There is no historical precedence to determine frequency though the probability of wildfires will increase as climate change impacts increase in the region. Based on their knowledge, the HMPC determined that there is an “unlikely” chance of wildfires occurring in Belmont County, meaning that there is less than a 1% chance.

8.5 VULNERABILITY FROM WILDFIRE

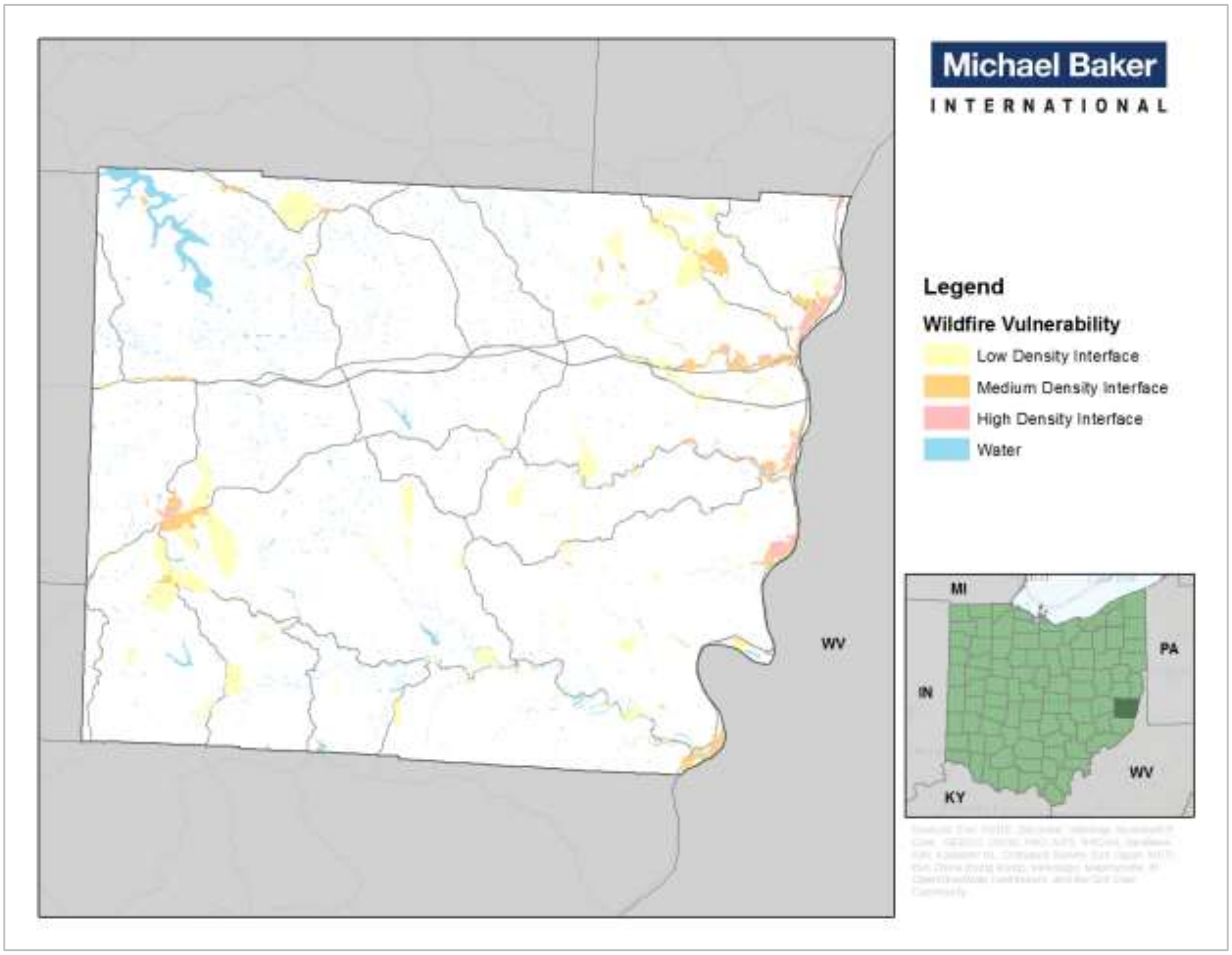
Potential Losses from Wildfire

Fires can extensively impact the economy of an affected area, especially the logging, recreation, and tourism industries, upon which many counties depend. Major direct costs associated with forest fires or wildfires include the salvage and removal of downed timber and debris and the restoration of the burned area. If burned-out woodlands and grasslands are not replanted quickly to prevent widespread soil erosion, then landslides, mudflows, and floods could result, compounding the damage.

TABLE 4-43 POTENTIAL IMPACTS FROM WILDFIRE

Impact	Description
People	Burn injuries, death, and homelessness possible as the result of destroyed buildings.
Infrastructure	Large fires can severely damage buildings, burn down homes and businesses, and several power to areas. Those areas in the WUI are most at-risk.
Economy	Fires can completely shut down a local economy. If businesses are destroyed, it may take years to recover and rebuild. Jobs may be lost permanently.
Natural Systems	Large swaths of forest or wildland can be burned down, especially in cases of prolonged drought.
Transportation	Transportation of any sort is incredibly dangerous in areas with active fires, due to both heat and smoke. Long delays and detours are expected.

FIGURE 18 WILDLAND URBAN INTERFACE AND INTERMIX



8.6 LAND USE & DEVELOPMENT TRENDS

The wildland-urban interface (WUI) will continue to be an issue for the more rural fringes of the County. Developed areas of the County will have little issue with wildfire. Drought conditions can increase the likelihood of fire events in rural areas. The WUI can be seen in Figure 18 above.

Regulatory Environment

State

ODNR has statutory responsibility for wildfire protection on private lands in Ohio. ODNR is the agency responsible for fire suppression and prevention on non-federal lands identified as the States responsibility. ODNR may also provide and manage emergency services through cooperative agreements with counties and fire districts.

8.7 WILDFIRE SUMMARY

Wildfires and brush fires can force school closings, disrupt telephone services by burning fiber optic cables, damage railroads and other infrastructure, and adversely affected tourism, outdoor recreation, and hunting. The likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Weather conditions, particularly drought events, increase the likelihood of wildfires occurring. It is important to note that 98% of wildfires are human-caused. Nonetheless, the critical inference to draw from this statistic is the fact that the occurrence of future wildfire events will strongly depend on patterns of human activity. Events are more likely to occur in wildfire-prone areas experiencing new or additional development.

9. SEISMIC ACTIVITY

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Seismic Activity	**1**	0.3	**1**	0.3	**2**	0.4	**4**	0.4	**2**	0.2	**1.6**
Low Risk Hazard (1.0-1.9)											

9.1 GEOLOGIC HAZARD CHARACTERISTICS

Belmont County has a highly-varied terrain that is conducive to several types of hazards relating to the geography and topography. Much of the land is highly uneven, making it conducive to landslides. There are also several fault lines that run within the County, and nearby, making Belmont County susceptible to earthquakes. This section does not include Mine Subsidence, as mines are man-made, as where Geologic Hazard encapsulates only those hazards that are naturally-occurring.

Earthquake Characteristics

The term "earthquake" refers to the vibration of the Earth's surface caused by movement along a fault, by a volcanic eruption, or even by manmade explosions. The vibration can be violent and cause widespread damage and injury, or may be barely felt. Most destructive earthquakes are caused by movements along faults. An earthquake is both the sudden slip on an active earth fault and the resulting shaking and radiated seismic energy caused by the slip (USGS 2009). Stresses in the earth’s outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth’s crust and cause the shaking that is felt during an earthquake. The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface. Seismic shaking is typically the greatest cause of damage to structures during earthquakes.

Earthquakes may also cause landslides, particularly during the wet season, in areas of high water or saturated soils. The most likely areas for earthquake-induced landslides correlate to areas of high landslide potential discussed later in this section.

Ohio lies on the outermost boundaries of the New Madrid fault, centrally located at New Madrid, Missouri. This particular fault has created significant activity over the last 200 years. The most intense activity occurred in the years 1811-1812. Two earthquakes estimated to be 7’s on the Richter scale hit the New Madrid Fault.

Ohio has recorded 170 earthquakes with a magnitude of 2.0 or greater since 1776. Of these earthquakes, 15 were reported to have caused noticeable to moderate damage statewide. Two (2) major centers of seismic activity in Ohio are 1) the Anna Seismogenic Area located in Shelby and Auglaize Counties, and 2) the northeast area of the state on the eastern side of Lake Erie, which is referred to as the Akron Magnetic Boundary. The Anna area has been home to 40 earthquakes, while northeastern Ohio has recorded 60. None of these earthquakes were reported to cause major damage or loss of life. Most sources in the geology science predict that the largest magnitude earthquake that might occur in the state of Ohio would register no higher than five (5). Predicting the amount of damage would be difficult due to lack of historic activity in the area.

The lack of noticeable activity in the County can be partly attributed to the Peak Ground Acceleration (PGA). PGA is partly determined by what soils and bedrocks are present in the area. In regards to the County, the PGA is very low.

According to the Ohio Seismic Network, when the peak acceleration nears 0.1g, damage may be caused to poorly constructed buildings while acceleration nearing 0.2 would create loss of balance and greater damage to lesser quality structures. Belmont County has peak acceleration much below that number, thus providing a buffer from most seismic activity.

Earthquake Mechanics

Regardless of the source of the earthquake, the associated energy travels in waves radiating outward from the point of release. When these waves travel along the surface, the ground shakes and rolls, fractures form, and water waves may be generated. Earthquakes generally last a matter of seconds but the waves may travel for long distances and cause damage well after the initial shaking at the point of origin has subsided.

Breaks in the crust associated with seismic activity are known as “faults” and are classified as either active or inactive. Faults may be expressed on the surface by sharp cliffs or scarps or may be buried below surface deposits.

“Foreshocks,” minor releases of pressure or slippage, may occur months or minutes before the actual onset of the earthquake. “Aftershocks,” which range from minor to major, may occur for months after the main earthquake. In some cases, strong aftershocks may cause significant additional damage, especially if the initial earthquake impacted emergency management and response functions or weakened structures.

Factors Contributing to Damage

The damage associated with each earthquake is subject to four primary variables:

- **Seismic Activity**: The properties of earthquakes vary greatly from event to event. Some seismic activity is localized (a small point of energy release), while other activity is widespread (e.g., a major fault letting lose all at once). Earthquakes can be very brief (only a few seconds) or last for a minute or more. The depth of release and type of seismic waves generated also play roles in the nature and location of damage; shallow quakes will hit the area close to the epicenter harder, but tend to be felt across a smaller region than deep earthquakes.

- **Geology and Soils**: The surface geology and soils of an area influence the propagation (conduction) of seismic waves and how strongly the energy is felt. Generally, stable areas (e.g., solid bedrock) experience less destructive shaking than unstable areas (e.g., fill soils). The siting of a community or even individual buildings plays a strong role in the nature and extent of damage from an event.

- **Development**: A small earthquake in the center of a major city can have far greater consequences than a major event in a thinly populated place.
- **Time of Day**: The time of day of an event controls the distribution of the population of an affected area. On work days, the majority of the community will transition between work or school, home, and the commute between the two. The relative seismic vulnerability of each location can strongly influence the loss of life and injury resulting from an event.

Types of Damage

- **Shaking:** In minor events, objects fall from shelves and dishes are rattled. In major events, large structures may be torn apart by the forces of the seismic waves. Structural damage is generally limited to older structures that are poorly maintained, constructed, or designed in all but the largest quakes. Un-reinforced masonry buildings and wood frame homes not anchored to their foundations are typical victims. Loose or poorly secured objects also pose a significant hazard when they are loosened or dropped by shaking. These “non-structural falling hazard” objects include bookcases, heavy wall hangings, and building facades. Home water heaters pose a special risk due to their tendency to start fires when they topple over and rupture gas lines. Crumbling chimneys may also be responsible for injuries and property damage. Dam and bridge failures are significant risks during stronger earthquake events, and due to the consequences of such failures, may result in considerable property damage and loss of life. In areas of severe seismic shaking hazard, Intensity VII or higher can be experienced even on solid bedrock. In these areas, older buildings especially are at significant risk.
- **Ground Displacement:** Often, the most dramatic evidence of an earthquake results from displacement of the ground along a fault line. Utility lines and roads may be disrupted but damage directly attributable to ground displacement is generally limited. In rare instances, structure located directly on the fault line may be destroyed by the displacement.
- **Landslides and Avalanches:** Even small earthquake events can cause landslides. Rock falls are common as unstable material on steep slopes is shaken loose, but significant landslides or even debris flows can be generated if conditions are ripe. Roads may be blocked by landslide activity, hampering response and recovery operations.
- **Liquefaction and Subsidence:** Soils may liquefy and/or subside when impacted by the seismic waves. Fill and previously saturated soils are especially at risk. The failure of the soils can lead to possibly widespread structural damage, and may result in increased water flow and/or failure of wells as the subsurface flows are disrupted and sometimes permanently altered. Increased flows may be dramatic, resulting in geyser-like water spouts

and/or flash floods. Similarly, septic systems may be damaged creating both inconvenience and health concerns.

9.2 GEOLOGIC HAZARD EXTENT

The most common method for measuring earthquakes is magnitude, which measures the strengths of earthquake. Although the Richter Scale is known as the measurement for magnitude, the majority of scientists currently use either the Mw Scale or Modified Mercalli Intensity (MMI) Scale. The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake.

The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. As shown in Table 4-44, there are seven earthquake magnitude classes, ranging from great to micro. A great class of magnitude can cause tremendous damage to infrastructure in the County, compared to a micro class, which results in minor damage to infrastructure.

TABLE 4-44 MOMENT MAGNITUDE SCALE

Magnitude Class	Magnitude Range (M = Magnitude)	Probable Damage Description
Micro	M < 3	Minor damage
Minor	3 <= M < 3.9	Rarely causes damage.
Light	4 <= M < 4.9	Moderate damage
Moderate	5 <= M < 5.9	Considerable damage
Strong	6 <= M < 6.9	Severe damage
Major	7 <= M < 7.9	Widespread heavy damage
Great	M > 8	Tremendous damage

The MMI Scale measures earthquake intensity as shown in Table 4-45, the MMI Scale has 12 intensity levels. Each level is defined by a group of observable earthquake effects, such as ground shaking and/or damage to infrastructure. Levels I through VI describe what people see and feel during a small to moderate earthquake. Levels VII through XII describe damage to infrastructure during a moderate to catastrophic earthquake.

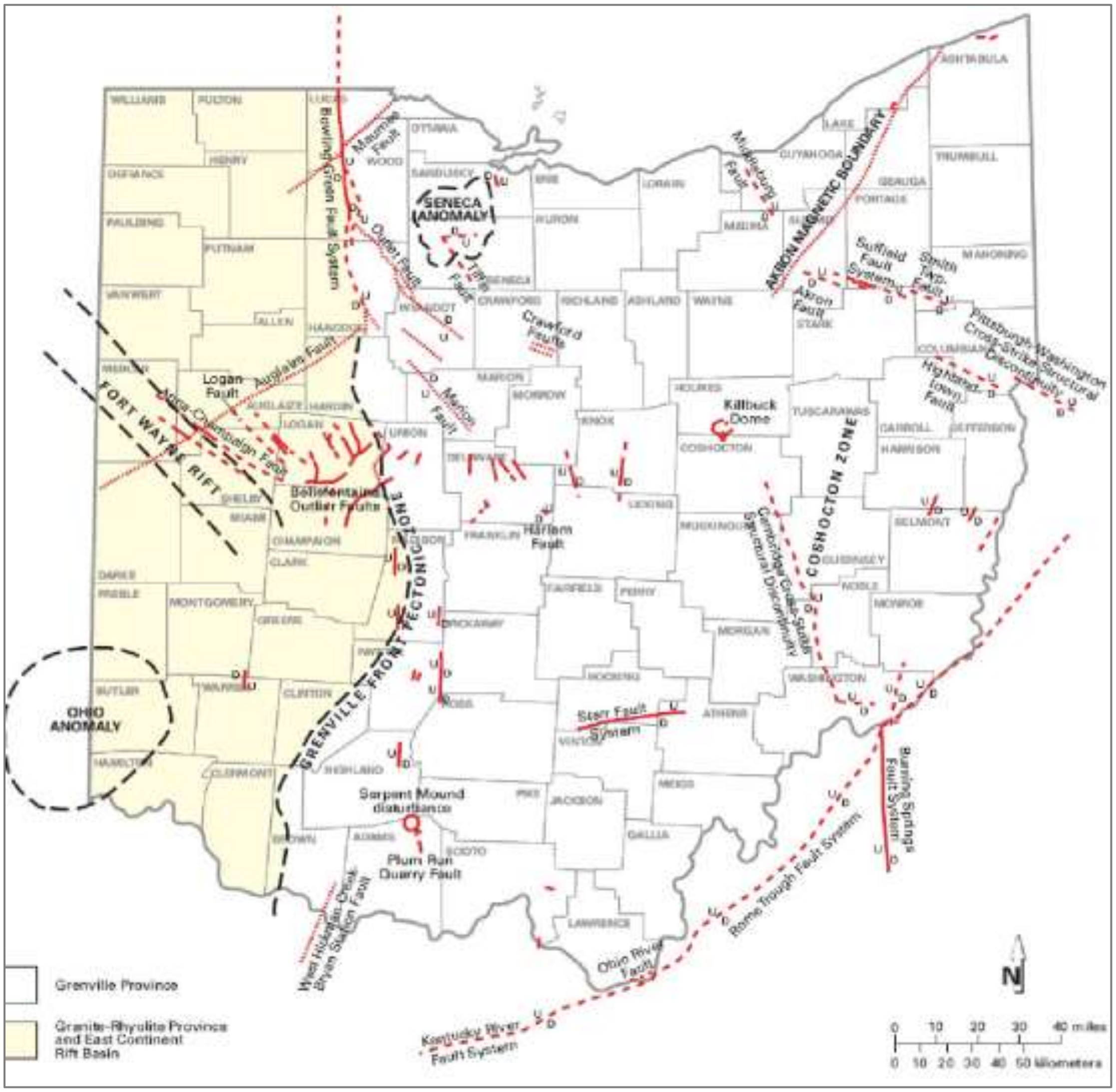
TABLE 4-45 MODIFIED MERCALLI SCALE WITH ASSOCIATED IMPACTS

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	**Instrumental**	Usually detected only on seismographs.	<4.2
II	**Feeble**	Felt only by a few persons at rest, especially on upper floors of buildings.	

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
III	**Slight**	Felt quite noticeably indoors, especially on upper floors. Most people don't recognize it as an earthquake (i.e. a truck rumbling).	
IV	**Moderate**	Can be felt by people walking; dishes, windows, and doors are disturbed.	
V	**Slightly Strong**	Sleepers are awoken; unstable objects are overturned.	<4.8
VI	**Strong**	Trees sway; suspended objects swing; objects fall off shelves; damage is slight.	<5.4
VII	**Very Strong**	Damage is negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, and considerable in poorly built or badly designed structures; some chimneys are broken.	<6.1
VIII	**Destructive**	Damage is slight in specially designed structures; considerable in ordinary, substantial buildings. Moving cars become uncontrollable; masonry fractures, poorly constructed buildings damaged.	<6.9
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open; damage is considerable in specially designed structures; buildings are shifted off foundations.	
X	**Disastrous**	Some well-built wooden structures are destroyed; most masonry and frame structures are destroyed along with foundations. Ground cracks profusely; liquefaction and landslides widespread.	<7.3
XI	**Very Disastrous**	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed.	<8.1
XII	**Catastrophic**	Total destruction; trees fall; lines of sight and level are distorted; ground rises and falls in waves; objects are thrown upward into the air.	>8.1

As indicated earlier, just as there are multiple sources of seismic activity in Ohio, the location of seismic activity varies as well. Many earthquakes do occur along faults. Information about faults can be obtained from the Ohio Seismic Network.

FIGURE 19 FAULT LINES IN OHIO



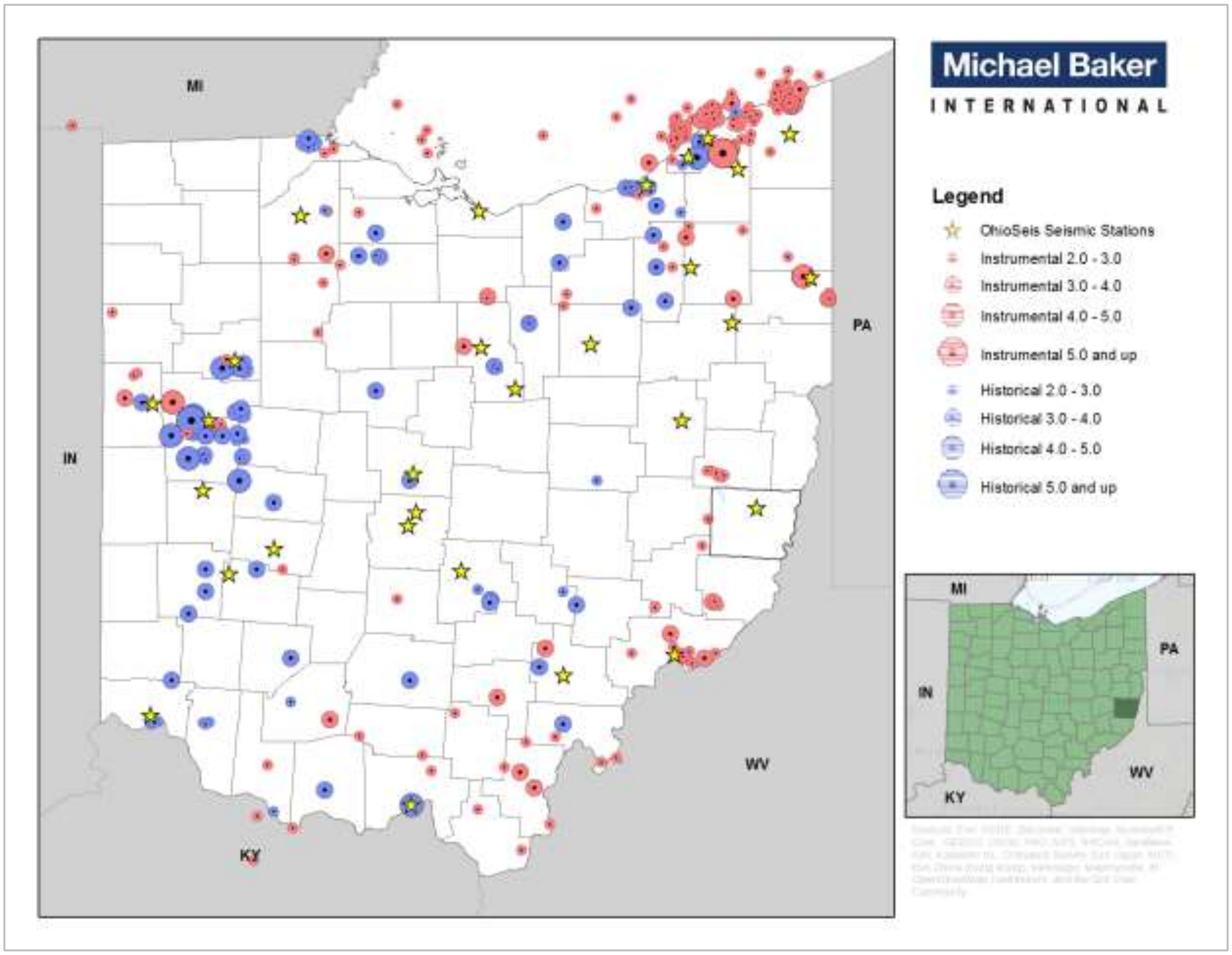
9.3 HISTORICAL OCCURRENCES

Earthquake Events

There have been no recorded earthquakes in Belmont County. In the adjacent Harrison County, only minor quakes have been felt. No significant effects were recorded in Belmont County.

Figure 20 shows epicenters in the State of Ohio from 1970 – 2018.

FIGURE 20 OHIO HISTORIC EARTHQUAKE EPICENTERS



9.4 PROBABILITY OF FUTURE OCCURRENCES

There has been an insufficient number of historical occurrences of earthquakes to effectively measure their frequency. Based on their local knowledge, the HMPC determined that earthquakes have an "unlikely" chance of occurring, or a less than 1% annual chance.

9.5 VULNERABILITY FROM GEOLOGIC HAZARDS

Potential Losses from Geologic Hazards

The method used in determining the types and numbers of potential assets exposed to earthquake damage was conducted using a loss estimation model called HAZUS-MH. HAZUS-MH is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Buildings Sciences (NIBS). This program was conducted at the census block level. For this Plan, a 5.0 magnitude earthquake was modeled and the results are presented below.

Although a 5.0-magnitude has never occurred within the planning area for this document, this is the accepted baseline for simulating potential losses due to seismic events. The software takes into account the depth of the epicenter, as well as its location. In addition, the program helps to determine the potential losses based on the prevailing soil types in the region.

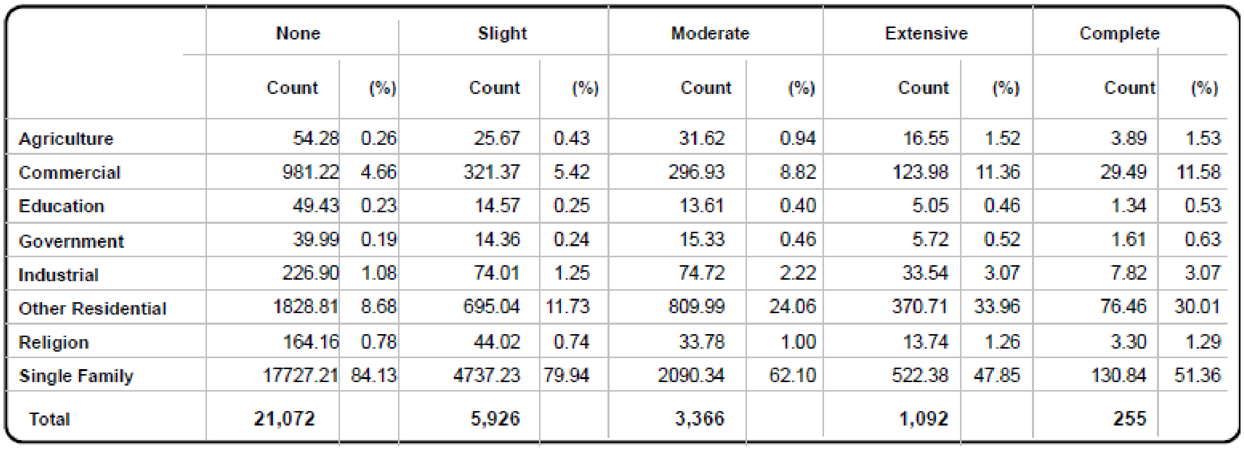
TABLE 4-46 POTENTIAL IMPACTS FROM SEISMIC ACTIVITY

Impact	Description
People	Injuries may occur from falling objects during an earthquake. Landslides can result in death or injury if unexpected.
Infrastructure	Homes and businesses can suffer cracks to their structure. If they are close to a landslide, they could be potentially destroyed. Underground infrastructure may be split open during an earthquake.
Economy	Localized damaged only.
Natural Systems	Landslides can move large sections of land, killing trees and rerouting rivers.
Transportation	Entire roads can be cracked, uplifted, or otherwise made to be impassable until repaired. Detours would be needed in the meantime.

HAZUS-MH HAZUS 5.0 Earthquake

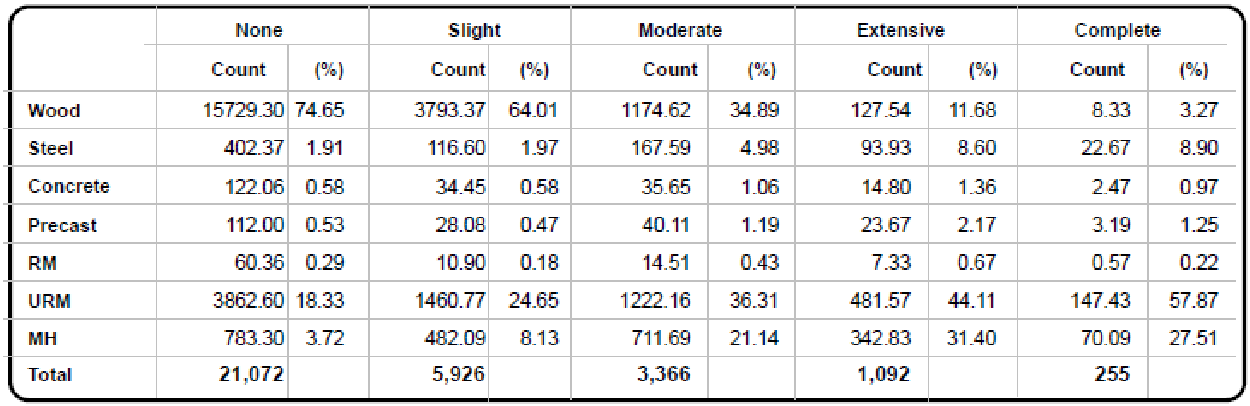
Hazus estimates that about 4,712 buildings will be at least moderately damaged. This is over 15 % of the buildings in the region. There are an estimated 254 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

FIGURE 21 EXPECTED BUILDING DAMAGE BY OCCUPANCY



	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	54.28	0.26	25.67	0.43	31.62	0.94	16.55	1.52	3.89	1.53
Commercial	981.22	4.66	321.37	5.42	296.93	8.82	123.98	11.36	29.49	11.58
Education	49.43	0.23	14.57	0.25	13.61	0.40	5.05	0.46	1.34	0.53
Government	39.99	0.19	14.36	0.24	15.33	0.46	5.72	0.52	1.61	0.63
Industrial	226.90	1.08	74.01	1.25	74.72	2.22	33.54	3.07	7.82	3.07
Other Residential	1828.81	8.68	695.04	11.73	809.99	24.06	370.71	33.96	76.46	30.01
Religion	164.16	0.78	44.02	0.74	33.78	1.00	13.74	1.26	3.30	1.29
Single Family	17727.21	84.13	4737.23	79.94	2090.34	62.10	522.38	47.85	130.84	51.36
Total	21,072		5,926		3,366		1,092		255	

FIGURE 22 EXPECTED BUILDING DAMAGE BY BUILDING TYPE



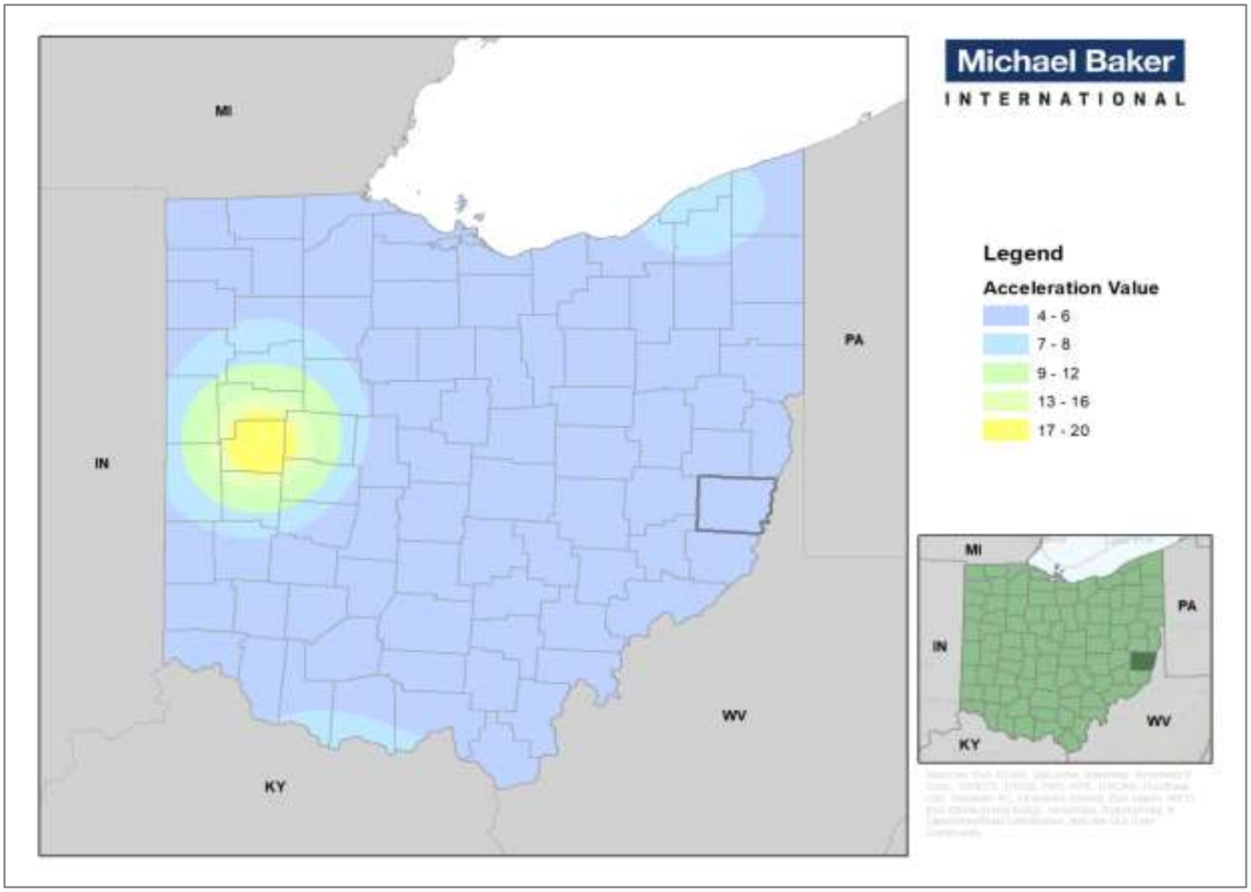
	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	15729.30	74.65	3793.37	64.01	1174.62	34.89	127.54	11.68	8.33	3.27
Steel	402.37	1.91	116.60	1.97	167.59	4.98	93.93	8.60	22.67	8.90
Concrete	122.06	0.58	34.45	0.58	35.65	1.06	14.80	1.36	2.47	0.97
Precast	112.00	0.53	28.08	0.47	40.11	1.19	23.67	2.17	3.19	1.25
RM	60.36	0.29	10.90	0.18	14.51	0.43	7.33	0.67	0.57	0.22
URM	3862.60	18.33	1460.77	24.65	1222.16	36.31	481.57	44.11	147.43	57.87
MH	783.30	3.72	482.09	8.13	711.69	21.14	342.83	31.40	70.09	27.51
Total	**21,072**		**5,926**		**3,366**		**1,092**		**255**	

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 143,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 56.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 5,720 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Belmont County is at a very low vulnerability to seismic activity. The nearest major fault, the New Madrid Fault, is hundreds of miles away. The lack of major historical events in the County, along with the relatively low PGA associated with the lands around the area put seismic events very low in the category of probability of occurrence. However, if a severe event were to occur with the County near the epicenter, damages would significant.

FIGURE 23 BELMONT COUNTY PEAK GROUND ACCELERATION



9.6 LAND USE & DEVELOPMENT TRENDS

Infrastructure, including office buildings, government buildings, and homes, in Belmont County are not built to withstand the effect of a major earthquake. Continued enforcement of the unified construction code should mitigate this vulnerability.

Regulatory Environment

Ohio building codes generally do not focus on construction relative to earthquake loads. In such instances where earthquakes of seismic events are mentioned, it is usually in relation to truss design and anchoring of appliances in structures. Because Ohio does not have strong earthquakes, there are negligible laws or guidelines pertaining to seismic stress on roads, bridges, or buildings.

9.7 GEOLOGIC HAZARDS SUMMARY

Most sources in the geology science predict that the largest magnitude earthquake that might occur in the state of Ohio would register no higher than five. However, some sources state that a magnitude of six, maybe higher, could be registered in the Anna region. An event of this intensity would likely be felt throughout the County. However, since the area has not been the epicenter to an earthquake or seismic event it is difficult to estimate the damage that could occur.

Man-Made Hazards

10. HAZARDOUS MATERIALS INCIDENT

Technological Hazard	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
HazMat Incident	**4**	1.2	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**3.5**
High Risk Hazard (3.0 – 3.9)											

10.1 HAZARD MATERIAL CHARACTERISTICS

Traditional Hazardous Materials

A hazardous material release is the contamination of the environment (i.e. air, water, soil) by any material that because of its quantity, concentration, physical characteristics, or chemical characteristics threatens human, animal, or plant health, the environment, or property. Hazardous material spills are usually accidental events that arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. The consequences of such spills are usually unintended. An accidental or intentional release of hazardous materials could produce a health hazard to those in the area, downwind, and/or downstream with immediate, prolonged, and/or delayed effects. The spread of the material may additionally be defined by weather conditions and topography of the area. A hazardous material release can come from a fixed facility, transportation, or an intentional release such as terrorism.

A hazardous material release may also occur due to a transportation accident. The most likely locations for a transportation-related hazardous material release are along the highways that run through the County. Gas, propane, and other hazardous materials are delivered throughout the area year-round. The need for gas, propane, fertilizers, and other toxic materials in daily life creates a larger risk for a hazardous materials release.

A hazardous materials release in the County may not only contaminate dirt or surface material but potentially contaminate flowing water in ditches, rivers, and small streams. Ground water may also be contaminated, depending on the size of the incident. Other potential concerns for spills/leaks are icy road conditions during winter months, sabotage, and terrorism.

Fixed facilities housing hazardous substances at the County include swimming pools, gas stations, and supply stores containing substances such as fuel, farm chemicals, propane, fuel oil, paint, and small amounts of chlorine.

Hospital Radioactive Isotopes

Hospitals are increasingly using radioactive isotopes for diagnostic and therapeutic applications. The bulk of the hospital radioactive waste is commonly generated in the department of Nuclear Medicine. Generally, most of the radioactive waste is liquid. Some lesser amounts of the waste are solid and gaseous. The solid waste containing traces of radioactivity can be in the form of syringes, needles, cotton swabs, vials, contaminated gloves and absorbent materials.

10.2 HAZARD MATERIAL EXTENT

With a hazardous material release, whether accidental or intentional, there are several potentially exacerbating or mitigating circumstances that will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous material release. Exacerbating conditions, or characteristics that can enhance or magnify the effects of a hazardous material release, include:

- **Weather conditions**: affects how the hazard occurs and develops
- **Micro-meteorological effects** of buildings and terrain: alters dispersion of hazardous materials
- **Non-compliance with applicable codes** (e.g. building or fire codes) and maintenance failures (e.g. fire protection and containment features): can substantially increase the damage to the facility itself and to surrounding buildings

Whether or not a hazardous materials site is contained in the SFHA is also a concern, as there could be larger-scale water contamination during a flood event should the flood compromise the production or storage of hazardous chemicals. Such a situation could swiftly move toxic chemicals throughout a water supply and across great distances.

The severity of a given incident is dependent not only on the circumstances described above, but also with the type of material released and the distance and related response time for emergency response teams. The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g., centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

10.3 HISTORICAL OCCURRENCES

There are small-scale spills and hazardous materials incidents that occur on a regular basis. These usually consist of mostly-innocuous incidents such as traffic accidents that leave gasoline on the roadway. However, large-scale incidents are far rarer and more catastrophic when they occur.

FIGURE 24 DRONE VIEW OF THE WELL FROM CLEVELAND.COM

February 2018 Explosion: In early 2018, a drilling well exploded and caught fire. At the time, there were 24 people on the well pad, though none were injured at the time. According to the Belmont County EMA Director, homes within 1 mile of the site were evacuated. Their occupants were housed in hotels, and they were given stipends to purchase new clothes if they were not able to return home before they were evacuated. It took nearly three weeks to cap the well after the initial explosion. It is estimated that during the time period of the leak, 60,000 tons of methane were released into the atmosphere, making it one of the single worst methane leaks of all time.

10.4 POSSIBILITY OF FUTURE OCCURRENCES

The HMPC, based on their knowledge of previous events, assigned HazMat incidents as being “likely,” or having a 10% - 100% chance of happening annually. Small-scale incidents will continue to occur as normal operation around the County. Larger incidents will remain seldom, but can still occur at any time.

10.5 VULNERABILITY TO HAZARDOUS MATERIAL INCIDENTS

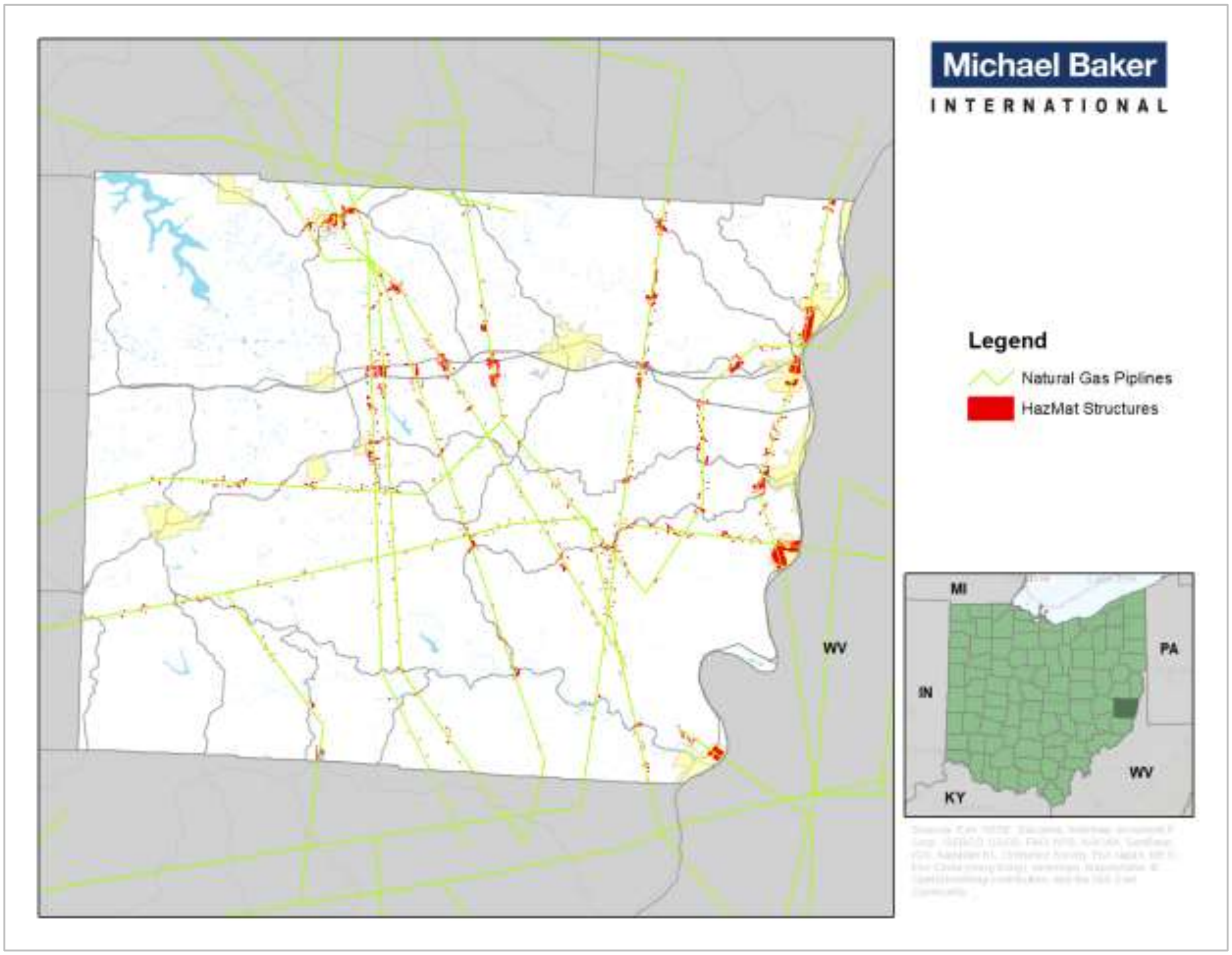
Assets Exposed to Hazardous Material Incidents

All County assets can be considered at risk from hazardous materials releases. This includes 100 percent of the County population and all buildings and infrastructure. The presence of the major highways that run throughout the County, as well as drilling and mining locations, present a high risk of hazardous materials incidents occurring.

TABLE 4-47 IMPACTS FROM HAZMAT INDICENTS

Impact	Description
People	In some hazmat incidents, toxic chemicals can force residents to evacuate. Too much exposure can result in health complications.
Infrastructure	Significant events can damage structures
Economy	Hazmat incidents are unlikely to cause long-lasting economic damage.
Natural Systems	Nearby vegetation may die as the result of hazmat spills. Materials that spills into waterways can adversely impact wildlife and other areas downstream.
Transportation	Major highways are the most likely to incur major incidents. If one does occur, major delays and reroutes are possible.

FIGURE 25 PIPELINES IN BELMONT COUNTY



Potential Losses from Hazardous Material Incidents

A hazardous materials release has the possibility of having a significant impact on the County. Most hazardous material releases do not usually have an effect on infrastructure, particularly underground infrastructure. Some critical facilities use hazardous materials to operate such as chlorine for water treatment and PCB's for electric transformers. Similarly, the contamination of the water supply may be treated like a hazardous material release. Propane, oil, and natural gas, necessary fuels for heating, can also be hazardous if released during their delivery due to their explosive potential. Transportation may be limited if a key roadway or railway is blocked by an incident.

- Possible losses to critical facilities include:
  - Critical functional losses
  - Contamination
  - Structural and contents losses, if an explosion is present

  Possible losses to structures include:
  - Inaccessibility

    - Contamination
    - Structural and contents losses, if an explosion is present
- Possible economic losses include:
    - Business closures and associated business disruption losses
- Possible ecologic losses include:
    - Loss of wildlife
    - Habitat damage
    - Reduced air and water quality
- Possible social losses include:
    - Canceled activities
    - Emotional impacts of significant population losses and illnesses

A GIS analysis of provided how many structures are at-risk due to pipelines throughout the County. It should be noted that because the pipeline geography file is only approximate that the numbers below are estimates based on a ¼ mile radius of the lines. The Village of Shadyside has the most structures at-risk with 1,138, followed by Martins Ferry at 806.

FIGURE 26 NUMBER OF STRUCTURES AT RISK TO PIPELINES

Community	At-Risk Structures
Armstrongs Mills	22
Avondale	4
Barkcamp Park	3
Barton	84
Bellaire	48
Belmont	15
Bethesda	1
Bridgeport	499
Centerville	48
Colerain Twp	114
East Richland	8
Flushing Twp	118
Flushing	232
Goshen Twp	179
Jacobsburg	45
Key	12
Lafferty	92
Lamira	3
Lansing	4
Lloydsville	2
Martins Ferry	806
Meade Twp	135

Neffs	12
New Castle	5
Pease Twp	236
Pleasant Grove	19
Powhatan Point	216
Pultney Twp	377
Richland Twp	588
Shadyside	1,138
Smith Twp	168
Somerset Twp	47
St Joe	33
Sunset Heights	1
Union Twp	378
Warren Twp	61
Washington Twp	52
Wayne Twp	54
Wheeling Twp	24
Wilson	21
Wolfhurst	67
York Twp	95
Grand Total	**6,066**

10.6 LAND USE & DEVELOPMENT TRENDS

The population impacts are often greater than the structural impacts during a hazardous material release. Depending on the material, the health impacts to humans can be long and short term. Generally, an incident will affect only a subset of the total population at risk. In a hazardous materials release, those in the immediate isolation area would have little to no warning, whereas, the population further away in the dispersion path may have some time to evacuate, depending on the weather conditions, material released, and public notification.

Representatives from Belmont County, Belmont, St. Clairsville, and Barnesville have all noted a drastic increase in the number of oil and gas laborers present in the County within the past few years. Many of these are migrant workers staying out of RV parks and hotels, which has created the need for additional lodging throughout the County. The more people there are in the County, particularly those who work in the oil and gas field, the more at-risk they become to potential issues, such as the 2018 explosion.

Regulatory Environment

Extensive regulations are in place, set forth by both the State of Ohio and the United States government on the handling and transport of hazardous materials. Newer hazards, such as those introduced through fracking, also have many regulations pertaining to their safety and use.

10.7 HAZARDOUS MATERIALS SUMMARY

Hazardous materials incidents can pose a series of threats to human safety and welfare, as well as the environment. Incidents occur regularly, but are not often of a size to cause a significant countywide threat. However, it seems likely that incidents will continue and the potential for a significant release is present. Incidents often occur in conjunction with, or as a result of, natural hazards impacting facilities that house hazardous materials. Depending upon the materials released, as well as atmospheric conditions, an incident has the potential to cause significant disruption to the County.

11. DAM FAILURE

Technological Hazard	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Dam Failure	**2**	0.6	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**2.9**
Medium Risk Hazard (2.0 – 2.9)											

11.1 DAM FAILURE CHARACTERISTICS

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is the collapse, breach, or other failure, often resulting in down-stream flooding.

A levee, unlike a dam, is an elongated ridge constructed of fill or wall which regulates water levels. These are usually earthen hills built along a river's floodplain to prevent flooding in nearby population areas. Typically, these run parallel to a river. **According to the National Levee Inventory, there are no levees in Belmont County.**

A dam impounds water in the upstream area, referred to as the reservoir. The amount of water impounded is measured in acre-feet. An acre-foot is the volume of water that covers an acre of land to a depth of one foot. As a function of upstream topography, even a very small dam may impound or detain many acre-feet of water. Two factors influence the potential severity of a full or partial dam failure: the amount of water impounded, and the density, type, and value of development and infrastructure located downstream.

Dam failures typically occur when spillway capacity is inadequate and excess flow overtops the dam, or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-laden water that rushes downstream.

Dam failures can result from any one or a combination of the following causes:

- **Prolonged periods of rainfall and flooding**, which cause most failures;
- **Inadequate spillway capacity**, resulting in excess overtopping flows;
- **Internal erosion** caused by embankment or foundation leakage or piping;
- **Improper maintenance**, including failure to remove trees, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational component;
- **Improper design**, including the use of improper construction materials and construction practices;
- **Negligent operation**, including the failure to remove or open gates or valves during high flow periods;
- **Failure of upstream dams** on the same waterway;
- **Landslides into reservoirs**, which cause surges that result in overtopping;

- **High winds**, which can cause significant wave action and result in substantial erosion; and
- **Earthquakes**, which typically cause longitudinal cracks at the tops of the embankments, which can weaken entire structures.

Dams are considered to be localized in the state and are most likely to affect inundation areas downstream and immediate areas around the dam. Discharge from a dam breach is usually several times the 1% chance flood, and, therefore, typical flood studies are of limited use in estimating the extent of flooding.

Determining the impact of flooding is difficult to accomplish, especially for estimating loss of life. Loss of life is a function of the time of day, warning time, awareness of those affected and particular failure scenarios. Many dam safety agencies have used “population at risk”, a more quantifiable measurement of the impact to human life, rather than “loss of life”. Population at risk is the number of people in structures within the inundation area that would be subject to significant personal danger, if they took no action to evacuate. The impacts of a dam failure are contingent on many factors and, therefore, cannot be concisely described.

11.2 DAM FAILURE EXTENT

The severity of a dam failure depends mostly on what class the dam is, where it is located, and what caused it to fail. The inundation zone as defined by each Emergency Action Plan (EAP) shows what areas will be the most heavily impacted during a dam failure event. During these events, hazardous materials such as agricultural chemicals and wastes, solid wastes, raw sewage, common household chemicals, and loose mud and concrete can worsen rescue and cleanup operation. Much of the damage done during a dam failure will be downstream and within the immediate area.

Many dams throughout Ohio were created 50 years ago or more. These dams present the possibility that at some point in time they may fail. If this is the case, there will be damage to the surrounding area. According to the Ohio Department of Natural Resources, the damage predicted by a dam failure coincides with the class of the dam. The potential downstream hazard is broken into four classes.

- **Class I** – Probable loss of life, serious hazard to health, structural damage to high value property (i.e., homes, industries, and major public utilities.).
- **Class II** – Floodwater damage to homes, businesses, and industrial structures (no loss of life envisioned); damage to state and interstate highways, railroads; only access to residential areas.
- **Class III** – Damage to low value non-residential structures, local roads, agricultural crops and livestock.
- **Class IV** – Losses restricted mainly to the dam

11.3 HISTORICAL OCCURRENCES

There have been no recorded dam failure events in Belmont County.

11.4 PROBABILITY OF OCCURRENCES

For reasons previously mentioned in this section and uncontrollable by humans, it is possible a dam can fail at any time, given the right circumstances. However, the probability of future occurrence is for regulated dams can be reduced due to proactive preventative action in compliance with the Ohio Department of Natural Resources – Dam Safety Program. Ohio's Dam Safety Program provides for the regulation and safety of high hazard dams and reservoirs throughout the state in order to protect the health, safety, and welfare of its citizens and their property.

11.5 VULNERABILITY TO DAM FAILURE

TABLE 4-48 ASSETS EXPOSED TO DAM FAILURE

Impact	Description
People	Loss of life and injury is most likely in Class I breaches. Fatalities could be expected in the dozens or hundreds depending on population density. Communities can become isolated due to impassable roads.
Infrastructure	Entire buildings can be washed away, or otherwise flooded irreparably. Power outages from disrupted underground utilities.
Economy	Significant or catastrophic dam failures can wipe out large portions of a single small town. Residents may move away permanently, and jobs may be lost.
Natural Systems	Flooding can destroy large tracts of land. Alteration of riverbeds can occur. Debris can become stuck in place.
Transportation	Bridges, highways, and roads can be destroyed completely. Significant detours will be necessary.

Potential Losses from Dam Failure

Dam failures can have a greater environmental impact than that associated with a flood event. Large amounts of sediment from erosion can alter the landscape changing the ecosystem. Hazardous materials can be carried away from flooded out properties and distributed throughout the floodplain. Industrial and agricultural chemicals and wastes, solid wastes, raw sewage, and common household chemicals comprise the majority of hazardous materials spread by flood waters along the flood zone, polluting the environment and contaminating private property and the community's water supply. The soil loss from erosion and scouring would be significantly greater because of a large amount of fast moving water affecting a small localized area, which would likely change the ecosystem.

TABLE 4-49 HIGH-HAZARD DAM INFORMATION FOR BELMONT COUNTY

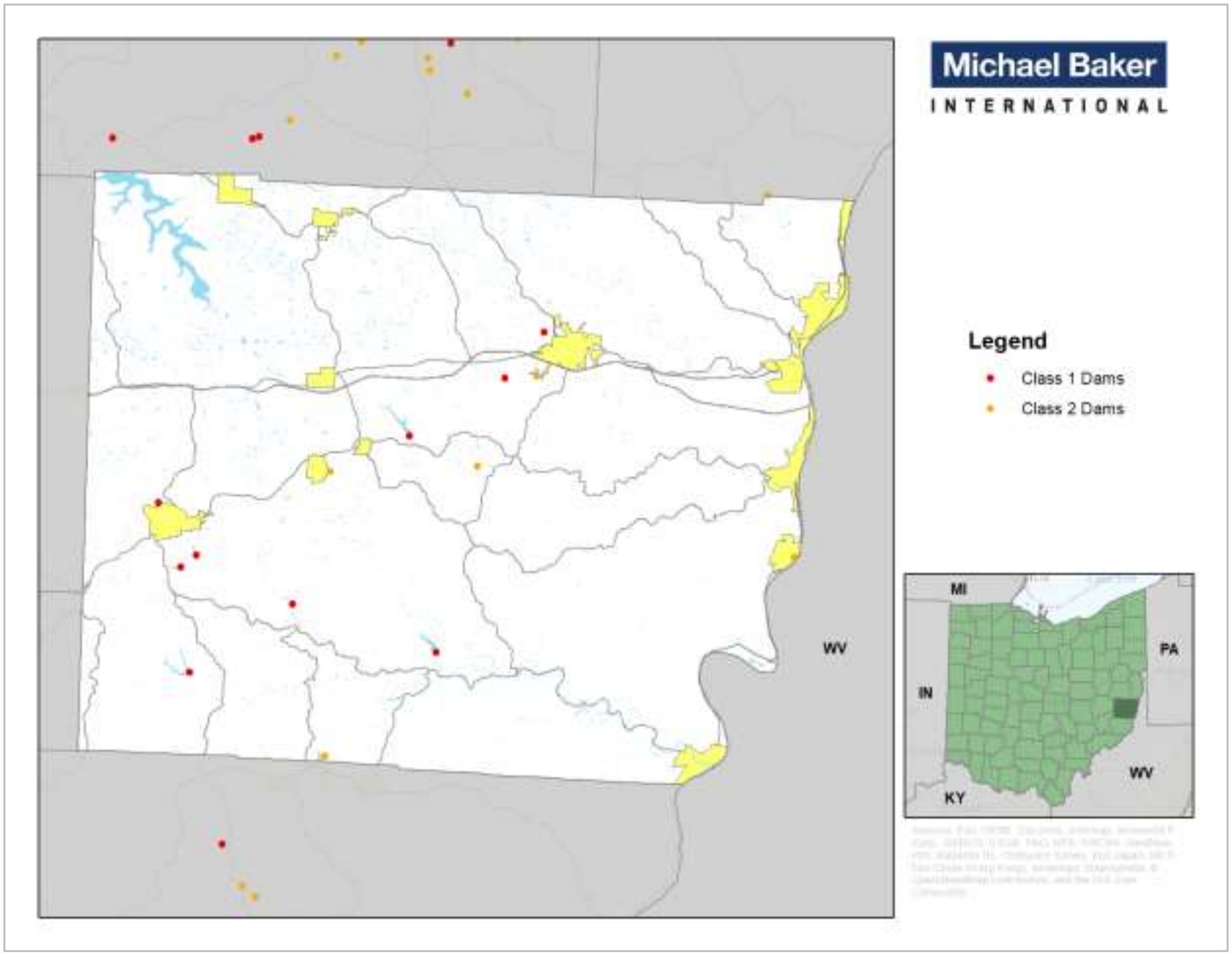
Dam Name	Hazard Class	EAP	Owner
Meigs-Phillips I No. 1 Dam	I		Capstone Mining Company
The Ohio Valley Coal Slurry Disposal Dam	I		The Ohio Valley Coal Company
Belmont Hills Country Club Lake Dam	I		Belmont Hills Country Club
Bethesda Reservoir Dam	I		Village of Bethesda
Barnesville Reservoir No. 1 Dam	I	Yes	Village of Barnesville
Barnesville Reservoir No. 2 Dam	I	Yes	Village of Barnesville
Barnesville Reservoir No. 3 Dam	I	Yes	Village of Barnesville
Barnesville Lake Dam	I	Yes	Village of Barnesville

Dam Name	Hazard Class	EAP	Owner
St. Clairsville Reservoir No. 2 Dam	I		City of St. Clairsville
Belmont Lake Dam	I	Yes	ODNR, Division of Parks & Recreation
R & F Lamira Freshwater Dam	II		Capstone Mining Company
Switzerland Lake Dam	II		Switzerland of Ohio Country Club
St. Clairsville Reservoir No. 1 Dam	II	Yes	City of St. Clairsville
Shadyside WWTP Levee	II	Yes	Village of Shadyside

EAPs are kept at ODNR and at the local County EMA. Due to regulatory limits, the EAPs are not able to be publicized, meaning that they are not able to be a part of this plan.

Emergency Action Plans from each of the dams within the county were unable to be obtained due to regulatory restrictions. Without this information, there was not a way to produce a quantitative GIS analysis of vulnerable assets within the inundation zones.

FIGURE 27 BELMONT COUNTY DAMS



The probability of future occurrence for regulated dams is reduced through compliance with the Ohio's Department of Natural Resources, Dam Safety Program. Only some of the Class I and II have Emergency Action Plans in place. Most of the Class I's that do are located near the Village of Barnesville.

11.6 LAND USE & DEVELOPMENT TRENDS

Public awareness measures such as notices on final plats and public education on dam safety are proactive mitigation measures that should be implemented by local communities. Also, Emergency Action Plans that identify potential dam failure inundation areas, notification procedures, and thresholds are also prepared for response to potential dam related disaster events. There are no development trends that are likely to affect the vulnerability of the County to dam failure.

Regulatory Environment

The Ohio Department of Natural Resources classifies dams by 2 conditions: height and storage. There are 4 classes of dams, which vary, based on the height of the actual dam, and the amount of water held behind the dam.

Dam safety laws are embodied in the Dam Safety and Encroachments Act ("DSE Act") -enacted July 1, 1979 and last amended in 1985. Rules pertaining to dam safety are found in Title 25-Rules and Regulations; Part I-Department of Environmental Resources; Subpart C-Protection of Natural Resources; Article II-Water Resources; Chapter 105-Dam Safety and Waterway Management ("the Rules") -adopted.

11.7 DAM FAILURE SUMMARY

As dams continue to age, the likelihood for failure increases as undesirable woody vegetation on the embankment, deteriorated concrete, inoperable gates, and corroded outlet pipes become problems. Since dam failures are often exacerbated by flooding, the probability of dam failures can be associated with projected flood frequencies. Overall, the probability of a dam failure throughout the state should remain low with continued maintenance of dams. Additionally, warning plans in place for designated high hazard dams will continue to decrease the danger for those residents in potential risk areas.

12. HEALTH RELATED EMERGENCY

Technological Hazard	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Epidemic	**2**	0.6	**2**	0.6	**4**	0.8	**4**	0.4	**4**	0.4	**2.8**
Medium Risk Hazard (2.0 – 2.9)											

12.1 HAZARD IDENTIFICATION

Pandemic

Pandemic is defined as a disease affecting or attacking the population of an extensive region which may include several countries and/or continents. It is further described as extensively epidemic. Generally, pandemic events cause sudden, pervasive illness in all age groups on a global scale, though some age groups may be more at risk. As such, pandemic events cover a wide geographic area and can affect large populations, depending on the disease. The exact size and extent of the infected population is dependent upon how easily the illness is spread, the mode of transmission, and the amount of contact between infected and non-infected persons. Two recent pandemics that have affected Belmont County are West Nile Virus and Influenza.

West Nile Virus is a vector-borne disease that can cause headache, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and, in its most serious form, death. The virus spreads via mosquito bite and is aided by warm temperatures and wet climates conducive to mosquito breeding.

Influenza, also known as "the flu," is a contagious disease that is caused by the influenza virus and typically presents with fever, headache, sore throat, cough, and muscle aches. Influenza is considered to have pandemic potential if it is novel, meaning that people have no immunity to it, virulent, it causes deaths in normally healthy individuals, and it is easily transmittable from person-to-person. Influenza spreads via the air in crowded populations in enclosed spaces, and it may persist on surfaces and in the air. Individuals are communicable for 3-5 days after clinical onset. Pandemic influenza planning began in response to the H5N1 (avian) flu outbreak in Asia, Africa, Europe, the Pacific, and the Near East in the late 1990s and early 2000s. In 2009, the US experienced a pandemic of H1N1. The County implemented its Pandemic Response Plan and Medical Countermeasures Plan to provide vaccinations to at risk populations once vaccine was available. Continuing to prepare and plan for future pandemics needs to continue. As stated in the Ohio Department of Health Pandemic Influenza Preparedness and Response Plan, "The impact of an influenza pandemic on the health care system could be devastating. The CDC estimates in the United States a moderate pandemic could result in 90 million people becoming ill; 45 million outpatient visits; 865,000 hospitalizations; and 209,000 deaths." This underscores the importance of planning for this hazard (Ohio Department of Health, 2006).

Epidemic

Epidemic is defined as something affecting many persons at the same time, and spreading from person to person in a locality where the disease is not permanently prevalent. The amount of a particular disease that is usually present in a community is referred to as the baseline or endemic level of the disease. This level is not necessarily the desired level, which may in fact be zero, but rather is the observed level. In the absence of intervention and assuming that the level is not high enough to deplete the pool of susceptible persons, the disease may continue to occur at this level indefinitely. Thus, the baseline level is often regarded as the expected level of the disease.

While 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. Sporadic refers to a disease that occurs infrequently and irregularly. Endemic refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area. Hyperendemic refers to persistent, high levels of disease occurrence.

Occasionally, the amount of disease in a community rises above the expected level. 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. Outbreak carries the same definition of epidemic, but is often used for a more limited geographic area. 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. Pandemic refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

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

12.2 HAZARD EVENTS/HISTORICAL OCCURRENCES

2009: The 2009 H1N1 influenza (flu) pandemic occurred against a backdrop of pandemic response planning at all levels of government including years of developing, refining and regularly exercising response plans at the international, federal, state, local, and community levels. At the time, experts believed that avian influenza A (H5N1) viruses posed the greatest pandemic threat. H5N1 viruses were endemic in poultry in parts of the world and were infecting people sporadically, often with deadly results. Given that reality, pandemic preparedness efforts were largely based on a scenario of severe human illness caused by an H5N1 virus. Despite differences in planning scenarios and the actual 2009 H1N1 pandemic, many of the systems established through pandemic planning were used and useful for the 2009 H1N1 pandemic response.

2009 H1N1 was first detected in the United States in April 2009. This virus was a unique combination of influenza virus genes never previously identified in either animals or people. The virus genes were a combination of genes most closely related to North American swine-lineage H1N1 and Eurasian lineage swine-origin H1N1 influenza viruses. Because of this, initial reports referred to the virus as a swine origin influenza virus. However, investigations of initial human cases did not identify exposures to pigs and quickly it became apparent that this new virus was circulating among humans and not among U.S. pig herds.

Infection with this new influenza A virus (then referred to as 'swine origin influenza A virus') was first detected in a 10-year-old patient in California on April 15, 2009, who was tested for influenza as part of a clinical study. Laboratory testing at Centers for Disease Control (CDC) confirmed that this virus was new to humans. Two days later, CDC laboratory testing confirmed a second infection with this virus in another patient, an 8-year-old living in California about 130 miles away from the first patient who was tested as part of an influenza surveillance project. There was no known connection between the two patients. Laboratory analysis at CDC determined that the viruses obtained from these two patients were very similar to each other, and different from any other influenza viruses previously seen either in humans or animals.

2014/2015: The 2014 Ebola epidemic is the largest in history, affecting multiple countries in West Africa. There were a small number of cases reported in Nigeria and Mali and a single case reported in Senegal; however, these cases were contained, with no further spread in these countries. Two imported cases, including one death, and two locally acquired cases in healthcare workers were reported in the United States. CDC and its partners are taking precautions to prevent additional Ebola cases in the United States. CDC is working with other U.S. government agencies, the World Health Organization (WHO), and other domestic and international partners and has activated its Emergency Operations Center to help coordinate technical assistance and control activities with partners. CDC has also deployed teams of public health experts to West Africa and will continue to send experts to the affected countries. At the time, the general public and media feared that the epidemic would spread to Ohio after a nurse from Texas traveled to the Akron, Ohio area in advance of a wedding.

12.3 MAGNITUDE/SEVERITY

The magnitude of a health related emergency will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. Pandemic influenza is more easily transmitted from person-to-person and is more easily transmitted than West Nile, but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time. In terms of lives lost, the impact various pandemic influenza outbreaks have had globally over the last century has declined. The 1918 Spanish flu pandemic remains the worst-case pandemic event on record.

In contrast, the severity of illness from the 2009 H1N1 influenza flu virus has varied, with the gravest cases occurring mainly among those considered at high risk. High risk populations considered more vulnerable include children, the elderly, pregnant women, and chronic disease patients with reduced immune system capacity. Most people infected with H1N1 in 2009 have recovered without needing medical treatment. According to the CDC, about 70% of those who have been hospitalized with the 2009 H1N1 flu virus in the United States have belonged to a high risk group (CDC, 2009).

The magnitude of a health related emergency may be exacerbated by the fact that outbreaks across the United States could limit the ability to transfer assistance from one jurisdiction to another. Additionally, effective preventative and therapeutic measures, including vaccines and other medications, will likely be in short supply or will not be available. There are no true environmental impacts in pandemic disease outbreaks, but there may be significant economic and social costs beyond the possibility of deaths. Widespread illness may increase the likelihood of shortages of personnel to perform essential community services. In addition, high rates of illness and worker absenteeism occur within the business community, and these contribute to social and economic disruption. Social and economic disruptions could be temporary but may be amplified in today's closely interrelated and interdependent systems of trade and commerce. Social disruption may be greatest when rates of absenteeism impair essential services, such as power, transportation, and communications.

12.4 FREQUENCY/PROBABILITY OF FUTURE OCCURRENCE

The precise timing of a health related emergency is uncertain. Pandemic occurrences are most likely when the Influenza Type A virus makes a dramatic change, or antigenic shift, that results in a new or "novel" virus to which the population has no immunity. Epidemic occurrences are more likely when there are ecological changes, the pathogen mutates, or the pathogen is introduced into an unprepared host population.

12.5 INVENTORY ASSETS EXPOSED TO HEALTH RELATED EMERGENCIES

Certain population groups are at higher risk of pandemic flu infection. This population group includes people 65 years and older, children younger than 5 years old, pregnant women, and people of any age with certain chronic medical conditions. Such conditions include but are not limited to diabetes, heart disease, asthma and kidney disease (CDC, 2015). Schools, colleges, convalescent centers, and other institutions serving those younger than 5 years old and older than 65 years old, are locations conducive to faster transmission of pandemic influenza since populations identified as being at high risk are concentrated at these facilities or because of a large number of people living in close quarters. The hospital system would be the most likely point of introduction for an epidemic or pandemic to enter the County's area.

TABLE 4-50 POPULAGE AGE ESTIMATES, 2015

Total	Population	Percent
Under 5 years	3,449	5.0%
65 and up	13,240	19.2%

Health-related emergencies are unlikely to directly impact buildings and infrastructure. However, losses can be measured in lost productivity from employees unable to perform their job duties and students not able to attend classes.

TABLE 4-51 POTENTIAL LOSSES FROM HEALTH-RELATED EMERGENCIES

Impact	Description
People	People are likely to bear the brunt of a health-related emergency, as they are the ones who will be impacted by diseases. They can become extremely sick and possibly die depending on the illness.
Infrastructure	There are no expected impacts on Infrastructure from this hazard.
Economy	The economy can be damaged due to drops in productivity due to illness. Large-scale pandemics may also result in Stay-At-Home orders, which can result in severe layoffs.
Natural Systems	There are no expected impacts on Natural Systems from this hazard.
Transportation	There are no expected impacts on Transportation from this hazard.

12.6 LAND USE AND DEVELOPMENT TRENDS

There is currently minimal new development within Belmont County. However, denser areas are more susceptible to the spread of diseases as people tend to live closer to one another. Because of this, incorporated areas including St. Clairsville, Martins Ferry, Bellaire, and Shadyside which have populations over 3,000, are the most vulnerable to a rapidly-spreading disease.

Regulatory Environment

There are a variety of regulations which drive the health industry, and as a result, the treatment of pandemics and epidemics. The Ohio Revised Code, Chapter 3701-59 specifically deals with hospitals. Barnesville Hospital was accredited by The Joint Commission in 2012 with its Gold Seal of Approval for demonstrating compliance with their national standard for health care quality. The Joint Commission is an independent, not-for-profit organization. The Joint Commission accredits and certifies nearly 21,000 health care organizations and programs in the United States. Joint Commission accreditation and certification is recognized nationwide as a symbol of quality that reflects an organization's commitment to meeting certain performance standards.

12.7 HEALTH RELATED EMERGENCIES HIRA SUMMARY

Pandemic and infectious disease events cover a wide geographical area and can affect large populations. The exact size and extent of an infected population is dependent upon how easily the illness is spread, the mode of transmission and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in denser areas where there are large concentrations of people. The transmission rate of infectious disease will depend on the mode of transmission of a given illness.

13. TERRORISM

Technological Hazard	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Terrorism	**1**	0.3	**4**	1.2	**2**	0.4	**4**	0.4	**4**	0.4	**2.7**
Medium Risk Hazard (2.0 – 2.9)											

13.1 HAZARD IDENTIFICATION

The term "terrorism" refers to intentional, criminal, malicious acts, but the functional definition of terrorism can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations as "…the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 CFR §0.85). Terrorists use threats to create fear, to try to convince citizens of the powerlessness of their government, and/or to get publicity for their cause.

Terrorist attacks can take many forms, including agriterrorism, arson/incendiary attack, armed attack, assassination, biological agent, chemical agent, cyberterrorism, conventional bomb, hijackings, intentional hazardous material release, kidnapping, nuclear bomb and radiological agent (FEMA April 2009). Explosives have been the traditional method of conducting terrorism, but intelligence suggests that the possibility of biological or chemical terrorism is increasing. The severity of terrorist incidents depends upon the method of attack, the proximity of the attack to people, animals, or other assets and the duration of exposure to the incident or attack device. For example, chemical agents are poisonous gases, liquids or solids that have toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death. In this case, severity of injuries depends on the type and amount of the chemical agent used and the duration of exposure.

Biological agents are organisms or toxins that have illness-producing effects on people, livestock and crops. Some biological agents cannot be easily detected and may take time to develop. Therefore, it can be difficult to know that a biological attack has occurred until victims display symptoms. In other cases, the effects are immediate. Those affected by a biological agent require the immediate attention of professional medical personnel. Some agents are contagious which may result in the need for victims to be quarantined.

Terrorism using **explosive** and incendiary devices includes bombs and any other technique that creates an explosive, destructive effect. Bombs can take many forms from a car bomb to a mail bomb. They can be remotely detonated using a variety of devices or directly detonated in the case of a suicide bomb.

Radiological terrorism involves the use of radiological dispersal devices or nuclear facilities to attack the population. Exposure to radiation can cause radiation sickness, long-term illness, and even death. Terrorism experts fear the use of explosive and radiological devices in the form of a "dirty bomb" to attack the population. A "dirty bomb" is a low-tech, easily assembled and transported device made up of simple explosives combined with a suitable radioactive agent.

In recent years, **cyber terrorism** has become a larger threat than in years past. Cyber terrorism can be defined as activities intended to damage or disrupt vital computer systems. These acts can range from taking control of a host website to using networked resources to directly cause destruction and harm. Protection of databases and infrastructure appear to be the main goals at this point in time. Cyber terrorists can be difficult to identify because the internet provides a meeting place for individuals from various parts of the world. Individuals or groups planning a cyber-attack are not organized in a traditional manner, as they are able to effectively communicate over long distances without delay. They have been known to overtake websites, and alter the content that is presented to the public. The largest threat to institutions from cyber terrorism comes from any processes that are networked and controlled via computer. Any vulnerability that could allow access to sensitive data or processes should be addressed, and any possible measures taken to harden those resources to attack.

In recent years, as **drones** have become more available to the public and prevalent in society; they pose a growing risk. These small, remote controlled objects are becoming a tool for criminals and terrorists. Of specific worry to law enforcement is that these small aircraft are difficult to detect and stop. Recently, drones have been used to smuggle drugs and contraband. Another concern is that these drones could be modified to mount attacks with explosives or chemical weapons. Most small drones remain limited by short battery life and small payload capacity. The most popular consumer drones can carry just a few pounds. But some of the features that have made the devices increasingly attractive for businesses and photographers—that they are small, easy to fly and can capture high-definition images—also make them a potentially powerful tool for criminals and terrorists.

NOAA Alerts

When notified by a government official, the NWS has the ability to send alert messages through the Emergency Alert System and over NOAA Weather Radio. Examples include the following:

Local Area Emergency Message: This message defines an event that by itself does not pose a significant threat to public safety and/or property, but the event could escalate, contribute to other more serious events, or disrupt critical public safety services. Instructions, other than public protective actions, may be provided by authorized officials. Examples of when this message may be used include: utility disruptions, road closures, or a potential terrorist threat where the public is asked to remain alert.

- Civil Emergency Message: This message outlines a significant threat or threats to public safety and/or property that is imminent or in progress. The hazard is usually less specific or severe than those requiring a Civil Danger Warning.
- Law Enforcement Warning: This warning is issued for a bomb explosion, riot, or other criminal event. An authorized law enforcement agency may block roads, waterways, or facilities, evacuate or deny access to affected areas, and arrest violators or suspicious persons.

- **Radiological Hazard Warning**: This warning warns of the loss, discovery, or release of a radiological hazard such as the theft of a radiological isotope used for medical, seismic, or other purposes, discovery of radioactive materials, or a transportation accident involving nuclear weapons, nuclear fuel, or radioactive wastes. Authorized officials may recommend protective actions be taken if a radioactive hazard is discovered.

- **Civil Danger Warning**: This warning is issued when an event presents a danger to a significant civilian population. The message usually warns of a specific hazard and outlines specific protective actions such as evacuation or shelter in place.

- **Shelter-in-Place Warning**: This warning is issued when the public is recommended to shelter in place (go inside, close doors and windows, turn off air conditioning or heating systems, and turn on the radio or TV for more information). Examples include hazardous material releases or radioactive fallout.

13.2 REGULATORY ENVIRONMENT

Terrorism, by definition, is an act that is against the law. The regulatory environment tied to terrorism falls under law enforcement jurisdiction. Terrorism is investigated by the Federal Bureau of Investigations.

13.3 HISTORICAL OCCURRENCES

While there have been no large-scale terrorist attacks on Belmont County, incidents throughout the country have occurred in locations analogous to those found in the Belmont County communities. There have been several small-scale incidents reported in the County, including numerous threats of violence. Nationally, terrorism continues to be an issue of significant importance.

May 2003: A series of over 24 sniper attacks concentrated along the Cap-City Beltway I-270 in the Columbus Metropolitan Area caused widespread fear across Ohio and leaving one dead.

May 1, 2012: Five self-described anarchists were arrested in an alleged plot to blow up a bridge in Cuyahoga Valley National Park in Brecksville, Ohio. The group was being monitored as part of an FBI undercover operation and had considered other plots previously. One of the suspects expressed a desire to cause financial damage to companies while avoiding casualties.

July 20, 2012: In Aurora, Colorado, during the midnight screening of The Dark Knight Rises, a gunman dressed in tactical clothing, set off tear gas grenades and shot into the audience with multiple firearms. Twelve people were killed and seventy others were injured.

December 2, 2015: In San Bernardino, CA a planned shooting occurred at the Inland Regional Center which resulted in 16 deaths and 23 casualties. A shootout occurred between the suspects, ultimately leading to their deaths.

June 12, 2016: A 29-year old man armed with an automatic assault rifle, walked into a gay nightclub in Orlando, Florida, killing 49 people and injuring 53 more. The man swore allegiance to the leader of the Islamic State of Iraq and the Levant. It has been marked as the deadliest terror attack since the 9/11 attacks in 2001 in the United States.

August 4, 2019: A gunman entered a bar in the Oregon Historic District in Dayton, Ohio. At around 1 AM, he opened fire on the bar, killing 10 and injuring 27 others. The gunman was shot dead by responding police. The incident was then investigated by the FBI as Domestic Terrorism.

13.4 MAGNITUDE OF EVENTS

Events classified as terrorism have been shown to impact as few as one person to tens of thousands. One of the inherent risks of terrorism is the unpredictability. Terrorism events impact not only those who are directly killed or injured, but also those around them through psychological trauma afterward. Terrorists are not always easily identified, and events can be unpredictable.

Schools and universities have also been sites around the nation where active shooters have been present, putting the many elementary, middle, and high schools at risk, as well as Belmont College or Ohio University Eastern at risk. Government-owned buildings of state or federal agencies also are a potential target.

Terrorism attacks can occur extremely quickly, with some events lasting just a few minutes from beginning to end.

13.5 PROBABILITY OF FUTURE OCCURRENCES

There is not enough historical precedence to determine frequency or future probability of terrorism or threatened terroristic events.

Since the probability of terrorism occurring cannot be quantified in the same way as that of many natural hazards, it is not possible to assess vulnerability in terms of likelihood of occurrence. Instead, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets, planning efforts can be put in place to reduce the risk of attack. FEMA's Integrating Manmade Hazards into Mitigation Planning (2003) encourages site-specific assessments that should be based on the relative importance of a particular site to the surrounding community or population, threats that are known to exist and vulnerabilities including:

- Inherent vulnerability:
    - Visibility – How aware is the public of the existence of the facility?
    - Utility – How valuable might the place be in meeting the objectives of a potential terrorist?
    - Accessibility – How accessible is the place to the public?
    - Asset mobility – Is the asset's location fixed or mobile?
    - Presence of hazardous materials – Are flammable, explosive, biological, chemical and/or radiological materials present on site? If so, are they well secured?
    - Potential for collateral damage – What are the potential consequences for the surrounding area if the asset is attacked or damaged?

    - Occupancy – What is the potential for mass casualties based on the maximum number of individuals on site at a given time?

- Tactical vulnerability:

  Site Perimeter

    - Site planning and Landscape Design – Is the facility designed with security in mind – both site-specific and with regard to adjacent land uses?
    - Parking Security – Are vehicle access and parking managed in a way that separates vehicles and structures?

  Building Envelope

    - Structural Engineering – Is the building's envelope designed to be blast-resistant? Does it provide collective protection against chemical, biological and radiological contaminants?

  Facility Interior

    - Architectural and Interior Space Planning – Does security screening cover all public and private areas?
    - Mechanical Engineering – Are utilities and Heating, Ventilating and Air Conditioning (HVAC) systems protected and/or backed up with redundant systems?
    - Electrical Engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lighting sufficient?
    - Fire Protection Engineering – Are the building's water supply and fire suppression systems adequate, code-compliant and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?
    - Electronic and Organized Security – Are systems and personnel in place to monitor and protect the facility?

13.6 POTENTIAL LOSSES TO TERRORISM

Due to its unpredictable nature, all County assets, including all structures and all population, can be considered at risk for terrorism. Public facilities such as government buildings, sports venues, and dams can be considered as higher-potential potential targets for terrorism since these are highly important and can cause severe disruption if their operations are interrupted due to terrorist threats or activity.

One particular note of concern that was brought up at all public meetings was a "cracker plant" that will be constructed for refining plastics. The term "cracker" comes from the process used to break the bonds between carbon molecules that are present in natural gas to turn it into a crude liquid that can then be used for petrochemical products. It is estimated that this plant will be a $10 billion investment. Due to the controversial nature of plastics and natural gas, there is some concern that this plant could be the target of ecoterrorist events, or otherwise be a target to severely disrupt Belmont County activities. Further, any event that damages this plant could result in massive fires or explosions due to the nature of its processes.

TABLE 4-52 POTENTIAL IMPACTS OF TERRORISM

Impact	Description
People	People can be killed or severely injured in terrorism attacks. Psychological scarring is also extremely likely after the events for those who survive.
Infrastructure	Infrastructure can be damaged or destroyed in an attack
Economy	The economy can be impacted and can slow after terrorism events
Natural Systems	Depending on the location of an attack, some natural systems can be damaged, particularly if the event is related to ecoterrorism. It is also possible for drinking water supplies to be damaged if they are the target.
Transportation	Transportation systems may be severely disrupted during an event. Transportation can be shut down for multiple hours as situations are contained.

13.7 LAND USE & DEVELOPMENT TRENDS

Land use and development are not directly tied to the prevention or discouragement of terrorism. However, structures can be designed with safety devices meant to protect the populations inside. Precautionary devices such as two-way fire alarm panels, security cameras, and alarm boxes are currently in use throughout the country.

13.8 TERRORISM HIRA SUMMARY

One of the primary attributes of terrorism is its unexpected nature. This makes planning for potential attacks virtually impossible. The key to terrorism mitigation lies in the planning phase, and understanding the potential vulnerability of a specific area.

14. MINE SUBSIDENCE

Natural Hazards	Probability		Impact		Spatial Extent		Warning Time		Duration		RF Rating
Mine Subsidence	**2**	0.6	**1**	0.3	**4**	0.8	**4**	0.4	**3**	0.3	**2.4**
Medium Risk Hazard (2.0 – 2.9)											

14.1 HAZARD IDENTIFICATION

Mine Subsidence is a readjustment of the overburden due to collapse or failures of underground mine workings. Surface subsidence features usually take the form of either sinkholes or troughs.

Sinkholes are typically associated with abandoned mine workings, since most active underground mines operate at depths sufficient to preclude the development of sinkhole subsidence.

Troughs are induced by room-and-pillar mining can occur over active or abandoned mines. The resultant surface impacts and damages can be similar; however, the mechanisms that trigger the subsidence are dramatically different. In abandoned mines, troughs usually occur when the overburden sags downward due to the failure of remnant mine pillars, or by punching of the pillars into a soft mine floor or roof.

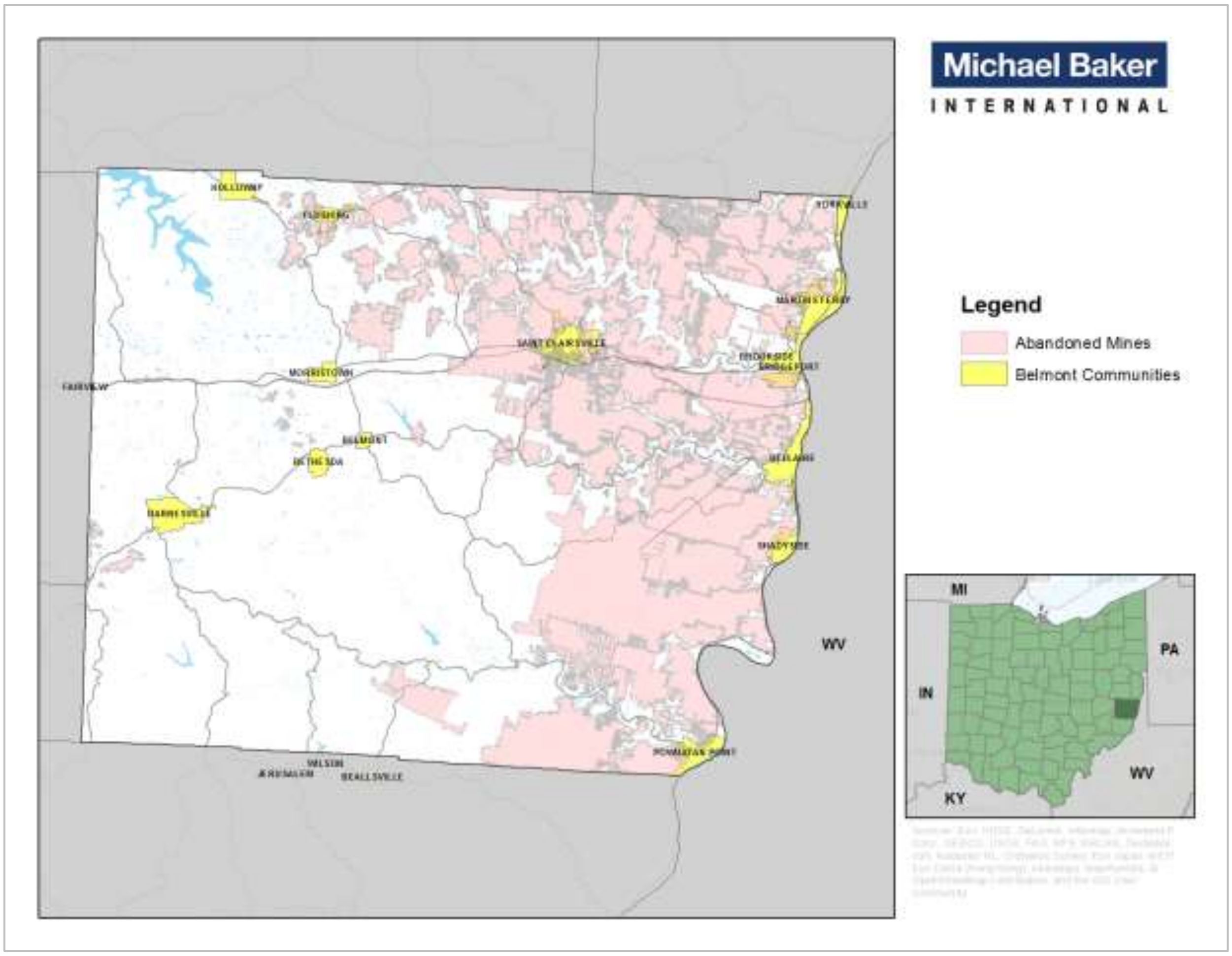
14.2 MINE SUBSIDENCE EXTENT

Eastern Ohio has by far the highest concentration of abandoned mines throughout the state. Abandoned mines have the potential to collapse and cause localized yet severe damage. Urban and rural land development is increasing the number of mine subsidence and the economic effects.

Areas of the state that have underlying mines are subject to subsidence and constitute a potential threat to people living in those areas. Isolated incidents throughout the coal regions over the years have been houses, garages, and trees swallowed up by subsidence holes. Lengths of local streets, highways, and countless building foundations have been damaged.

Subsidence damages to transportation routes, utilities, and buildings, create travel delays and other side effects. Fortunately, deaths and injuries due to subsidence are rare in Ohio. Almost all of the known deaths due to subsidence have occurred when boulders/rocks fall along highways and involve vehicles.

Belmont County has a moderate risk to mine subsidence due having over 560 abandoned mines. It is difficult, if not impossible, to predict if or when failure in an abandoned mine might occur, since abandoned mines may collapse many decades after the mining is completed, if the mine workings were not designed to provide long-term support.



14.3 HISTORICAL OCCURRENCES

In 1996, a mine remediation project was undertaken underneath Interstate 470, which had started to show signs of subsidence. It was discovered that a large void area was migrating upward from the abandoned mine, causing potholes near ditch and backslope locations. The project area included 518 linear meters of interstate highway just west of the bridge over the Ohio River. The project to repair the mine took place between September and December that year.

14.4 PROBABILITY OF FUTURE OCCURRENCE

The eastern portion of Belmont County is pockmarked with abandoned mines. It is estimated that approximately 30% of the County is covered with those mines that are known. Due to poor documentation of early mines, there may be more than are thus far unaccounted.

There have been several subsidence events in the state, and in Belmont County and subsidence remain a possible occurrence in localized areas of Belmont County, but impacts from such an event would likely cause minimal localized damage and are unlikely. Thus, the probability of Belmont County experiencing a mine subsidence in a given year is low and would be typically localized.

14.5 VULNERABILITY FROM MINE SUBSIDENCE

TABLE 4-53 ASSETS EXPOSED TO MINE SUBSIDENCE

Impact	Description
People	In the instance of a sudden collapse, people can be injured or killed. Collapses may also lead to homelessness where sinkholes exist in residential areas.
Infrastructure	Infrastructure may be damaged or destroyed in mine subsidence events.
Economy	The economy is unlikely to be severely affected by mine subsidence
Natural Systems	Trees may be swallowed by sinkholes.
Transportation	Transportation systems are unlikely to be affected, unless a mine collapses under a major road.

Potential Losses to Mine Subsidence

Several communities in Belmont County are vulnerable to subsidence, including St. Clairsville, Bridgeport, and Shadyside. In addition, places where landforms have been altered for purposes of highway construction or other development may be uniquely vulnerable to subsidence hazards. This is especially true if development is located at or near a known abandoned mine.

There is no way to predict an area that will be impacted by mine subsidence. Based on the mapping conducted by the Ohio Department of Natural Resources, the eastern portion of Belmont County is most susceptible to underground mines and potential mine subsidence. The Belmont County Auditor has determined that the Cities of Martins Ferry and St. Clairsville have property valued at over $200 million. Currently, there are an estimated 566 abandoned mines in Belmont County, and 2 that are active.

14.6 LAND USE & DEVELOPMENT TRENDS

As development continues, there is the risk that abandoned mines could potentially pose a problem, particularly those that are not mapped. A collapse of any of these could prove disastrous for new development projects.

Regulatory Environment

Mines are overseen by the ODNR Division of Minerals, as well as the Code of Federal Regulations. However, older mines that were abandoned a century or more ago very likely do not conform to these standard.

14.7 MINE SUBSIDENCE SUMMARY

Mine subsidence gives little to no warning. The after-effects from mine subsidence can include impacts to roadways, homes, buildings and critical infrastructure. They are not seasonal and can happen year-round.

SECTION 5. MITIGATION STRATEGY

The intent of the Mitigation Strategy is to provide Belmont County and its municipalities with the goals that will serve as the guiding principles for future mitigation policy and project administration, along with a list of proposed actions deemed necessary to meet those goals and reduce the impact of natural, technological, and man-made hazards. It is designed to be comprehensive and strategic in nature.

The development of the strategy included a thorough review of natural, technological, and man-made hazards and identified policies and projects intended to not only reduce the future impacts of hazards, but also to help the County achieve compatible economic, environmental and social goals. The development of this section is also intended to be strategic, in that all policies and projects are linked to establish priorities assigned to specific departments or individuals responsible for their implementation and assigned target completion deadlines. Funding sources are identified that can be used to assist in project implementation.

- **Mitigation goals** are general guidelines that explain what the County wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results.
- **Mitigation objectives** describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date.
- **Mitigation Actions** provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve prescribed goals and objectives.

1. GOALS

The following are the goals and objectives for this mitigation plan:

- **GOAL 1: Reduce the loss of life and impact to property as a result of flooding in Belmont County**
    - OBJECTIVE 1.1: Increase coordination among pertinent individuals/groups to mitigate flood hazards
    - OBJECTIVE 1.2: Increase public safety and response efforts during a flooding event
    - OBJECTIVE 1.3: Reduce flood damage by undertaking structural projects to lessen obstructions to the flow of water
    - OBJECTIVE 1.4: Develop, implement, or strengthen regulatory requirements to lessen flood damage
    - OBJECTIVE 1.5: Preserve the natural course of waterways

- GOAL 2: Minimize the loss of life and property due to severe summer storms in Belmont County
    - OBJECTIVE 2.1: Increase public awareness that thunderstorms are imminent
- GOAL 3: Reduce the effects of severe winter storms in Belmont County
    - OBJECTIVE 3.1: Minimize the impact on the health and safety of Belmont County residents
- GOAL 4: Minimize the loss of life and property due to drought in Belmont County
    - OBJECTIVE 4.1: To educate the citizens of Belmont County on methods to reduce the effects of drought
- GOAL 5: Minimize the loss of life, property, and infrastructure due to landslide in Belmont County
    - OBJECTIVE 5.1: Minimize the effects of landslide activity to life and property to include buildings, infrastructure, critical facilities and critical infrastructure in Belmont County (include uphill slopes, slips, and slides)
- GOAL 6: Reduce damage from severe wind and tornadoes in Belmont County
    - OBJECTIVE 6.1: Minimize future damages from severe wind or tornadoes throughout Belmont County through public outreach
- GOAL 7: Minimize the loss of life and property due to temperature extremes in Belmont County
    - OBJECTIVE 7.1: Minimize the effects of temperature extremes to life, public and private property in Belmont County through public outreach and coordination
- GOAL 8: Minimize the loss of life and property due to dam failure in Belmont County
    - OBJECTIVE 8.1: Reduce the probability of significant flood damage as a result of dam failure
- GOAL 9: Lessen the effects of mine subsidence in Belmont County
    - OBJECTIVE 9.1: Minimize the effects of mine subsidence to life and property to include buildings, infrastructure, critical facilities and critical infrastructure in Belmont County

Based on participation from the Belmont County Mitigation Planning Committee, the mitigation strategy was developed. Objectives were clarified to better document roles and responsibilities. Actions have been added to address particular hazards facing the County and the consensus achieved in how to address those actions.

The last step in updating the Mitigation Strategy is the creation of Mitigation Action Plans (MAPs). The MAPs represent the key outcome of the mitigation planning process. MAPs include a prioritized list of proposed hazard mitigation actions (policies and projects) for the County, including accompanying information such as those agencies or individuals assigned responsibility for their implementation, potential funding sources, estimated target date for completion, and a current status. The MAPs provide those individuals or agencies responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring progress over time. The collection of actions listed in each jurisdictions MAP also serves as an easily understood synopsis of activities for local decision makers.

In order to ensure that a broad range of mitigation actions were considered, the Mitigation Planning Committee analyzed a comprehensive range of specific mitigation actions for each hazard after it had completed the risk assessment. This helped to ensure that there was sufficient span and creativity in the mitigation actions considered.

There are **four categories** of mitigation actions which the County considered in developing its mitigation action plan. Those categories include:

1. **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
2. **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. Many of these types of actions are projects eligible for funding through the FEMA Hazard Mitigation Assistance program.
3. **Natural Systems Protection:** These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.
4. **Education and Awareness Program:** These are actions to inform and educate students, faculty and staff about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady or Firewise Communities. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk among County officials, stakeholders, and the public is more likely to lead to direct actions.

2. 2020 PLAN UPDATE MITIGATION ACTION PRIORITIZATION METHODOLOGY

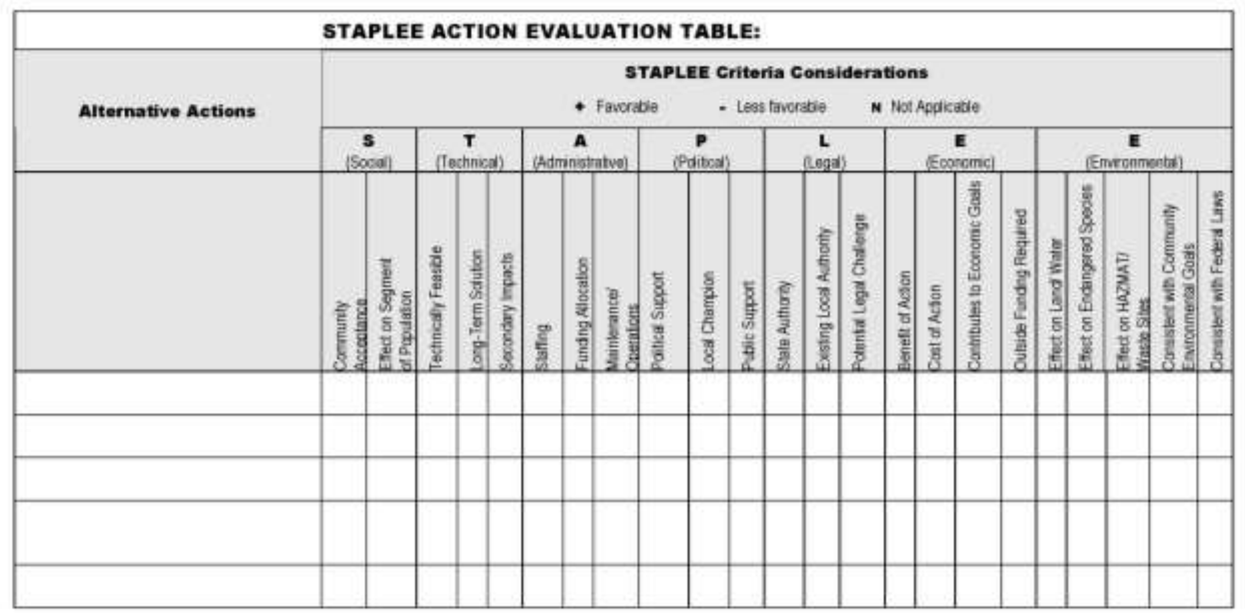
Prioritizing mitigation actions for the 2013 plan, and this 2020 plan update, were completed using FEMA's STAPLEE methodology for each jurisdiction's actions. The prioritization process has changed from the previous plan in order to incorporate this adaptable method that allows for a more comprehensive examination of the mitigation actions. The STAPLEE approach allows for a careful review of the feasibility of mitigation actions by using seven criteria. The criteria are described below:

- S - Social
- T - Technical
- A - Administrative
- P - Political
- L - Legal
- E - Economic
- E - Environmental

FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects. To do this in an efficient manner that is consistent with FEMA's guidance on using cost-benefit review in mitigation planning, the STAPLEE method was adapted to include a higher weighting for two elements of the economic feasibility factor – Benefits of Action and Costs of Action. This method incorporates concepts similar to those described in Method C of FEMA 386-5: Using Benefit Cost Review in Mitigation Planning (FEMA, 2007).

For the individual action plans, a STAPLEE score was calculated based on the number of favorable considerations that can be found on the STAPLEE document. Up to 23 considerations can be used to prioritize each action using this evaluation methodology. Typically, scores rank between 17 and 21. Infrastructure projects tend to incur a lower score due to their high price and lengthy completion times, while actions such as plans, regulations, and educational programs rank higher due to their ease of deployment. The table below shows an example of the STAPLEE tool.

FIGURE 28 EXAMPLE STAPLEE EVAULUATION



STAPLEE ACTION EVALUATION TABLE:

Alternative Actions	STAPLEE Criteria Considerations																						
	◆ Favorable - Less favorable N Not Applicable																						
	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)				
	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws

3. PLANNING PROCESS FOR SETTING HAZARD MITIGATION GOALS AND OBJECTIVES

The mitigation strategy represents the key outcomes of the 2020 Belmont County HMP planning process. The hazard mitigation planning process conducted by the Planning Committee is a typical problem-solving methodology:

- Estimate the impacts the problem could cause;
- Describe the problem;
- Assess what safeguards and resources exist that could potentially lessen those impacts;
- Develop Goals and Objectives with current capabilities to address problem
- Using this information, determine what, if anything, can be done, and select those actions that are appropriate for the community

4. BELMONT COUNTY CAPABILITY ASSESSMENT

The mitigation strategy includes an assessment of Belmont County planning and regulatory, administrative/technical, fiscal, and political capabilities to augment known issues and weaknesses from identified natural, technological, and man-made hazards.

4.1 ABILITY TO EXPAND ON EXISTING CAPABILITIES

The planning process used surveys to determine the existing capabilities of the County and its political subdivisions. These capabilities can be expanded upon with the proper influx of funds or personnel. Should additional state or federal funding become available to specifically augment existing capabilities, then the jurisdictions represented in this plan would be able to improve their capabilities. Additionally, as personnel turn over, they may be replaced with individuals with skillsets not captured in these surveys. The County will continue to develop their capabilities over time, and expand upon them where they are able.

Planning and Regulatory Capability: The table below summarizes each community's planning and regulatory capabilities. These are the plans and policies that jurisdictions have in place that can help to further mitigation.

TABLE 5-1 PLANNING AND REGULATORY CAPABILITIES

Tool/Program	Belmont County	City of Martins Ferry	City of St. Clairsville	Village of Barnesville	Village of Bellaire	Village of Belmont	Village of Bethesda	Village of Bridgeport	Village of Brookside	Village of Flushing	Village of Holloway	Village of Morristown	Village of Powhatan Point	Village of Shadyside	Village of Yorkville
Hazard Mitigation Plan	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD
Emergency Operations Plan	X	X	X	X	X	X			X				X	X	UD
Disaster Recovery Plan	X		X		X	X			X				X	X	
Evacuation Plan	X	X	X		X				X				X	X	X
Continuity of Operations Plan	X		X		X				X				X	X	X
NFIP	X	X	X	X	X	X	X	X	X		X	X	X	X	X
NFIP-CRS															
Floodplain Regulations	X	X	X	X	X				X				X	X	
Floodplain Management Plan	X	X	X		X						X		X	X	
Zoning Regulations		X	X	X	X	X	X	X	X		X	X	X	X	X
Subdivision Regulations		X	X		X		X	X				X	X	X	
Other							X*								

*The Village of Bethesda indicated that they have Dam Planning.

*UD = Under Development

Tool/Program	Belmont County	City of Martins Ferry	City of St. Clairsville	Village of Barnesville	Village of Bellaire	Village of Belmont	Village of Bethesda	Village of Bridgeport	Village of Brookside	Village of Flushing	Village of Holloway	Village of Morristown	Village of Powhatan Point	Village of Shadyside	Village of Yorkville
Comprehensive Plan	X	UD			X	UD			X			X	X	X	
Open Space Management Plan	X	X			X	UD							X	X	
Stormwater Management Plan	X	UD	X	X	X								X		UD
Natural Resource Protection Plan		X											X		
Capital Improvement Plan		UD	X		X		X						X		
Economic Development Plan		UD	X		X								X		UD
Historic Preservation Plan					X	X							X		
Farmland Preservation															
Building Code	X	X	X	X	X	X	X		X				X	X	
Fire Code	X			X	X	X	X						X	X	
Firewise													X		
Storm Ready		X			X								X		
Other															

Administrative and Technical Capability: The table below provides a summary of administrative and technical capabilities organized by staff type and department. It is important to understand current administrative and technical capabilities before developing a myriad of mitigation activities.

TABLE 5-2 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

Tool/Program	Belmont County	City of Martins Ferry	City of St. Clairsville	Village of Barnesville	Village of Bellaire	Village of Belmont	Village of Bethesda	Village of Bridgeport	Village of Brookside	Village of Flushing	Village of Holloway	Village of Morristown	Village of Powhatan Point	Village of Shadyside	Village of Yorkville
Planners (with land use / development knowledge)	X		X		X				X				X		
Planners or engineers	X		X	X	X		X	X					X		
Engineers	X	X	X		X								X		
Emergency Manager	X		X	X	X		X	X	X				X		
Floodplain Manager	X	X	X		X		X	X					X	X	
Land Surveyor	X												X		
Scientists					X	X									
GIS Personnel	X	X	X				X	X					X		
Grant Writers	X	X			X	X			X				X	X	X
Other							X								

Fiscal Capability: This section identifies the financial tools or resources that Belmont County could potentially use to help fund mitigation activities. Fiscal capabilities include community-specific as well as state and federal resources.

TABLE 5-3 FISCAL CAPABILITY

Tool/Program	Belmont County	City of Martins Ferry	City of St. Clairsville	Village of Barnesville	Village of Bellaire	Village of Belmont	Village of Bethesda	Village of Bridgeport	Village of Brookside	Village of Flushing	Village of Holloway	Village of Morristown	Village of Powhatan Point	Village of Shadyside	Village of Yorkville
Capital Improvement Planning	X	X	X		X				X				x		
Community Development Block Grant	X	X			X								x	X	X
Special Purpose Taxes	X				X	X	X	X					x		
Gas / Electric utility fees	X														
Water / Sewer fees	X	X	X	X	X	X	X	X	X		X	X	x	X	X
Stormwater utility fees													x		
Development impact fees	X				X										
General obligation, revenue, or special tax bonds	X	X		X	X			X					x		
Partnering / intergovernmental arrangements	X	X			X							X	X		
Other															

Community Political Capability: Political capability in this instance is being measured by the degree to which local political leadership (including appointed boards) is willing to enact policies and programs that reduce hazard vulnerabilities in their community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum State or Federal requirements (e.g., building codes, floodplain management, etc.). The table below shows a qualitative ranking of jurisdiction's political capability to enact policies and programs that reduce hazard vulnerabilities on a scale from 0 to 5. A higher the score corresponds to a higher degree of community political capability.

5-Very Willing **3-Moderately Willing** **0-Unwilling to Adopt**

Community	Willingness Score
Belmont County	**5**
City of Martins Ferry	**3**
City of St. Clairsville	**5**
Village of Barnesville	**4**
Village of Bellaire	**3**
Village of Belmont	**3**
Village of Bethesda	**5**
Village of Bridgeport	**5**
Village of Brookside	**5**
Village of Flushing	**1**
Village of Holloway	**3**
Village of Morristown	**3**
Village of Powhatan Point	**5**
Village of Shadyside	**4**
Village of Yorkville	**3**

Self-Assessment of Capability: The table below is each community's estimated degree of capability.

TABLE 5-4 OVERALL DEGREE OF CAPABILITY

Area	Limited	Moderate	High
Planning and Regulatory Capability	Belmont Flushing Morristown	Barnesville Bellaire Bethesda Brookside Holloway Martins Ferry Powhatan Point Shadyside Yorkville	Belmont County Bridgeport St. Clairsville Yorkville
Administrative and Technical Capability	Belmont Brookside Flushing Holloway Morristown	Barnesville Bellaire Bethesda Bridgeport Martins Ferry Powhatan Point Shadyside	Belmont County St. Clairsville
Fiscal Capability	Belmont Bridgeport Holloway Flushing Morristown Martins Ferry Yorkville	Barnesville Bellaire Bethesda Brookside Powhatan Point	Belmont County Shadyside St. Clairsville
Community Political Capability	Belmont Bethesda Bridgeport Flushing Morristown	Barnesville Bellaire Brookside Holloway Martins Ferry Powhatan Point Shadyside Yorkville	Bellaire Belmont County St. Clairsville
Community Resiliency Capability	Belmont Flushing Morristown	Barnesville Bellaire Bethesda Bridgeport Brookside Holloway Martins Ferry Powhatan Point Shadyside Yorkville	Belmont County St. Clairsville

5. MITIGATION GOALS, OBJECTIVES AND ACTIONS

Goals and objectives discussed in this section help describe what actions should occur, using increasingly narrow descriptors. Long-term goals are developed which can be accomplished by objectives. To achieve the stated objectives “mitigation actions” provide specific measurable descriptors on how to accomplish the objective. The goals, objectives, and actions form the basis for the development of a Mitigation Action Strategy and specific mitigation projects to be considered for implementation.

The process consists of 1) setting goals and objectives, 2) considering mitigation alternatives, 3) identifying strategies or “actions”, and 4) developing a prioritized action plan resulting in a mitigation strategy.

5.1 GOALS AND OBJECTIVES

The Planning Committee discussed goals and objectives for this plan at distinct points in the planning process. On October 14th (Planning Committee Meeting #2), the Planning Committee discussed the results of the risk assessment and the identified issues/weaknesses to be addressed by the Mitigation Goals and Objectives. More details of this particular meeting are provided in Appendix B.

5.2 2013 MITIGATION ACTION REVIEW

During the third planning meeting, the mitigation actions from the 2013 HMP were reviewed and determined to be; deferred into the new plan, changed to reflect an update in priorities, completed, or deleted. These actions can be found in Table 5-5. Actions marked as “Completed” were finished between the drafting of the 2013 HMP, and the 2020 HMP. Deletion of an action generally refers to that action no longer being relevant to the community.

TABLE 5-5 PREVIOUS MITIGATION ACTION STATUS

Action	**Jurisdiction** (Find the action applicable to your community and fill out the status on the right)	**Status** (Completed / Carrying to New Plan / Removed from Plan / In Progress) For those not completed, removed, or in progress, please provide a short description on their status.
Develop inundation studies of flood-prone areas to supplement this mitigation plan	Belmont County, Village of Bellaire, Village of Bethesda, Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Deferred
Improve flood warning system, especially near Kings Run	Belmont County, Village of Bellaire, Village of Bethesda., Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Deferred
Coordinate with FEMA, Belmont County EMA, and other pertinent agencies to provide floodwater rescue training to county emergency service providers	Belmont County, Village of Bellaire, Village of Bethesda., Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Deferred
Consider moving the air intake valves on apparatus at county fire departments, as well as on other rescue vehicles, so that they might be used in floodwaters.	Belmont County, Village of Bellaire, Village of Bethesda., Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Remove. No longer relevant.
Ensure that NFIP requirements are being met concerning repairs, renovations, and remodeling of structures located in the regulatory floodplain	Belmont County, Village of Bellaire, Village of Bethesda., Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Remove. Should be a capability
Update existing flood damage prevention and ordinances (as it relates to 44 CFR 60.3)	Belmont County, Village of Bellaire, Village of Bethesda., Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Remove. Should be a capability
Identify structure inventory for properties at-risk to flood (specifically properties located in the special flood hazard area/1% annual chance area)	Belmont County, Village of Bellaire, Village of Bethesda., Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Deferred
Encourage participation in the community rating system (CRS) to reduce flood insurance rates	Belmont County, Village of Bellaire, Village of Bethesda, Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Deferred
Develop a multi-jurisdictional committee to manage current and oversee future stream cleaning projects, as well as identify the areas that need cleaned	Belmont County, Village of Bellaire, Village of Bethesda, Village of Bridgeport, Village of Brookside, Village of Holloway, City of Martins Ferry, Village of Powhatan Point, Village of Shadyside, City of St. Clairsville, Village of Yorkville	Deferred
Continue to coordinate with the NWS to obtain relevant weather forecast information in advance of threatening storms.	Belmont County	Ongoing

Action	Jurisdiction (Find the action applicable to your community and fill out the status on the right)	Status (Completed / Carrying to New Plan / Removed from Plan / In Progress) For those not completed, removed, or in progress, please provide a short description on their status.
Update flood studies to provide more accurate information in future flood evaluations	Belmont County	Deferred
Coordinate with the Belmont Technical College to manipulate and analyze data from the USACOE to determine flood trends in the county and estimate water levels	Belmont County	Remove. No longer a priority.
Protect and preserve wetlands near streams and riparian zones to mitigate flash floods and prevent damage downstream	Belmont County	Remove. No longer a priority.
Place depth markers on frequently flooded roads to advise travelers of flooding depth	Belmont County	Deferred
The creation/improvement of impaired or damaged wetlands	Belmont County	Remove. No longer a priority.
Clean/drag creeks and streams, clearing log jams, trees and shrubs, and sediment bars	Belmont County	Deferred
Install stream gauges throughout the county to continually monitor and study water levels	Belmont County	Deferred
Assess the feasibility of using the debris cleaned from streams to build earthen floodwalls along the stream banks	Belmont County	Deferred
Develop a Belmont County evacuation plan and procedures for road closures	Belmont County	Deferred
Spot dredging on all creeks to remove sediment buildup and strengthen creek banks in unincorporated areas	Belmont County	Deferred
Identify and consider undertaking structural projects to address the amount of water runoff on kings run	Belmont County	Deferred
Increase the capacity of existing storm drainage systems that may involve detention and retention ponds	Belmont County	Deferred

Action	**Jurisdiction** (Find the action applicable to your community and fill out the status on the right)	**Status** (Completed / Carrying to New Plan / Removed from Plan / In Progress) For those not completed, removed, or in progress, please provide a short description on their status.
Construct dry dams on Little McMahons Creek feeder streams	Belmont County	Remove. No longer a priority.
Acquisition of property within Belmont County that is repetitively damaged by flash flooding	Belmont County	Deferred
Coordinate with the USACOE to facilitate the release of rain gauge information and other data pertinent to flooding to local officials	Belmont County	Remove. No longer a priority.
Acquire structures in identified repetitive loss areas throughout Belmont County	Belmont County	Remove. Redundant.
Establish countywide zoning that incorporates floodplain development permitting	Belmont County	Deferred
Notify owners in writing of flood prone properties and recommend the need for flood insurance	Belmont County	Deferred
Develop and hold land conservation easements to protect riparian vegetation in floodplain zones	Land Conservancy Organizations / Muskingum Watershed	Deferred
Remove debris from Wegee Creek	Mead Township	Remove. This area is in good shape.
Remove debris from Pipe Creek (address problems with sediment)	Mead Township	Remove.

Action	**Jurisdiction** (Find the action applicable to your community and fill out the status on the right)	**Status** (Completed / Carrying to New Plan / Removed from Plan / In Progress) For those not completed, removed, or in progress, please provide a short description on their status.
Repair and clear clogged storm water culvert pipe	Pease Township	Deferred
Installation of creek and river gauges on Captina Creek and the Ohio river	The Village of Powhatan Point	Complete – Captina Defer - Ohio
Improve storm water drainage system	Belmont (Village)	Deferred
Examine possible improvements to storm water system – to include replacement of culverts, storm sewers and catch basins	Bridgeport	Deferred
Plan and develop a storm sewer system to improve drainage	Morristown	Deferred
Plan and develop a storm sewer control system	Powhatan Point	Deferred
Install generators at emergency shelters	Shadyside	Complete
Install new storm sewers to address street flooding	Shadyside	In Progress
Assess the feasibility of installing a stabilization pond to reduce the speed of water runoff behind the Ohio Valley Mall in St. Clairsville	St. Clairsville	Remove. No longer a priority.
Replace culverts to reduce flooding and damage to roads resulting from high waters	Wayne Township	Deferred

5.3 MITIGATION ACTION DEVELOPMENT

To begin the process of identifying mitigation actions, the HMP Planning Committee reviewed the identified hazards, as well as the mitigation goals and objectives. Based upon priorities and risk assessment results, mitigation actions were developed. Most importantly, the newly developed mitigation actions acknowledge updated risk assessment information outlined in Section 4.

Mitigation Costs

Cost effectiveness of each measure was a primary consideration when developing mitigation actions. Because mitigation is an investment to reduce future damages, it is important to select measures for which the reduced damages over the life of the measure are likely to be greater than the project cost. For structural projects, the level of cost effectiveness is primarily based on the likelihood of damages occurring in the future, the severity of the damages when they occur, and the level of effectiveness of the selected measure.

While detailed analysis was not conducted during the mitigation action development process, these factors were of primary concern when selecting measures. For measures that do not result in a quantifiable reduction of damages, such as public education and outreach, the relationship of the probable future benefits and the cost of each measure was considered when developing the mitigation actions.

New mitigation actions for the 2020 plan are found below:

Landslides					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Establish erosion control on Kirkwood Heights Rd., Bridgeport Manor, Oak St., and Bench St. by stabilizing hillsides and reinforcing the banks and providing larger catch basins	Village of Bridgeport Street Supervisor	3-5 years	$70-90,000	Ohio Public Works Grants, OMEGA Fund	20

Extreme Temperatures					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Provide educational materials letting Belmont County residents know where the nearest heating/cooling centers are located	Belmont County EMA	1-3 years	Staff time and budget	Local Funding	22

Flooding					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Create a retention pond for stormwater runoff at Ohio Valley Mall	Belmont County EMA	2 years	$500,000	County Funds	23
Identify structure inventory for properties at-risk to flood (specifically properties located in the special flood hazard area/1% annual chance area)	Belmont County EMA	4 years	$10,000	Local Funding	23
Meet with local communities to encourage participation in the NFIP Community Rating System program.	Belmont County EMA	5 years	Staff time	Local Funding	23
Establish countywide zoning that incorporates floodplain development permitting	Belmont County Engineer	3-5 years	Staff time	Local Funding	23
Relocated stream bed, repair damaged roadway, and remove any debris that impacts the sewage plant	Yorkville Mayor and Engineer	5 years	$80,000	NRCS, FEMA PDM, OMEGA, Local general fund	22
Place depth markers on frequently flooded roads to advise travelers of flooding depth	Belmont County EMA	5 years	$10,000	Local Funding	22
Install stream gauges throughout the county continually monitor water levels	Belmont County EMA	5 years	$10,000	Local Funding	22
Notify owners in writing of flood prone properties and recommend the need for flood insurance	Belmont County EMA	1-2 years	$12,000	Local Funding	22
Stabilize roadway on Front Street near the marina	Powhatan Point Mayor, Street Department	3-5 years	$250,000	Village general fund, ODNR, Belmont Soil and Water	21
Upsize the undersized culvert on Colerain Pike	Belmont Co. Engineer	5 years	$100,000	County Funds, FEMA HMGP, OMEGA	21
Update flood studies to provide more accurate information in future flood evaluations	Belmont County EMA	5 years	$150,000	FEMA PDM grant funds	21
Installation of creek and river gauges on the Ohio River	Village of Powhatan Point Mayor	1-2 years	$10,000	Local Funding, PDM funds	21
Dredge the creek that runs through town	Shadyside Village Council, Army Corps of Engineers	3-5 years	$2 million	OMEGA fund	20
Perform an H&H study	Village of Holloway Council	2 years	$25,000	OMEGA loan, FEMA PDM	20
Use the results of the H&H study to devise an action plan to clear the creek for drainage	Village of Holloway Council	3 years	$25,000	OMEGA loan, FEMA PDM	20

Install larger drain pipes at various locations throughout the township	Smith Township	4 years	$25,000	OMEGA loan, FEMA PDM	20
Replace stormwater line underneath County Road 226 downtown	Village of Bethesda Administrator	5 years	$100,000	Local Funding, Ohio Public Works, OMEGA	20
Examine possible improvements to storm water system – to include replacement of culverts, storm sewers and catch basins	Bridgeport	2-3 years	$40,000	Local Funding, Ohio Public Works, OMEGA	20
Replace twin culverts with bridge near Maynard	Belmont Co. Engineer	5 years	$400,000	County Funds, FEMA HMGP, OMEGA	19
Upgrade sewer system to be able to cope with increased stormwater	Village of Bellaire Mayor	2.5 years	$80,000	ODNR, FEMA PDM	19
Repair the park spillway	Village of Bethesda Administrator	5 years	$150,000	Local Funding, Ohio Public Works, OMEGA	19
Develop inundation studies of flood-prone areas to supplement this mitigation plan	Belmont County EMA	1-5 years	Staff time and resources	Existing funds	19
Dredge Pipe Creek	Belmont Co. Engineer	5 years	$750,000	County Funds, FEMA HMGP, OMEGA	18
Engineer and improve existing stormwater system on Bellview Street	St. Clairsville Mayor, Director of Public Service	2-3 years	$1 million	FEMA HMGP, OPWC, City Resources	18
Upgrade stormwater infrastructure on Willow Grave Road	Belmont Co. Engineer	5 years	$600,000	County Funds, FEMA HMGP, OMEGA	18
Upsize the undersized culverts on Barton Rd.	Belmont Co. Engineer	5 years	$600,000	County Funds, FEMA HMGP, OMEGA	18
Relocate village offices out of the floodplain, as the river causes severe flooding in the basement and the first floor, affecting the Street, Fire, and Mayor's offices	Village of Brookside Mayor and Council	3-5 years	$920,000	Local general fund, Firefighter's Grant, OMEGA loan	18
Add in storm drains south of Zane and Euclid	Martins Ferry Service Director	3-5 years	$2-3 million	Local Funding, Ohio Public Works, OMEGA	18
Clear stormwater drains of debris to prevent localized flooding	Flushing Mayor	5 years	$15,000	Local Funding, Ohio Public Works, OMEGA	18
Acquisition of property within Belmont County that is repetitively damaged by flash flooding	Belmont County EMA	2-3 years	$120,000	FEMA FMA, PDM funds	18
Reroute the underground creek that runs through the City	Martins Ferry Service Director	3-5 years	$15 million	Local Funding, Ohio Public Works, OMEGA	17

Coordinate with FEMA, Belmont County EMA, and other pertinent agencies to provide floodwater rescue training to county emergency service providers	Belmont County EMA	1-5 years	Staff time and resources	Existing funds	17
Replace culverts to reduce flooding and damage to roads resulting from high waters	Wayne Township	1-2 years	$8,000 - $15,000	Township road and bridge budget	16
Improve flood warning system, especially near Kings Run	Belmont County EMA	1-5 years	$20,000	County funds, HMA grant	16

Severe Thunderstorms

Action	Lead Agency/ Department	Implementation Schedule	Estimated Cost	Funding Source	Priority Score
Upgrade the existing storm water drainage system to accommodate additional flow	Village of Belmont Mayor	3-5 years	$250,000	OPWC fund	23
Install storm basins and 24” to 30” culvert pipe on S. Chestnut St. in Barnesville	Barnesville Village Administrator	2-3 years	$150,000 - $200,000	OPWC fund	22
Provide weather radios to all Barnesville residents	Barnesville Village Administrator	3 years	$15,000	Local general fund	22
Provide weather radios to all Morristown residents	Morrisville Mayor	2-4 years	$5,000	Local general fund, FEMA PDM	22
Repair and clear clogged storm water culvert pipe	Pease Township	1-3 years	$2,000	Local funds, OPWC	21
Develop a multi-jurisdictional committee to manage current and oversee future stream cleaning projects, as well as identify the areas that need cleaned	Belmont County EMA	2-3 years	Staff time	Local County funds	20
Provide generator for critical facilities	Belmont Co. Engineer	5 years	$250,000	County Funds, FEMA HMGP, OMEGA	19
Plan and develop a storm sewer system to improve drainage	Morristown Mayor	3-5 years	$750,000	CDBG, FEMA grants	16
Plan and develop a storm sewer control system	Powhatan Point Mayor	3-5 years	$10 million	Local Funds, OPWC, OMEGA	15

Severe Winter Storms

Action	Lead Agency/ Department	Implementation Schedule	Estimated Cost	Funding Source	Priority Score
Obtain generators to operate a heating center	Yorkville Village Mayor	5 years	$35,000	Local funding, FEMA PDM and HMGP	19

Tornado					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Locate additional existing areas throughout the County that can be used as storm shelters	Belmont County EMA	1-2 years	Staff time	Local funds	23
Complete retrofits on buildings to be used as storm shelters	Belmont County EMA	3-5 years	$3 million	Local funding, FEMA PDM and HMGP	18

Wildfire					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Develop a Belmont County evacuation plan and procedures for road closures	Belmont County EMA	1-2 years	$15,000	Local funding, FEMA PDM and HMGP	16

Seismic Activity					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Ensure that County buildings are up to code to withstand potential earthquakes	Belmont County Engineer	2-4 years	Staff time	Local Budget	17

Hazardous Material Incidents					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Create an educational brochure explaining what to do in the event of a hazardous material spill	Yorkville Mayor	5 years	$1,000	Local General Fund	18

Dam Failure					
Action	**Lead Agency/ Department**	**Implementation Schedule**	**Estimated Cost**	**Funding Source**	**Priority Score**
Coordinate with dam owners to ensure that their inundation mapping and response plans are being kept up to date	Belmont County EMA	2-3 years	Staff time and resources	Local funding	18

Health Related Emergency

Action	Lead Agency/ Department	Implementation Schedule	Estimated Cost	Funding Source	Priority Score
Belmont County will create and distribute a newsletter informing residents and workers about disease entities, and how to prevent bacteria and viruses from spreading.	Belmont County EMA	5 years	$1,000	Existing Funds	22

Terrorism

Action	Lead Agency/ Department	Implementation Schedule	Estimated Cost	Funding Source	Priority Score
Provide law enforcement and firefighters with the proper training on how to best deal with an active shooter incident.	Belmont County EMA	2-5 years	$3,500 and staff time	DHS grants, County Funds, Local funds for match	20

Mine Subsidence

Action	Lead Agency/ Department	Implementation Schedule	Estimated Cost	Funding Source	Priority Score
Map the abandoned mines more accurately to determine where weak areas may exist	Belmont County EMA	5 years	$100,000	FEMA PDM, HMGP Grants	17

SECTION 6. PLAN IMPLEMENTATION AND MAINTENANCE

As a living document, it is important that this plan becomes a tool in County resources to ensure reductions in possible damage from a hazard event. This section discusses plan adoption, implementation, monitoring, evaluating, and updating the HMP. Plan implementation and maintenance procedures will ensure that the HMP remains relevant and continues to address the changing environment in Belmont County. This section describes the incorporation of the HMP into existing planning mechanisms, and how the planning committee will continue to engage the public.

1. PLAN ADOPTION

This section will be completed following the adoption of the plan by the County.

2. EVALUATION, MONITORING AND UPDATING

Monitoring, evaluating, and updating this plan is critical to maintaining its value and success in regards to identified mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis.

Belmont County HMPC established for this 2020 Plan is designated to lead plan maintenance processes of monitoring, evaluation and updating with support and representation from all participating municipalities. The Mitigation Planning Committee will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from County-wide representatives and other important stakeholders.

The HMPC will oversee the progress made on the implementation of action items identified and modify actions, as needed, to reflect changing conditions. The HMPC will meet annually to evaluate the plan and discuss specific coordination efforts that may be needed.

The annual evaluation of the 2020 Plan will not only include an investigation of whether mitigation actions were completed, but also an assessment of how effective those actions were in mitigating losses. A review of the qualitative and quantitative benefits (or avoided losses) of mitigation activities will support this assessment. Results of the evaluation will then be compared to the goals and objectives established in the plan and decisions will be made regarding whether actions should be discontinued, or modified in any way in light of new developments in the community. Progress will be documented by the Mitigation Planning Committee for use in the next Hazard Mitigation Plan update. Finally, the Mitigation Planning Committee will monitor and incorporate elements of this Plan into other planning mechanisms.

This Plan will be updated by the FEMA approved five year anniversary date, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness of the HMP.

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the plan?
- Should additional resources be committed to address identified hazards?

Issues that arise during monitoring and evaluation which require changes to the local hazard, risk and vulnerability summary, mitigation strategy, and other components of the plan will be incorporated during future updates.

Update process for plan prior to 5-year update. Any interested party wishing for an update of this Plan sooner than the 5-year update will submit such a request to the HMPC for consideration. The request shall be accompanied by a detailed rationale. The request will be evaluated and a determination will be made as to whether the update request should be acted upon. If the decision is in the affirmative, an assignment will be made for an individual to author the update. The draft updated section along with a detailed rationale will be submitted to the Mitigation Planning Committee. The committee will circulate the draft updated section of the plan for comment and after an appropriate period of time, the committee shall make a decision to update the plan at least partially based on the feedback received.

3. PLAN UPDATE AND MAINTENANCE

This section describes the schedule and process for monitoring, evaluating, and updating the 2020 HMP.

3.1 SCHEDULE

Monitoring the progress of the mitigation actions will be on-going throughout the five-year period between the adoption of the HMP and the next update effort. The HMPC will meet on an annual basis to monitor the status of the implementation of mitigation actions and develop updates as necessary.

The HMP will be updated every five years, as required by DMA 2000. The update process will begin at least one year prior to the expiration of the HMP. However, should a significant disaster occur, the HMPC will reconvene within 30 days of the disaster to review and update the HMP as appropriate.

3.2 PROCESS

The HMPC will coordinate with responsible agencies/organizations identified for each mitigation action. These responsible agencies/organizations will monitor and evaluate the progress made on the implementation of mitigation actions and report to the HMPC on an annual basis. Working with the HMPC, these responsible agencies/organizations will be asked to assess the effectiveness of the mitigation actions and modify the mitigation actions as appropriate.

Future updates to the HMP will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. Issues that arise during monitoring and evaluating the HMP, which require changes to the risk assessment, mitigation strategy and other components of the HMP, will be incorporated into the next update of the HMP. The questions identified above would remain valid during the preparation of the update.

Public Involvement

At all stages of the plan maintenance process, the general public of the County will be invited to participate. Prior to the HMP's annual review and after major disaster events when the HMP is revisited, the public will be invited through The Times Leader, posts on social media, and through fliers posted at the Belmont County Court House.

Any comments received will be logged and then addressed within the main document of the plan. A new version of the plan will be created and saved per each round of major edits.

3.3 INCORPORATION INTO EXISTING PLANNING MECHANISMS

An important implementation mechanism is to incorporate the recommendation and underlying principles of the HMP into planning and development such as capital improvement budgeting, general plans and comprehensive plans. Mitigation is most successful when it is incorporated within the day-to-day functions and priorities of the entity attempting to implement risk reducing actions. The integration of a variety of departments on the HMPC provides an opportunity for constant and pervasive efforts to network, identify, and highlight mitigation activities and opportunities. This collaborative effort is also important to monitor funding opportunities which can be leveraged to implement the mitigation actions.

Past Integration

County Building Codes: As of April 2018, the Belmont County Building Department is a sub-department of the Mid-East Ohio Building Department. The department issues plan approvals and inspects all building activity regulated by the Ohio Building Code.

Community Development Committee: Between 2013 and 2020 the County acquired a number of greenspace properties. In order to put them to the best possible utilization, a Community Development Committee was formed to investigate uses for these properties. Green spaces can be used for mitigation to reduce erosion and flooding, particularly along rivers. The HMPC, beginning with its meetings after the adoption of this plan, looked at more actively integrating hazard mitigation with these spaces.

Future Integration

- **Capital Improvement Plans:** Plans that involve the upgrade of existing infrastructure provide an excellent opportunity for the County to build in hazard mitigation. This may include roadways, stream embankments, riverfront upgrades, or public walkways, but is not limited to these.

- **Local Plans and Polices**: The HMP will provide information that can be incorporated into local master plans during the next plan update. Specific risk and vulnerability information from the HMP will assist to identify areas where development may be at risk to potential hazards.

- **Historic Building Inventory**: The HMP includes information on historic buildings that can help to guide decisions on what actions to take with historic buildings.

- **Emergency Operations Plan**: The County uses an Emergency Operations Plan that gives emergency personnel guidelines and procedures on how to best respond to dangerous events. Hazards as described in this plan, including those that are new to the 2020 iteration, will be included in the next version of the EOP.

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APPENDIX A. ADOPTION RESOLUTION

To be completed upon adoption of this plan

APPENDIX B. MEETING MINUTES & AGENDAS

Belmont County Hazard Mitigation Plan Update

Kickoff Meeting

May 7, 2019

10:00 AM – 12:00 PM

Place: Belmont County EMA
68329 Bannock Rd, St. Clairsville, OH 43950

ATTACHED: LIST OF ATTENDANCE

MEETING FACILITATORS:

Dave Ivan, Director, Belmont County Emergency Management Agency

Jason Farrell, Planner, Michael Baker International

Josh Vidmar, Planner, Michael Baker International

1. Welcome and Introductions
2. Project Overview
3. Planning Process
4. Participation
5. Hazard Review
    - Exercise: Risk Factor Evaluation
    - Exercise: Hazard Evaluation
6. Capability Assessment
    - Exercise: Capability Assessment Survey
7. Planning Timeline
8. Next Steps and Action Items

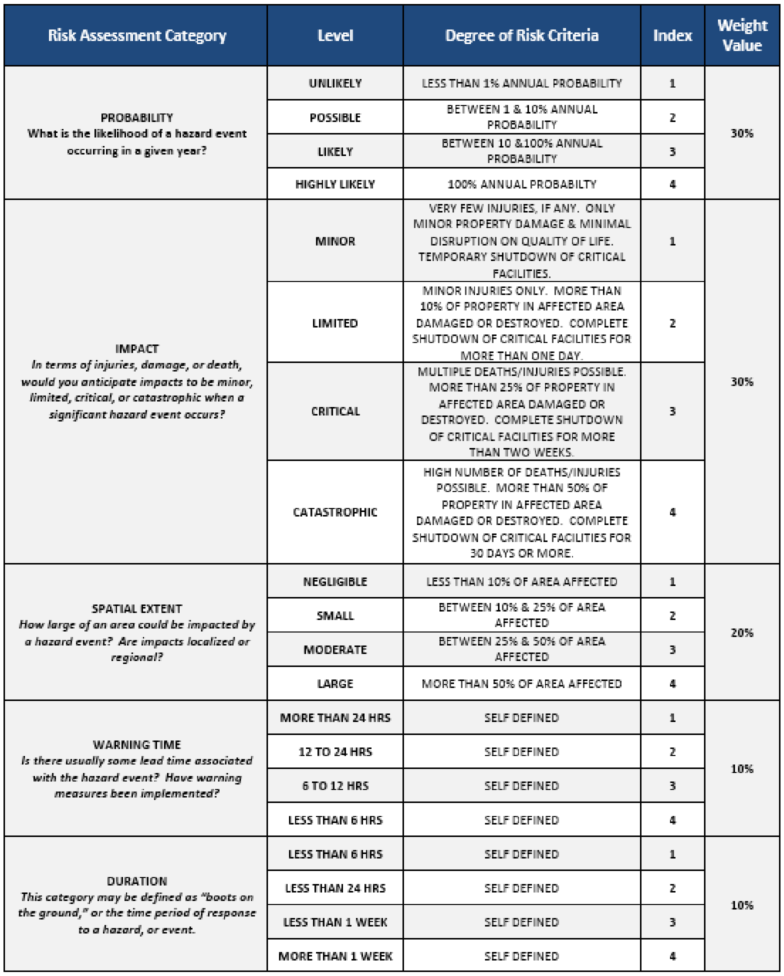
Director Ivan opened the meeting by thanking everyone for coming and briefly introducing the overall project. He then turned the floor over to Jason Farrell of Michael Baker International.

Jason explained the core concept of mitigation and why it is needed, and that the mitigation plan is required to receive certain funds through FEMA. In addition, he covered what is expected of the participants, both currently in attendance and those who will serve on the Belmont County Hazard Mitigation Planning Committee in future meetings.

Jason then provided those in attendance with a project timeline and an explanation of how Baker will complete the plan based on the proposed project schedule (looking at an approximate eight-month project schedule). He explained that it is a goal that the updated plan be delivered to Ohio for state review and then to FEMA for review in sufficient time for review and adoption.

Identification of New Hazards

The first task for the group was to identify the hazards that are to be profiled in the new edition of the plan. This involved looking at those hazards currently identified in the 2013 plan and determining if they were to be carried over to the new plan. They were then prioritized using the Risk Factor worksheet:



Risk Assessment Category	Level	Degree of Risk Criteria	Index	Weight Value
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	4	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN TWO WEEKS.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	NEGLIGIBLE	LESS THAN 10% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 10% & 25% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 25% & 50% OF AREA AFFECTED	3	
	LARGE	MORE THAN 50% OF AREA AFFECTED	4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	MORE THAN 24 HRS	SELF DEFINED	1	10%
	12 TO 24 HRS	SELF DEFINED	2	
	6 TO 12 HRS	SELF DEFINED	3	
	LESS THAN 6 HRS	SELF DEFINED	4	
DURATION *This category may be defined as "boots on the ground," or the time period of response to a hazard, or event.*	LESS THAN 6 HRS	SELF DEFINED	1	10%
	LESS THAN 24 HRS	SELF DEFINED	2	
	LESS THAN 1 WEEK	SELF DEFINED	3	
	MORE THAN 1 WEEK	SELF DEFINED	4	

During the meeting the hazard of infestation was removed, as it was deemed no longer necessary. The rest of the hazards were reviewed for their overall priority, and it was determined that they should all remain in. As part of the HazMat hazard, it was requested that natural gas lines be included in this iteration of the plan.

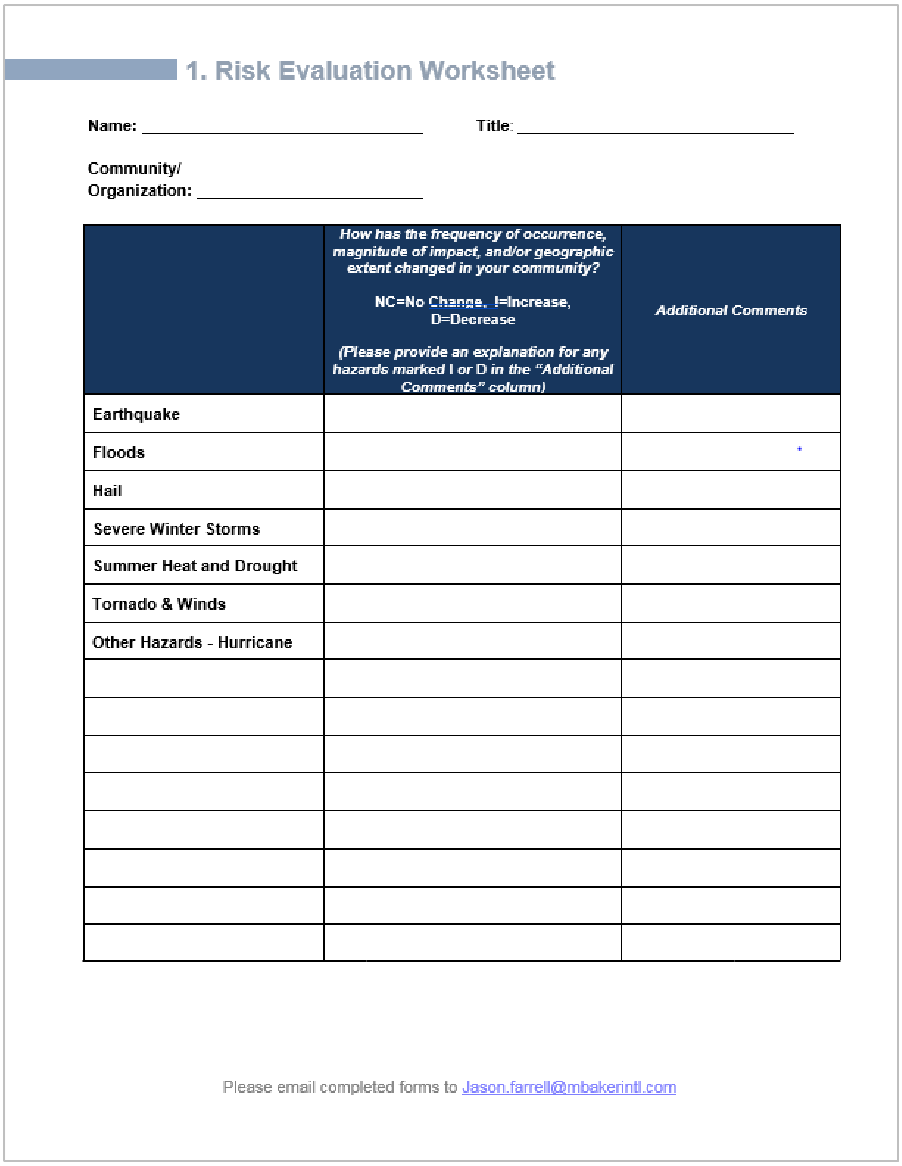
The hazards were then rescored to determine their overall change in priorities.

The resulting table of hazards and their relative Risk Factor score can be found below:

Natural Hazards		Probability		Impact		Spatial Extent		Warning Time		Duration		RF Factor
1	Landslide	**4**	1.2	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**3.5**
2	Extreme Temperatures	**4**	1.2	**3**	0.9	**4**	0.8	**1**	0.1	**4**	0.4	**3.4**
3	Flooding	**4**	1.2	**3**	0.9	**2**	0.4	**3**	0.3	**4**	0.4	**3.2**
4	Severe Winter Storms	**4**	1.2	**2**	0.6	**4**	0.8	**1**	0.1	**3**	0.3	**3**
5	Severe Thunderstorms	**4**	1.2	**2**	0.6	**4**	0.8	**1**	0.1	**2**	0.2	**2.9**
6	Drought	**2**	0.6	**1**	0.3	**4**	0.8	**4**	0.4	**4**	0.4	**2.5**
7	Tornado	**2**	0.6	**1**	0.3	**1**	0.2	**4**	0.4	**4**	0.4	**1.9**
8	Wildfire	**2**	0.6	**1**	0.3	**1**	0.2	**4**	0.4	**2**	0.2	**1.7**
9	Seismic Activity	**1**	0.3	**1**	0.3	**2**	0.4	**4**	0.4	**2**	0.2	**1.6**
Technological Hazards		**Probability**		**Impact**		**Spatial Extent**		**Warning Time**		**Duration**		**RF Factor**
1	Hazardous Materials	**4**	1.2	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**3.5**
2	Dam Failure	**2**	0.6	**3**	0.9	**3**	0.6	**4**	0.4	**4**	0.4	**2.9**
3	Epidemic	**2**	0.6	**2**	0.6	**4**	0.8	**4**	0.4	**4**	0.4	**2.8**
4	Terrorism	**1**	0.3	**4**	1.2	**2**	0.4	**4**	0.4	**4**	0.4	**2.7**
5	Mine Subsidence	**2**	0.6	**1**	0.3	**4**	0.8	**4**	0.4	**3**	0.3	**2.4**

Evaluating Risk

After the hazards were decided upon, another exercise was completed by the group. The exercise was called the Risk Evaluation, in which the members of the committee determine, based on their own general knowledge, if the hazards selected pose more of a threat, less of a threat, or if there were no changes. It was explained to them that these were purely qualitative responses and that each would likely have different answers. The forms were completed and turned back in at the end of the meeting. They are enclosed in these minutes.



1. Risk Evaluation Worksheet

Name: ______________________________ **Title**: ______________________________

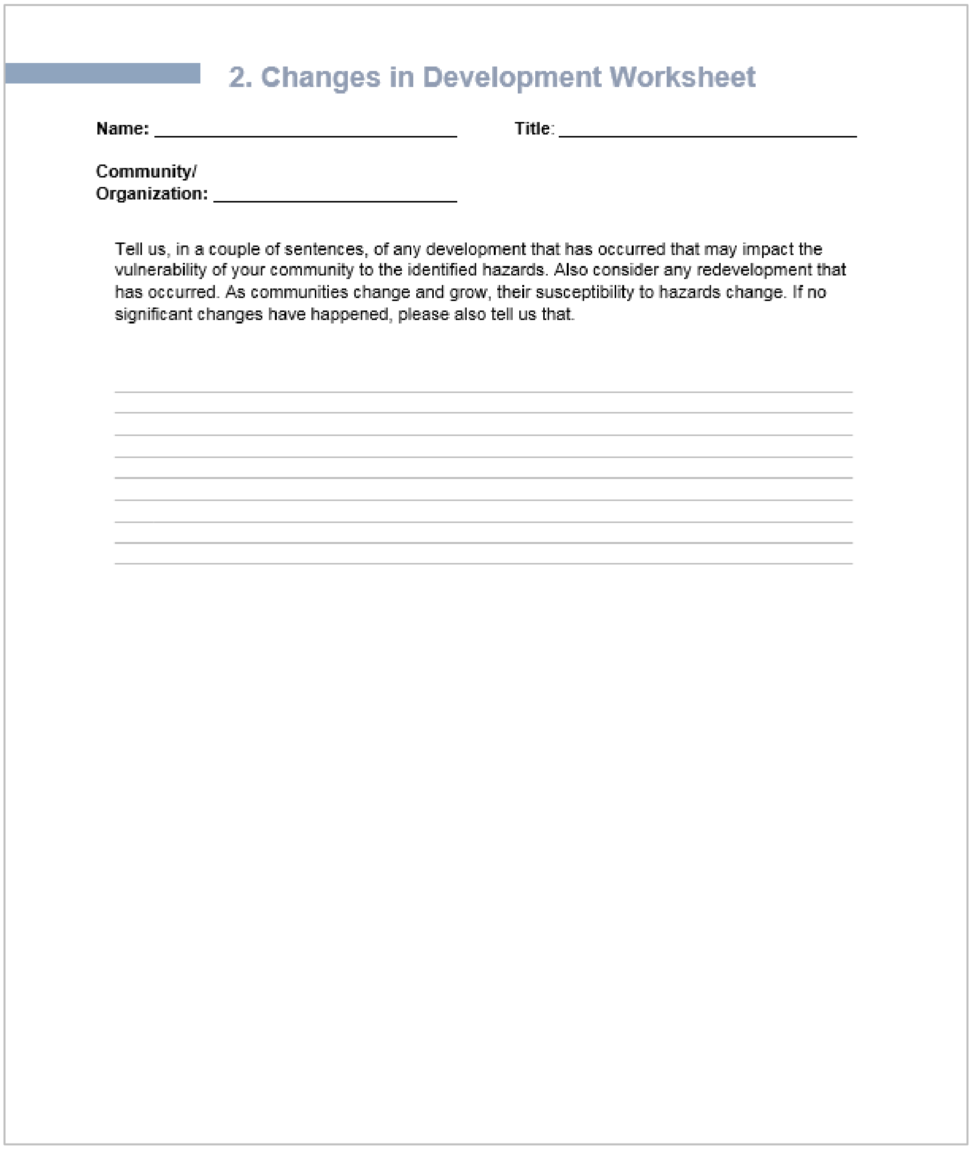
Community/
Organization: ________________________

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? **NC=No Change, I=Increase, D=Decrease** ***(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)***	***Additional Comments***
Earthquake		
Floods		
Hail		
Severe Winter Storms		
Summer Heat and Drought		
Tornado & Winds		
Other Hazards - Hurricane		

Please email completed forms to Jason.farrell@mbakerintl.com

Changes in Development

Upon completion of the Risk Evaluation, one more form was handed out, the Community Development Worksheet. This form asks representatives to explain what development has happened in recent years that would cause greater or lessen the vulnerability of their communities.



2. Changes in Development Worksheet

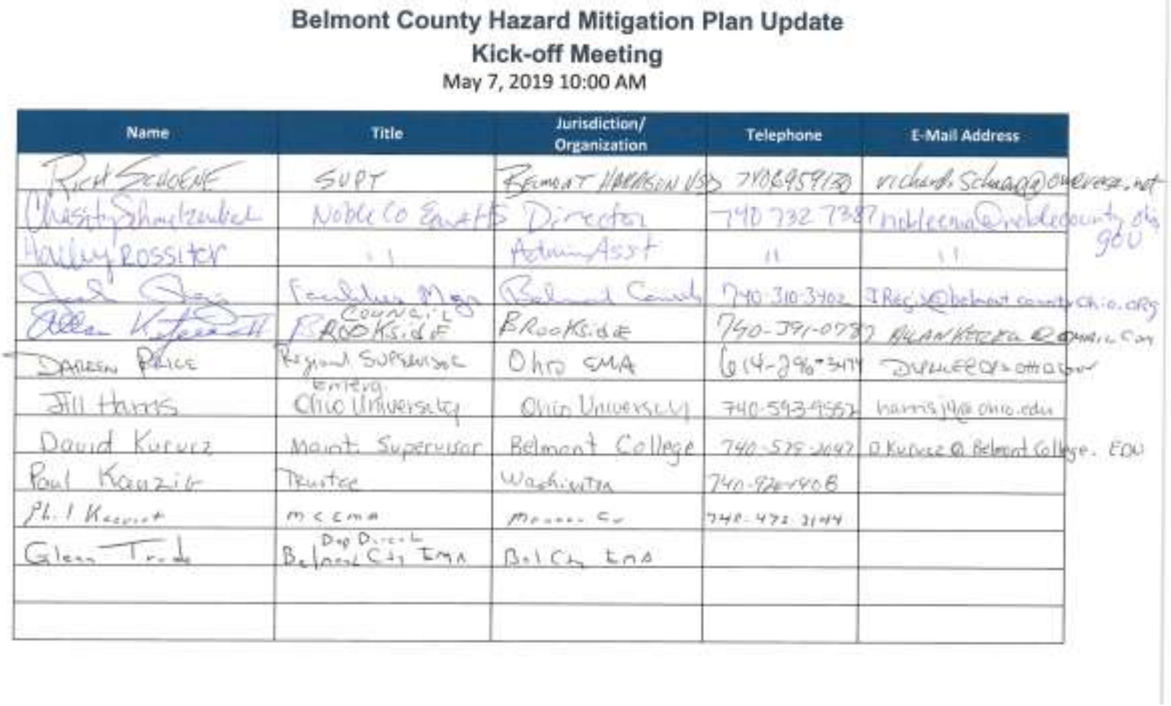
Name: ______________________________ **Title:** ______________________________

Community/
Organization: ________________________

Tell us, in a couple of sentences, of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

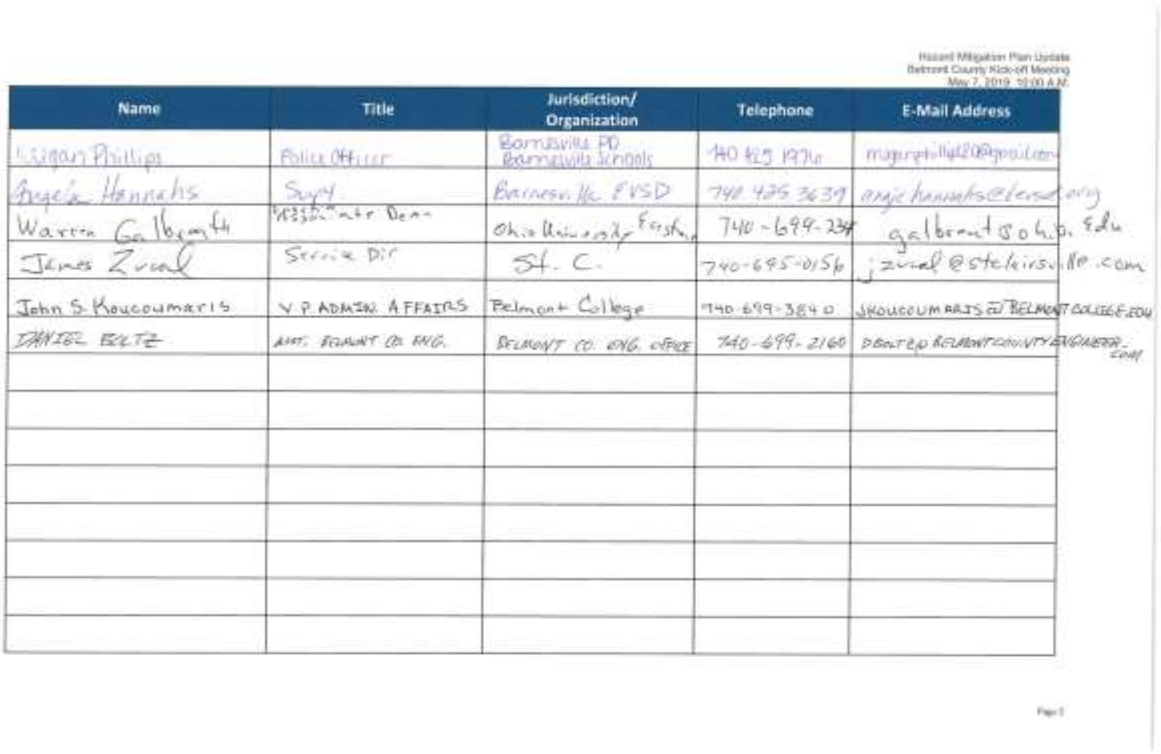
Closing and Next Steps

Once the Community Development exercise was completed, the final step was to go over the remainder of the project. This included a short discussion about the types of goals and objectives that would be discussed at the next meeting, as well a short talk about what mitigation actions are. After reviewing the planning schedule, those in attendance were asked if there were any further questions before adjourning. No questions were asked and the meetings were adjourned.



Belmont County Hazard Mitigation Plan Update
Kick-off Meeting
May 7, 2019 10:00 AM

Name	Title	Jurisdiction/ Organization	Telephone	E-Mail Address
Rick Schoene	SUPT	Belmont Harrison VSD	7406959130	richard.schaag@ovevese.net
Christy Schmelzenbach	Noble Co EM+HS	Director	740 732 7387	nobleema@noblecountyohio.gov
Hailey Rossiter	"	Admin Asst	"	"
	Facilities Mgr	Belmont County	740-310-3402	JRegis@belmontcountyohio.org
Allen K[illegible]	Council BROOKSIDE	BROOKSIDE	740-391-0787	ALANKITZEA@gmail.com
DARREN PRICE	Regional SUPERVISOR	Ohio EMA	614-296-3474	DWPRICE@dps.ohio.gov
Jill Harris	Emerg. Ohio University	Ohio University	740-593-9582	harrisj4@ohio.edu
David Kurucz	Maint. Supervisor	Belmont College	740-575-2047	DKurucz@BelmontCollege.EDU
Paul Kanzig	Trustee	Washington	740-926-1408	
Phil Keevert	MCEMA	Monroe Co	740-472-2144	
Glenn Trudo	Dep Direct Belmont Cty EMA	Bel Cty EMA		



Hazard Mitigation Plan Update
Belmont County Kick-off Meeting
May 7, 2019 10:00 A.M.

Name	Title	Jurisdiction/ Organization	Telephone	E-Mail Address
Logan Phillips	Police Officer	Barnesville PD Barnesville Schools	740 425 1976	loganphillips20@gmail.com
Angela Hannahs	Supt	Barnesville EVSD	740 425 3639	angie.hannahs@bevsd.org
Warren Galbraith	Associate Dean	Ohio University Eastern	740-699-234	galbrait@ohio.edu
James Zucal	Service Dir	St. C.	740-695-0156	jzucal@stclairsville.com
John S. Koucoumaris	V.P. ADMIN. AFFAIRS	Belmont College	740-699-3840	JKOUCOUMARIS@BELMONTCOLLEGE.EDU
DANIEL BOLTZ	ASST. BELMONT CO. ENG.	BELMONT CO. ENG. OFFICE	740-699-2160	DBOLTZ@BELMONTCOUNTYENGINEER.COM

Belmont County Hazard Mitigation Plan Update

Mitigation Strategy Meeting

July 23, 2019 10:00 AM

Place: Belmont County EMA
68329 Bannock Rd, St. Clairsville, OH 43950

ATTACHED: LIST OF ATTENDANCE

Dave Ivan, Director, Belmont County Emergency Management Agency

Jason Farrell, Planner, Michael Baker International

Josh Vidmar, Planner, Michael Baker International

1. Welcome and Introductions
2. Risk Assessment Meeting Review
3. Review and Update Goals and Objectives (2011 Plan)
4. Develop New Goals and Objectives
5. Next Steps and Action Items

Questions? Comments?

Mitigation Planner: Jason Farrell, CFM

Jason.farrell@mbakerintl.com

614-538-7610

BELMONT COUNTY HMPU 2020 KICKOFF MEETING OVERVIEW

Dave Ivan, the Director of the Belmont County Emergency Management Agency, welcomed everyone and thanked them for attending the Kickoff Meeting for the Belmont County Hazard Mitigation Plan Update. A short round of introductions then took place, including Jason Farrell and Josh Vidmar of Michael Baker International.

After introductions, Mr. Farrell provided a brief overview of the purpose of the meeting and then spoke about the mitigation planning process.

RISK ASSESSMENT REVIEW

Mr. Farrell began by reviewing some of the information presented in the kickoff meeting, as well as some of the information that had been gathered through the Hazard Identification and Risk Assessment process, and progress that had thus far been made on the plan. This presentation primarily consisted of presenting the maps that had been created based on the data. There was some discussion about where the data came from, and how it was used.

Once the existing hazards had been reviewed, Mr. Farrell made a call from the committee if they wanted to see any other hazards profiled than what was already covered.

Natural Hazards		Probability		Impact		Spatial Extent		Warning Time		Duration		RF Factor
1	Landslide	4	1.2	3	0.9	3	0.6	4	0.4	4	0.4	3.5
2	Extreme Temperatures	4	1.2	3	0.9	4	0.8	1	0.1	4	0.4	3.4
3	Flooding	4	1.2	3	0.9	2	0.4	3	0.3	4	0.4	3.2
4	Severe Winter Storms	4	1.2	2	0.6	4	0.8	1	0.1	3	0.3	3
5	Severe Thunderstorms	4	1.2	2	0.6	4	0.8	1	0.1	2	0.2	2.9
6	Drought	2	0.6	1	0.3	4	0.8	4	0.4	4	0.4	2.5
7	Tornado	2	0.6	1	0.3	1	0.2	4	0.4	4	0.4	1.9
8	Wildfire	2	0.6	1	0.3	1	0.2	4	0.4	2	0.2	1.7
9	Seismic Activity	1	0.3	1	0.3	2	0.4	4	0.4	2	0.2	1.6
Technological Hazards		**Probability**		**Impact**		**Spatial Extent**		**Warning Time**		**Duration**		**RF Factor**
1	Hazardous Materials	4	1.2	3	0.9	3	0.6	4	0.4	4	0.4	3.5
2	Dam Failure	2	0.6	3	0.9	3	0.6	4	0.4	4	0.4	2.9
3	Epidemic	2	0.6	2	0.6	4	0.8	4	0.4	4	0.4	2.8
4	Terrorism	1	0.3	4	1.2	2	0.4	4	0.4	4	0.4	2.7
5	Mine Subsidence	2	0.6	1	0.3	4	0.8	4	0.4	3	0.3	2.4

UPDATE MITIGATION GOALS AND OBJECTIVES

The next step of the meeting involved reviewing the mitigation goals and objectives from the previous version of the plan. During this review, several goals and objectives were changed to be more in-line with what the County and its communities had in mind for this update.

This most revolved around slight changes in wording and eliminating objectives that were no longer relevant. For those hazards that

UPDATE MITIGATION ACTIONS

Each member of the committee was given a sheet that had their jurisdiction's mitigation actions from the previous plan. They were asked to review this information and, based on their best knowledge, determine if those actions had been completed, had not been completed and should be deferred into the new plan, were part of ongoing processes, or were no longer relevant and should be removed.

Mr. Farrell then went over the next step, which was to create new mitigation actions based on the current needs of the County and its communities. He then explained the different types of actions that FEMA recommends, those being natural systems protections, public education and outreach, structure and infrastructure projects, and local plans and regulations. The committee members then filled out actions, with Mr. Vidmar and Mr. Farrell addressing questions.

CLOSING AND NEXT STEPS

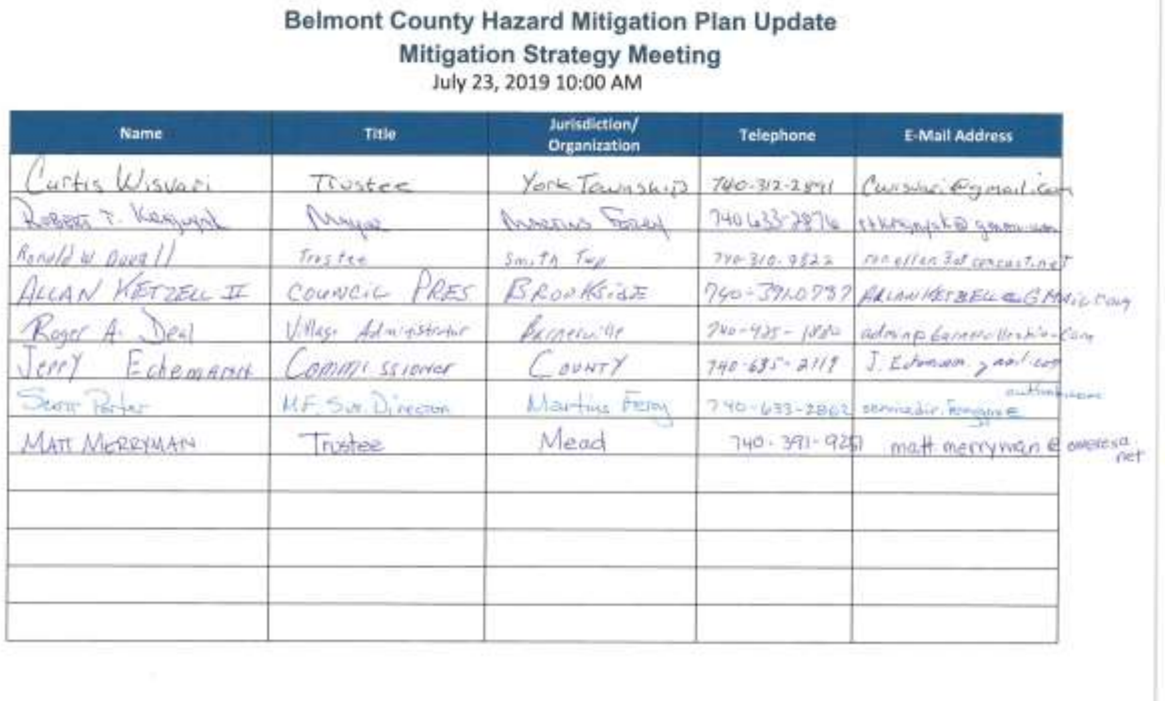
The formal closing of the meeting came before the mitigation actions were updated so that committee members could leave as they finished their exercises. After the majority of the committee had left, Mr. Ivan took a few moments to discuss further information requests with the consultants.

GOALS AND OBJECTIVES TABLE

The following table represents the changes made to the existing goals, and the objectives that were written for the plan update:

Goal	Objective	Defer	Change	Delete	Reason
GOAL 1: Reduce the loss of life and impact to property as a result of flooding in Belmont County	**OBJECTIVE 1.1:** Increase coordination among pertinent individuals/groups to mitigate flood hazards	X			
	OBJECTIVE 1.2: Increase public safety and response efforts during a flooding event	X			
	OBJECTIVE 1.3: Reduce flood damage by undertaking structural projects to lessen obstructions to the flow of water	X			
	OBJECTIVE 1.4: Develop, implement, or strengthen regulatory requirements to lessen flood damage	X			
	OBJECTIVE 1.5: Preserve the natural course of waterways	X			
GOAL 2: Minimize the loss of life and property due to severe summer storms in Belmont County	**OBJECTIVE 2.1:** Increase public awareness that a thunderstorms is imminent	X			
GOAL 3: Reduce the effects of severe winter storms in Belmont County	**OBJECTIVE 3.1:** Minimize the impact on the health and safety of Belmont County residents		X		

GOAL 4: Minimize the losses of life and property due to drought in Belmont County	**OBJECTIVE 4.1:** To educate the citizens of Belmont County on methods to reduce the effects of drought	X			
	OBJECTIVE 4.2: To address the conditions brought about by drought conditions in Belmont County			X	This does not occur.
GOAL 5: Minimize the losses of life, property, and infrastructure due to landslide in Belmont County	**OBJECTIVE 5.1:** Minimize the effects of landslide activity to life and property to include buildings, infrastructure, critical facilities and critical infrastructure in Belmont County (include uphill slopes, slips, and slides)		X		
GOAL 6: Reduce damage from severe wind and tornadoes in Belmont County	**OBJECTIVE 6.1**: Minimize future damages from severe wind or tornadoes throughout Belmont County through public outreach		X		
GOAL 7: Minimize the losses of life and property due to temperature extremes in Belmont County	**OBJECTIVE 7.1**: Minimize the effects of temperature extremes to life, public and private property in Belmont County through public outreach and coordination		X		
GOAL 8: Minimize the losses of life and property due to dam failure in Belmont County	**OBJECTIVE 8.1:** Reduce the probability of significant flood damage as a result of dam failure	X			
GOAL 9: Lessen the effects of mine subsidence in Belmont County	**OBJECTIVE 9.1:** Minimize the effects of mine subsidence to life and property to include buildings, infrastructure, critical facilities and critical infrastructure in Belmont County	X			

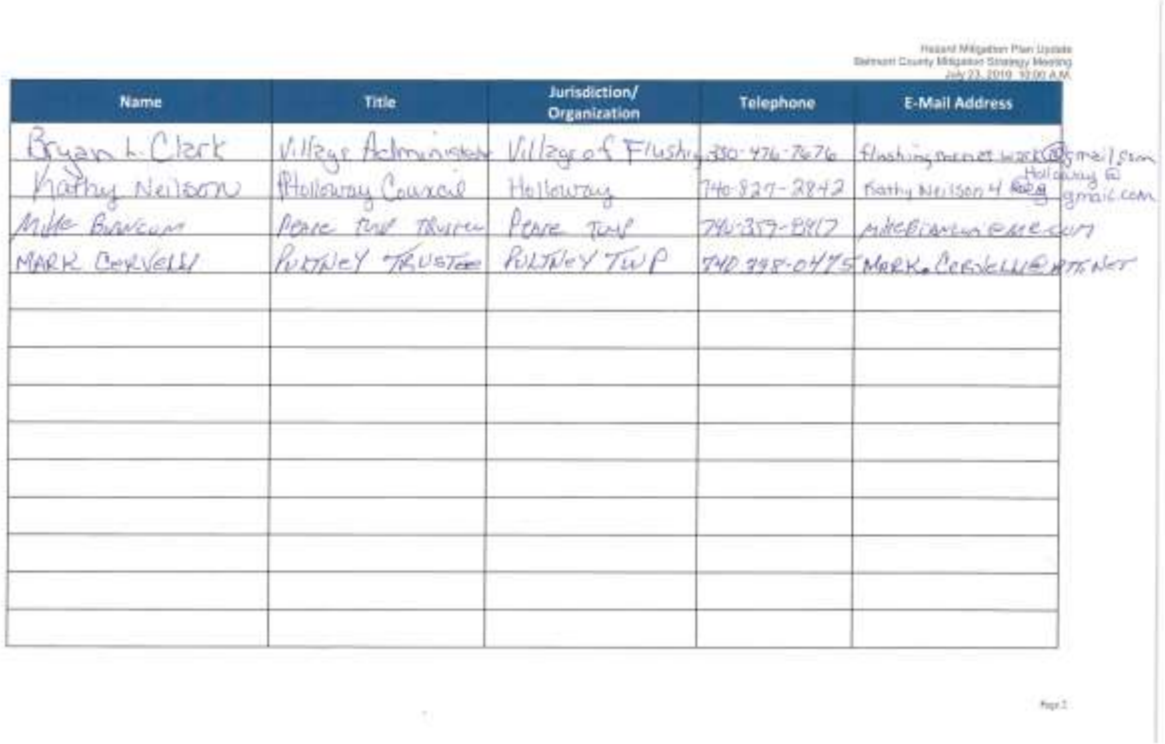


Belmont County Hazard Mitigation Plan Update

Mitigation Strategy Meeting

July 23, 2019 10:00 AM

Name	Title	Jurisdiction/ Organization	Telephone	E-Mail Address
Curtis Wisvari	Trustee	York Township	740-312-2891	[illegible]@gmail.com
Robert T. Kanyuck	Mayor	Martins Ferry	740 633-2876	rtkanyuck@[illegible]
Ronald W. Dunn ll	Trustee	Smith Twp	740-310-9822	ronellen3@comcast.net
ALLAN KETZELL II	COUNCIL PRES	BROOKSIDE	740-3910737	ALLANKETZELL@GMAIL.COM
Roger A. Deal	Village Administrator	Barnesville	740-425-1880	adminap@barnesvilleohio.com
Jerry Echemann	Commissioner	COUNTY	740-635-2119	J. Echemann [illegible]
Scott Porter	M.F. Swr. Director	Martins Ferry	740-633-2862	sewerdir.[illegible]@outlook.com
MATT MERRYMAN	Trustee	Mead	740-391-9251	matt.merryman@[illegible].net



Hazard Mitigation Plan Update
Belmont County Mitigation Strategy Meeting
July 23, 2019 10:00 A.M.

Name	Title	Jurisdiction/ Organization	Telephone	E-Mail Address
Bryan L. Clark	Village Administrator	Village of Flushing	330-476-7676	flushingmeters work@gmail.com
Kathy Neilson	Holloway Council	Holloway	740-827-2842	KathyNeilson4Holloway@gmail.com
Mike Bianconi	Pease Twp Trustee	Pease Twp	740-359-9917	mikebianconi@[illegible]
MARK CERVELLI	PULTNEY TRUSTEE	PULTNEY TWP	740-398-0475	MARK.CERVELLI@ATT.NET

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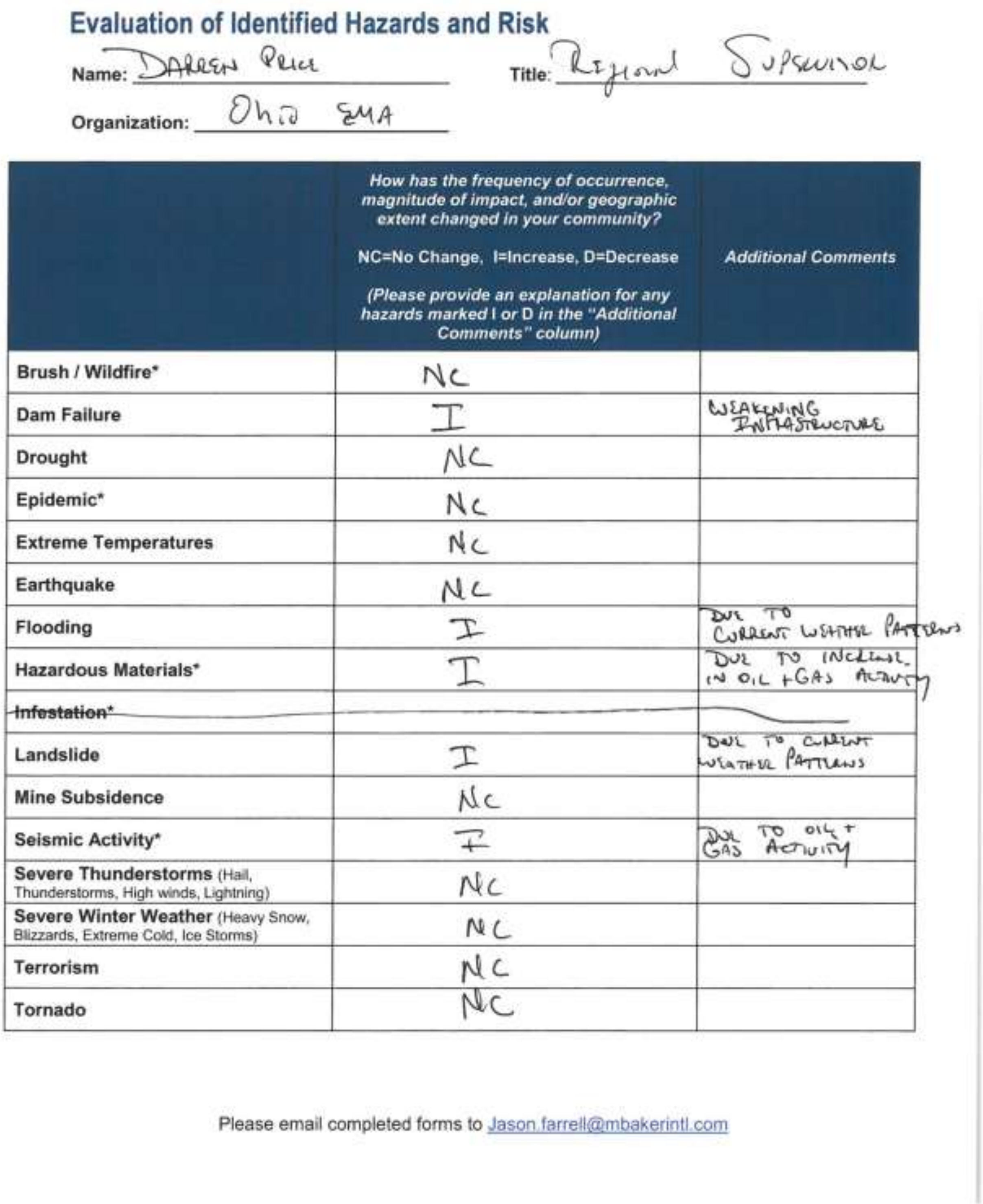
APPENDIX C. RISK EVALUATIONS



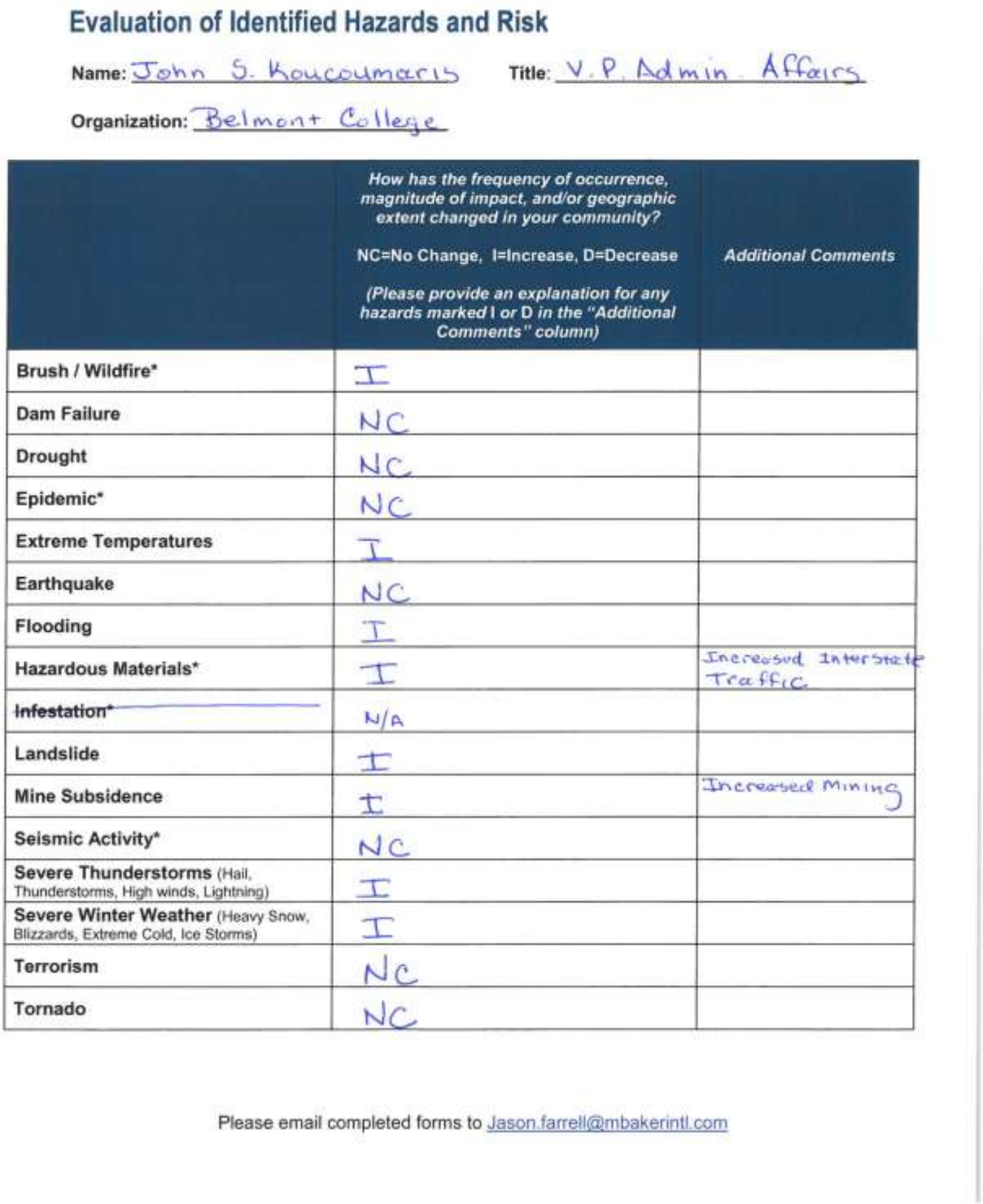
Evaluation of Identified Hazards and Risk

Name: DARREN PRICE **Title:** Regional Supervisor

Organization: Ohio EMA

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	I	WEAKENING INFRASTRUCTURE
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	NC	
Earthquake	NC	
Flooding	I	DUE TO CURRENT WEATHER PATTERNS
Hazardous Materials*	I	DUE TO INCREASE IN OIL + GAS ACTIVITY
~~**Infestation***~~		
Landslide	I	DUE TO CURRENT WEATHER PATTERNS
Mine Subsidence	NC	
Seismic Activity*	I	DUE TO OIL + GAS ACTIVITY
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	NC	
Tornado	NC	

Please email completed forms to Jason.farrell@mbakerintl.com



Evaluation of Identified Hazards and Risk

Name: John S. Koucoumaris **Title:** V. P. Admin. Affairs

Organization: Belmont College

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	I	
Dam Failure	NC	
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	I	
Earthquake	NC	
Flooding	I	
Hazardous Materials*	I	Increased Interstate Traffic
~~**Infestation***~~	N/A	
Landslide	I	
Mine Subsidence	I	Increased Mining
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	I	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	I	
Terrorism	NC	
Tornado	NC	

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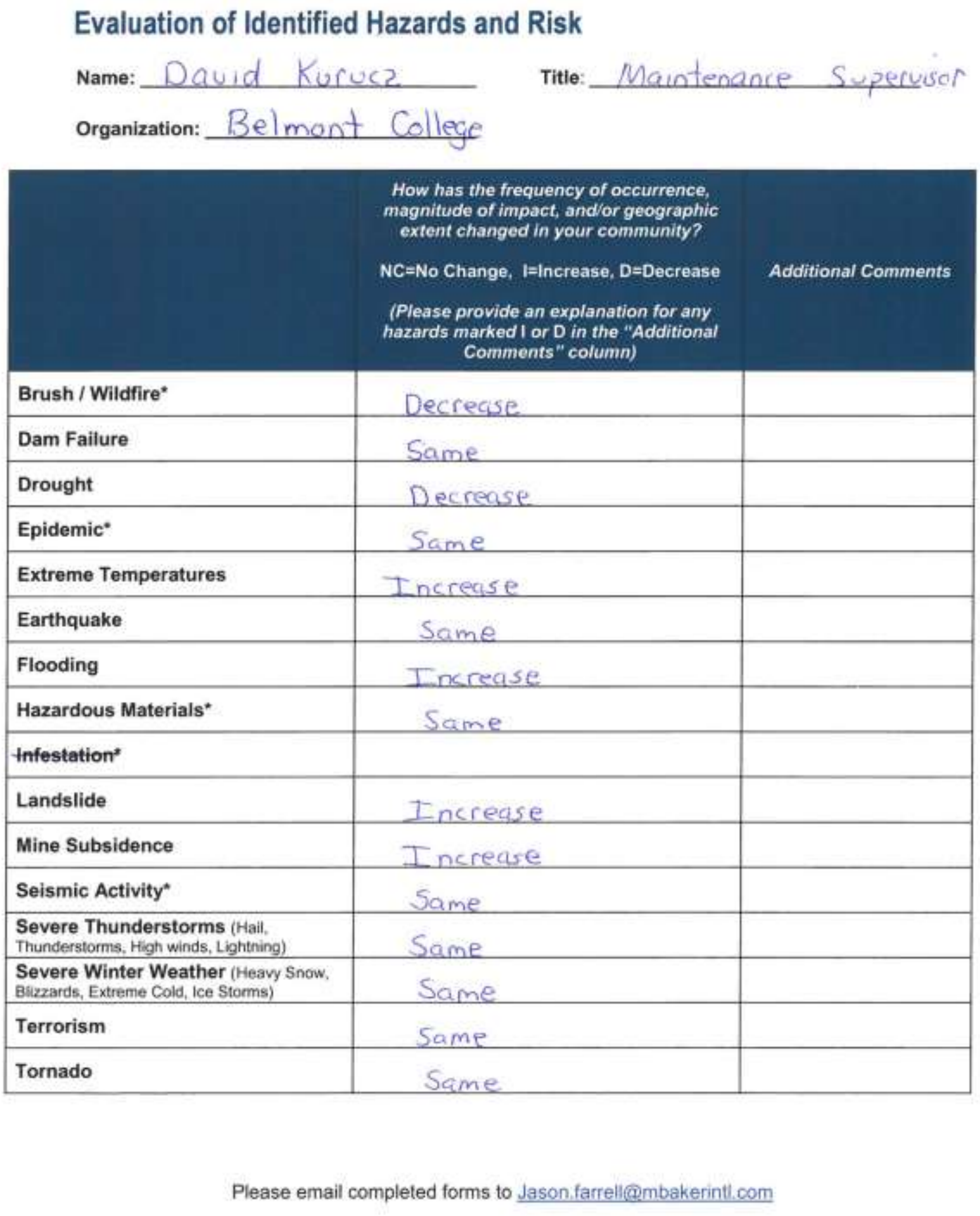

Evaluation of Identified Hazards and Risk

Name: David Kurucz **Title:** Maintenance Supervisor

Organization: Belmont College

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	Decrease	
Dam Failure	Same	
Drought	Decrease	
Epidemic*	Same	
Extreme Temperatures	Increase	
Earthquake	Same	
Flooding	Increase	
Hazardous Materials*	Same	
~~**Infestation***~~		
Landslide	Increase	
Mine Subsidence	Increase	
Seismic Activity*	Same	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	Same	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	Same	
Terrorism	Same	
Tornado	Same	

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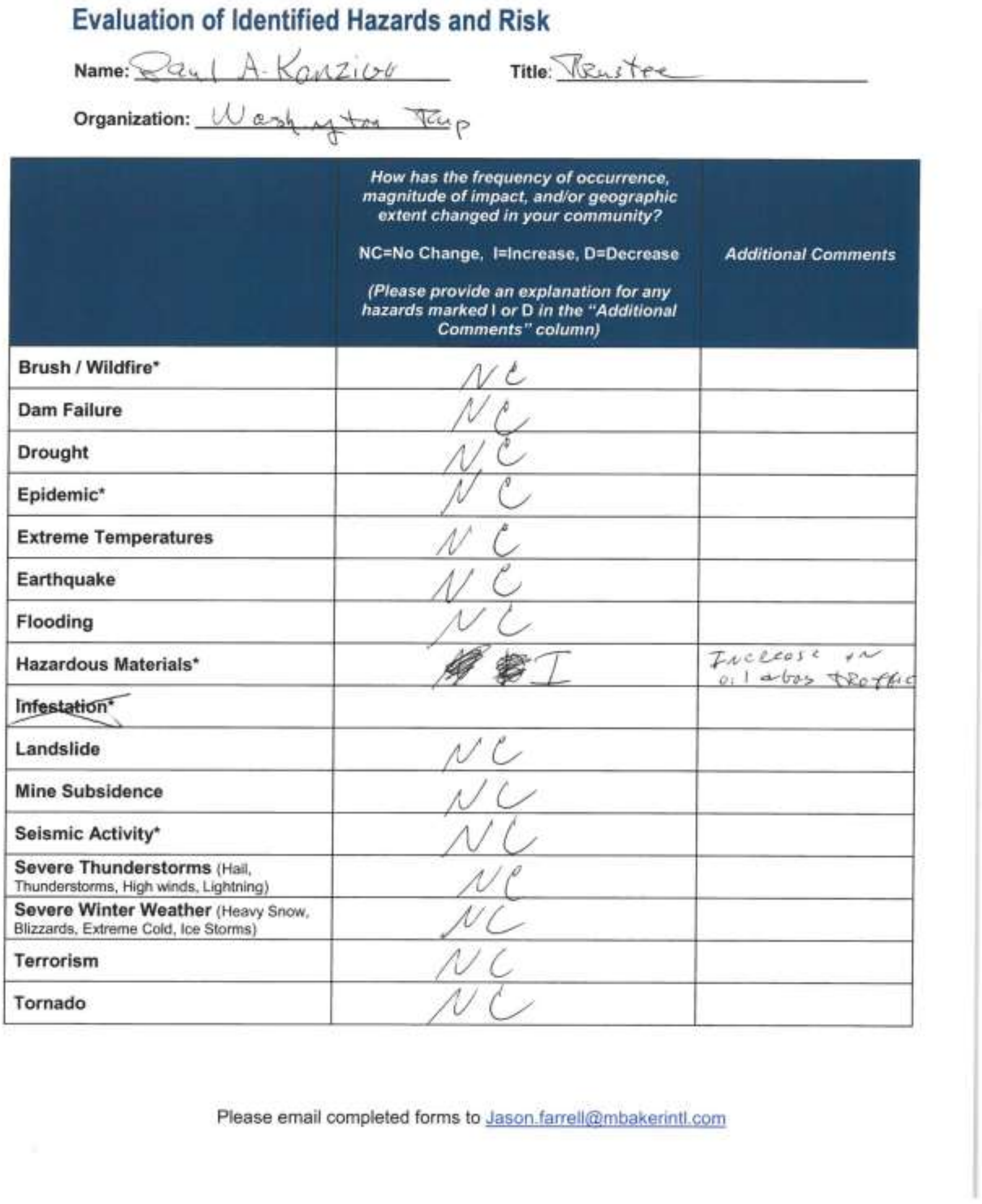

Evaluation of Identified Hazards and Risk

Name: Paul A. Konzick **Title:** Trustee

Organization: Washington Twp

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	NC	
Earthquake	NC	
Flooding	NC	
Hazardous Materials*	I	Increase in oil & gas traffic
~~**Infestation***~~		
Landslide	NC	
Mine Subsidence	NC	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	NC	
Tornado	NC	

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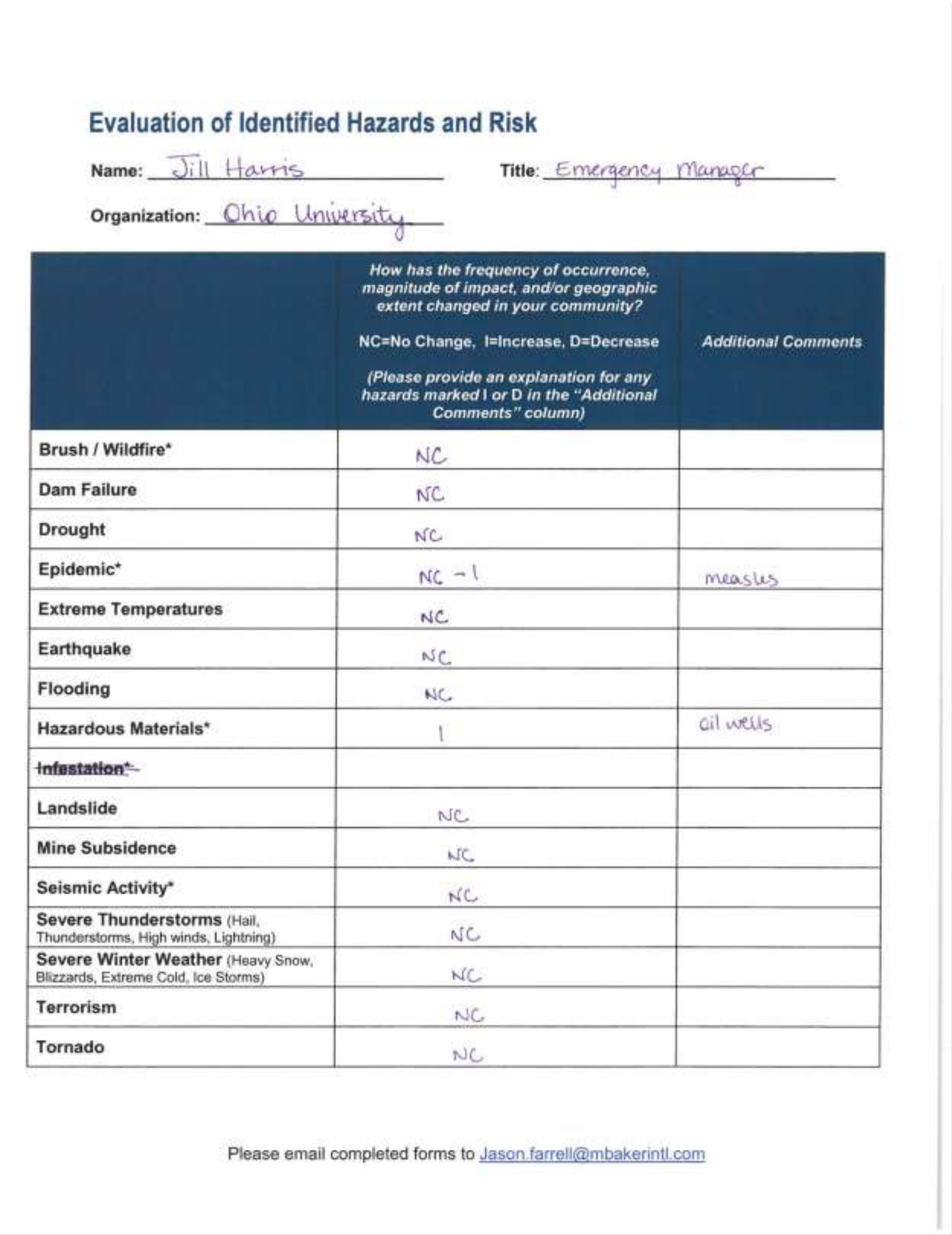

Evaluation of Identified Hazards and Risk

Name: Jill Harris **Title:** Emergency Manager

Organization: Ohio University

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	NC	
Epidemic*	NC – I	measles
Extreme Temperatures	NC	
Earthquake	NC	
Flooding	NC	
Hazardous Materials*	I	oil wells
~~**Infestation***~~		
Landslide	NC	
Mine Subsidence	NC	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	NC	
Tornado	NC	

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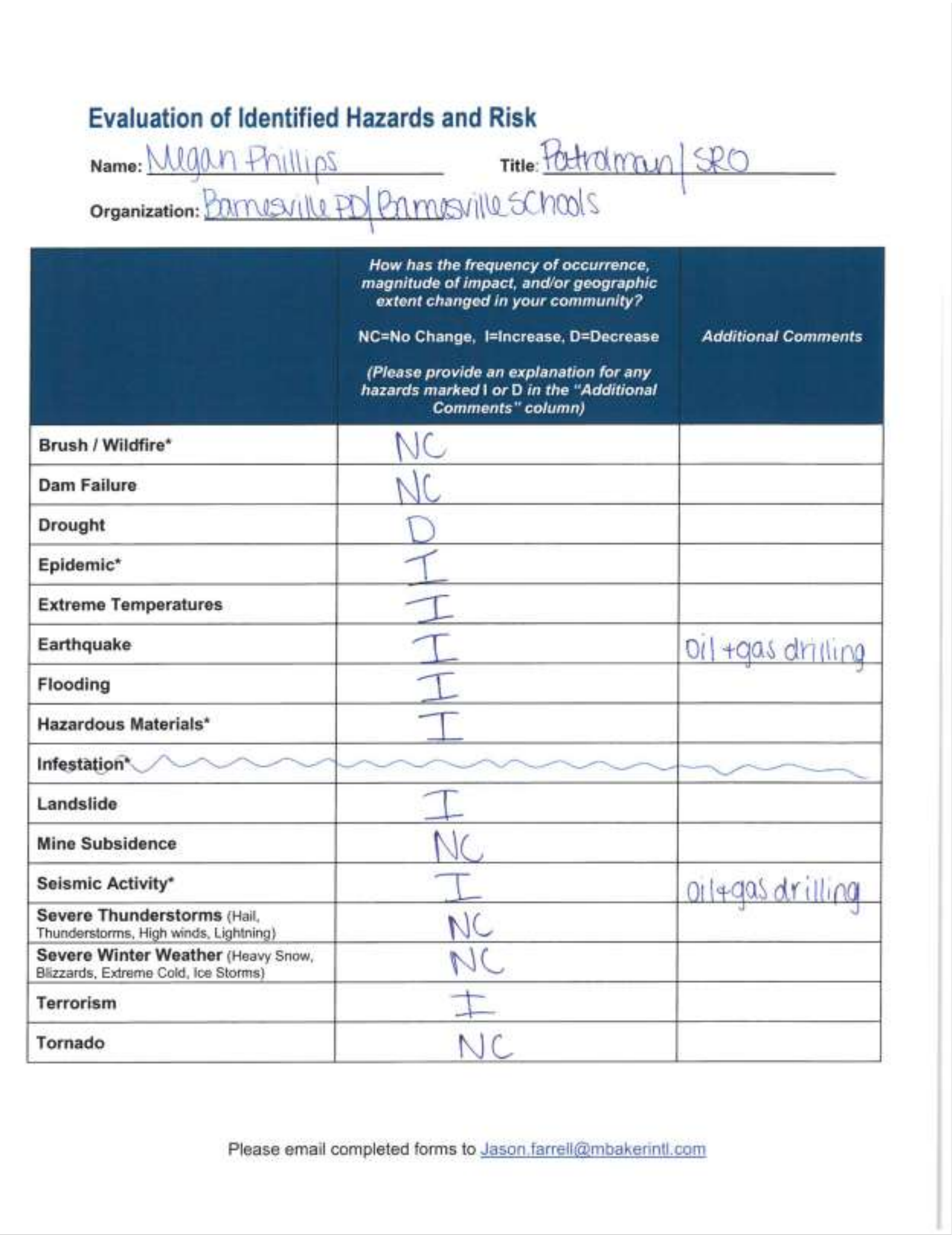

Evaluation of Identified Hazards and Risk

Name: Megan Phillips **Title:** Patrolman | SRO

Organization: Barnesville PD | Barnesville Schools

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	D	
Epidemic*	I	
Extreme Temperatures	I	
Earthquake	I	oil + gas drilling
Flooding	I	
Hazardous Materials*	I	
~~**Infestation***~~		
Landslide	I	
Mine Subsidence	NC	
Seismic Activity*	I	oil + gas drilling
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	I	
Tornado	NC	

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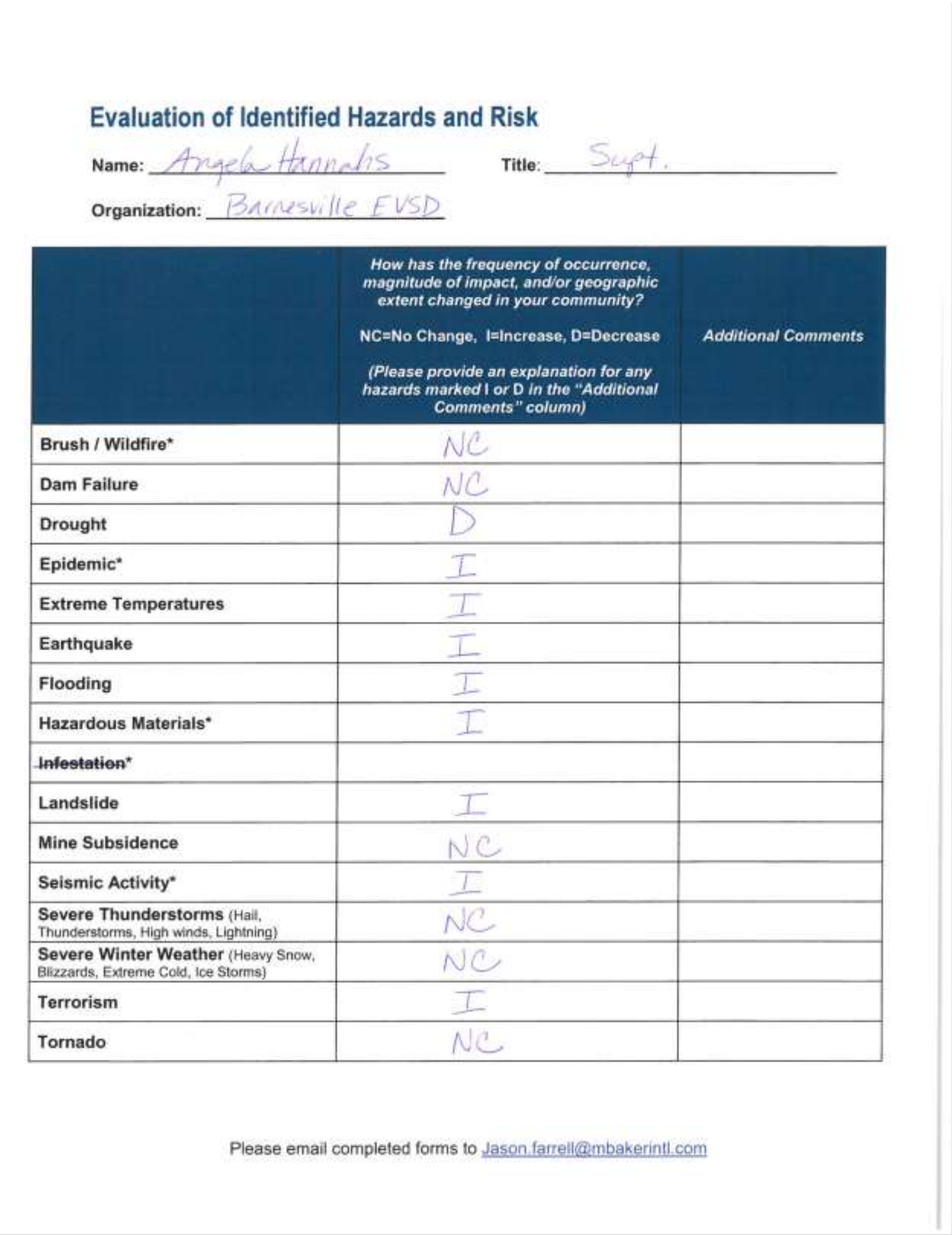


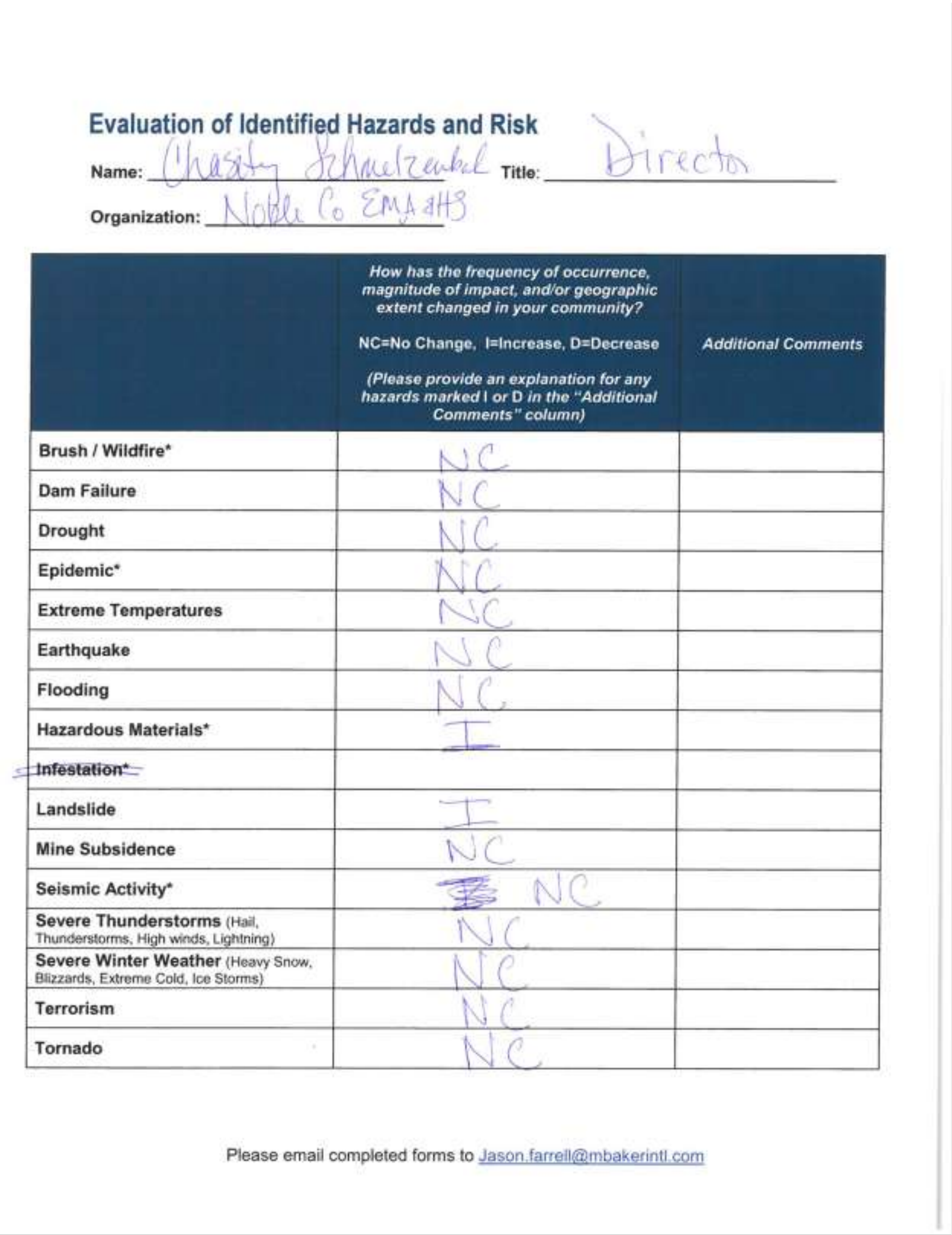
Evaluation of Identified Hazards and Risk

Name: Angela Hannahs **Title:** Supt.

Organization: Barnesville EVSD

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	D	
Epidemic*	I	
Extreme Temperatures	I	
Earthquake	I	
Flooding	I	
Hazardous Materials*	I	
~~**Infestation***~~		
Landslide	I	
Mine Subsidence	NC	
Seismic Activity*	I	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	I	
Tornado	NC	

Please email completed forms to Jason.farrell@mbakerintl.com



Evaluation of Identified Hazards and Risk

Name: Chasity Schmelzenbach **Title:** Director

Organization: Noble Co EMA &HS

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	NC	
Earthquake	NC	
Flooding	NC	
Hazardous Materials*	I	
~~**Infestation***~~		
Landslide	I	
Mine Subsidence	NC	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	NC	
Tornado	NC	

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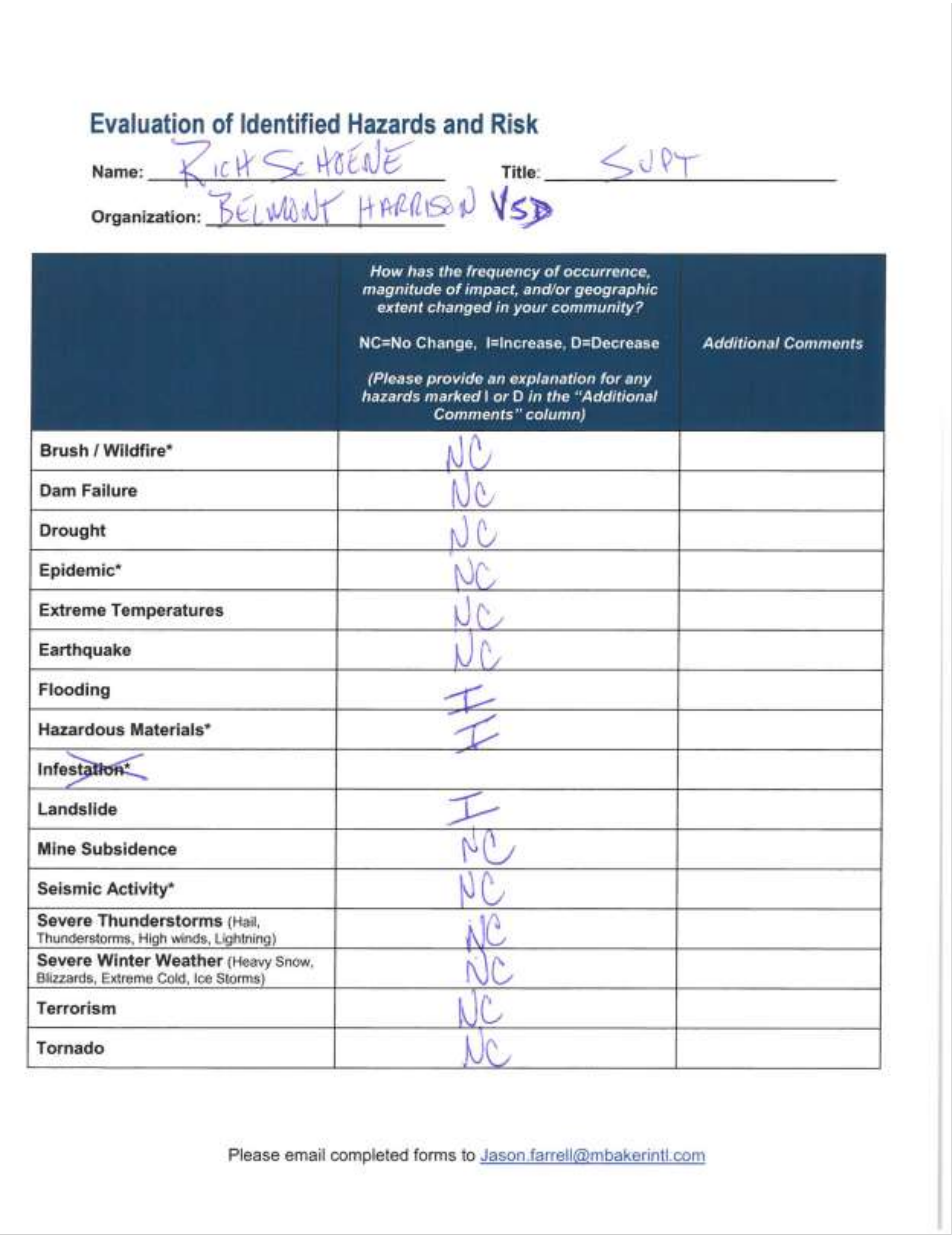

Evaluation of Identified Hazards and Risk

Name: Rich Schoene **Title:** Supt

Organization: Belmont Harrison VSD

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	NC	
Earthquake	NC	
Flooding	I	
Hazardous Materials*	I	
~~**Infestation***~~		
Landslide	I	
Mine Subsidence	NC	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	NC	
Tornado	NC	

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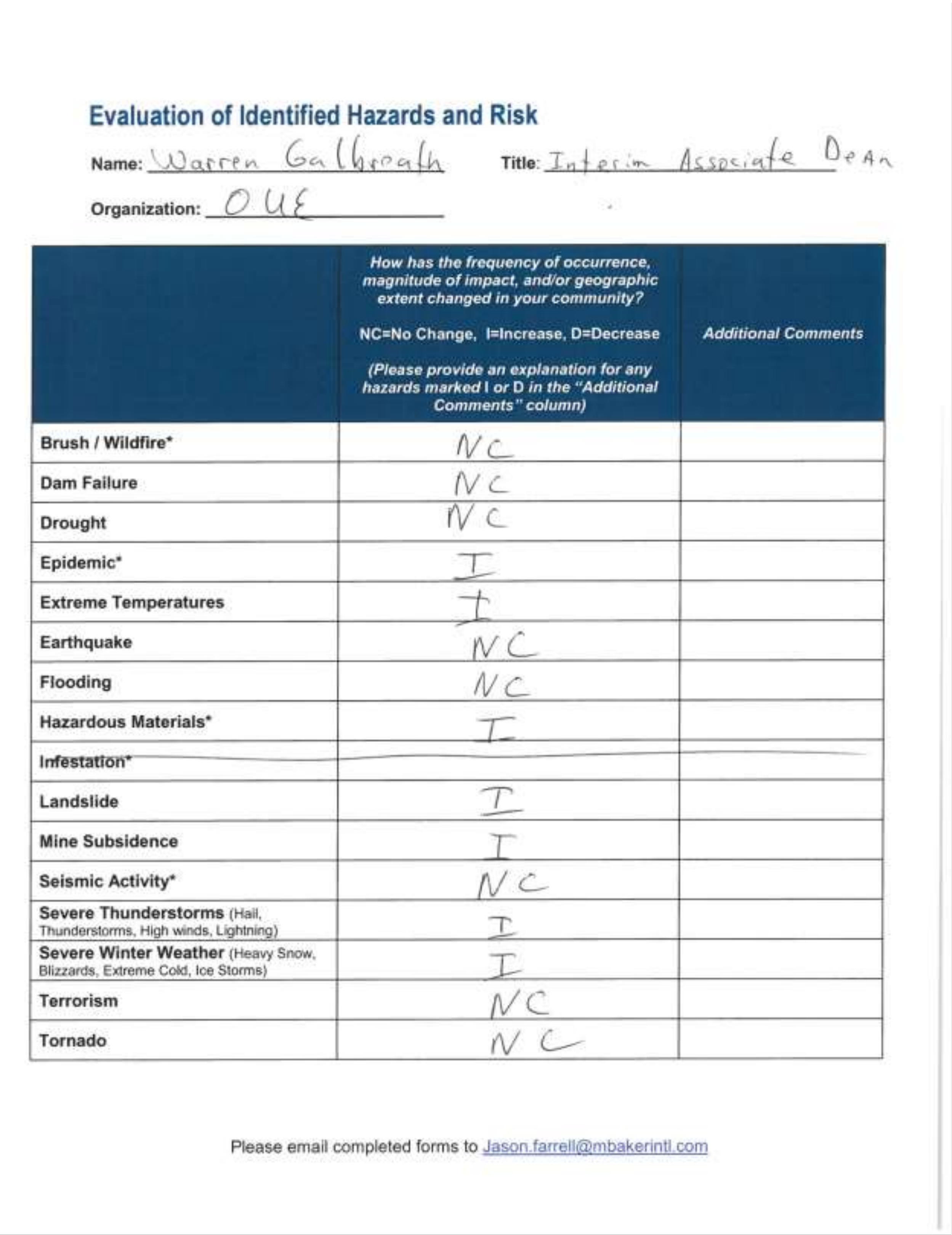

Evaluation of Identified Hazards and Risk

Name: Warren Galbreath **Title:** Interim Associate Dean

Organization: OUE

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	NC	
Epidemic*	I	
Extreme Temperatures	I	
Earthquake	NC	
Flooding	NC	
Hazardous Materials*	I	
~~**Infestation***~~		
Landslide	I	
Mine Subsidence	I	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	I	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	I	
Terrorism	NC	
Tornado	NC	

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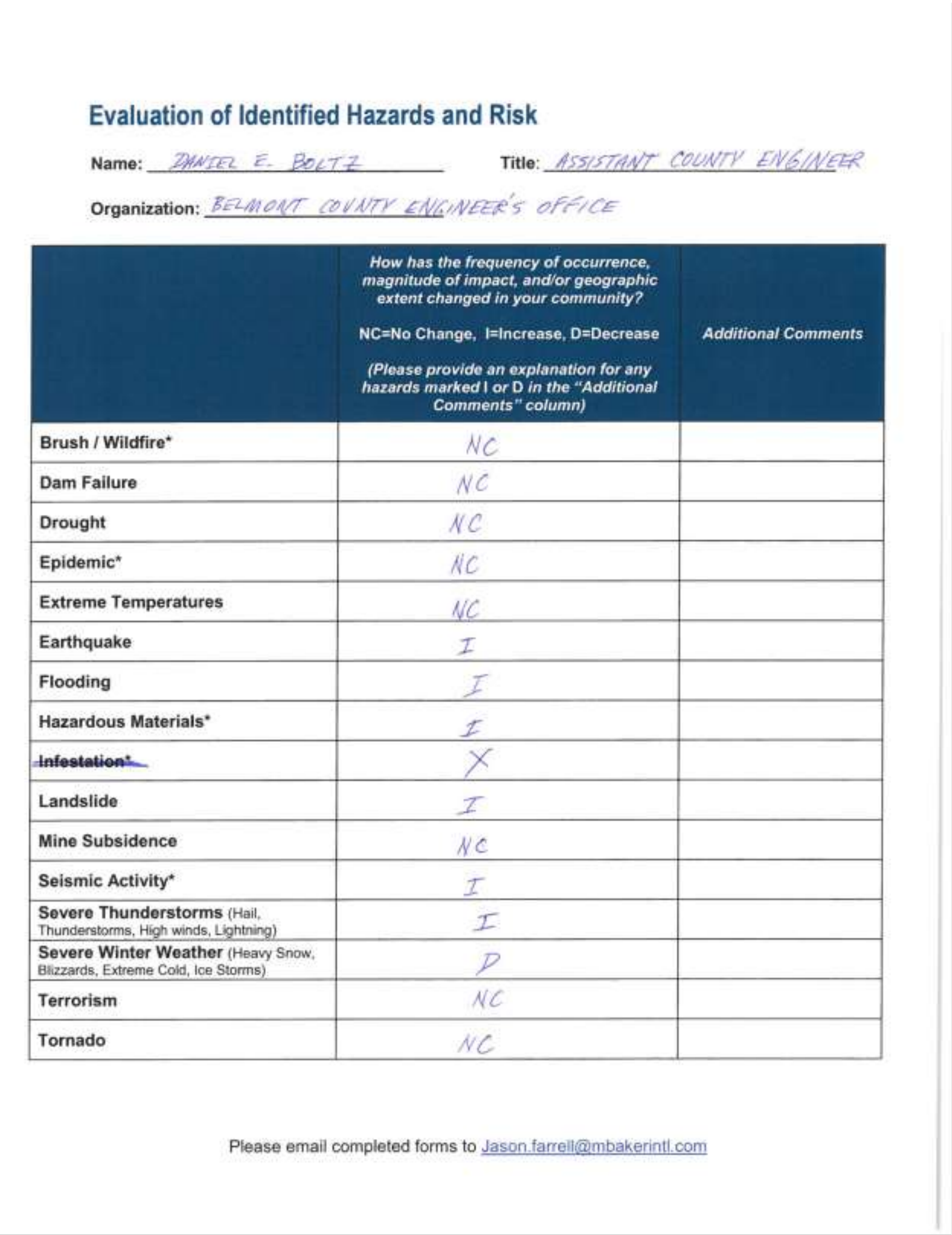


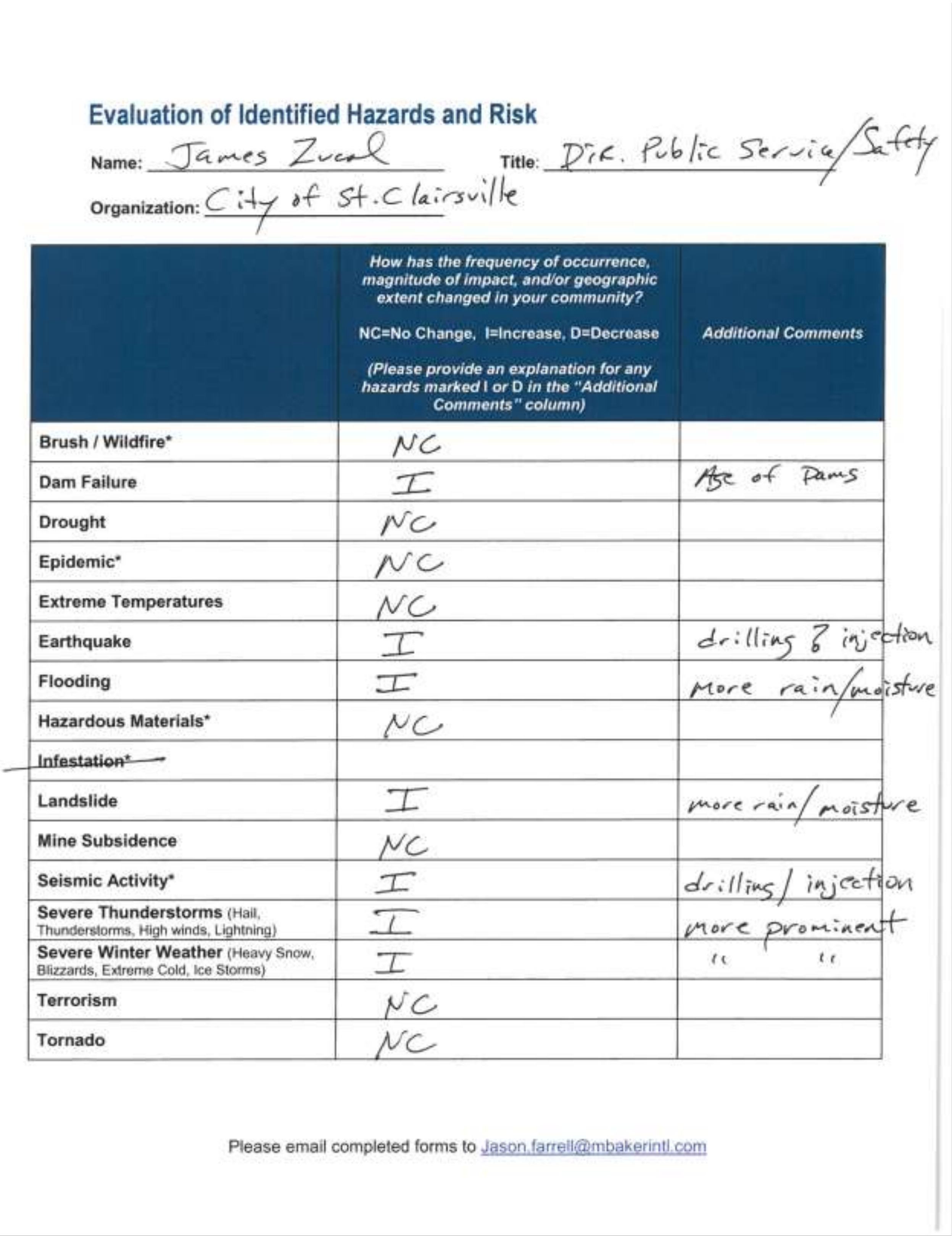
Evaluation of Identified Hazards and Risk

Name: DANIEL E. BOLTZ **Title:** ASSISTANT COUNTY ENGINEER

Organization: BELMONT COUNTY ENGINEER'S OFFICE

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? **NC=No Change, I=Increase, D=Decrease** *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	NC	
Earthquake	I	
Flooding	I	
Hazardous Materials*	I	
~~**Infestation***~~	X	
Landslide	I	
Mine Subsidence	NC	
Seismic Activity*	I	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	I	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	D	
Terrorism	NC	
Tornado	NC	

Please email completed forms to Jason.farrell@mbakerintl.com



Evaluation of Identified Hazards and Risk

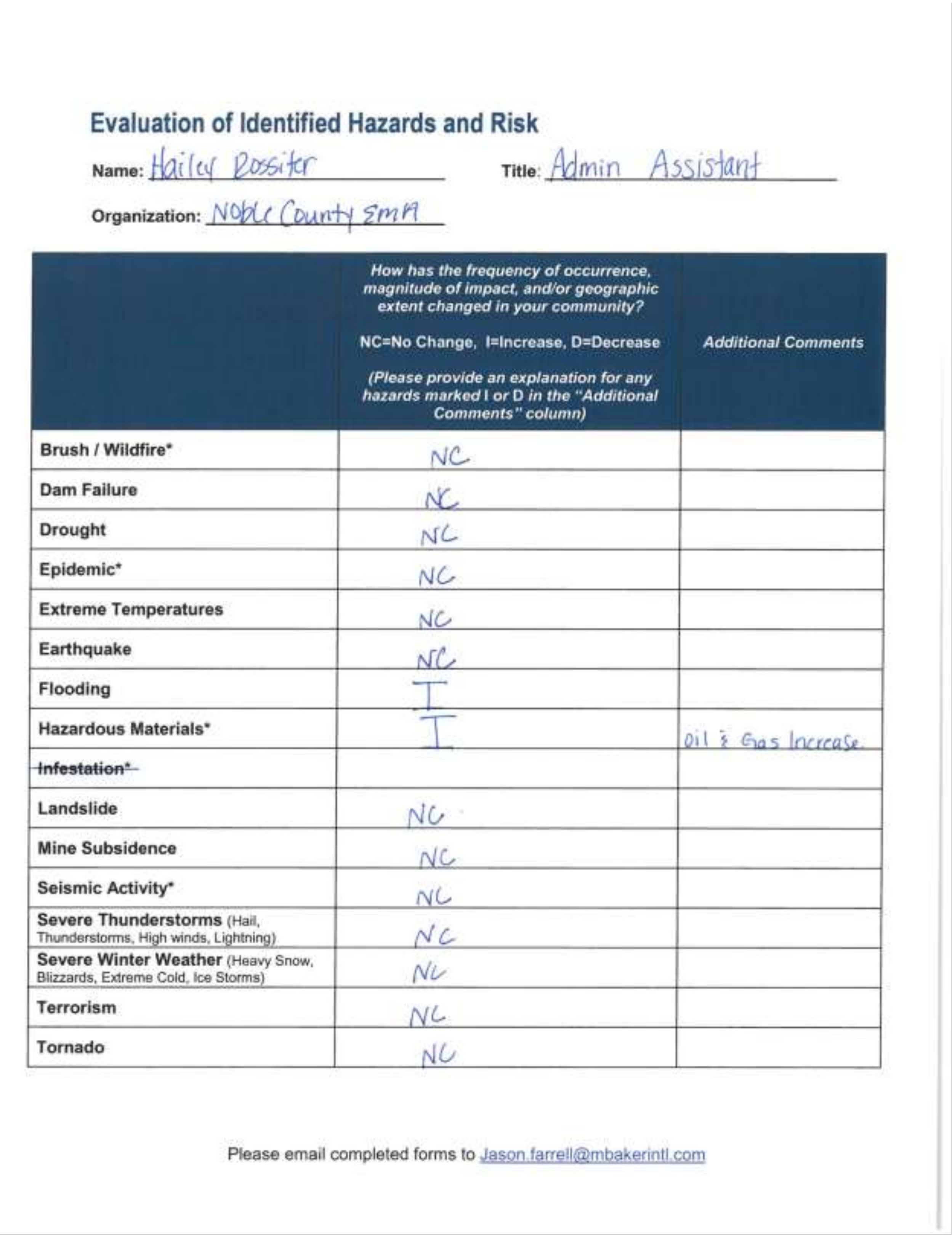
Name: James Zucal

Title: Dir. Public Service/Safety

Organization: City of St. Clairsville

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease (Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)	Additional Comments
Brush / Wildfire*	NC	
Dam Failure	I	Age of Dams
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	NC	
Earthquake	I	drilling & injection
Flooding	I	More rain/moisture
Hazardous Materials*	NC	
~~**Infestation***~~		
Landslide	I	more rain/moisture
Mine Subsidence	NC	
Seismic Activity*	I	drilling/injection
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	I	more prominent
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	I	" "
Terrorism	NC	
Tornado	NC	

Please email completed forms to Jason.farrell@mbakerintl.com



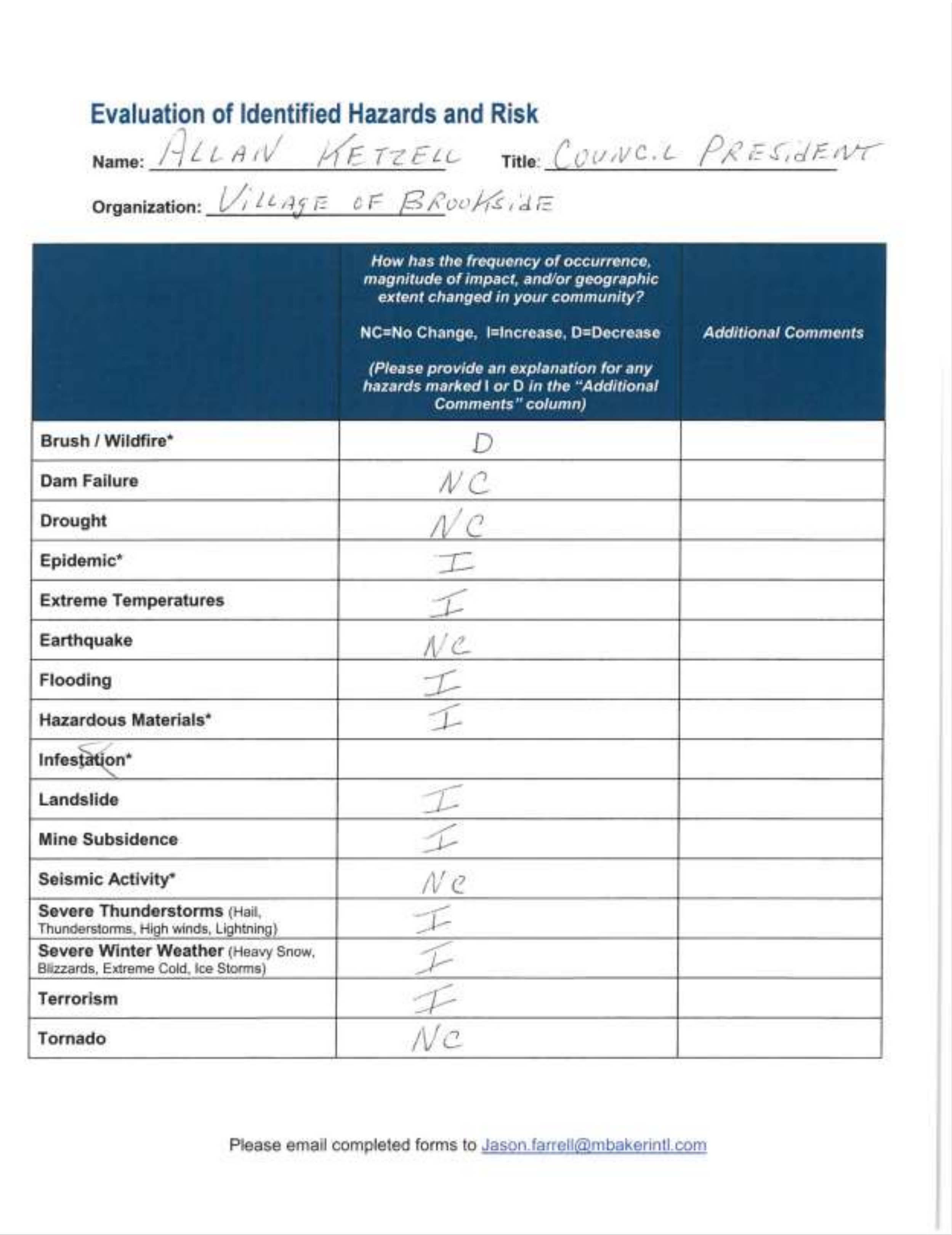
Evaluation of Identified Hazards and Risk

Name: Hailey Rossiter **Title:** Admin Assistant

Organization: Noble County EMA

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? NC=No Change, I=Increase, D=Decrease *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	NC	
Dam Failure	NC	
Drought	NC	
Epidemic*	NC	
Extreme Temperatures	NC	
Earthquake	NC	
Flooding	I	
Hazardous Materials*	I	Oil & Gas Increase.
~~**Infestation***~~		
Landslide	NC	
Mine Subsidence	NC	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	NC	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	NC	
Terrorism	NC	
Tornado	NC	

Please email completed forms to Jason.farrell@mbakerintl.com



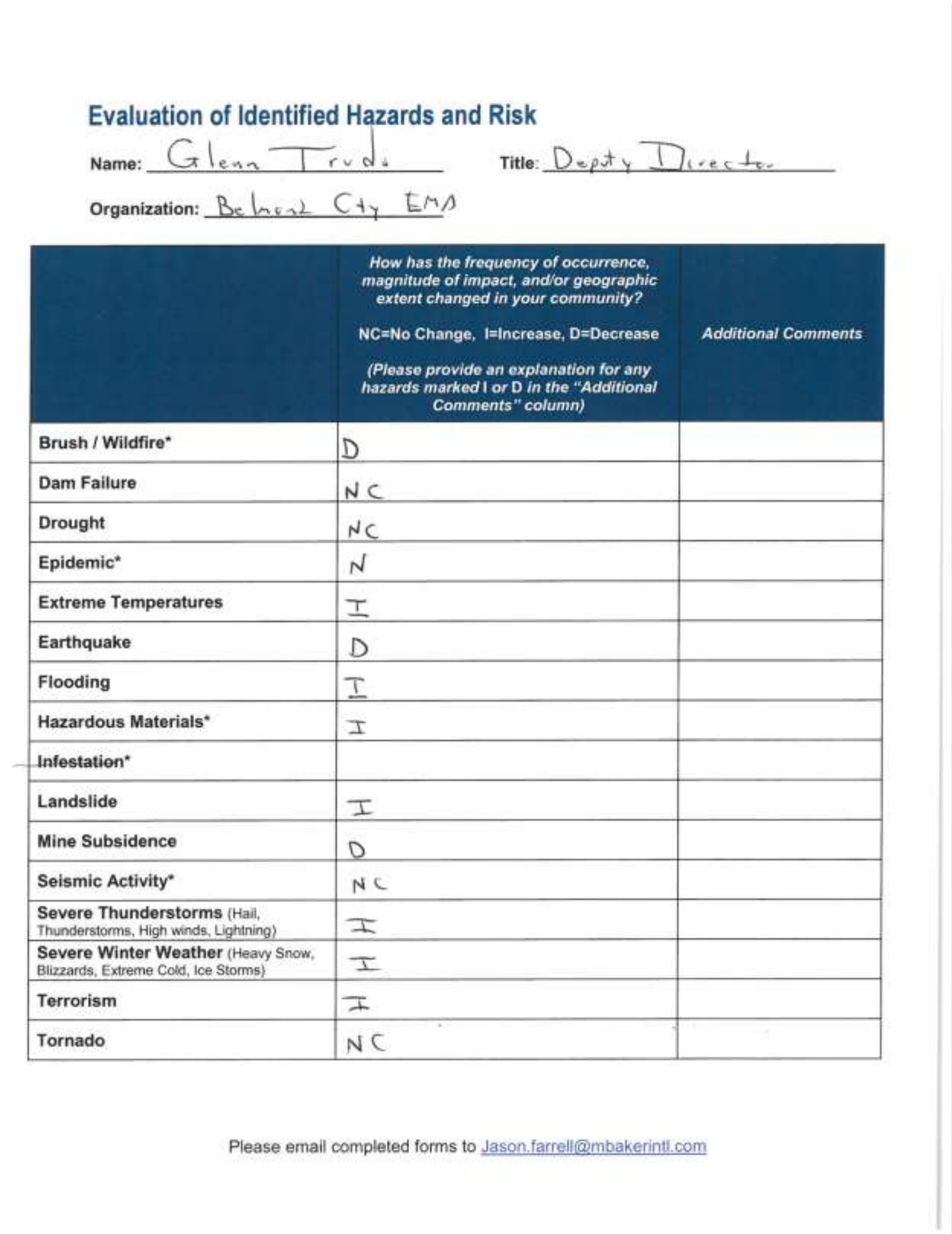
Evaluation of Identified Hazards and Risk

Name: ALLAN KETZELL **Title:** COUNCIL PRESIDENT

Organization: VILLAGE OF BROOKSIDE

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? **NC=No Change, I=Increase, D=Decrease** *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	D	
Dam Failure	NC	
Drought	NC	
Epidemic*	I	
Extreme Temperatures	I	
Earthquake	NC	
Flooding	I	
Hazardous Materials*	I	
Infestation*		
Landslide	I	
Mine Subsidence	I	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	I	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	I	
Terrorism	I	
Tornado	NC	

Please email completed forms to Jason.farrell@mbakerintl.com



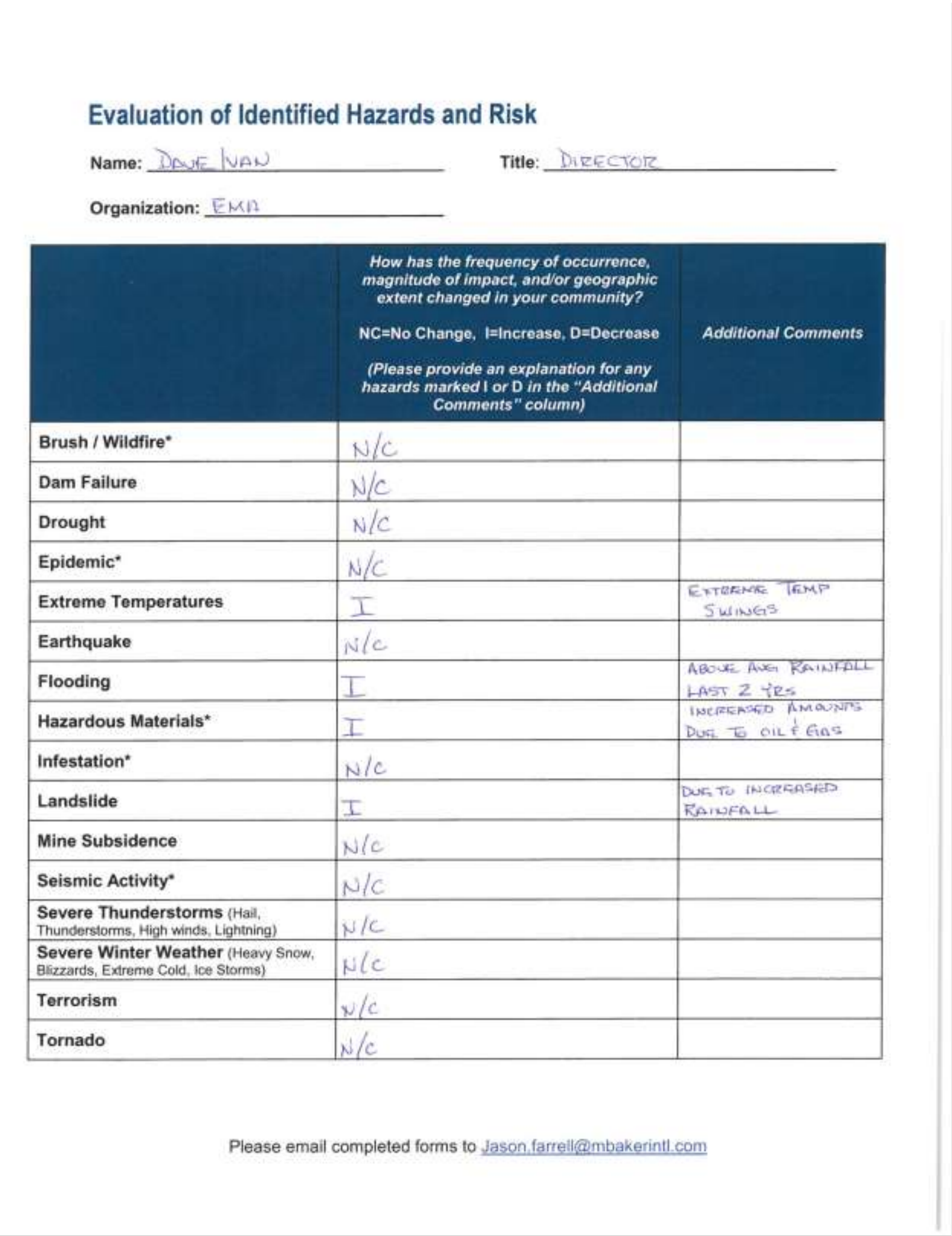
Evaluation of Identified Hazards and Risk

Name: Glenn Trudo **Title:** Deputy Director

Organization: Belmont Cty EMA

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? **NC=No Change, I=Increase, D=Decrease** *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	D	
Dam Failure	NC	
Drought	NC	
Epidemic*	N	
Extreme Temperatures	I	
Earthquake	D	
Flooding	I	
Hazardous Materials*	I	
~~**Infestation***~~		
Landslide	I	
Mine Subsidence	D	
Seismic Activity*	NC	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	I	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	I	
Terrorism	I	
Tornado	NC	

Please email completed forms to Jason.farrell@mbakerintl.com



Evaluation of Identified Hazards and Risk

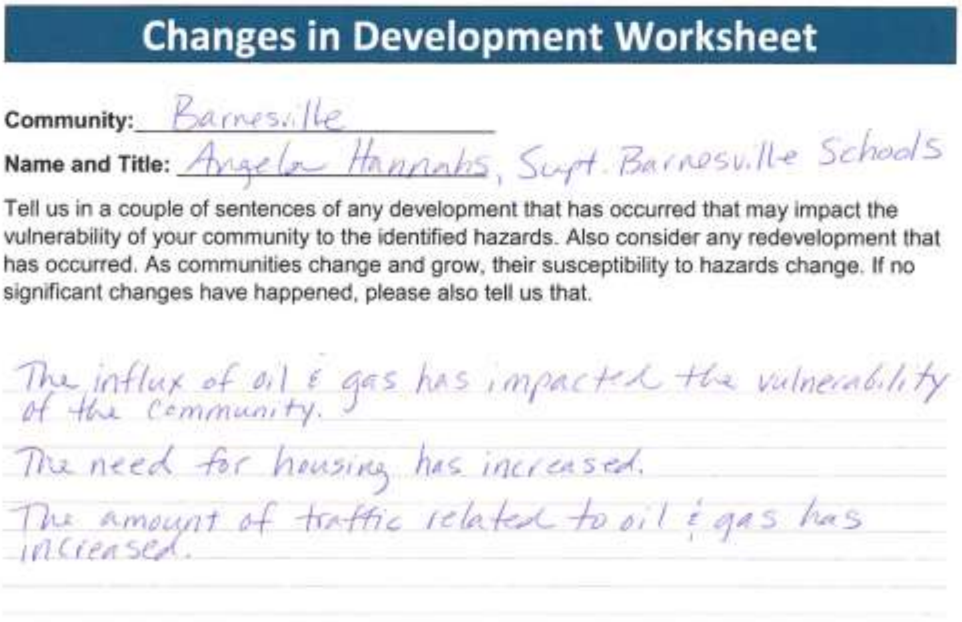
Name: DAVE IVAN **Title:** DIRECTOR

Organization: EMA

	How has the frequency of occurrence, magnitude of impact, and/or geographic extent changed in your community? **NC=No Change, I=Increase, D=Decrease** *(Please provide an explanation for any hazards marked I or D in the "Additional Comments" column)*	*Additional Comments*
Brush / Wildfire*	N/C	
Dam Failure	N/C	
Drought	N/C	
Epidemic*	N/C	
Extreme Temperatures	I	EXTREME TEMP SWINGS
Earthquake	N/C	
Flooding	I	ABOVE AVG RAINFALL LAST 2 YRS
Hazardous Materials*	I	INCREASED AMOUNTS DUE TO OIL & GAS
Infestation*	N/C	
Landslide	I	DUE TO INCREASED RAINFALL
Mine Subsidence	N/C	
Seismic Activity*	N/C	
Severe Thunderstorms (Hail, Thunderstorms, High winds, Lightning)	N/C	
Severe Winter Weather (Heavy Snow, Blizzards, Extreme Cold, Ice Storms)	N/C	
Terrorism	N/C	
Tornado	N/C	

Please email completed forms to Jason.farrell@mbakerintl.com

APPENDIX D. CHANGES IN DEVELOPMENT



Changes in Development Worksheet

Community: Barnesville

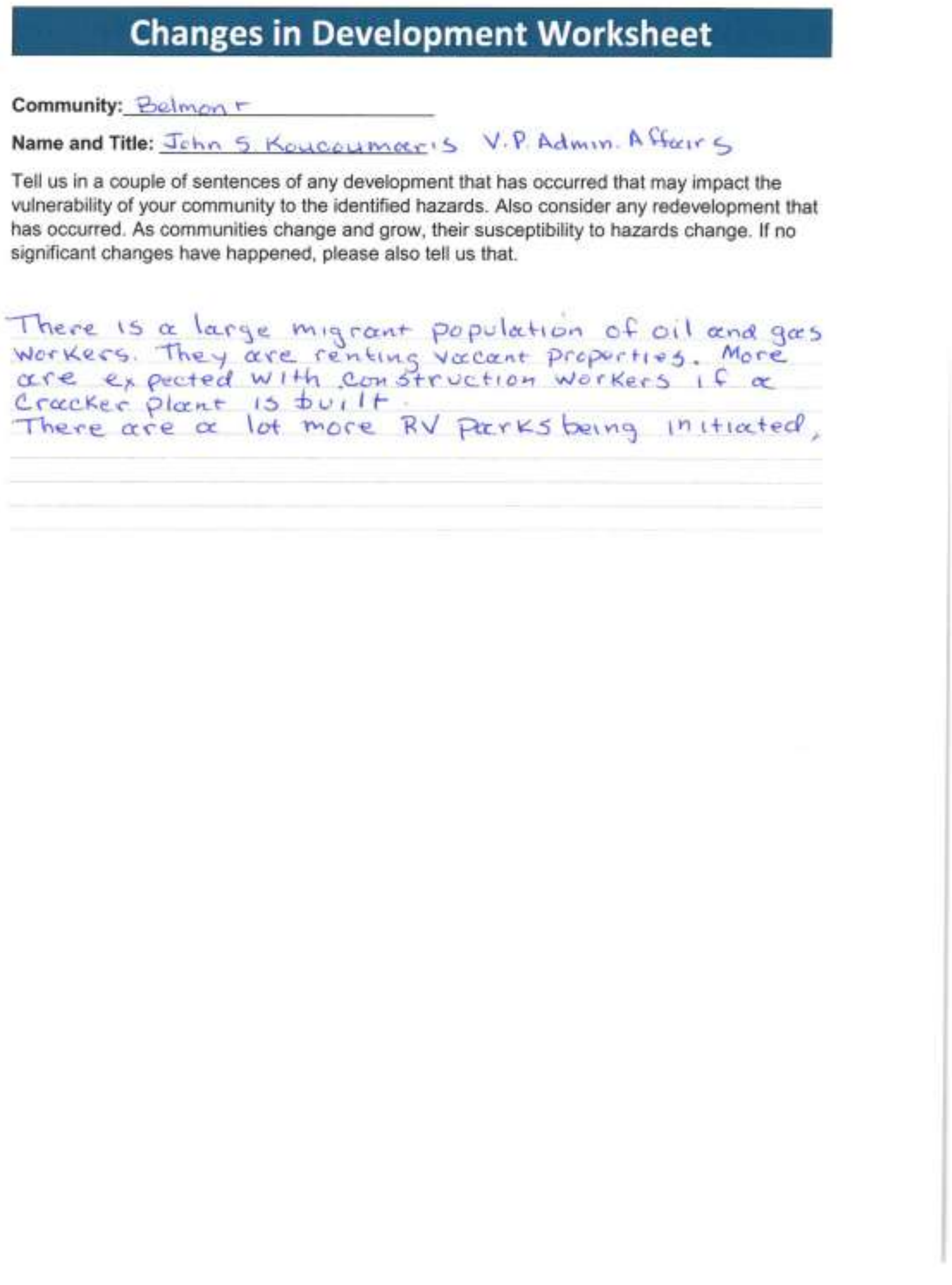
Name and Title: Angela Hannahs, Supt. Barnesville Schools

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

The influx of oil & gas has impacted the vulnerability of the community.

The need for housing has increased.

The amount of traffic related to oil & gas has increased.



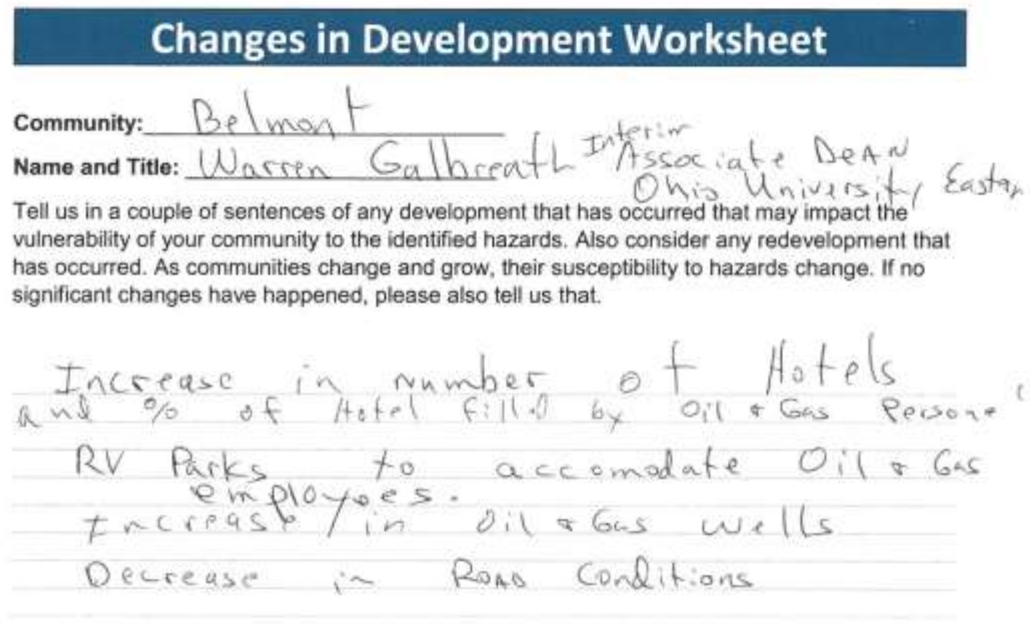
Changes in Development Worksheet

Community: Belmont

Name and Title: John S. Koucoumaris V.P. Admin. Affairs

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

There is a large migrant population of oil and gas workers. They are renting vacant properties. More are expected with construction workers if a Cracker plant is built.
There are a lot more RV Parks being initiated,



Changes in Development Worksheet

Community: Belmont

Name and Title: Warren Galbreath Interim Associate Dean Ohio University Eastern

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

Increase in number of Hotels and % of Hotel filled by Oil & Gas Personnel

RV Parks to accomodate Oil & Gas employees.

Increase in Oil & Gas wells

Decrease in Road Conditions

Changes in Development Worksheet

Community: Belmont

Name and Title: Rich Sclowe -Supt BHKSD

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

① Increase of temporary workers and their housing, Increase in trailer parks and motels/hotels to handle their housing

② Increase in drilling and wells overall in Belmont County

Changes in Development Worksheet

Community: Belmont.

Name and Title: David Kurucz Maintenance Supervisor

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

More Hotels are filling up and being built. Seems like more houses are on the market. Some major businesses are closing there doors.

Changes in Development Worksheet

Community: Belmont County

Name and Title: Chasity Schu[illegible] Health Director Noble & M[illegible]HS

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

Significant transient population driving hotel / restaurant development. Rental rates have significant increases. Unemployment rates all time lows. Influx of theft / drug activity. Enrollment in public schools of transient children. Significant increase in heavy highway traffic and hazmat. Additional tax revenue with competing interests emerging.

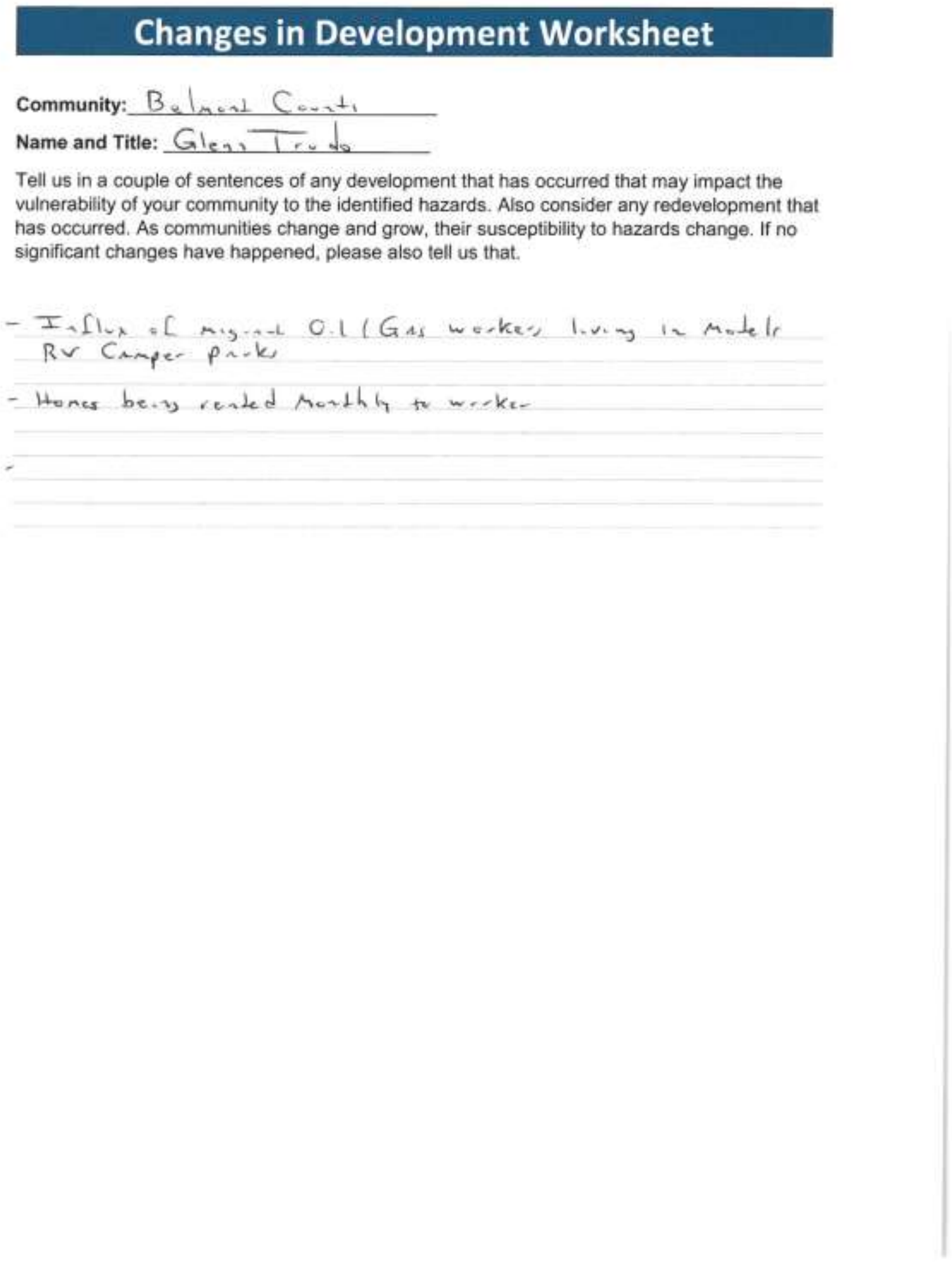
Changes in Development Worksheet

Community: Belmont County Sheriffs

Name and Title: Hailey Rossiter Admin Assistant

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

The increase of oil and gas has increased. There are constently people moving in and out of the community. We also have a lot more hazmat materials going through the county.



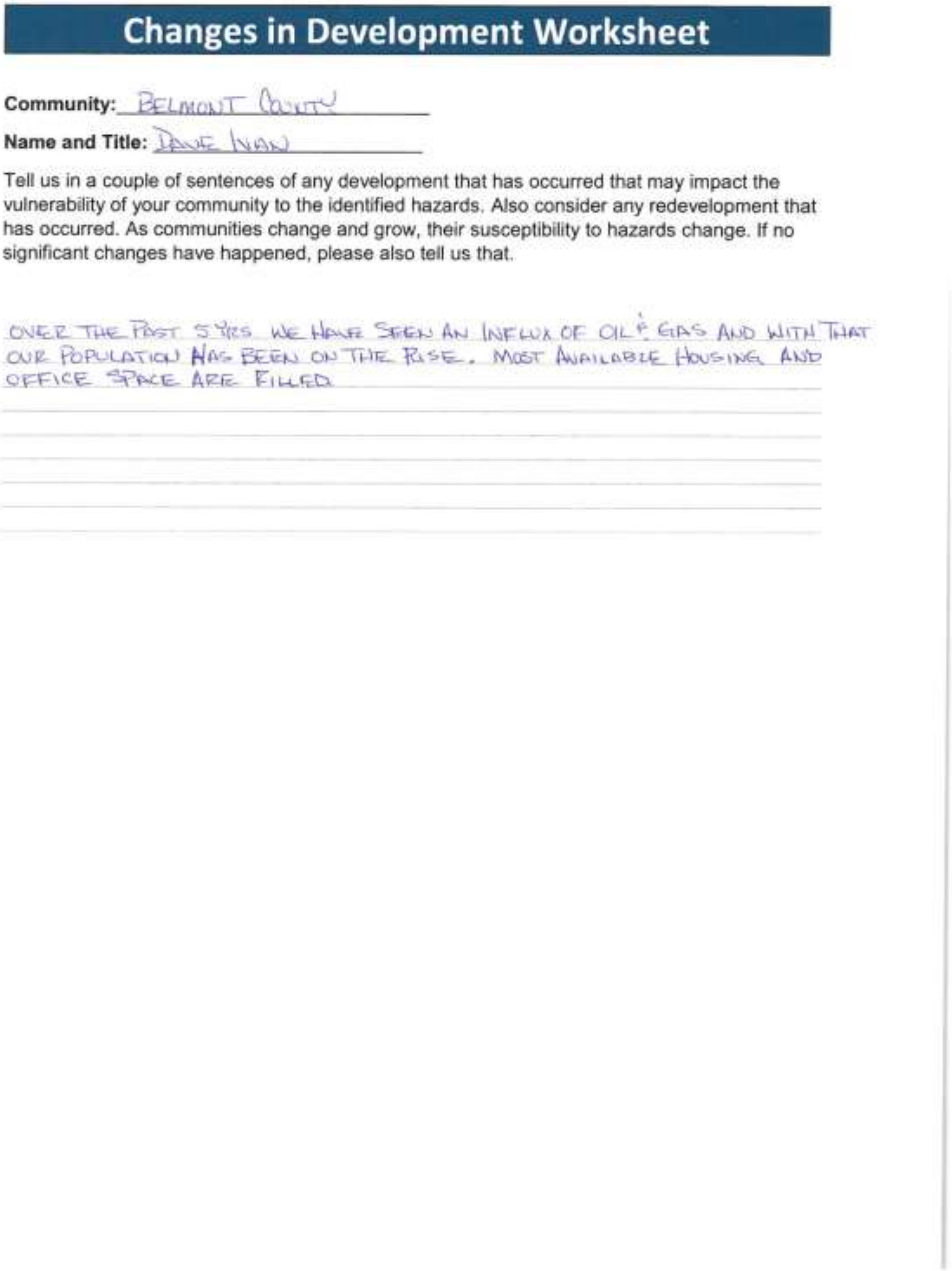
Changes in Development Worksheet

Community: Belmont County

Name and Title: Glenn Trudo

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

- Influx of migrant Oil/Gas workers living in Motels RV Camper parks
- Homes being rented Monthly to worker



Changes in Development Worksheet

Community: BELMONT COUNTY

Name and Title: DAVE IVAN

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

OVER THE PAST 5 YRS WE HAVE SEEN AN INFLUX OF OIL & GAS AND WITH THAT OUR POPULATION HAS BEEN ON THE RISE. MOST AVAILABLE HOUSING AND OFFICE SPACE ARE FILLED

Changes in Development Worksheet

Community: BELMONT COUNTY

Name and Title: DANIEL BOLTZ, ASST. CO. ENGINEER

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

INCREASE
→ POTENTIAL FLOODING/SLIPS
— PIPELINES — LESS TREE AREAS TO HANDLE RAIN
INFLUX OF OIL & GAS INDUSTRY — 600 + WELLHEADS PERMITTED
— 100 + WELLPADS CONSTRUCTED
↳ INCREASE IN POSSIBILITY OF HAZARDS RELATED TO O&G

~~[illegible]~~ SEEMS LIKE MORE RAIN / FLOODS / LANDSLIDES IN LAST 5 YEARS

DEVELOPMENT — ~~MORE~~ LESS EMPTY BUILDINGS
— MORE RV AREAS

Changes in Development Worksheet

Community: BELMONT COUNTY

Name and Title: DARREN PRICE, OHIO EMA

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

INCREASE IN OIL + GAS ACTIVITY. ~~DUE TO~~ AS A RESULT, there IS AN INCREASE PROPERTY ACQUISITIONS RESULTING IN VACANT STRUCTURES. INFLUX OF WORKERS + DRILLING INCREASES RISK for INCIDENTS.

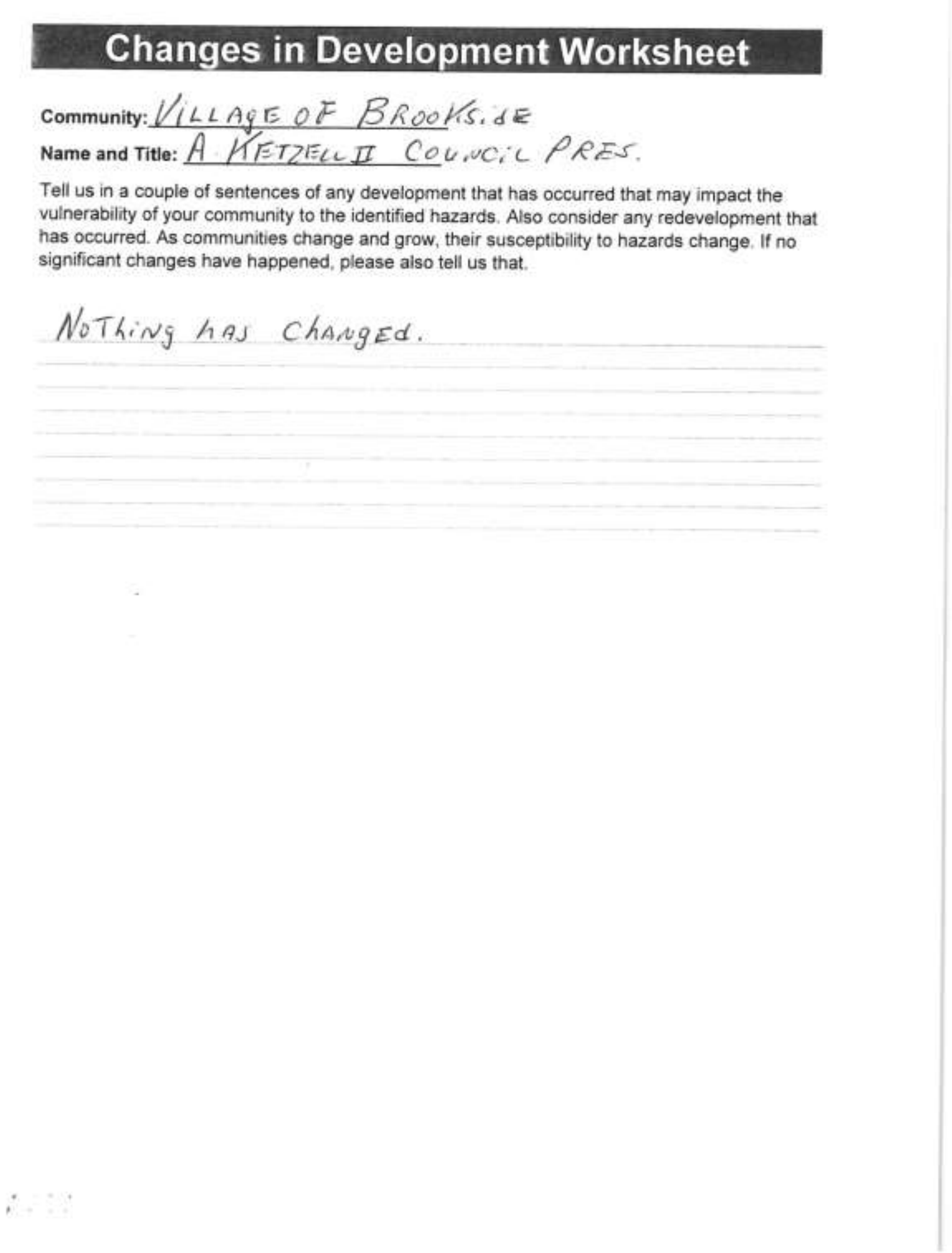
Changes in Development Worksheet

Community: BROOKSIDE

Name and Title: ALLAN KETZELL — COUNCIL PRESIDENT

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

NOTHING HAS CHANGED



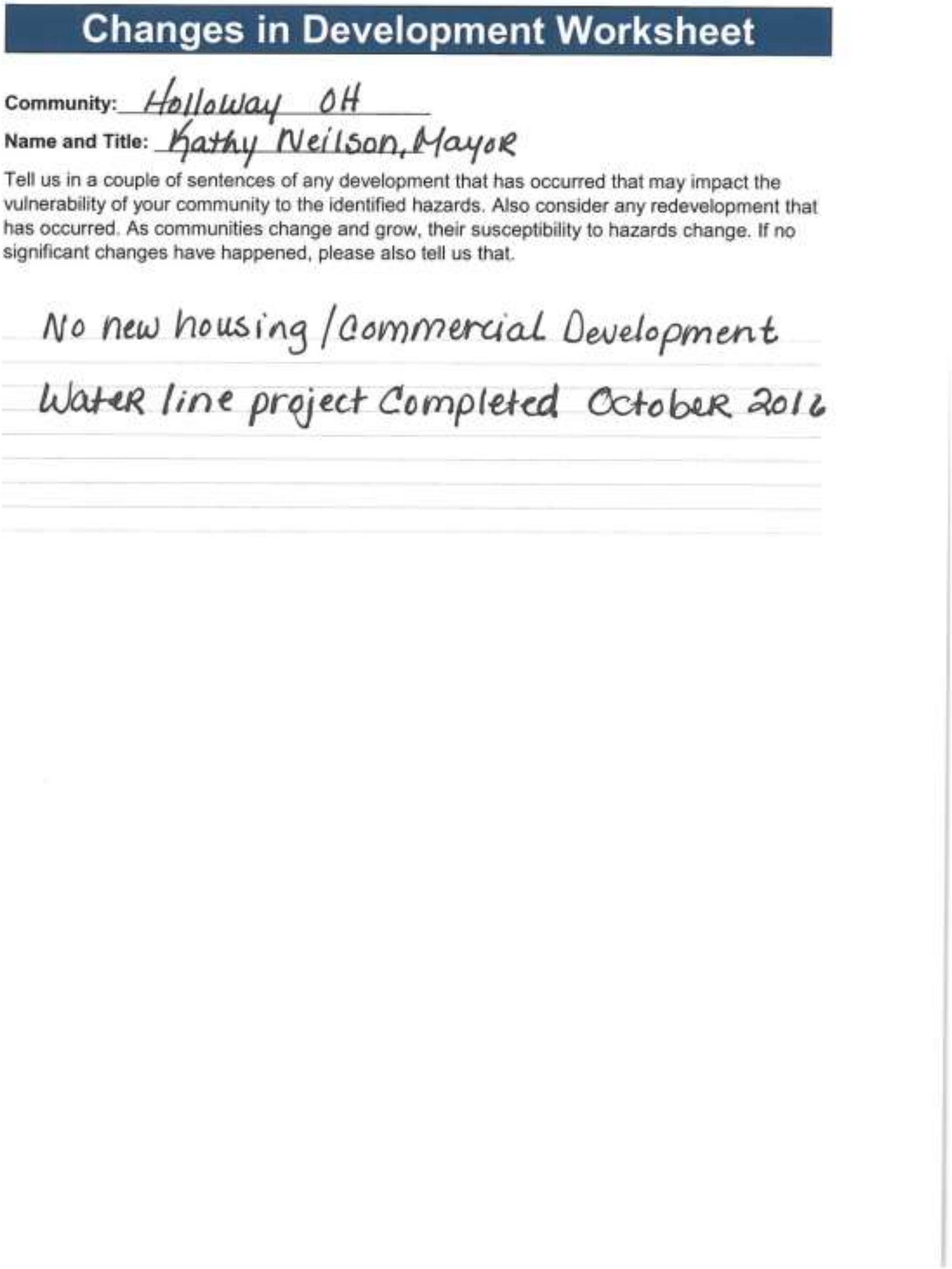
Changes in Development Worksheet

Community: VILLAGE OF BROOKSIDE

Name and Title: A. KETZELL II COUNCIL PRES.

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

Nothing has changed.



Changes in Development Worksheet

Community: Holloway OH

Name and Title: Kathy Neilson, Mayor

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

No new housing / Commercial Development

Water line project Completed October 2016

Changes in Development Worksheet

Community: City of Martins Ferry

Name and Title: Scott Porter, Direct of Public Svs.

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

No significant changes have occured, continued educational programs are monitored to help keep Martins Ferry updated on critical issues.

— SP —

Changes in Development Worksheet

Community: Village of Morristown

Name and Title: Heather Stitt / Mayor

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

Oil/gas Well off of town hill Road, Morristown Ohio.

Changes in Development Worksheet

Community: Ohio University

Name and Title: Jill Harris

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

I would defer to Dave on this.

From today's discussion, oil and gas industry has had an impact on the County.

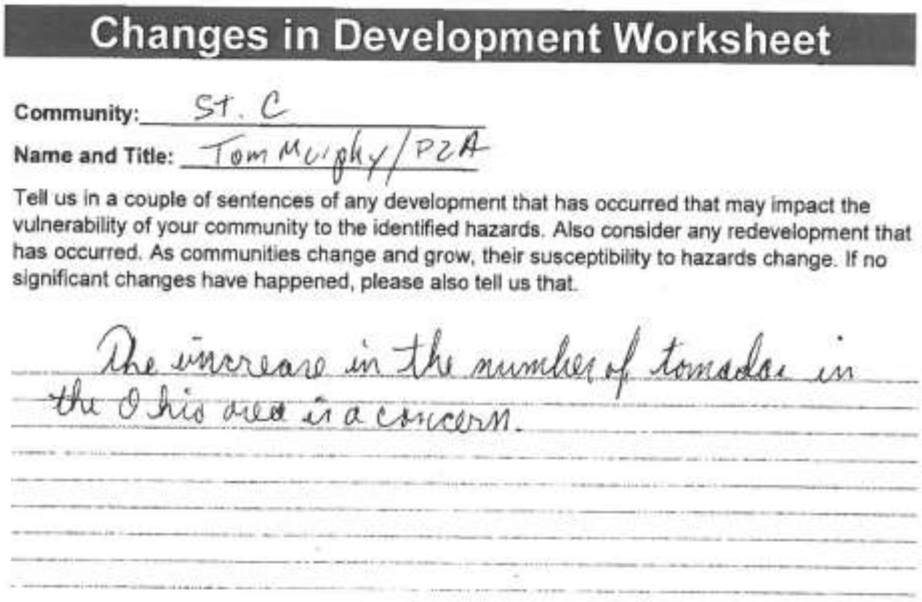
Changes in Development Worksheet

Community: St Clairsville

Name and Title: James Zucal Dir. Public Service/Safety

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

influx of people from oil/gas. Development near I-70, Traffic increases. Demand on utilities and services.



Changes in Development Worksheet

Community: St. C

Name and Title: Tom Murphy/PZA

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

The increase in the number of tornados in the Ohio area is a concern.

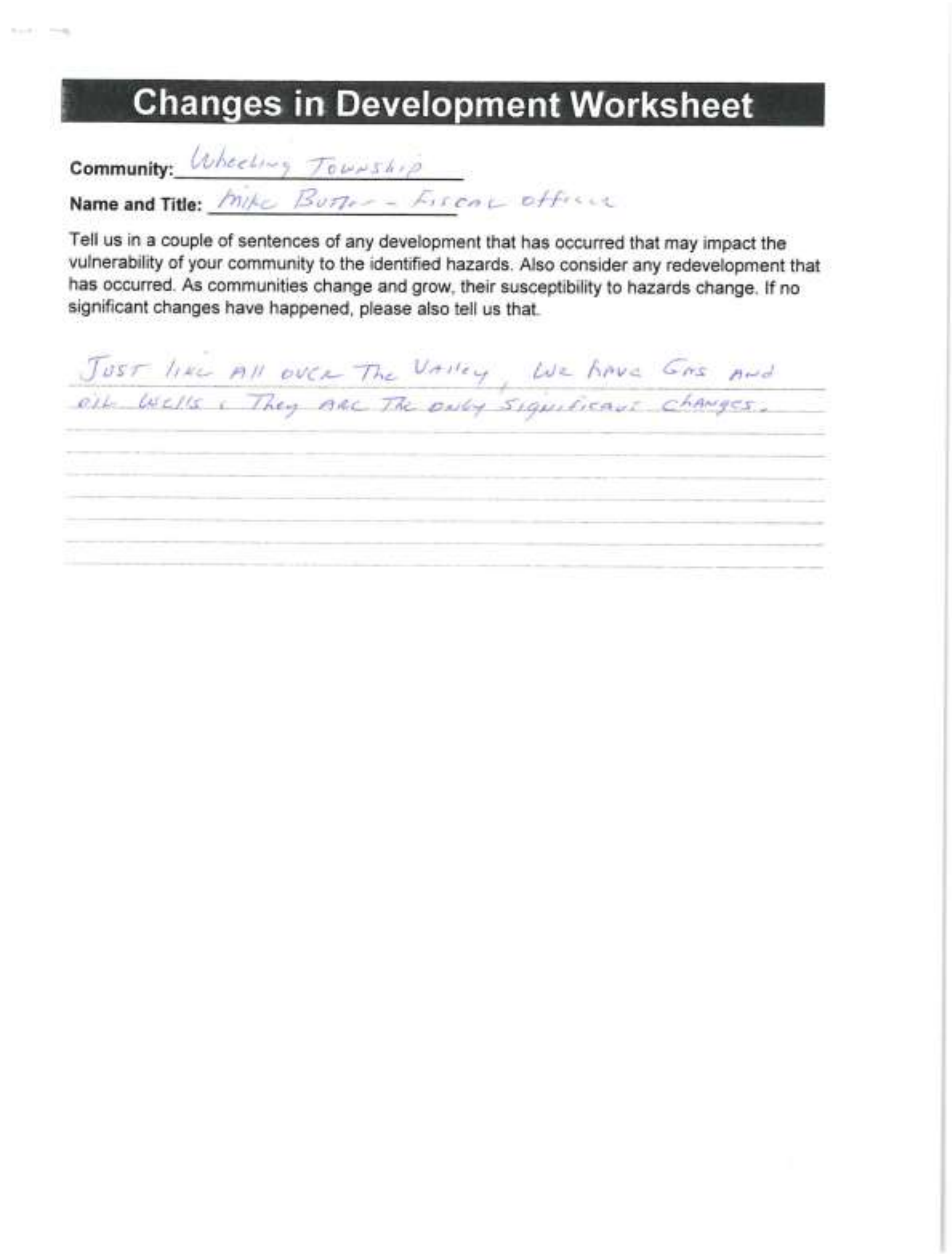
Changes in Development Worksheet

Community: Washington Twp

Name and Title: Paul A [illegible] Trustee

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

More oil & gas gas activity - lots of pipelines
population decrease



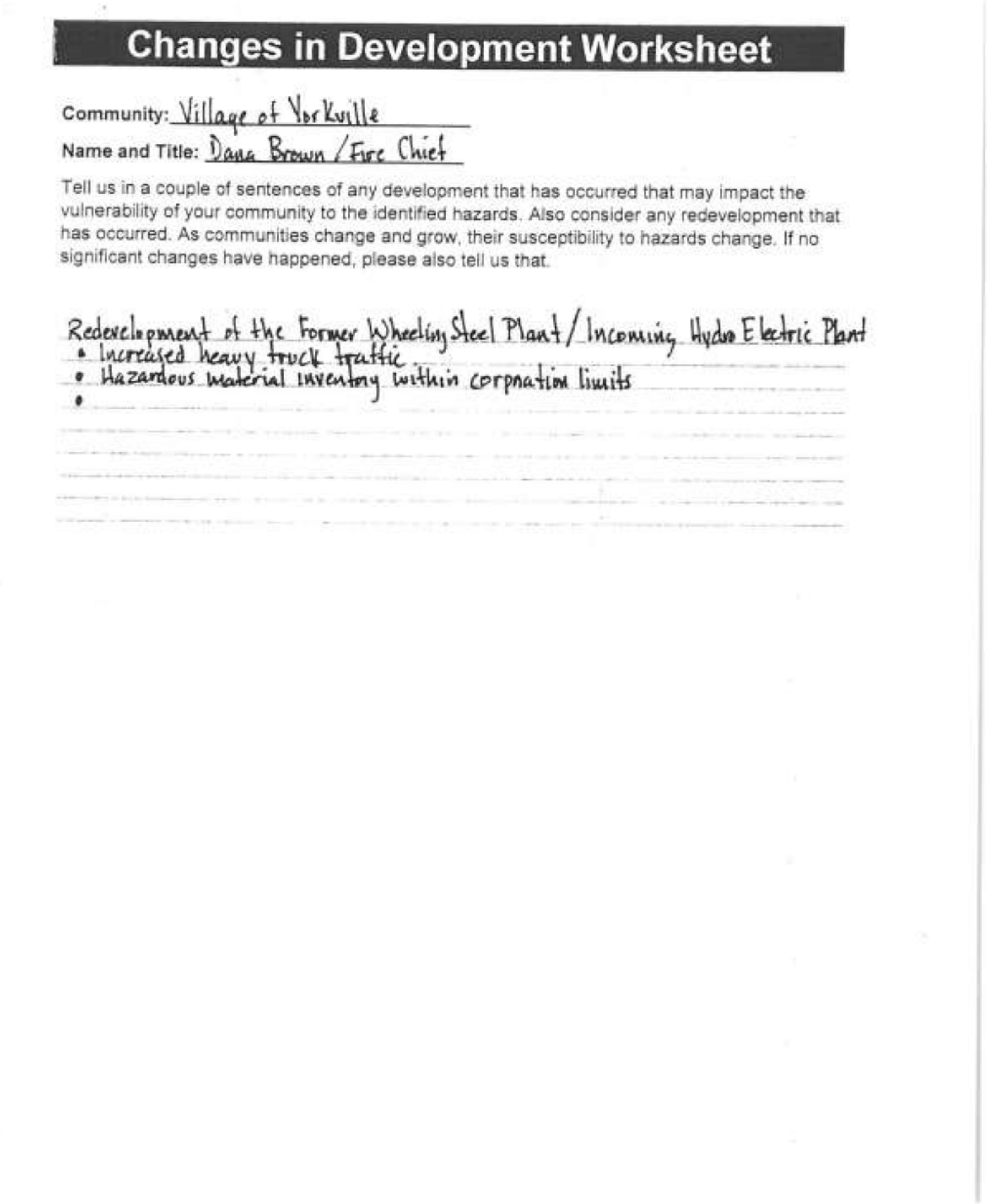
Changes in Development Worksheet

Community: Wheeling Township

Name and Title: Mike Butler - Fiscal officer

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

Just like all over The Valley, We have Gas and oil wells. They are The only significant changes.



Changes in Development Worksheet

Community: Village of Yorkville

Name and Title: Dana Brown / Fire Chief

Tell us in a couple of sentences of any development that has occurred that may impact the vulnerability of your community to the identified hazards. Also consider any redevelopment that has occurred. As communities change and grow, their susceptibility to hazards change. If no significant changes have happened, please also tell us that.

Redevelopment of the Former Wheeling Steel Plant / Incoming Hydro Electric Plant

- Increased heavy truck traffic
- Hazardous material inventory within corpnation limits
-

APPENDIX E. PLAN REVIEW TOOL

LOCAL MITIGATION PLAN REVIEW TOOL 2019

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Belmont County	**Title of Plan:** Belmont County 2020 Hazard Mitigation Plan	**Date of Plan:** **4/3/2020** **4/29/2020**

Local Point of Contact: Dave Ivan	**Address:** 68329 Bannock Road St. Clairsville, Ohio 43950
Title: Director	
Agency: Belmont County Emergency Management Agency	
Phone Number: 740-695-5984	**E-Mail:** dave.ivan@co.belmont.oh.us

State Reviewer: **Luan Nguyen**	**Title:** **State Hazard Mitigation Planner**	**Date:** **4/21/2020** **4/29/2020**

FEMA Reviewer:	**Title:**	**Date:**

Date Received in FEMA Region ***(insert #)***	
Plan Not Approved	
Plan Approvable Pending Adoption	
Plan Approved	

SECTION 1:

REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Sec. 3, pp. 1-8	**X**	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Sec. 3, pp. 2-4	**X**	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Sec. 3, pp. 5-6	**X**	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Sec. 3, p. 6 References throughout the plan	**X**	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Sec. 6, p. 3	**X**	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Sec. 3, pp. 3-4; Sec. 6, pp. 1-3	**X**	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A: REQUIRED REVISIONS			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Sec. 4, pp. 4-5, 10-106	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Sec. 4, pp. 5-6, 12-106	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Sec. 4, pp. 12-106	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Sec. 4, pp. 32-33	X	
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Sec. 5, pp. 5-11	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Sec. 4, pp. 31-33; Sec. 5, p. 6, pp. 13-16, p. 18	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Sec. 5, pp. 1-2	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Sec. 5, pp. 17-22	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Sec. 5, pp. 3-5, 17-22	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Sec. 6, pp. 3-4	X	
ELEMENT C: REQUIRED REVISIONS			
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Sec. 2, p. 6; App. D, pp. XXIX-L	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Sec. 5, pp. 13-16	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Sec. 4, pp. 4-5	X	
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Sec. 6, p. 1; App. A, p. I	X	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Sec. 6, p. 1; App. A, p. I	X	
ELEMENT E: REQUIRED REVISIONS			
OPTIONAL: HIGH HAZARD POTENTIAL DAM RISKS			
HHPD1. Did Element A4 (planning process) describe the incorporation of existing plans, studies, reports, and technical information for high hazard potential dams?		X	
HHPD2. Did Element B3 (risk assessment) address HHPDs?		X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
HHPD3. Did Element C3 (mitigation goals) include mitigation goals to reduce long-term vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public?		**X**	
HHPD4. Did Element C4-C5 (mitigation actions) address HHPDs prioritize mitigation actions to reduce vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public?		**X**	
REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

+ Plan is very well organized. Plan has strong capability assessment that assesses the capabilities of the county and each jurisdiction. The assessments reviews capabilities on the STAPLEE criteria.

- Risk assessments were heavily limited by lack of available data on a county-wide scale. Future plan updates should review and utilize the best available data for that time. Future plan updates should also apply more GIS in vulnerability assessments where available and applicable.