



PUBLIC SAFETY COMMITTEE

SPECIAL MEETING

AGENDA

DATE: August 24, 2020

Time: 4:00 p.m.

Location: **IN AN EFFORT TO FACILITATE THE CONTINUED
RESPONSE TO THE CORONAVIRUS DISEASE (COVID-19),
THIS MEETING WILL BE CONDUCTED VIA GOOGLE MEETS**

- I. CALL TO ORDER
- II. ANNOUNCE MEMBERS IN ATTENDANCE (VERIFY QUORUM)
- III. **RESOLUTION 20-2020-21: A Resolution adopting the Montgomery County
Mutli-Jurisdictional Hazard Mitigation Plan (*Chairman Henley*)**
- IV. **ORDINANCE 22-2020-21: Amending the Official Code relative to storage of
inoperable vehicles on commercial property (*Councilman Chandler*)**
- V. **ADJOURMENT**

RESOLUTION 20-2020-21

A RESOLUTION ADOPTING THE MONTGOMERY COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, the MONTGOMERY COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN (the 'Plan') was developed in accordance with and following the guidelines and requirements established, published and provided by FEMA and TEMA; and

WHEREAS, the City of Clarksville and its various departments, agencies, and operating units actively participated in and contributed to the preparation and development of the 'Plan;' and

WHEREAS, the 'Plan' has been developed to guide each participating jurisdiction in planning for and mitigating local hazards; and

WHEREAS, the completion and adoption of hazard mitigation plan is a condition of qualification for potential future mitigation funding.

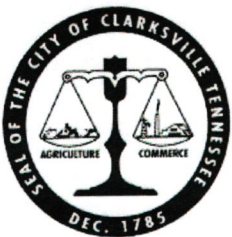
NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF CLARKSVILLE, TENNESSEE

That the Clarksville City Council hereby adopts the Montgomery County Multi-Jurisdictional Hazard Mitigation Plan.

ADOPTED:

Montgomery County, Tennessee

Multi-Jurisdictional All Hazards Mitigation 2020 Plan Update



**Including the City of Clarksville & the Clarksville-
Montgomery County School System**



Executive Summary

Montgomery County Tennessee, like many other places in the nation has experienced major disasters. In 1999, an F3 tornado destroyed a large amount of buildings and infrastructure as it covered almost the entire length of the county. In 2018, two tornados occurred within minutes apart from each other in Montgomery County. An EF2 tornado touched down in Eastern Clarksville and an EF1 tornado touched down near the Dotsonville community. The tornadoes caused severe to minor damage to the affected areas, several homes, businesses and cars were damaged, including hundreds of trees being destroyed.

The 2020 Montgomery County Multi-Jurisdictional Hazard Mitigation Plan Update is the third update of the plan since becoming a multi-jurisdictional plan including the City of Clarksville and the Clarksville-Montgomery County School System (CMCSS). The 2020 plan update was completed with the assistance of multiple individuals, departments/agencies, private organizations, businesses, non-profits, and academia.

The Montgomery County Multi-Jurisdictional Hazard Mitigation Plan Update process includes efforts to meet the principles and intent of new guidance and directives such as Presidential Policy Directive – 8 (PPD-8) the “Whole Community” concept and the five mission areas: Prevention, Protection, Mitigation, Response, and Recovery. The process also involved the Threat and Hazard Identification and Risk Assessment (THIRA) guidance.

The jurisdictions in the plan continue mitigation efforts in an effort to protect the citizens and property within the jurisdictions and as required by the Disaster Mitigation Act of 2000 (DMA 2000). This 2020 plan update is in accordance with 44 CFR 201, which requires an updated hazard mitigation plan to be submitted and approved by Federal Emergency Management Agency (FEMA) every five years.

For additional information, please contact:

Edward Baggett, Director
Montgomery County Emergency Management Agency
130 S. First Street
Clarksville, TN 37040



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Section 1: Introduction

This 2020 plan update was completed in accordance with the requirements of the Federal Emergency Management Agency (FEMA) to assist in the elimination of losses of life and property in the jurisdictions of Montgomery County, the City of Clarksville, and the Clarksville-Montgomery County School System (CMCSS) in Tennessee as a result of natural and manmade hazards. Fort Campbell Military Reservation, while located partially within the borders of Montgomery County is not included in this plan as it is a Federal installation.

Montgomery County has one incorporated entity, the City of Clarksville, and one school system, the Clarksville-Montgomery County School System. Prior to March 2009, both the city and the county had developed and received approval for independent, stand-alone plans. In March 2009 both plans were consolidated into a single, composite plan. During the planning process to include the City of Clarksville in the Montgomery County plan, the Clarksville-Montgomery County School System was notified of their status as a local government as defined by 44 CFR Part 201.2. The Clarksville-Montgomery County School System requested to be included in the planning process for the five year 2010 plan update that was to start later in 2009, so that the school system could be included as a local government in the multi-jurisdictional plan. The plan is now referred to as the Montgomery County Multi-Jurisdictional Hazard Mitigation Plan. The Montgomery County Multi-Jurisdictional Hazard Mitigation Plan Update from 2015 has been incorporated into the risk assessment of all planning processes used within the county, the city, and the school system to the extent that it is appropriate. The 2020 Montgomery County Multi-Jurisdictional Hazard Mitigation Plan Update will continue to be incorporated into risk assessment and other applicable areas within the jurisdictions.

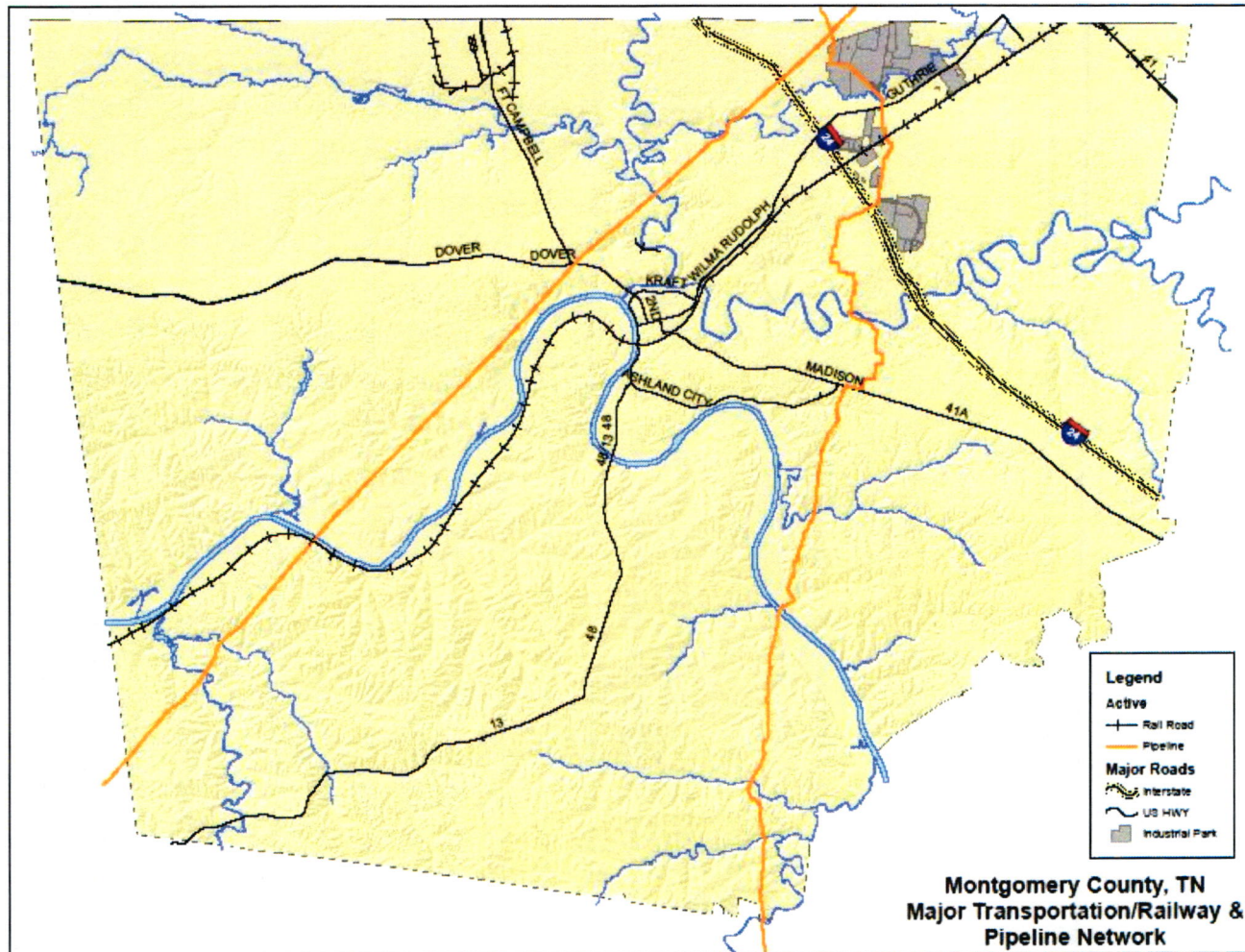
1.1 The Community

Montgomery County is located in northern middle Tennessee, on the Tennessee – Kentucky border. The area continues as it was in 2015 as the center of one of the Southeast's largest and most rapidly growing industrial complexes and also serves as one of its premier development locations. Montgomery County is surrounded by five Tennessee counties and two Kentucky counties.

Montgomery County has a total of 539 square miles within its borders and is comprised of multiple unincorporated communities (Palmyra, Woodlawn, etc.) and one incorporated entity, the City of Clarksville (98 square miles). Fort Campbell Military Reservation, home of the 101st Air Assault Division, encompasses an area of 62 square miles within the county.

CMCSS is one of a distinguished group of school districts that has earned whole district accreditation from AdvancEd, which rated the system in the top 2% of school districts internationally. We are one of 9 school districts in the nation with ISO-9001:2015 quality certification, which measures efficiency and effectiveness.

With a graduation rate of 94.2% between 2017-2018 the school system exceeds both state and national averages and receives strong community support for education with an emphasis on 100% graduation for every student. The dropout rate for 2017-18 was 5.8%. In May 2019, 2,035 CMCSS graduates earned \$51.5 million in college scholarships.



Map provided by APSU GIS Center

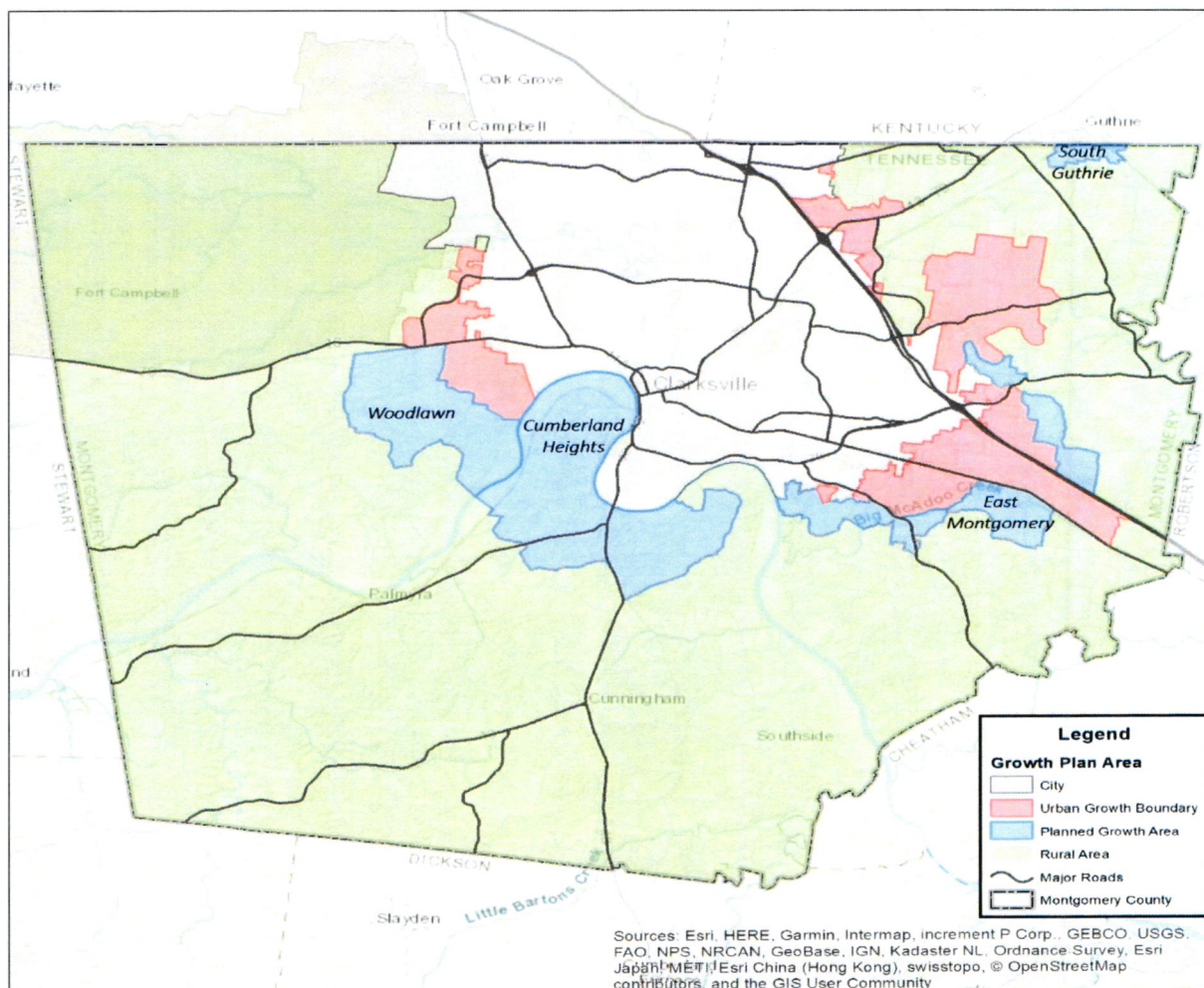
According to 2010 Census Bureau, the population for Montgomery County was 172,331 residents. The Census Bureau estimates for 2018 population was recorded at 205,950, which is a 19.5% increase in population over 8 years. Montgomery County foresees further increase in the population for the 2020 Census Bureau report.

Although there has been a steady stream of businesses and industries building in Montgomery County, recent development trends have leaned toward large residential subdivisions as more and more people relocate here. The Fort Campbell Military Reservation here brings in a large number of both active duty and retired military, fueling our need for more homes and the supporting infrastructure.

The University of Tennessee conducted a study and calculated a projection for the 2040 Montgomery County Growth Plan population, they estimate the population for 2040 will reach to 298,919 residents. That would suggest a 40% increase in population over the next 20 years. Adding over 90k new residents to the city and county. Their estimated projection of students will reach to an additional 15,648 students over the next 20 years.



2040 Clarksville-Montgomery County Growth Plan Map



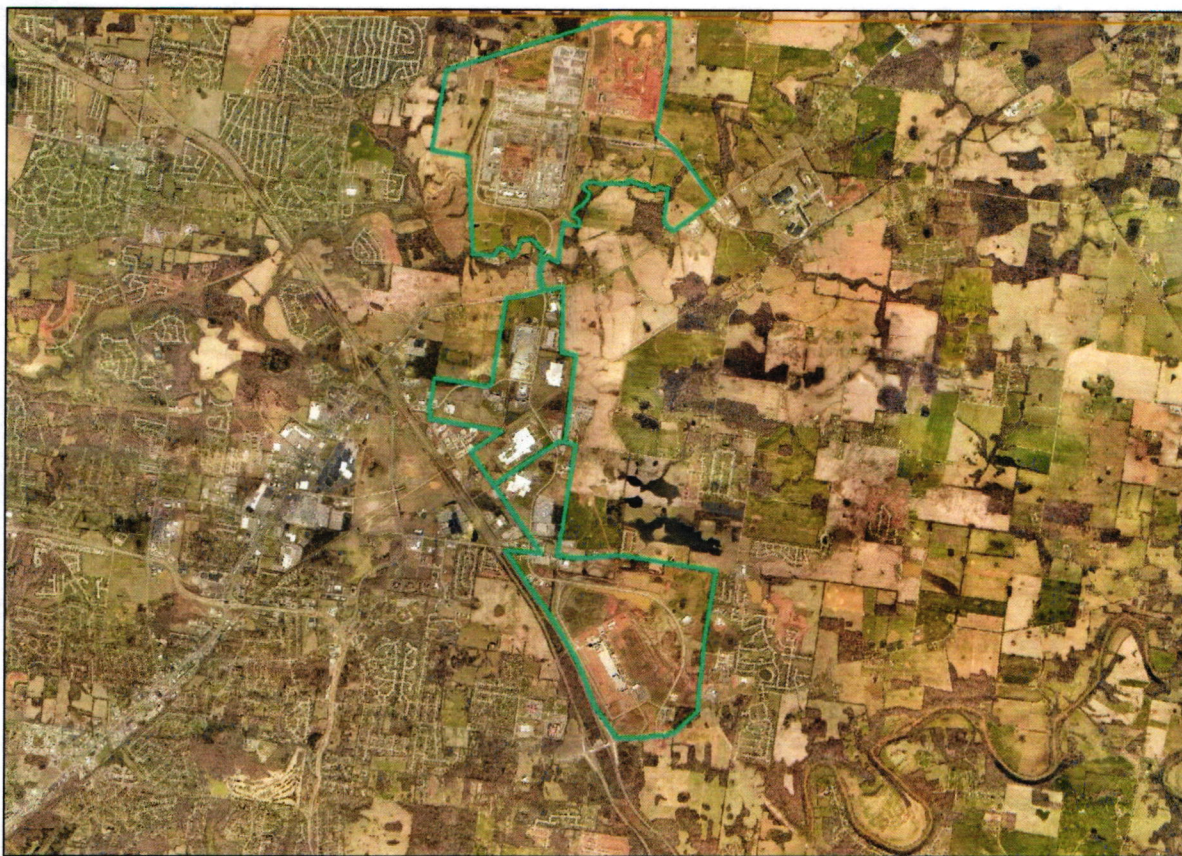
Provided by Clarksville-Montgomery County Regional Planning Commission

Urban Growth Boundary: This boundary encompasses the existing municipality and contiguous territory where higher-density residential, commercial, and industrial growth is expected to take place. This area is further defined as to its capability to provide urban services in an orderly and timely fashion to facilitate higher density land use patterns. By allowing high densities, it is anticipated that the land will be utilized to a fuller degree of potential giving support to the community's needs for future expansion.

Planned Growth Areas: This is the territory outside the municipality and the Urban Growth Boundary where low to moderate density residential, commercial, and industrial growth is projected within the planning period.

Rural Areas: This territory is the remainder of the county that was not included in a UGB or PGA. Based on growth expectations, it does not exhibit the need for higher density development patterns within the planning period delineated by this report. This area's development will be governed by the land use control ordinances established and maintained by the county. Any changes in density of development will require correlation with the provisions of the plan.

Montgomery County, TN Industrial Park 2018



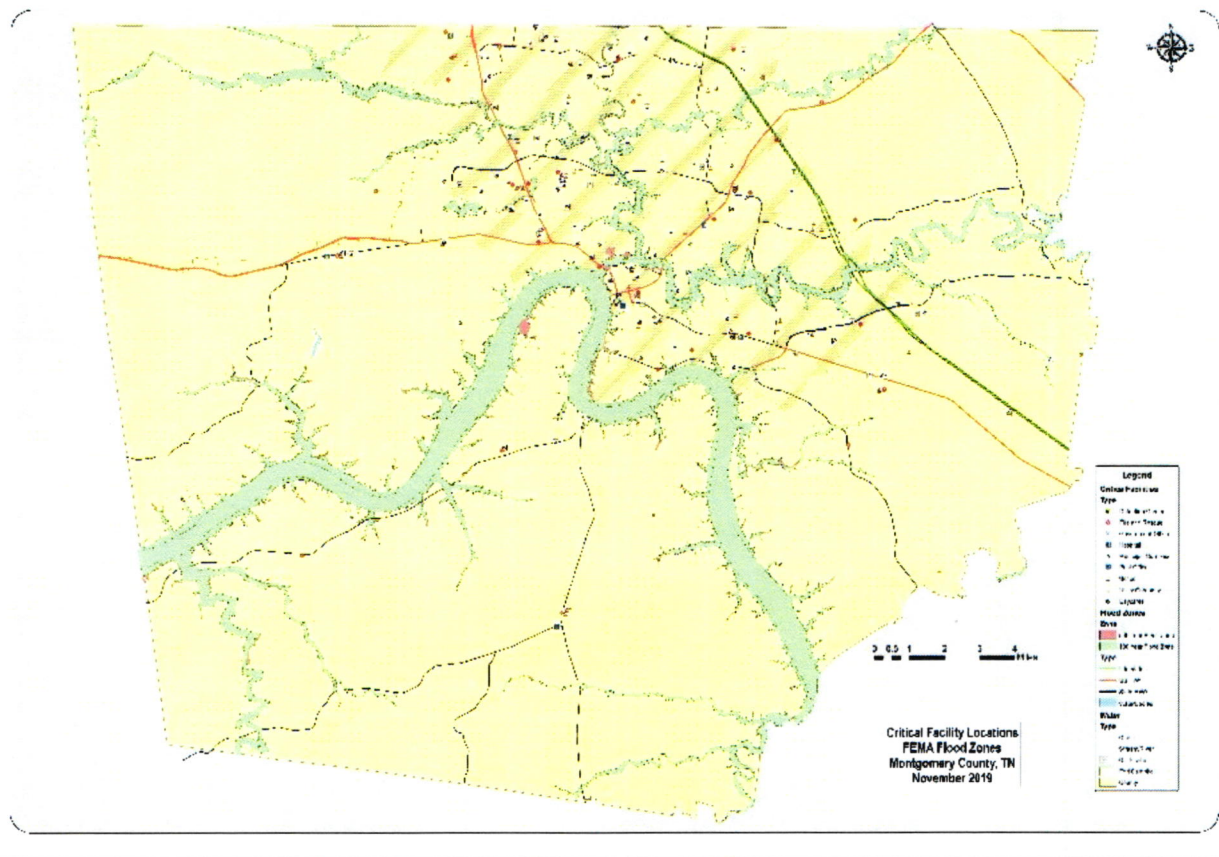
Map provided by APSU GIS Center

Several businesses and industries have opened and are still in the process of expanding their facilities in the area. In October 2017, Hankook Tire opened a \$800 million plant in Montgomery County that employs over 1,000 employees and foresees a future total of approximately 1,800 people being employed. In June 2019, LG Electronics opened a new \$360 million TN Appliance Factory, which employs nearly 600 employees. Google announced in 2018 and is still in process of opening a \$600 million Data Center with plans of employing about 70 employees.

Development, whether residential, commercial, or industrial, is controlled through zoning regulations adopted by both the city and the county. These regulations contain specific requirements for development such as lot size, distance from neighbors and property lines, and zoning classifications.



Critical Facilities Map- Montgomery County, TN 2019



Map provided by APSU GIS

1.2 Local Government

Montgomery County is governed by an elected County Mayor and Board of Commissioners, while the City of Clarksville is governed by an elected Mayor and City Council.

The Clarksville-Montgomery County School System is governed by an elected school board who sets the policies that govern the system.

1.3 Infrastructure

Montgomery County is crossed by eight Federal and State highways (including Interstate 24), two rail lines, one petro-chemical (Xylene) pipeline, one crude oil pipeline, numerous natural gas pipelines from three separate carriers, the Cumberland and Red Rivers, and a regional airport.

There are 1,786 miles of roadway and 167 bridges inside Montgomery County, including two railroad bridges, one railroad tunnel, and 71 miles of railroad.



Natural gas service does not extend to all parts of the county, with the predominant service area being the City of Clarksville, adjacent residential developments, and the industrial park. The local natural gas distribution system consists of 572 miles of pipeline of various sizes.

The City of Clarksville's wastewater collection system (731 miles of lines) is a complex network which includes 220 lift stations, collection lift stations, and overflow facilities.

While some sewer service is provided for county residents by the City of Clarksville, most of the county is not serviced by sewer and relies on septic tanks for wastewater collection.

Montgomery County is serviced by four water utilities serving nearly 10,000 homes and businesses. Some areas of the county are served by the City of Clarksville's water utility, which serves nearly 150,000 residents. Some rural homes still depend upon wells for potable water.

All water systems have a redundant, looped design and water can flow in either direction in a main, depending on where the greater pressure exists. Thus it is possible that a single break in a main could be isolated by shut-off valves, and water service could continue for most customers with little or no interruption.

1.4 Agriculture

Montgomery County (excluding Ft. Campbell) contains 305,280 acres of which 133,212 were in agricultural use as of 2017 per the USDA 2017 Census of Agriculture County Profile, which is a 10% decrease since 2012. This was comprised of 787 farms growing/raising a wide range of products (soybeans, corn, cattle, tobacco, etc.) accounting for \$49,834,000 in agri-business in 2017, which was a 5% increase in agri-business since 2012.

1.5 Climate

Winters (December – February) are cold and wet with an average low of 27.5 degrees and average annual snowfall of 10.6 inches. Occasional winter storms can be brutal with frigid temperatures and accompanying ice and snow.

Summers (June – August) are hot and humid, with an average high of 88.6 degrees with a period of low rainfall amounts during the summer, particularly in July and August.

The area's prevailing winds are Southerly at an average of 6 mph. The area has an average relative humidity of 90% at its peak (6 AM) and 78% at its low (noon).

1.6 Hazards

Historically, a variety of natural hazards have impacted Montgomery County, including floods, earthquakes, wind storms, tornadoes, ice and snow storms, and land subsidence (sinkholes). Typically, the natural hazards including land subsidence (sinkholes), that impact the county generally would include the City of Clarksville and the Clarksville-Montgomery County School System also, since they lie within the county boundaries. With the exception of service disruptions to utilities such as natural gas and wastewater treatment, which are predominately only available within the city limits, the extent from a disaster including land subsidence (sinkholes), would not be different because of jurisdictional boundary lines. Man-made hazards also occur, to date primarily as hazardous material incidents.



Across-the-street proximity to Ft. Campbell and a large active military population also creates a possibility for terrorist incidents. An earlier threat assessment for Montgomery County brought this fact to light and plans were made for response and prevention. Due to the sensitive nature of this subject it was decided to not include a section on terrorism within this plan.

1.7 Partnerships

The Hazard Mitigation Team consists of representatives from Montgomery County, The City of Clarksville, The Clarksville-Montgomery County School System, emergency services agencies, academia, non-profits, businesses, regional planning, and the private sector. The planning reflects the same types of partnerships that exist in many of the on-going jurisdiction activities. Many members are involved with various other advisory groups or organizations which helped bring unique perspectives in the compilation of this plan.

1.8 Resources

A majority of the statistics used to develop this plan were derived from governmental, technical, and historical resources including, but not limited to the following: the United States Geological Survey, the Tennessee Emergency Management Agency, NOAA Archives and Reports Section, local print media, U.S. Census Bureau, and the GIS Center at Austin Peay State University.

Software used in the compilation of data included, Arc Map, HAZUS-MH, and Microsoft Office.

Additional resources used in the formulation of the plan include City Ordinances, County Resolutions, school system policies, the Hazard Mitigation Team, and various subject-matter experts.

1.9 Challenges and Limitations

The primary obstacle for the mitigation team for the 2020 plan update is the changes to members of the hazard mitigation team no longer being point of contacts and the new number of members. Also, the inability to overcome schedule conflicts for all members in order to have more concise meeting with all the members at the same time.

We are still able to overcome this problem through dissemination of minutes from the meetings to members who were unable to attend. Those members would then respond with their own comments, suggestions, etc. for inclusion. Administration changes have also been a challenge going into the 2020 plan update.

1.10 New Benefits and Capabilities

Since the 2015 plan update was completed there are new capabilities and several updates.

The working relationships between agencies and organizations involved with disaster planning and response have increased. New partners such as Tennova Healthcare has recently joined the Hazard Mitigation Planning Team for the 2020 plan update.

The Clarksville-Montgomery County School System converted a 6,000 gallon diesel fuel storage tank to gasoline at its facility across the Cumberland River in August 2011. This was done as part of mitigation actions



after the 2010 flood waters blocked bridge access to that area. The gasoline has been made available to all emergency assets in the event of future disasters and continues to be available.



Section 2: Local Hazard Mitigation Planning Process and Team

This plan, its development, and the processes which were followed, adhere to the principles and stipulations outlined in 44 CFR Part 201. The three Jurisdictions involved in the planning process are Montgomery County, The City of Clarksville, and the Clarksville-Montgomery County School System.

A summary of changes from the 2020 plan update process is listed as appendix 8a.

2.1 Hazard Mitigation Planning Team

The Montgomery County Multi-Jurisdictional Hazard Mitigation Team is currently composed of 20 agencies within the county, city, and the school system with at least one representative from each. The latest meeting of the Hazard Mitigation Team was held on September 12, 2019 at the Montgomery County Emergency Operations Center to discuss the plan update process and the schedule of the upcoming plan update that would begin in 2019. The Montgomery County Emergency Management Agency Assistant Director led the meeting and requested information from various agencies and departments to be used in the 2020 plan update. Minutes and attendance sheets are kept on record at the Montgomery County Emergency Management Agency and copies are located in appendix section of this plan.

Composition of the Hazard Mitigation Team is as follows:

Montgomery County Emergency Management Agency (project lead)
Montgomery County Government
Montgomery County Building and Codes
Montgomery County Highway Department
Montgomery County Emergency Medical Services
City of Clarksville
Clarksville Building and Codes
Clarksville Street Department
Clarksville Gas & Water
Clarksville Parks & Recreations
Clarksville Police Department
Clarksville-Fire/Rescue
Clarksville Department of Electricity
Clarksville Finance Department (Grants Division)
Clarksville- Montgomery County School System (CMCSS)
Clarksville- Montgomery County Regional Planning Commission
Clarksville-Montgomery County Industrial Development Board
Clarksville Transit System
Coast Guard Auxiliary
Cumberland Electric Membership Corporation
Austin Peay State University Geographic Information System Center
Austin Peay State University Police Department
Red Cross
Tennessee Emergency Management Agency (TEMA)
Tennova Healthcare
Community Emergency Response Team (CERT)



2.2 Planning Team- Method of Approach

Evaluation of this 2020 plan update began with a meeting with the Tennessee Emergency Management Agency (TEMA) Mitigation Planner and State Hazard Mitigation Officer, the Montgomery County Emergency Management Agency Planner and Director, the City of Clarksville and the Clarksville-Montgomery County School System (CMCSS) on December 13, 2016 to discuss the planning process following the current protocol established by FEMA. This meeting involved an overall assessment of the current plan and some minor structural changes to include in the new plan update.

Some recommendations included adding non-profit organizations and private sector members on the hazard mitigation team. The TEMA Mitigation Planner advised that the planning process steps used to evaluate the current plan could be used for the 2020 update process. The risk assessment should be reviewed, along with updated weather, census information, NFIP repetitive losses, building trends, and other data used in the plan to reflect the current conditions. New capabilities for mitigation were also discussed that are available for the local jurisdiction to apply for through FEMA's HMGP (Hazard Mitigation Grant Program). The discussion of removing the risk of "Flood Hazards from Inundation due to Dam Failure" from the 2015 Hazard Mitigation Plan was made due to the threat being eliminated since the last plan update.

The latest meeting of the Hazard Mitigation Team was held on September 12, 2019, and consisted of a discussion over the 2020 plan update process, and the next steps to be covered in the process. Four new members on the team were introduced. The meeting also covered updated mitigation strategies as they have been updated through the process and any final information needed prior to the draft and final review components. Each jurisdiction through team member participation has provided updated data relevant to their respective jurisdictions to incorporate into the multi-jurisdictional plan.

Processes used to review and analyze each section of the plan during the 2020 update including the planning process, risk assessment, mitigation strategies, and plan maintenance.

Each hazard mitigation team member followed the same review process format in the 2020 plan update process that was used in the 2015 update, to include review, analysis, and update of the current plan. On December 10, 2019 the members of the Hazard Mitigation Planning Team were sent the draft copy of the 2020 plan update to review by email. No comments or suggestions were made by the team. Each section of this plan was revised as needed during the update process. Most of the revisions were due to updated data, some were changes in terminology, and certain areas within the plan were rewritten to clarify the subject material.

Initiation of the plan update process began with the Montgomery County Emergency Management Agency Planner revisiting data sources utilized in developing the risk assessment for each hazard included within the plan, and where new data existed, the information resources were updated. This information was used to modify or verify the sections of the plan pertaining to risk assessment, which were then presented to the team.

The amended risk information, particularly event frequency and probability, were presented to team members, where each team member reviewed the existing exposure and impact analysis based upon the exposure information for each hazard. In turn, they presented recommendations for amendment or modification, if the revised risk analysis data appeared to have any change implications on subsequent elements of the plan update process.



Each team member then reviewed the consequences of the hazard and potential event to assess if the current status in the plan was appropriate. From that determination, the loss estimation was modified, but only in those situations where loss estimates were deemed out of line with the amended risk analysis.

Finally, each team member re-examined the existing mitigation strategies in the plan to determine if the needs of their jurisdiction were adequately being addressed should natural hazard events occur and objectives were amended, added, or deleted by team participants.

Because of this organizational structure to the review process, each team member was apprised of the total picture and the elements involved in the risk analysis procedure. Team members reviewed the risk analysis based on several elements including:

- If the risk assessment is still valid and in line with current conditions?
- Have the nature, magnitude, and/or types of risks changed since the plan was approved?
- Are the current resources still appropriate as when the plan was approved?

Any changes or modifications were submitted to the Montgomery County Emergency Management Agency Planner who was tasked with administering the plan review and modification process for incorporation into the plan update document. The draft update with the changes and modifications was submitted to the hazard mitigation team members for another review for concurrence that the updated plan does meet the new hazard mitigation guidance as well as the needs of the jurisdictions represented in the plan.

A summary of the section by section 2020 review process including changes is provided as an appendix 8A in this plan.

As components of the plan update unfolded and were developed, each jurisdiction reviewed critical dimensions of the plan to ensure that they met all federal, state, and local guidelines. As a consequence of the evaluation process by the team members, the final plan was assessed as being comprehensive, fair, and effective for each of the partners.

The opportunity for any plan maintenance issues with the 2015 plan update were addressed as part of the 2020 update was also discussed. Team members were asked to review and analyze each section of the existing plan, recognize and identify hazards which affect our community, identify new hazard mitigation opportunities, and develop objectives and strategies to maximize those opportunities. The members were asked to make all recommendations and changes for each section of the plan through email as an electronic document rather than hard copies that would require retyping. The Montgomery County Emergency Management Agency Planner as the plan leader will condense and redistribute any changes to all of the members for review prior to incorporation into the update.

A Public Briefing announcing the draft plan update was available for review and comment by the general public, business, and academia was posted on the News and Information section of the Montgomery County Web Site and Facebook Page, and also in the Community Calendar section of Clarksville Now (local online daily news). A copy of the Public Briefing Announcement is located in the appendix 3 of this plan. In addition, existing local government ordinances (both City and County), school system policies, land-use plans, industrial development strategies, and other pertinent updated data were discussed individually with



Montgomery County
Multi-Jurisdictional All Hazards Mitigation Plan

affected team members, reviewed, and included in the assessment. Multiple meetings of this type were held outside of the formal team meetings.

The final draft of the plan was then assembled and reviewed by the Hazard Mitigation Team. A Public Briefing announcing the final draft of plan update was available for review and comment by the general public, business, and academia was posted on the News and Information section of the Montgomery County Web Site and Facebook Page, and also in the Community Calendar section of Clarksville Now (local online daily news). A copy of the Public Briefing Announcement is located in the appendix 3 of this plan.

A summary of the section by section review process including changes is provided as an appendix 8A in this plan.



Section 3: Risk Assessment

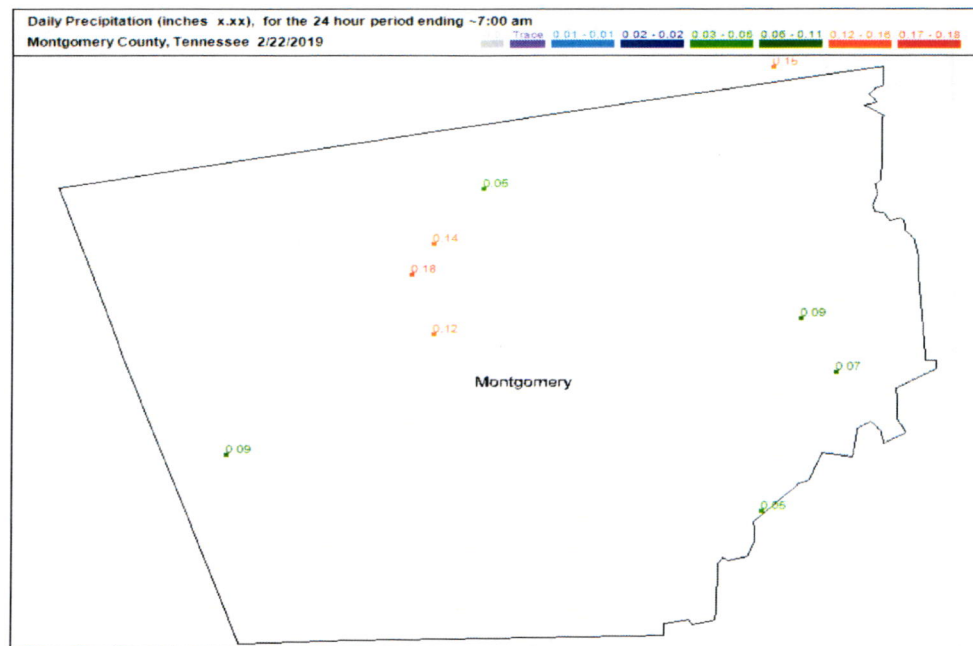
The Hazard Mitigation Team has determined that the hazards identified in the 2015 update still represent the most *significant hazards* affecting the jurisdictions during the 2020 plan update process.

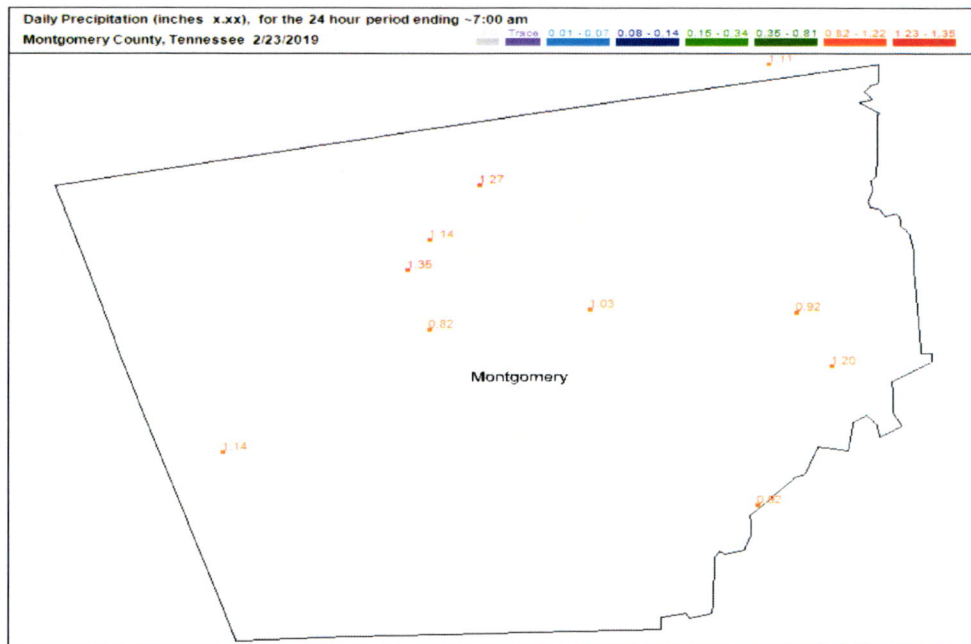
3.1 Flood Hazards

The Cumberland River (with a watershed of 17,914 square miles), the Red River (with a watershed of 1,482 square miles), and multiple small tributaries flow through Montgomery County. Over the years the Army Corps of Engineers and the Tennessee Valley Authority have constructed a series of upstream locks, dams, and flood control reservoirs that collectively reduce the probability of major floods on the Cumberland in our area. Before the Corps' efforts, major flood events on the section of the Cumberland occurred in 1882, 1927, and 1937. The last major flood event on this section of the Cumberland was in May 2010.

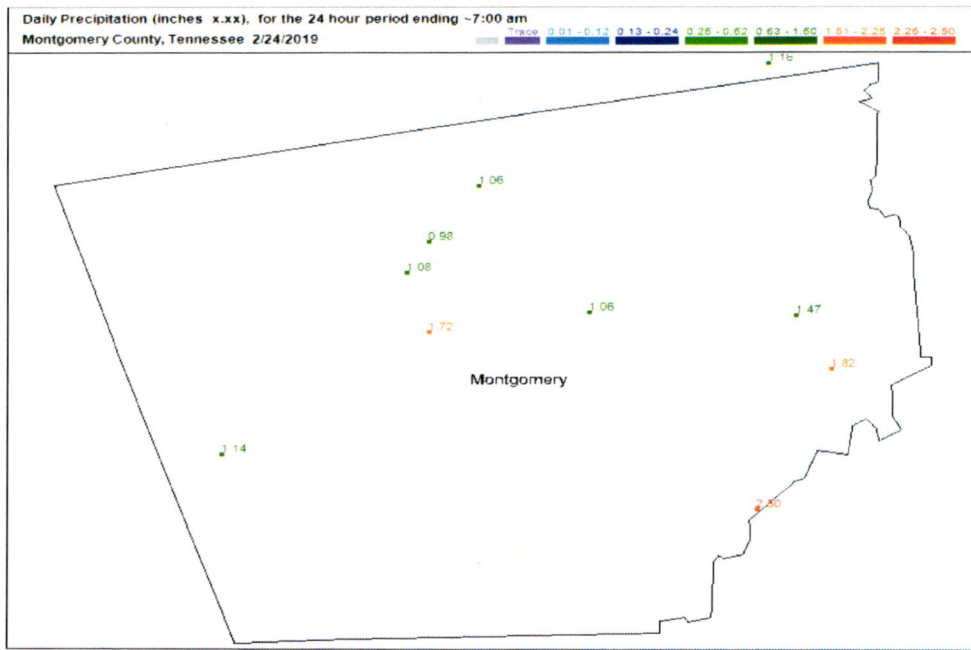
The other streams within the county have no flood control structures and are of a smaller scale than the Cumberland and the Red rivers, but are still significant flood areas. Due to the topography of Montgomery County with its rolling hills and deep valleys, flood events are prone to occur on these streams. Flooding does not occur only in land areas adjacent to flowing streams. Many subdivisions and industries within Montgomery County and the City of Clarksville utilize sinkholes as drainage structures and as injection wells. As a natural drainage structure these sinkholes allow water to pool and then infiltrate through a natural, vertical drain channel to the groundwater system. Injection wells are simply sinkholes which have been improved to facilitate and improve the drainage properties of the sinkhole. These sinkholes, injection wells, and drainage methods are prone to localized flooding due to them becoming clogged. Localized heavy rains with rapid runoff characteristics, as well as flash flooding along the drainage routes, can also lead to local area flooding. Other hazards related to sinkholes will be discussed further in another section of this plan.

Daily Precipitation Maps for Montgomery County- February 22-24, 2019





NOAA, NWS CoCoRaHS Daily Precipitation Maps for Montgomery County





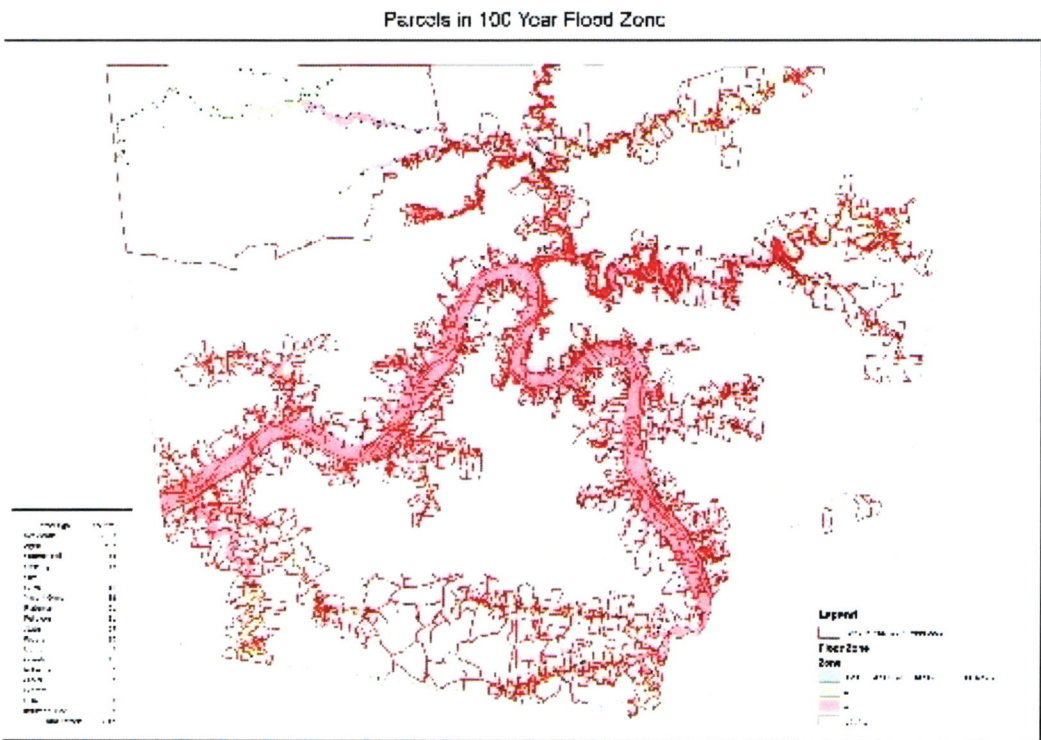
3.1.1 Probability and Frequency

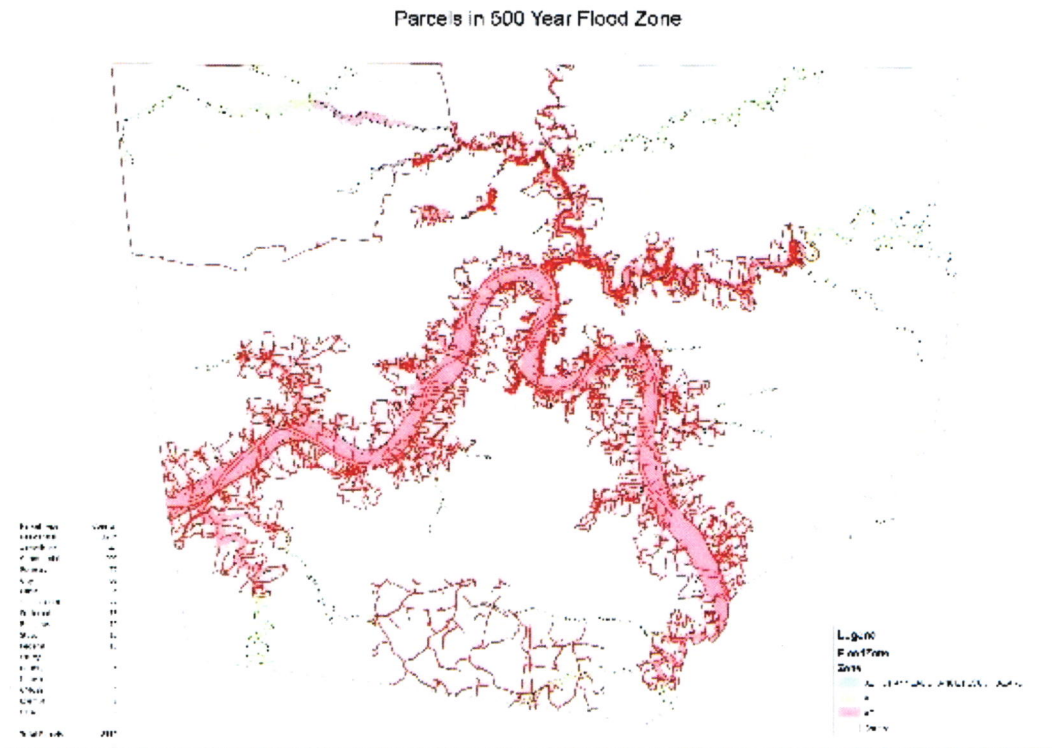
Throughout the past 10 year period from May 9, 2009 to May 9, 2019, the city/county experienced 16 reported flood and flash flood events causing approximately \$4,305,000 in property damage. Various degrees of flooding occurred with each of these events ranging from short-term flooding of lands in the primary flood plain to damage to homes and other property. The flood event that occurred on May 1, 2010 caused over \$1,900,000 in damage according to NWS storm data. Actual damages including infrastructure repairs were much higher. There were also two other flash floods that occurred in April of 2013 and July of 2016 in Montgomery County that estimated each of \$1 million worth of damages.

The Clarksville Wastewater Treatment Plant is the official weather reporting agency submitting climactic data to the National Weather Service.

Although the area receives an average of about 50 inches of precipitation annually, few of those events involve heavy rain over an extended period of time. It is reasonable to expect that based on yearly average data, the county can expect an average of two flood/flash flood events annually.

100yr/500yr Parcels Flood Zone Maps





Maps provided by APSU GIS

3.1.2 Exposure and Impact

Exposure to runoff flooding and flash flooding events occur most frequently in four (4) types of topography across the county: (1) flood plain areas adjacent to smaller streams and river tributaries which have no flood control structures, (2) over roadways that traverse drainage flowage paths, (3) land in primary flood plains, and (4) in most areas where excessive rainfall is impounded.

There is always the potential for pollution and noxious conditions that accompany standing, slowly draining water accumulations after heavy rains.

The extent of damage based on a scale of low, medium, and high where “low” equals minor curb-deep street flooding and “high” equals major flooding from the rivers above flood stage. “High” would be the worst case scenario for all three jurisdictions.

Damage in paths of drainage typically is caused by either an abnormally large volume of runoff that exceeds the capacity of the drainage system, or trash and debris accumulation during runoff which blocks drainage outlets. In these situations, the runoff water may seek other routes resulting in damage to areas normally unaffected.

Because such runoff often lasts for a relatively brief time, the damage may be limited to short term isolation, minor flooding of outbuildings, and for drivers not alert to conditions, vehicle drown-out or loss of control. If residential structures are affected the damage is normally minor although an inconvenience due to the brief inundation.

Many pumping stations related to water and sewer service are located within floodplains. Heavy rains causes these stations to be flooded which disables them and has caused problems related to wastewater backing up into the floodwaters.

Update: The pump stations have been raised. The wastewater treatment plant was completed in 2017.

Clarksville Wastewater Treatment Plant (completed)



Map provided by APSU GIS

Flash flooding with its high, rapid volume of runoff damages infrastructure by undercutting roads; washing away road shoulders, ditches, and culverts; and by depositing debris and silt on transportation routes. All these factors may affect roadways and railroads within Montgomery County.

Montgomery County and the City of Clarksville both began participation in the National Flood Insurance Program in June of 1984. Using data generated from the APSU GIS Center based on parcels intersecting with the '100 year' and '500 year' flood zones from a FEMA flood zone overlay. The overlay yielded an intersection of 2,288 parcels in 100-year flood zones (2,035 residential and 253 non-residential) and an additional 322



parcels (271 residential and 51 non-residential) within the 500-year flood zone. Of these 2,610 parcels within the flood zone, 324 NFIP policies were in effect within the city, and another 88 within the county.

According to information provided by FEMA as of September 12, 2019 there are currently 412 NFIP policies in effect for Montgomery County, including the City of Clarksville for a combined coverage of \$116,572,600.00. According to official records, there are twenty-nine (29) properties within Montgomery County and the City of Clarksville covered by the NFIP that have experienced *repetitive* flood losses. The total of these losses is \$1,492,853.90.

NFIP Policy Data for Montgomery County			
Jurisdiction	Policies In-Force	Insurance In-Force Whole \$	Written Premium In-Force
MONTGOMERY CO.	88	\$24,276,400.00	\$45,753.00
CLARKSVILLE	324	\$92,296,200.00	\$382,071.00

Policies In-force: number of NFIP flood insurance policies

Insurance In-force whole \$: value of building and contents insured by the NFIP

Written Premium In-force: total premiums paid for NFIP insurance policies

NFIP Loss Data for Montgomery County		
Jurisdiction	Number of Closed Paid Losses	Total Losses Paid
MONTGOMERY CO.	59	\$1,826,558.39
CLARKSVILLE	144	\$6,182,478.96

Closed Paid Losses: number of flood insurance claims paid to policy holders and closed

Total Losses Paid: total dollars paid to policyholders

According to the National Flood Insurance Program, repetitive flood loss is defined as a facility or structure that has experienced two or more insurance claims of at least \$1,000 in any given 10 year period since 1978. Within the NFIP, repetitive flood loss properties are usually considered the most vital structures to mitigate. The chart below provides a summary of repetitive losses for Montgomery County.



Repetitive Loss Properties for Montgomery County						
Jurisdiction	Type of Structure	Zone	Losses	Total Building Payment	Total Contents Payment	Total Paid
CLARKSVILLE, CITY OF	SINGLE FMLY	AE	3	\$258,209.54	\$4,377.29	\$262,586.83
CLARKSVILLE, CITY OF	NON RES.	EMG	2	\$33,976.76	\$0	\$33,976.76
CLARKSVILLE, CITY OF	SINGLE FMLY	EMG	2	\$13,667.28	\$0	\$13,667.28
CLARKSVILLE, CITY OF	SINGLE FMLY	AE	3	\$92,275.49	\$11,025.49	\$103,300.98
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$13,878.42	\$0	\$13,878.42
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$32,299	\$14,052.13	\$46,351.13
CLARKSVILLE, CITY OF	SINGLE FMLY	X	6	\$16,931.59	\$8,244.44	\$25,176.03
CLARKSVILLE, CITY OF	SINGLE FMLY	X	3	\$148,694.79	\$89,125.02	\$237,819.81
CLARKSVILLE, CITY OF	SINGLE FMLY	AE	2	\$14,704.47	\$0	\$14,704.47
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$11,397.66	\$232.26	\$11,629.92
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$32,392.38	\$0	\$32,392.38
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$18,682.19	\$25,646.56	\$44,328.75
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$12,848.57	\$2,612.56	\$15,461.13
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$15,693.88	\$1,181.57	\$16,875.45
CLARKSVILLE, CITY OF	SINGLE FMLY	AE	2	\$3,973.55	\$0	\$3,973.55
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$18,511.90	\$4,882.01	\$23,393.91
CLARKSVILLE, CITY OF	SINGLE FMLY	AE	2	\$48,875.91	\$20,000	\$68,875.91
CLARKSVILLE, CITY OF	SINGLE FMLY	C	2	\$4,973.54	\$3,907.93	\$8,881.47
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$12,354.82	\$0	\$12,354.82
CLARKSVILLE, CITY OF	SINGLE FMLY	X	2	\$71,171.76	\$1,979.22	\$73,150.98
CLARKSVILLE, CITY OF	SINGLE FMLY	X	3	\$60,670.80	\$7,325.67	\$67,996.47
MONTGOMERY COUNTY	SINGLE FMLY	X	2	\$8,218.78	\$0	\$8,218.78
MONTGOMERY COUNTY	SINGLE FMLY	X	2	\$10,238.63	\$0	\$10,238.63
MONTGOMERY COUNTY	SINGLE FMLY	X	2	\$53,233.77	\$0	\$53,233.77
MONTGOMERY COUNTY	SINGLE FMLY	C	3	\$96,637.86	\$27,308.94	\$123,946.80
MONTGOMERY COUNTY	SINGLE FMLY	X	3	\$45,741.93	\$15,337.86	\$61,079.79
MONTGOMERY COUNTY	SINGLE FMLY	A17	2	\$19,554.96	\$0	\$19,554.96
MONTGOMERY COUNTY	SINGLE FMLY	X	2	\$43,923.51	\$5,924.01	\$49,847.52
MONTGOMERY COUNTY	SINGLE FMLY	EMG	2	\$27,800	\$8,157.20	\$35,957.20

Disclaimer: The RL information in the table above was provided to us by FEMA (Federal Emergency Management Agency). Flood zones EMG, A17 and C are no longer valid floodzones used. EMG is obsolete, A17 (part of A1-A30) has been converted into the AE Zone, and C has been changed to the X zone.

To continue compliance with the NFIP, the jurisdictions have identified, analyzed, and prioritized three mitigation strategies to stay active with the program.

1. Continue to evaluate improved standards that are proven to reduce flood damage.
2. Maintaining supplies of FEMA/NFIP materials to help homeowners evaluate measures to reduce damage.
3. Maintaining a map of areas that flood frequently and prioritizing those areas for inspection immediately following heavy rains or flooding event.

Update: Since the 2010 flood, the City of Clarksville has had 7 home acquisition/demolition projects completed. Of the 7 properties, six were home buyouts and one was a furniture store.

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) W10 R1 or Depth
		Perennial Floodway
		0.7% Annual Chance Flood Hazard. Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile. Future Conditions 1% Annual Chance Flood Hazard
		Areas with Reduced Flood Risk due to Lower Sea Levels
OTHER AREAS OF FLOOD HAZARD		Areas with Flood Risk due to Lower Sea Levels
OTHER AREAS		Area of Minimal Flood Hazard
GENERAL STRUCTURES		Areas of Undetermined Flood Hazard
		Channel, Culvert, or Stream Shore
		Dike, Dam, or Floodwall
		Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Tranche
		Coastal Tranche Baseline Profile Hydrographic Feature
OTHER FEATURES		Base Flood Elevation Line (BFE) Line of Study Jurisdiction Boundary

For university and independent high school use only: the *Florida Holocaust Study Report* for this jurisdiction.

To determine if a local chapter is eligible to be included, contact your designated agency or call the National Jewish Post-Opinion Program at 1-800-444-2444.

Additional information about the program is available from the United States Holocaust Memorial Museum's Holocaust Educational Resource Center, 1000 Wisconsin Avenue, N.W., Washington, D.C. 20007, (202) 388-2300, <http://www.ushmm.org>. Other sites also list chapters from the past and present, including the following:

- <http://www.ushmm.org/education/teachingmaterials/teachingmaterials.cfm>
- <http://www.ushmm.org/education/teachingmaterials/teachingmaterials.cfm>
- <http://www.ushmm.org/education/teachingmaterials/teachingmaterials.cfm>

The Department of Transportation (DOT) and have a 10-year ground clearance.

PANEL LOCATOR

0 750 500 250 1,000 2,000 meters
0 125 625 2500 feet

Mammography Unit

0208 0229 0235
0217 0236 0237 0241
0220 0238 0239 0243

NATIONAL FLOOD INSURANCE PROGRAM
 FLOOD INSURANCE RATE MAP

**MONTGOMERY COUNTY,
 TENNESSEE**
 (Map of Montgomery County)

Panel: **236 of 491**

Policy Community

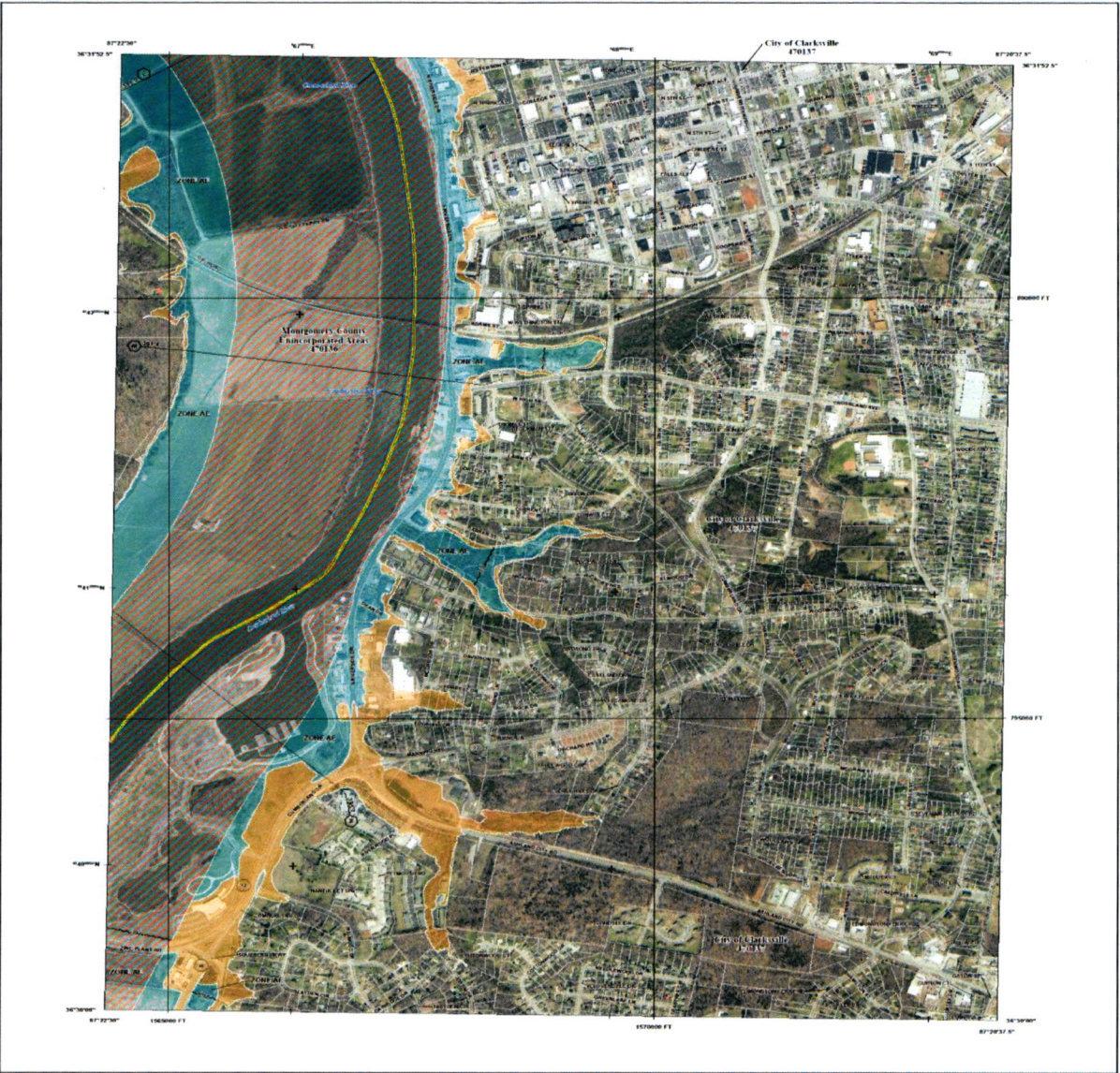
COMMUNITY	NUMBER	PANEL	SUFFIX
13 MONTGOMERY, CITY OF	47021	0216	6
14 MONTGOMERY COUNTY	47022	0216	6

**REVISED
 PRELIMINARY
 10/7/2019**

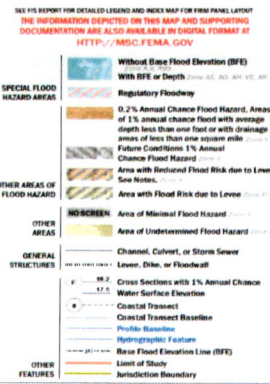
VERSION NUMBER:
 2.8.8S
 MAP NUMBER:
 4712NC0236
 MAP REVISION:



Montgomery County, TN Preliminary FIRM Map



FLOOD HAZARD INFORMATION

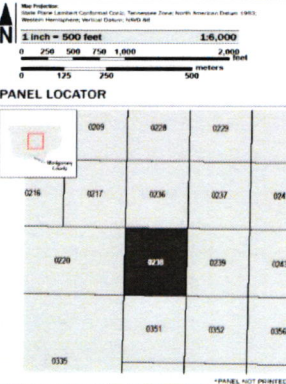


NOTES TO USERS

The information and data used in this Flood Insurance Rate Map (FIRM) are derived from a variety of sources, including aerial photography, ground surveys, and other data. The information is provided for informational purposes only and is not intended to be used for any other purpose. The information is provided for informational purposes only and is not intended to be used for any other purpose.

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SCALE



FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FEDERAL INSURANCE COASTAL MAP
MONTGOMERY COUNTY, TENNESSEE
Panel 238 of 491

COMMUNITY
CLARKVILLE, CITY OF
MONTGOMERY COUNTY, TENNESSEE

NUMBER 47033
PANEL 238
SUFFIX 1

PRELIMINARY
6/29/2018

VERSION NUMBER 2.4.3.5
MAP NUMBER 47033C0238E
MAP REVISION



3.1.3 Consequences

For residential property owners, the consequences of flooding are potential exposure to mold, deposited pollutants, loss of access to personal property, economic diversion of disposable income for recovery expenses in lieu of normal living expenditures, loss of time from employment and expense for alternate living accommodations. For the non-residential property owner, there is loss of business, sometimes layoff for employees, loss of inventory, and recovery operations to manage.

For local governments, the most significant consequence is a diversion of resources away from normal use and the imposition of overtime pay related to maintenance and emergency operations (sandbagging, temporary signage and barricades, etc.). Limited school closures could be expected mainly due to road blockages, and possible minor flooding around facilities.

3.1.4 Loss Estimation

Flooding Extent – The severity of flooding in Montgomery County is measured by inches of rainfall and by feet of flooding. Based on previous occurrences, it is possible for the extent of a flooding event to exceed 10 inches of rainfall locally and upstream amounts in the same record flood event of over 15 inches of rain. This rain caused the Cumberland in Clarksville to reach a historical flood stage of 62.58 feet in the span of 2 days in Montgomery County.

Given a worst-case scenario, with generally heavy rainfall over a prolonged period, the potential exists for as many as 2,306 residential parcels and as many as 304 other parcels in the floodplain to be flooded for at least one or more days. Due to the topographic character of the county, it is estimated that no more than 30% of the potential structures subject to flood damage would be affected in this scenario.

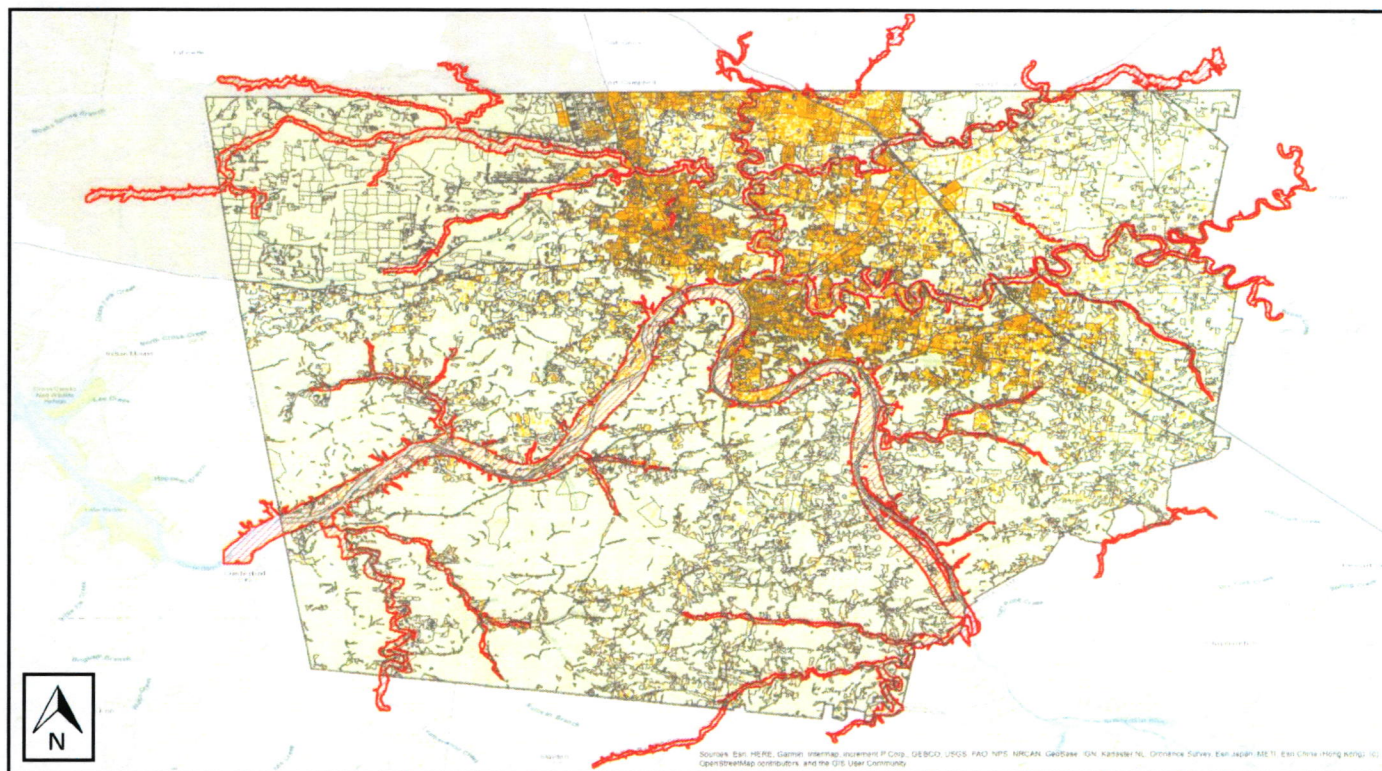
As discussed earlier, the impact on residences that is caused by the blockage or overloading of drainage systems is usually minor but still causes losses through overtime and materials expended by the street and highway departments in attempting to control the rising waters.

Note that this loss estimate does not take into consideration costs for temporary shelter for dislocated residents, the value of functional downtime nor displacement time for affected businesses.

No human losses are projected for the flood event scenarios. Tragically, as seen in the 2010 floods, some of the deaths that occurred in the region occurred from vehicles entering water on the roadways or other accidents not related to homes or businesses being flooded.



Montgomery County HAZUS Results for 500 Year Flood Event



(Provided by TEMA Mitigation Planner)



General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Tennessee

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 544 square miles and contains 3,731 census blocks. The region contains over 64 thousand households and has a total population of 172,331 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 62,303 buildings in the region with a total building replacement value (excluding contents) of 15,872 million dollars. Approximately 94.36% of the buildings (and 81.51% of the building value) are associated with residential housing.



Building Inventory

General Building Stock

Hazus estimates that there are 62,303 buildings in the region which have an aggregate total replacement value of 15,872 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure (\$1000)	Percent of Total
Residential	12,937,313	81.5%
Commercial	1,875,985	11.8%
Industrial	421,991	2.7%
Agricultural	37,679	0.2%
Religion	315,164	2.0%
Government	45,968	0.3%
Education	238,105	1.5%
Total	15,872,205	100%

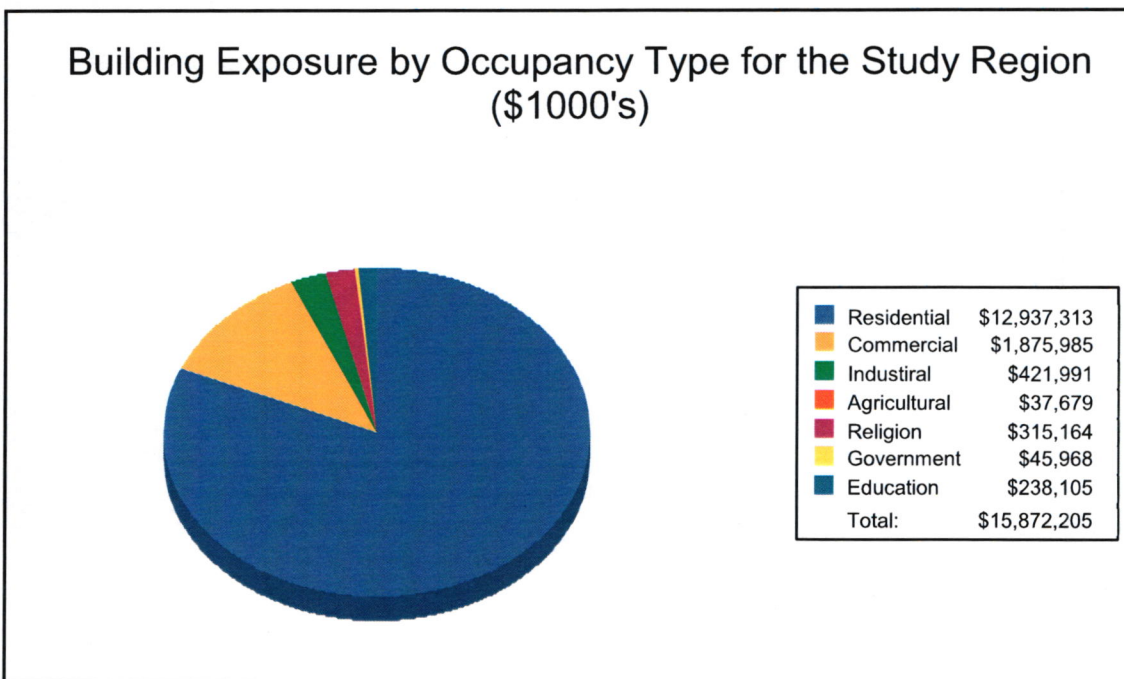
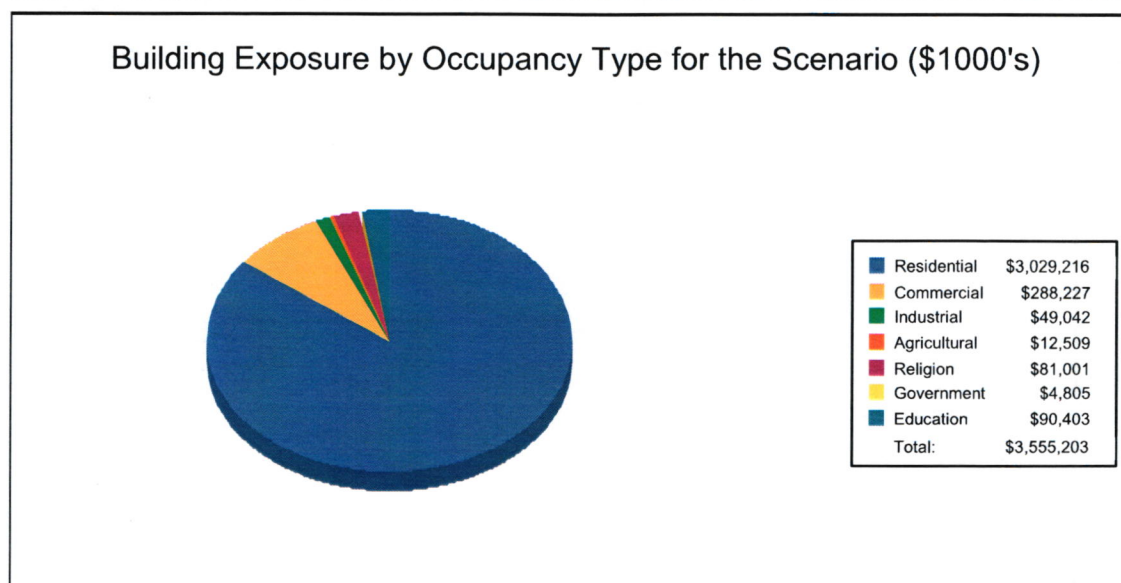




Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure (\$1000)	Percent of Total
Commercial	288,227	85.2%
Industrial	49,042	1.4%
Agricultural	12,509	0.4%
Religion	81,001	2.3%
Government	4,805	0.1%
Education	90,403	2.5%
Residential	3,029,216	85.2%
Total	3,555,203	100%



Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 179 beds. There are 42 schools, 2 fire stations, 4 police stations and no emergency operation centers.

Building Damage

General Building Stock Damage

Hazus estimates that about 1,087 buildings will be at least moderately damaged. This is over 14% of the total number of buildings in the scenario. There are an estimated 713 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.

Total Economic Loss (1 dot = \$300K) Overview Map

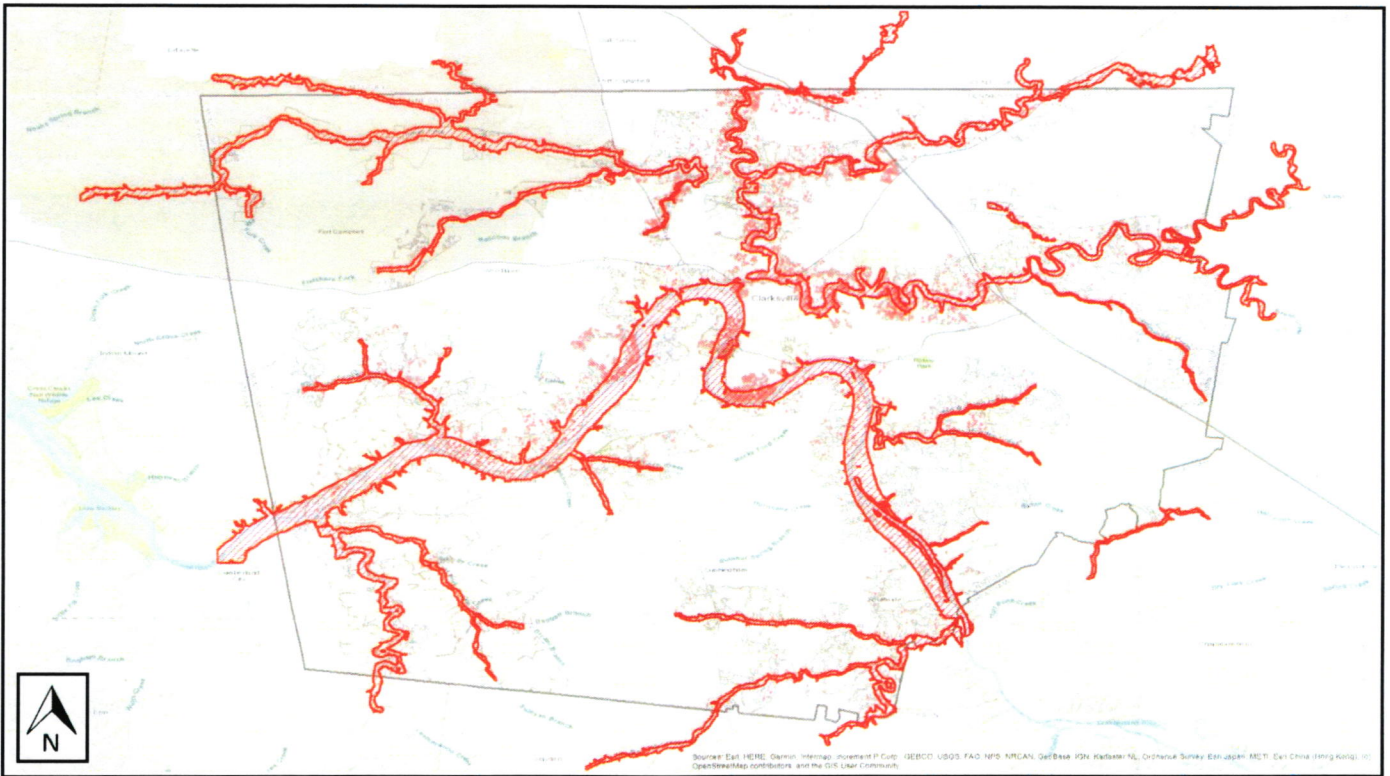
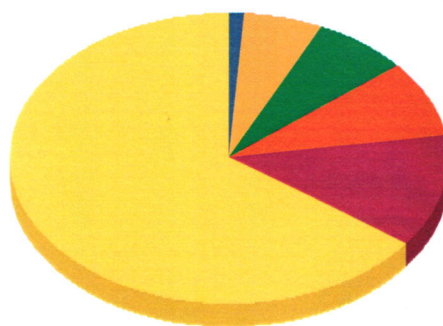




Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	1	25	1	25	0	0	2	50
Education	0	0	1	100	0	0	0	0	0	0	0	0
Government	0	0	1	100	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	2	100	0	0	0	0	0	0	0	0
Residential	12	1	60	5	75	7	94	9	139	13	711	65
Total	12		64		76		95		139		713	

Counts By Damage Level



Damage Level 1-10	12
Damage Level 11-20	64
Damage Level 21-30	76
Damage Level 31-40	95
Damage Level 41-50	139
Damage Level >50	713
Total:	1099



Table 4: Expected Building Damage by Building Type

Building	1-10		11-20		21-30		31-40		41-50		>50	
Type	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
Manuf/Housing	0	0	0	0	0	0	0	0	0	0	29	100
Masonry	0	0	4	5	4	5	6	8	7	9	56	73
Steel	0	0	1	50	0	0	0	0	0	0	1	50
Wood	12	1	59	6	72	7	90	9	132	13	637	64



Essential Facility Damage

Before the flood analyzed in this scenario, the region had 179 hospital beds available for use. On the day of the scenario flood event, the model estimates that 179 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	0	0	0	0
Fire Stations	2	0	0	0
Hospitals	1	0	0	0
Police Stations	4	0	0	0
Schools	42	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

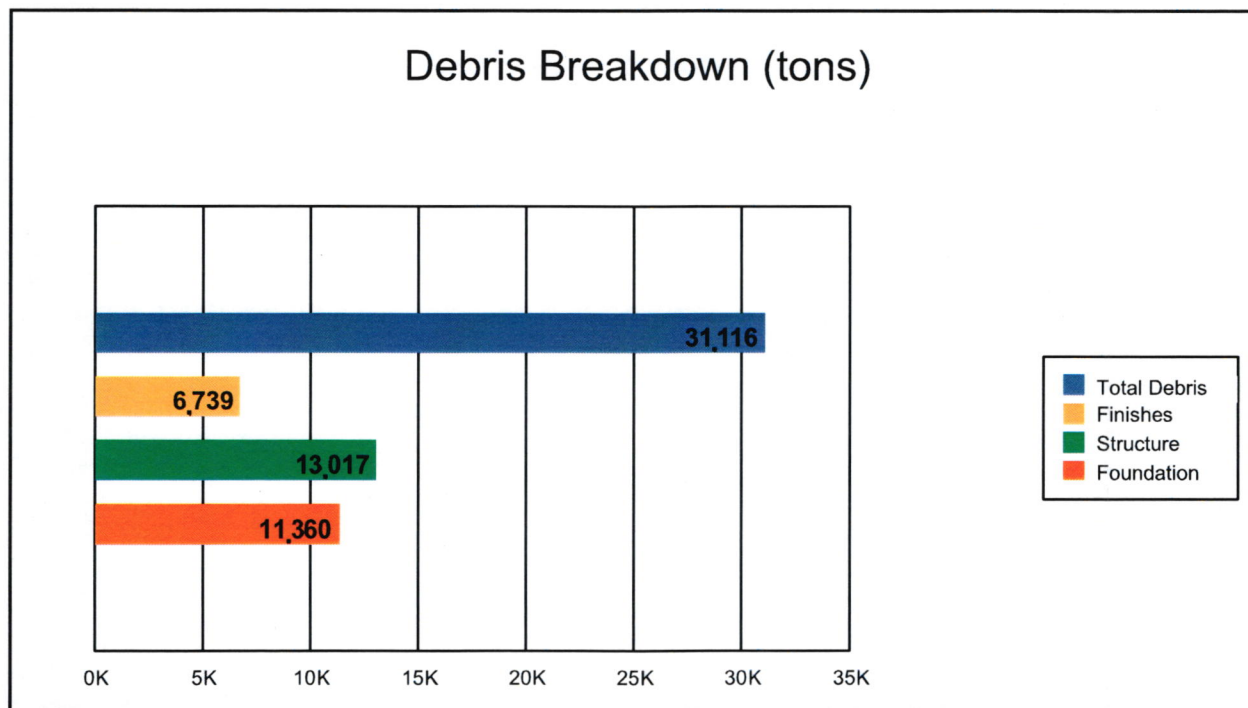
- (1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.
- (2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.



Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.



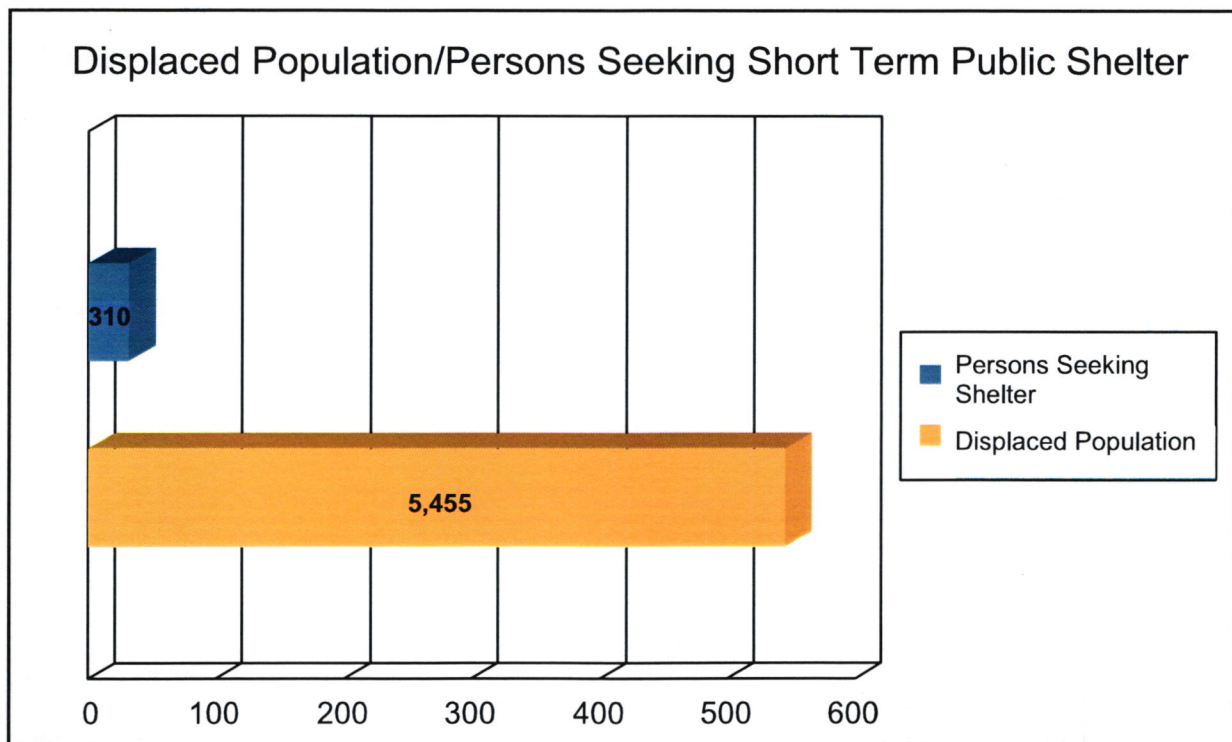
The model estimates that a total of 31,116 tons of debris will be generated. Of the total amount, Finishes comprises 22% of the total, Structure comprises 42% of the total, and Foundation comprises 37%. If the debris tonnage is converted into an estimated number of truckloads, it will require 1245 truckloads (@25 tons/truck) to remove the debris generated by the flood.



Social Impact

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 1,818 households (or 5,455 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 310 people (out of a total population of 172,331) will seek temporary shelter in public shelters.





Economic Loss

The total economic loss estimated for the flood is 691.94 million dollars, which represents 19.46 % of the total replacement value of the scenario buildings.

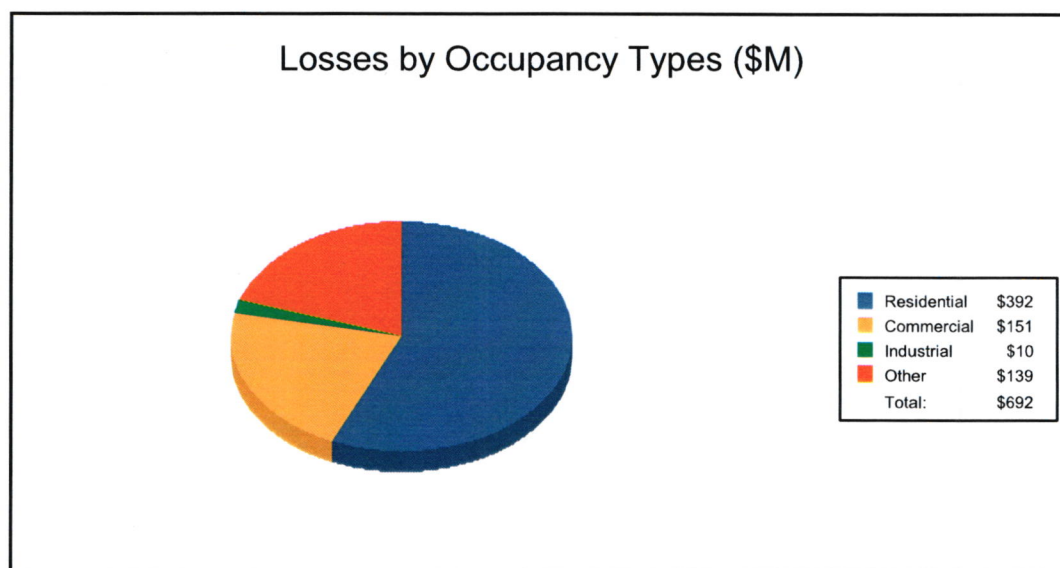
Building-Related Losses

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 488.84 million dollars. 29% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 56.61% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Building Loss</u>						
	Building	224.16	25.57	3.51	23.78	277.02
	Content	108.91	47.61	5.54	47.38	209.44
	Inventory	0.00	1.44	0.80	0.15	2.39
	Subtotal	333.07	74.63	9.85	71.30	488.84
<u>Business Interruption</u>						
	Income	0.37	31.15	0.23	16.91	48.66
	Relocation	43.07	7.15	0.10	7.86	58.18
	Rental Income	14.36	5.49	0.02	0.64	20.52
	Wage	0.87	32.56	0.21	42.12	75.75
	Subtotal	58.66	76.35	0.56	67.53	203.10
	Total	391.73	150.98	10.41	138.83	691.94



3.1.5 Mitigation Approaches

Mitigation options for flooding are of several forms. Flood control structures on the Cumberland demonstrate the effectiveness of major, long-term flood control measures. On a smaller, community basis however, the economics of such efforts do not have an apparent, similar cost-benefit. It is easier to control and restrict the use of the land in flood prone areas than it is to build and maintain dams and levees.

Warning signage, both of permanent and temporary nature in areas subject to runoff flooding have been and continue to be utilized to advise vehicle operators to be alert for flood conditions and standing water in roadways. Placement of such signage is predicated upon years of experience and identification of flood prone areas, whether adjacent to riverine areas or in impoundment areas on “high ground.”

Social media is being used more often now as an additional tool to get information out to the public in a timely manner. County and local governments use media outlets and also have websites, Facebook, and Twitter accounts that send out updates as needed to assist in community awareness.

Continuous improvement in weather forecasting and local alerts and advisories via mass media (radio, cable, and broadcast television) has given local residents improved opportunity for watchfulness and personal planning. Special NOAA radio receivers are available to receive not only weather watches and warnings for the community as well as routine weather information from the National Weather Service Emergency Broadcasting System, but also all-hazards notifications. In 2004 the city installed an outdoor early warning system in large outdoor assembly areas (major parks and school stadiums) with voice advisories having the capability of giving advance warning of potential flood and flash flood conditions, as well as any other impending hazard. Driven by the National Weather Service information system with automated USGS stream gauging system data, anticipated flash flood warnings are available around the clock.

Land use planning conducted via the Clarksville-Montgomery County Regional Planning Commission, the City of Clarksville building and Codes, the Montgomery County Building and Codes Storm Water Division, flood



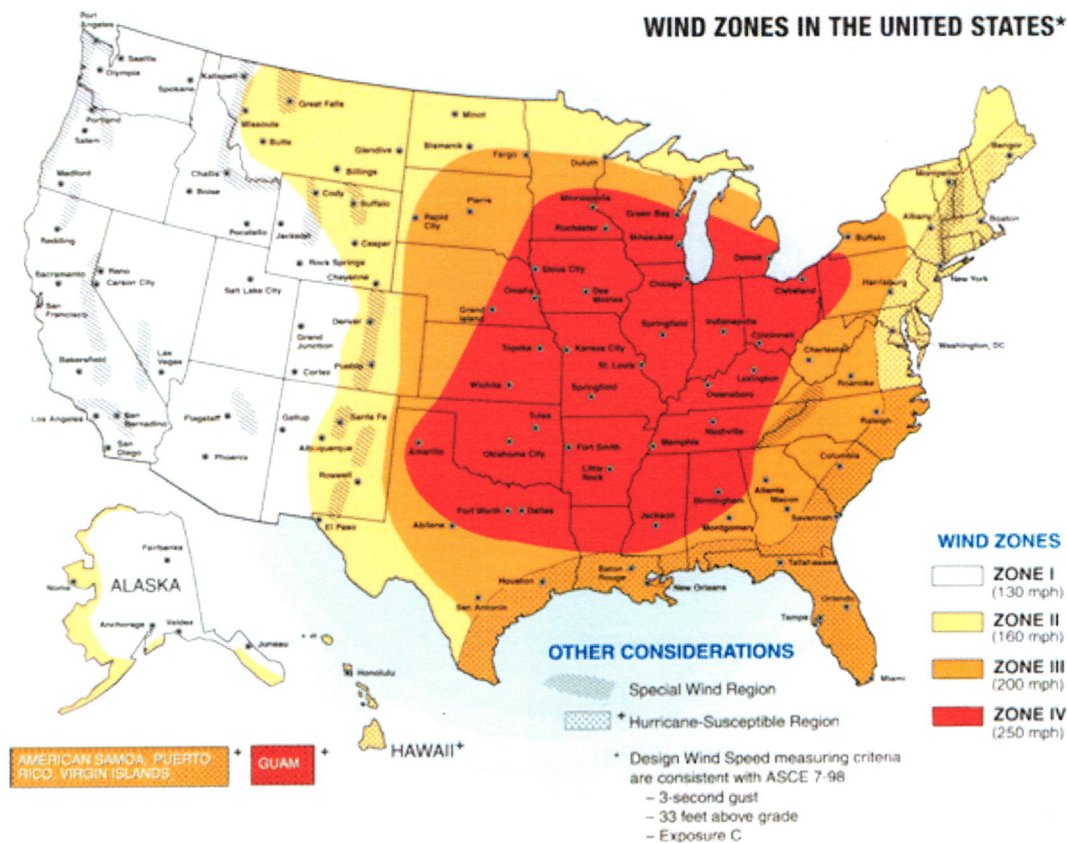
plain mapping, and cooperative efforts from the risk management industry assure that proactive efforts to reduce or eliminate damage from flood events in our populated areas are aggressively pursued.

Rigorous zoning and permit enforcement by both city and county, and compliance with floodway management regulations are not only cost efficient, but they also contribute to maintenance of nature's handiwork. Both county and city permit issuance practices contribute to reduction of the potential for flood hazard damage. All county and city planning and permitting actions are analyzed to ensure that when permits are issued they will be in compliance with NFIP standards. Any flood mitigation projects will be prioritized based on a benefit-cost analysis to maximize the benefits of each project based on the cost associated with it.

Other options available to mitigate damage from flood events include elevation of structures in flood prone areas. New construction requires such measures and both city and county permitting and codes enforcement units ensure this is the case. Elevation of existing structures in flood areas can alleviate the potential for flood event damage. Relocation of structures or acquisition and demolition of subject areas and converting the areas into permanent public greenways, parks, and public use facilities are other options. Currently, there are no projects waiting in this category.

3.2 Tornado/High Wind Hazards

Montgomery County (Including the City of Clarksville and the Clarksville-Montgomery County School System) is located just northwest of Nashville, Tennessee on the Kentucky/Tennessee border. This places us in Zone IV (highest level) of the FEMA Design Wind Speed Map for structural design of community shelters, as shown below.



FEMA Library, https://www.fema.gov/pdf/library/ism2_s1.pdf Retrieved November 5, 2019

Climatology records (<http://www.ncdc.noaa.gov/stormevents>) indicate 31 tornadoes have been recorded in Montgomery County (Including the City of Clarksville, and The Clarksville-Montgomery County School System) since November 18, 1957. Of these tornadoes, 8 were graded EF0 (F0), 15 were EF1 (F1), 5 were EF2 (F2), 2 were EF3 (F3) and 1 was an EF4 (F4). The total damage from these events is 86.213 million dollars.

The most recent tornadoes that struck Montgomery County on February 24, 2018 caused \$8 million worth of damages. These two tornadoes struck within minutes from each other producing an EF2 and EF1 tornado.

Four EF1 tornadoes struck on the same day on May 2, 2008 causing \$145,000 damage in the county and the city.



The January 22, 1999 EF3 (F3) tornado that struck downtown Clarksville and areas within Montgomery County produced 72.7 million dollars in damages.

Fujita Scale		Enhanced Fujita Scale*	
F-0	40–72 mph winds	EF-0	65–85 mph winds
F-1	73–112 mph	EF-1	86–110 mph
F-2	113–157 mph	EF-2	111–135 mph
F-3	158–206 mph	EF-3	136–165 mph
F-4	207–250 mph	EF-4	166–200 mph
F-5	251–318 mph	EF-5	>200 mph

Complete Tornado, <https://www.teamcomplete.com/tornado/> Retrieved November 5, 2019

Note: Updated tornado history is transcribed under the Enhanced Fujita Scale from the decommissioned Fujita Scale that when into effect on February 1, 2007. The May 2, 2008 tornados were the first ones that were classified with the enhanced fujita scale. The EF5 tornado would be the worst case scenario for all three jurisdictions.

A graphical plot of the locations of tornados which have struck the county shows that the preponderance of the events have been located in the southern half of the county (it should be noted that the amount of damage in the southern half of the county comprises a very small percentage of the damage from these tornadoes due to the rural nature of the area and less dense industrial concentration. Storms with damaging winds showed no preponderance to any particular area.

From July 1, 2005 through July 31, 2019, the County (Including the City of Clarksville, and The Clarksville-Montgomery County School System) experienced 144 severe thunderstorm and high wind events, with cumulative damage estimated at \$1,736,000.00. It is believed that tornadoes or severe wind damage in the rural and sometimes rugged southern sections of the county may have gone unreported until the early 1980's when the county began to experience a building boom. Longtime residents of these areas support this supposition.

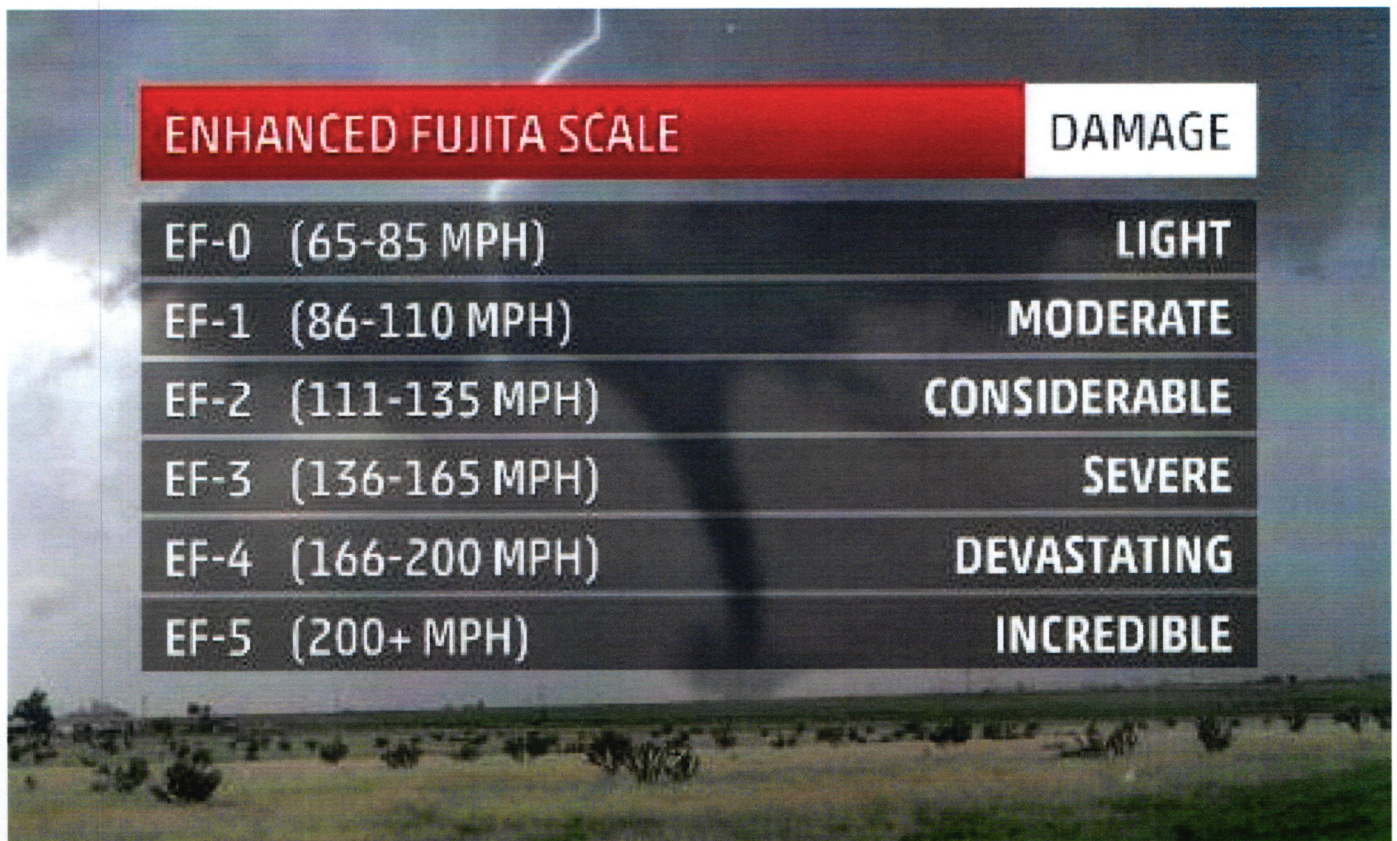
Update: The most recent High Wind Storm with winds of 60 mph occurred on October 26, 2019 causing excessive amounts of damage throughout Montgomery County and several other counties. The storm left thousands without power for nearly a week and caused over 90 households to evacuate their destroyed homes. Over 600 houses, including mobile homes and the Clarksville Regional Airport were damaged on a scale of destroyed to minor. The initial costs to restore power across the county was estimated between \$3-4 million. Total costs of damage are still being worked, as well as the debris removal is still in process.

3.2.1 Probability and Frequency

Based on the historical data, damaging wind storms can be expected to occur nine times annually within the jurisdictions. The most "active" season for damaging winds is the May-June-July period, with the peak occurring during June.

Local tornado events, based upon historical frequency over the past 62 years of recorded events, leads to a prediction of a tornado in the county on the average of once each 3.1 years. However, in some years and even on some dates (such as May 5, 2008 and February 24, 2018) multiple occurrences occur.

Enhanced Fujita Scale



ENHANCED FUJITA SCALE		DAMAGE
EF-0	(65-85 MPH)	LIGHT
EF-1	(86-110 MPH)	MODERATE
EF-2	(111-135 MPH)	CONSIDERABLE
EF-3	(136-165 MPH)	SEVERE
EF-4	(166-200 MPH)	DEVASTATING
EF-5	(200+ MPH)	INCREDIBLE

*** **IMPORTANT NOTE ABOUT ENHANCED F-SCALE WINDS:** *The Enhanced F-scale still is a set of wind estimates (not measurements) based on damage.* Its uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to 28 indicators. These estimates vary with height and exposure. **Important:** The 3 second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, "one minute mile" speed.

Montgomery County, TN- High Wind Storm Damage (October 26, 2019)



Photos provided by Montgomery County Emergency Management Agency





Photos provided by Montgomery County Emergency Management Agency



Montgomery County, TN- Tornado Damage (February 24, 2018)



Photos provided by Montgomery County Emergency Management Agency





Photos provided by Montgomery County Emergency Management Agency

3.2.2 Exposure and Impact

As the county (Including The City of Clarksville, and The Clarksville-Montgomery County School System) becomes more urbanized and more subdivisions are developed, the “windbreaks” planted or that occurred naturally have been replaced by rows of residential structures. The mature, aging trees which are left in place often are more susceptible to damage from winds without the partial protection from brush and smaller trees.

A second factor contributing to damage from wind events is the widespread use of mobile homes. Data shows that the rate of loss for residential structures is twice as high for mobile homes as it is for site-built homes. Residents of mobile homes are at greater risk since these homes do not withstand high wind speeds as well as permanent, site-built structures due to the nature of their construction, and antiquated anchoring methods. Hurricane proof anchoring systems have been developed, but a tiny percentage of local mobile homes have had this technique applied.

The extent of damage based on The Enhanced Fujita - Scale and EF5 tornado would be the worst case scenario for all three jurisdictions.

3.2.3 Consequences

The damage from a tornado or severe thunderstorm varies from trees in roadways to entire homes demolished. They can leave a community without power and interrupt other utilities.

During the 1999 F3 tornado which hit all three jurisdictions, buildings were ripped from their foundations causing gas and water lines to break and leak. This added another element to an already hazardous situation.



The impact of these storms or tornadoes on people's lives must also be taken into account, in addition to the destruction of buildings and infrastructure. The 2018 EF2 and EF1 tornadoes that struck Montgomery County minutes apart didn't cause any deaths, but there were two injuries reported. The 2002 F1 tornado caused the deaths of two citizens who resided in a mobile home. During the 1999 F3 tornado there were no deaths, but 5 minor injuries. The preponderance of mobile homes in some areas of Montgomery County could prove to be deadly if a tornado or severe storm were to strike.

3.2.4 Loss Estimation

Tornado/Wind Storm Extent – The severity of Tornadoes in Montgomery County is measured by historical events and current population and building trends. Based on previous occurrences, it is possible for the extent of a tornado to reach the EF-4/5 scale. An EF-5 tornado following the same storm path as the January 1999 F-3 tornado during normal business hours or a weekend using current growth trends in commercial, residential, and industrial buildings could be catastrophic in damage and fatalities.

Tornadoes which have occurred over the last few years have caused property damage ranging from \$15,000 to the central city devastation at \$8 million. Our history of damage from the smaller tornados has averaged \$185,000 per event. Severe thunderstorm events in the past 14 years have caused average per event damage over \$13,000. All tornadoes and storms have caused damage such as downed trees, power lines, and debris covering roadways. Overtime and equipment costs were incurred during the clean-up of these items.

Loss estimations in terms of vulnerability to damage from tornados and wind storms are virtually impossible to classify based on any type of scale such as the hundred year flood plain that limits the scope of damage to a predictable geographic location, along with a known amount of buildings, critical facilities, and transportation and utilities within that geographic area.

The only damage values that are reliable are the cost of replacement or repair of private property and government facilities/infrastructure after the event. For the purpose of planning for a worst case scenario the mitigation team determined that using the 30% estimate of damage for an event would be a plausible worse case destruction scenario.

HAZUS MH information summarized in the following paragraphs for buildings, critical facility, and transportation and utility lifeline inventory was used as a basis to define worst case scenario replacement values as our loss estimation.

Building Inventory

Building Inventory

HAZUS estimates that there are 62,303 buildings in the study region with an aggregate total replacement value of \$15,872 million. Building construction types found in the region are 64% wood frame construction. The remaining percentage is distributed between the other general building types.

30% of 62,303 buildings is 18,690.9

30% of the \$15,872 million replacement value would be \$4,761,600 million

Building stock – Throughout the county many buildings and the majority of the infrastructure networks can be vulnerable to tornado impacts. Montgomery County's building stock can be broken down to the following



percentage categories based on the HAZUS information provided by the state mitigation section: 81.5% Residential, 11.8% Commercial, 2.7% Industrial, 0.2% Agricultural, 2.0% Religion, 0.3% Government, and 1.5% Education.

3.2.5 Mitigation Approaches

Three predominant strategies exist as key measures for mitigating life and property losses associated with wind events. The first is regulatory in nature and includes land use planning and zoning -- including reduction of building density -- and the subsequent adoption, enforcement and compliance of appropriate codes to assure that construction standards resistant to thunderstorm winds, wind shear, and tornadic events are in place.

Montgomery County has adopted the 2009 International Code Council Building Codes on September 12, 2011. These codes require buildings to be designed and built to withstand wind speeds of 90 MPH.

Second, is an aggressive public awareness program of the dangers of wind hazards and the self-help options available to home owners to reduce their vulnerability and the possibility of damage to their personal property, as well as other information resources that are available to the public in the form of storm tracking and weather advisories. The electronic siren/warning system project developed by the city with TEMA assistance augments public awareness of impending destructive storm watches and warnings.

The third approach is the design and construction of shelters, whether personal or community shelters, for protection from wind events. Unfortunately, even with recent events involving fatalities, public outreach and education, the community is generally uninformed about tornado and strong wind protection.

There is little difference in the mitigation approaches for tornado events and severe wind events. Of primary consideration is the insistence upon quality construction practices and an aware, informed population.



3.3 Winter Storm Hazards

Montgomery County (Including the City of Clarksville and The Clarksville-Montgomery County School System) generally has mild winters but property damaging winter storms do occur. Much of this can be attributed to our location on the Northern border of Tennessee and the proximity to one of the major jet streams of the United States which carries arctic air southward into the United States.

3.3.1 Probability and Frequency

From January 1, 2015 through January 15, 2018, Montgomery County has experienced 6 significant snow and ice events. Some years multiple storms hit while some have none. An average of one major winter storm per year can be expected.

The most recent winter storm occurred on January 15, 2018 with reports indicating 3-6 inches of snow fall throughout Montgomery County. The temperatures dropped into the single digits and even below zero in some areas. It led to snow and ice lingering on the roadways for several days. Schools were closed, as well as city offices due to the snow on the roads and road closures due to accidents. There were no injuries or deaths reported.

On January 21, 2016 freezing rain changed to snow with Montgomery County accumulating nearly 5-8 inches of snow over a duration of 3 days long. Temperatures remained below freezing, causing ice to surface on roads, power lines and trees. There were several vehicle accidents and power outages throughout the county. There were no injuries or deaths reported. However, the damages of this storm estimated at \$10,000.

3.3.2 Exposure and Impact

Due to the nature of this hazard the entire County is exposed to this hazard, including the City of Clarksville, and the Clarksville-Montgomery County School System.

The following is the terminology used by the National Weather Service to classify the strength/hazard potential of winter weather.

Winter Weather Advisory- It is expected to create hazardous or restricted travel conditions, but not as severe as expected with a winter storm.

Winter Storm Watch- A significant winter storm may affect your area, but its occurrence, location, and timing are still uncertain. A winter storm watch is issued to provide 12 to 36 hour's notice of the possibility of severe winter weather.

Winter Storm Warning- A warning is used for winter weather conditions posing a threat to life and property.

The extent of damage using the weather terminology classification as a damage scale with a Winter Weather Advisory equals the low end of the scale and high equals a Winter Storm Warning. The Winter Storm Warning would be the worst case scenario for all three jurisdictions.



Besides the obvious impact of ice and snow there is often the problem of accompanying high winds that causes drifting and later, flooding once melting begins. Areas prone to flooding are then inundated with the melt off from the remaining snow and ice.

3.3.3 Consequences

Loss of utilities is not unusual during these winter storms. Common causes are falling trees and large branches from the weight of the snow and ice, frozen pipes, and ice accumulation on overhead utility lines. Repair crews are slowed by road conditions as the Street and Highway Departments work to clear the roadways.

Transportation also becomes a problem during these storms. The general public is unable to operate as they normally do thereby causing a negative impact on the local economy due to their being unable to report to work and inability to go about their normal business.

Due to the distances traveled by salt trucks and snowplows significant time is added to getting roads cleared or treated and reopened. Experiments with temporary stockpiling salt in some school parking lots with impending storm announcements have proven to be useful if the storm hits as predicted.

Response times of emergency services are also affected by these storms. Response times are extended due to road conditions and the danger of running emergency traffic is multiplied many times over.

3.3.4 Loss Estimation

Winter Storm Extent – The severity of Winter Storms in Montgomery County is measured by historical events and current population and building trends. Based on previous occurrences, it is possible for the extent of an event to exceed 6 inches of sleet and ice in a single storm. There have been snow fall amounts exceeding 6 inch amounts several times in the past, but the impacts of snow alone are typically easier to recover from. An ice/sleet event on March 2, 2014 consisted of localized amounts of over 6-8 inches of sleet on top of freezing rain, followed by additional fresh snow. Temperatures remained in the twenties and teens for much of the next week which kept the ice and snow on the ground and on the streets. Road salt and brine were ineffective on ice with temperatures below 28 degrees Fahrenheit so some secondary roads and streets remained ice covered for nearly a week. The mixed precipitation caused significant problems road crews who could not keep the roads cleaned. Emergency services units in some cases could not even get out of their parking lots. Many units were stuck or damaged while on calls. Regular vehicle traffic ground to a halt, and multi-vehicle accidents were common. Current growth trends in commercial, residential, and industrial building locations will continue to strain current levels of equipment for winter road treatments and clearing.

Losses in utility operation and in transportation are difficult to estimate. Interruption of these services affects so many variables it is nearly impossible to calculate. Losses to commerce and industry can be substantial due to reduced workforce availability during and following the storms (i.e. – transportation difficulties) and possible utility losses (water, electricity, natural gas, etc.).

The historical 27 winter storms on record has caused property damage totaling \$290,000 plus uncalculated valuation of road and street crew overtime and equipment operation costs. Because our community is not plagued with numerous recurring winter storms annually, neither the city nor the county has extensive snow removal equipment inventories which does slow the removal process when heavy accumulations occur.



Loss estimations in terms of vulnerability to damage from winter storms are virtually impossible to classify based on any type of scale such as the hundred year flood plain that limits the scope of damage to a predictable geographic location, along with a known amount of buildings, critical facilities, and transportation and utilities within that geographic area. The only damage values that are reliable are the cost of replacement or repair of private property and government facilities / infrastructure after the event. For the purpose of planning for a worst case scenario the mitigation team determined that using the 30% estimate of damage for an event would be a plausible worse case destruction scenario

HAZUS MH information summarized in the following paragraphs for buildings, critical facility, and transportation and utility lifeline inventory was used as a basis to define worst case scenario replacement values as our loss estimation.

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30% of the \$15,872 million replacement value would be \$4,761,600 million

Building stock – Throughout the county many buildings and the majority of the infrastructure networks can be vulnerable to winter storm impacts. Montgomery County's building stock can be broken down to the following percentage categories based on the HAZUS information provided by the state mitigation section: 81.5% Residential, 11.8% Commercial, 2.7% Industrial, 0.2% Agricultural, 2.0% Religion, 0.3% Government, and 1.5% Education.

3.3.5 Mitigation Approaches

One mitigation approach for winter storm hazards is the adoption and enforcement of building codes and regulations designed to reduce losses in new and retrofit construction whether they be structures or utility infrastructure. Enforcing the building codes relative to snow loads and wind loads for the area would be a cornerstone of any mitigation for this hazard.

Another approach to address snow and ice removal during and after winter storms would be the construction of salt sheds throughout the county and city. This would significantly reduce the distances that these trucks currently travel for supplies thereby reducing the time available to clear the roads and streets. This would have the added benefit of reduced overtime and fuel costs during these storms.

3.4 Earthquake Hazards

No portion of the United States is immune from the potential for an earthquake hazard. Geologic hazard maps of Tennessee indicate that while no earthquakes of substance have occurred in the three jurisdictions, we would feel the results of events elsewhere such as the massive earthquakes of December 1811 – February 1812 in the New Madrid Seismic Zone, approximately 120-130 miles due west of Clarksville.

Different scales have been developed to measure seismic activity. The Richter Scale is used to measure magnitude and is reported in whole numbers and decimals ranging from 1 to 10. For example, a quake with a magnitude of 5.0 is classified as a moderate event. The major earthquakes of the New Madrid events are estimated to have ranged from magnitude of 7.0 to a magnitude of 8.6.

The effect on the earth's surface of an earthquake is called the intensity. This scale (the Modified Mercalli Intensity scale – MMI) is arranged in 12 different levels from imperceptible to catastrophic. The New Madrid quakes were estimated to be in the X to XII range. With an intensity of V, for example, nearly everyone would feel the quake, some dishes, and windows may be broken, and unstable objects would be overturned.

Geologic studies indicate that three jurisdictions appear to sit in the center of an “island” in relation to the surrounding regions which have faults. There is one small, inactive fault near the north edge of Montgomery County, and two other fault structures nearby. The largest is the Wells Creek Structure near the southwest corner of the county, and the other is a single fault line running southwest to northeast just north of Nashville. The fault lines in the Wells Creek site are resultant of a meteor impact.

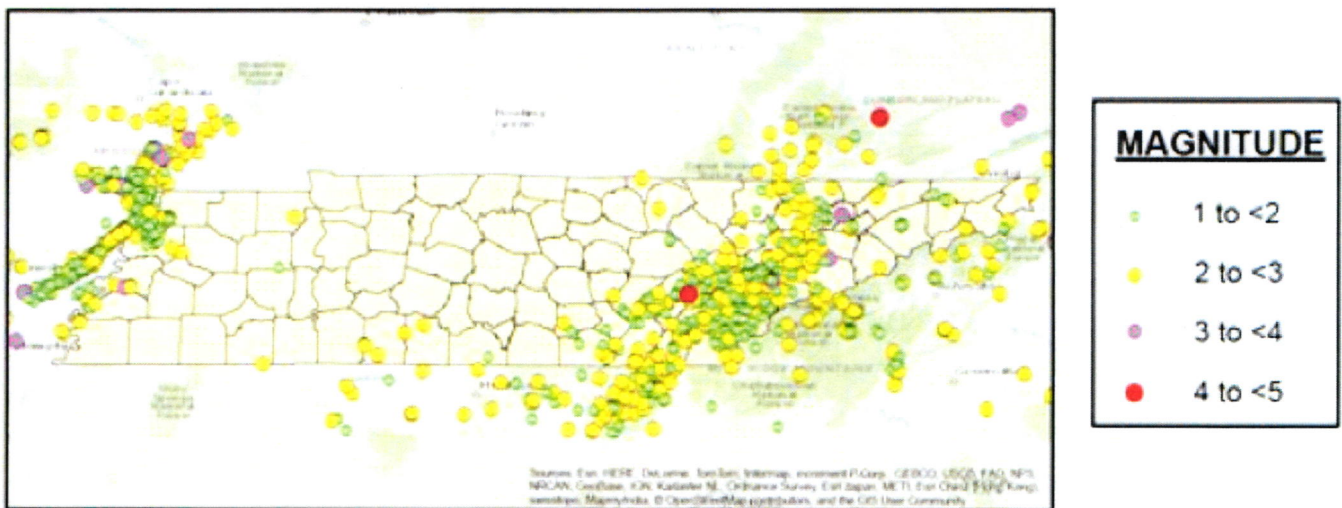


Figure 4-22: 2010-2018 Seismic Activities Throughout Tennessee
Source: USGS Advanced National Seismic System Earthquake Catalog

3.4.1 Probability and Frequency

A review of the mass of literature on the rate of occurrence of earthquakes in the Montgomery County (Including The City of Clarksville, and The Clarksville-Montgomery County School System) area shows little evidence that we can “look forward” to such an event centered here, although historical records indicate that



Clarksville was at the epicenter of a small earthquake on April 3, 1924, with a Mercalli rating of III-IV. People indoors may have felt this event, while most who were outside may not have even noticed it. The greatest likelihood of an event that might impact the county is a recurrence of a major event in the New Madrid Seismic Zone, rather than a new event in our own community.

There is broad agreement in the scientific community that a continuing concern exists for a major destructive earthquake in the New Madrid seismic zone. There are published reports based on GPS instruments with results of geodetic measurements of strain in the Earth's crust that indicated the New Madrid seismic zone may be shutting down. A USGS workshop of experts convened in 2006 to evaluate the latest findings of earthquake hazards in the Eastern United States. The experts did not find the GPS data to be a convincing reason to lower the assessment of earthquake hazard in the New Madrid region, especially in light of the many other types of data that are used to construct hazard assessments. Based on (USGS Fact Sheet 2009-3071) Based on this history of past earthquakes, the USGS estimates the chance of having an earthquake similar to one of the 1811–12 sequence in the next 50 years is about 7 to 10 percent, and the chance of having a magnitude 6 or larger earthquake in 50 years is 25 to 40 percent. (USGS Fact Sheet 2009-3071)

A debate has swirled in recent years, fueled in part by past studies suggesting that continuing New Madrid seismic activity could be the tail end of a long-lived aftershock sequence following the 1811-1812 earthquakes. If modern activity is an aftershock sequence, the argument goes, then there is no evidence that stress is currently building in the zone. Instead, Page and Hough conclude that the current level of activity must be the signature of active, ongoing processes that continue to generate stress in the region – stress that we expect will eventually be released in future large earthquakes. In other words, the New Madrid Seismic Zone is not dead.

Excerpt from "The New Madrid Seismic zone: Not Dead Yet," from the journal "Science" found on the USGS website.

3.4.2 Exposure and Impact

The New Madrid events of the early 1800s saw little if any damage to property, primarily because the area was not heavily populated. St. Louis, for example, was just a small frontier settlement at the time, and there was virtually no development beyond the settlement/village in any part of the territory. Today, however, a repetition of the New Madrid, or a new event nearby, would have much different consequences.

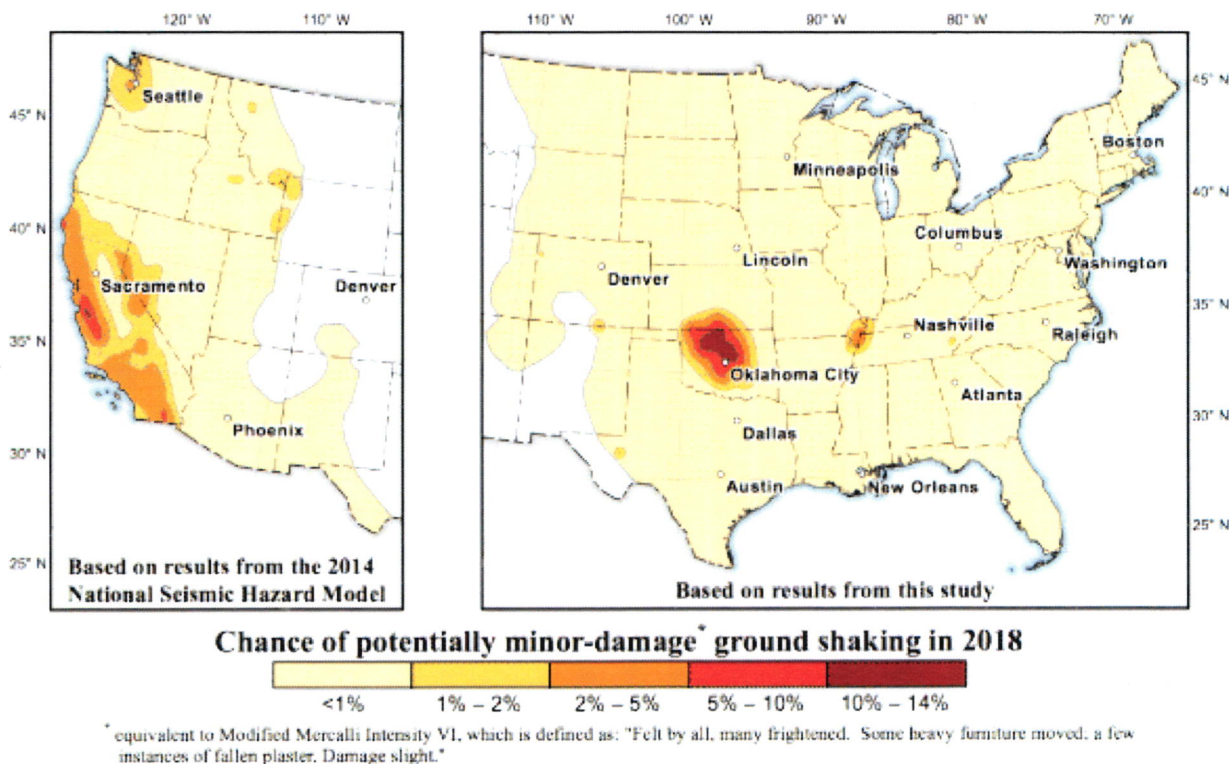
The extent of damage using the Richter Scale of 1-10 would indicate that 7.0 would be the worst case scenario based on current hazard maps for all three jurisdictions. In reality the damage caused to the multi-state regional transportation, electrical, and emergency response infrastructure alone by an earthquake of magnitude 8 along the New Madrid Fault could cause catastrophic consequences.

The seismic hazard in central United States is relatively low due to the infrequency of large magnitude earthquakes. However, the seismic risk is considerable due in part to the lower attenuation of soil and rock in this region, the sometimes inadequate enforcement of seismic building codes, and the lack of earthquake preparedness.

What makes an event here different from the West Coast is that the Mississippi basin faults are buried under sedimentary deposits as much as a mile deep allowing seismic waves to travel up to 20 times further than in California which has firm rock sub-soil strata.

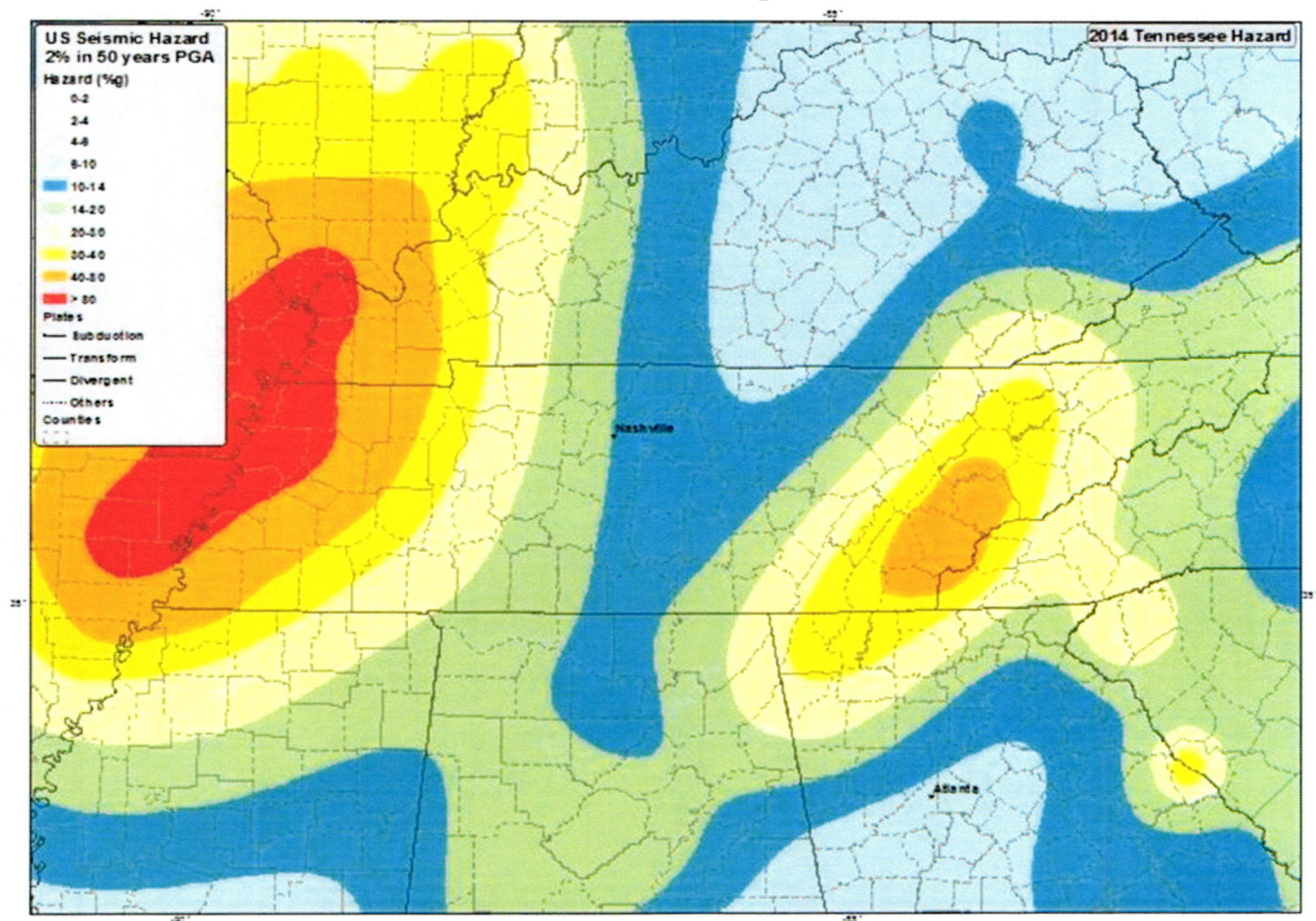


The map below shows the chance of damage from an earthquake in the Central and Eastern United States during 2018. Percent chances are represented as follows: pale yellow, less than 1 percent; dark yellow, 1 to 2 percent; orange, 2 to 5 percent; red, 5 to 10 percent; dark red, 10 to 12 percent.



Montgomery County (Including The City of Clarksville and the Clarksville-Montgomery County School System) is located in a seismic risk zone classified by the United States Geological Survey as being at Medium Risk from a New Madrid earthquake. The Geological Survey's National Seismic Hazard Mapping Project places most of the county in the 8% to 16% Peak Acceleration boundary zones, while the extreme western portion of the County is in the 16% to 24% zone.

2014 Seismic Hazard Map-Tennessee



To consider the potential impact of an earthquake to be negligible would be foolhardy, if simply based upon the premise that it has never happened in the past. Whether the county is located in a minimal risk zone or in a high risk zone is less important than recognizing that the entire county is at risk to the effects of a significant earthquake event.

3.4.3 Consequences

A large magnitude event could directly affect more than 50% of the state's population. A 7.5 magnitude event somewhere along the New Madrid Seismic Zone would be felt across the entire region and would cause significant damage across most of the western 2/3 of the State.

Scientists estimate that the probability of a magnitude 6.0 or larger earthquake occurring in this seismic zone within any 50 year period is 25% to 40%. (<http://www.cusec.org/earthquake-information/new-madrid-seismic-zone.html>).



The following table shows potential Mercalli ratings for various New Madrid earthquake events.

Category	Effects	Richter Scale (approximate)
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8

The possible damage to wood and masonry structures is of particular concern. The following table is derived from HAZUS-MH inventory data:

Expected Building Damage by Building Type												
Building	1-10		11-20		21-30		31-40		41-50		>50	
Type	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	29	100
Masonry	0	0	4	5	4	5	6	8	7	9	56	73
Steel	0	0	1	50	0	0	0	0	0	0	1	50
Wood	12	1	59	6	72	7	90	9	132	13	637	64



Building stock – Throughout the county many buildings and the majority of the infrastructure networks can be vulnerable to earthquake impacts. Montgomery County’s building stock can be broken down to the following percentage categories based on the HAZUS information provided by the state mitigation section: 81.5% Residential, 11.8% Commercial, 2.7% Industrial, 0.2% Agricultural, 2.0% Religion, 0.3% Government, and 1.5% Education.

3.4.4 Loss Estimation

As can be seen in the preceding chart, the majority of buildings within Montgomery County (Including The City of Clarksville, and The Clarksville-Montgomery County School System) are of wood and masonry construction. Calculations taken from HAZUS-MH also show that 99.04% of all buildings within the County are residential occupancies (single family, apartments, duplexes, etc.). From these calculations it is easy to deduce that the majority of the wood and masonry construction buildings are residential, adding to the probability of lives endangered particularly if a quake were to occur outside of normal working hours when residences have their lowest occupancy level. Drawing upon a worst case scenario of a massive quake striking in the New Madrid Seismic Zone outside of normal working hours we could also expect high financial losses.

A 2019 Real Property Assessment Summary for Montgomery County was pulled on November 7, 2019 and it reports \$4,318,742,409.00 worth of real property. The 2014 assessment was reported at \$3,293,922,000.00 worth of real property. Taking into account the figures shown in the above chart and considering the total assessment it can be reasoned that any quake causing massive damage to masonry and unbolted frame houses would have a devastating financial effect also.

Loss estimations in terms of vulnerability to damage from earthquakes are virtually impossible to classify based on any type of scale such as the hundred year flood plain that limits the scope of damage to a predictable geographic location, along with a known amount of buildings, critical facilities, and transportation and utilities within that geographic area. The only damage values that are reliable are the cost of replacement or repair of private property and government facilities / infrastructure after the event. For the purpose of planning for a worst case scenario the mitigation team determined that using the 30% estimate of damage for an event would be a plausible worse case destruction scenario

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3.4.5 Mitigation Approaches

Both The City of Clarksville and Montgomery County are old, historic entities with many aged structures. Being located in a seismically complacent geographical location, the voluntary inclusion of earthquake resistant features in past construction projects, particularly residential projects, has not been of notable consideration, nor considered economically feasible. The primary mitigation approach for seismic hazards is the adoption of building codes and regulations designed to reduce losses in new and retrofit construction whether they be structures or utility infrastructure. Resources include FEMA, the local Building Codes Department, and structural engineer associations.



3.5 Land Subsidence (Sinkhole) Hazards

Montgomery County including the City of Clarksville and the Clarksville-Montgomery County School System lies in an area dominated by karst topography. The term karst describes a distinctive topography that involves the dissolution of the underlying limestone by surface water or ground water. Underground voids occur when the limestone is dissolved by exposure to water movement through cracks and channels in the limestone. When the surface material collapses into the underground void, the resulting depression is referred to as a sinkhole.

The major concentration of sinkholes in Montgomery County lies in the northern half of the county, and includes part of the jurisdictional area within the City of Clarksville, and the Clarksville-Montgomery County School System (Karst Hazard Map, TDEC Groundwater Division 2002 305b report). This is also an area of rapid development, increasing the possibility that sinkhole formations can result in property damage and/or a danger to public health.

Sinkhole rim collapse and secondary throat formations can be dangerous for persons working at a collapse site and economic loss due to structural damage can be significant. Subsidence can result in foundation failures, damage to roadways, parking lots, and buried utilities.

Sinkholes provide a direct connection of area runoff with ground water supplies. Due to the large number of sinkholes in the area, new developments sometimes convert area sinkholes into Class V Injection Wells in order to facilitate drainage of the development. Injection well design area required including a detention area capable of holding the area runoff that would result from a 100 year, 24 hour rain event and these designs must assume that the injection well is completely clogged. In this way, Montgomery County is able to limit damage from flooding due to injection well failure. The injection wells also provide easy access for pollutants to come in contact with the local groundwater system which is already listed as a vulnerable aquifer (Vulnerable Aquifers for Public Water Systems, TDEC Groundwater Division 2002 305b Report).

3.5.1 Probability and Frequency

The probability of new sinkholes occurring is a 100% reality in Montgomery County. The karst subsoil structure is a predominant land form feature affecting all of Montgomery County, and each jurisdiction within it.

There is currently no technology, modeling, or prediction algorithm that can forecast the location, the probability of, nor the frequency of sinkhole collapse. The probability of sinkholes occurring in areas that have not had notable historic problems increases with change in land use, diversion of runoff water from naturally occurring paths to forced routes, the addition of impermeable surfaces that concentrate runoff, and subsoil vibration caused by heavy construction.

As a result of recent business and industrial growth adjacent to the route of Interstate 24 across the northeast corner of the county, and the desire to locate housing, commercial, and industrial development close to that corridor, the northeastern section of the county continues to experience substantial development. Much of this development is in an area with high sinkhole density. Urban growth persists with residential, commercial, and industrial development continuing at a fast pace.



3.5.2 Exposure and Impact

As the transition from agricultural use to urban use has occurred in the county, more sinkholes have been identified. According to the Natural Resources Conservation Service, the total number of existing sinkholes in the county is unknown. Over 460 sinkholes within the 96 square mile corporate area of the city have been identified since the city was founded in 1785.

The distribution of these sink holes covers the entire area within the corporate limits of the City. No area is immune, no area is without its sinkhole network. The majority of these have not been plotted on GIS databases, since many of them were identified prior to the availability of convenient and accurate location and mapping tools. The most recent county soil survey, issued in 1975, indicates soil types prone to flooding due to their properties and the soil profile. Location of these soil types might be used in conjunction with aerial photography and GIS information, plus currently identified sinkholes to project potential sinkhole collapse.

The event of sinkhole collapse presents substantive economic impact, particularly in highly developed areas. Roadbeds and street surfaces can be damaged, structures settle at irregular rates and levels, utilities are disrupted, traffic is detoured, projects can be delayed while remediation measures are completed. It is not common, but occasionally persons can be injured by driving into a new sinkhole, and heavy equipment can be lost or damaged by sliding or rolling into the collapsed area.

For roads/public works/utility departments, sinkhole collapses affecting the infrastructure mean unbudgeted expense as well as the diversion of work crews. For the home or property owner, a sinkhole can mean dislocation and even the eventual loss of the structure.

3.5.3 Consequences

In general, sinkhole collapse is primarily an economic issue more than a safety and welfare issue in terms of the event. Of course there are human safety issues related to some sinkhole events – the undiscovered opening in a street, or the collapse of a foundation footing, or even the possible involvement of an equipment operator at the site of a sudden collapse, but these tend to be unusual events. In the main, however, the greatest consequence of this type of hazard is financial. A homeowner who suffers damage to or loss of a residence, a merchant whose customers cannot access his establishment due to a street closing, the municipal utility that loses a primary potable water pipeline all suffer economic loss due to the incident in addition to the inconvenience and the cost of remediation and recovery.

Fortunately, sinkholes tend to form over time, and thus most local sinkhole incidents are not catastrophic. The consequences of sinkhole events may result from improper engineering, conservation, construction, or land use planning practices. Or, they may be caused by failure of aged, brittle materials in an underground utility system. Whatever the cause, the remediation measures require time, financial and human capital resources -- often to the detriment of other important work.

Repairing a caved in street requires detours, diversion of equipment and labor from other projects, expenditure for construction materials, repair and replacement of curbs, signage, and traffic markings. Public safety personnel are required to assure safety of workers, and all this may occur under the pressure of an imminent event such as an approaching storm, or the need to quickly restore utilities for public health and welfare.

Sinkhole opened on I-24 in Clarksville- September 2018

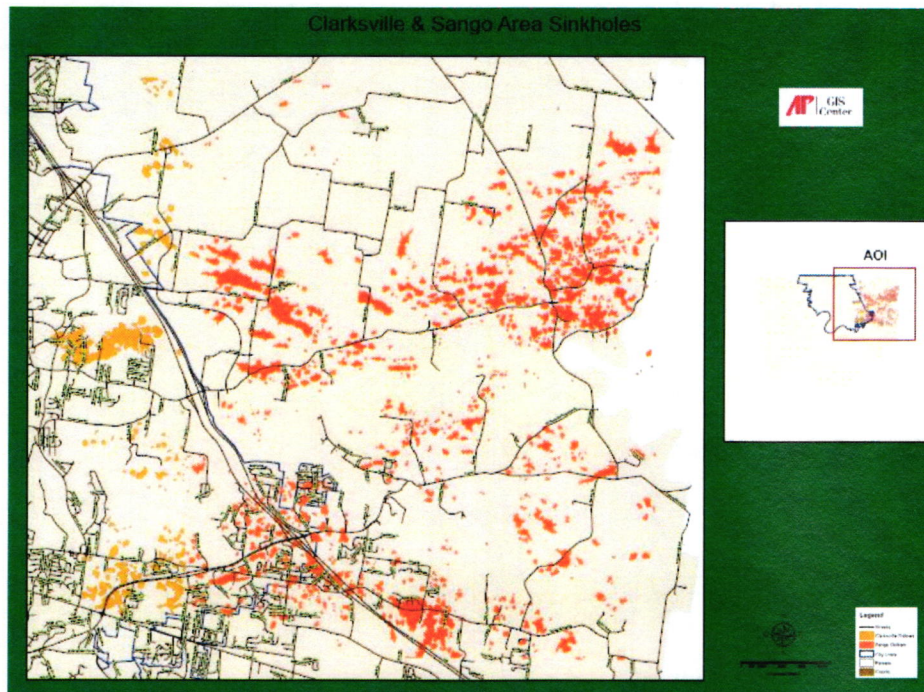


Photo Retrieved from Clarksville Now Website

3.5.4 Loss Estimation

Sinkhole Extent – The severity of sinkholes in Montgomery County are not measured by historical events that are tracked by NOAA, rather they are based on previous occurrences known by local residents. It is possible and likely that sinkholes are developing on a daily basis somewhere in the county. Only the very large ones such as the photo above that close major roadways are normally news worthy or tracked locally. Normally, the sinkholes are noticed as depressions in roadways or other areas and some even develop “throat” openings that are visible. Sinkholes in this area are not usually prone to the rapid openings that swallow buildings within minutes or hours. The corvette museum in Kentucky is a very graphic illustration that rapid openings are possible in this region though. The extent of damage from a sinkhole is in most cases is the need to excavate large areas to bedrock depth to “fix” the source rather than fill in voids above it.

Loss estimations in terms of vulnerability to damage from sinkholes are virtually impossible to classify based on any type of scale such as the hundred year flood plain that limits the scope of damage to a predictable geographic location, along with a known amount of buildings, critical facilities, and transportation and utilities within that geographic area. The only damage values that are reliable are the cost of replacement or repair of private property and government facilities / infrastructure after the event. It is not likely to damage from a sinkhole would cover a large area like other weather related events. A more likely worst case scenario would be the total loss of a single residence, building, or roadway repairs at a cost of possibly \$200,000.00.



Map produced by the Austin Peay GIS Center

The City of Clarksville is outlined in blue in the AOI box above

3.5.5 Mitigation Approaches

The best mitigation approaches for dealing with sinkholes are aggressive land use planning and informed engineering design. The Clarksville-Montgomery County Regional Planning Commission plays an active role in land use planning and in recommending projects from a zoning/site plan perspective.

The city and county building codes departments, along with the city and county engineers who deal with utilities, storm water, land use issues, streets and roads in several municipal and county departments play a vital role in permitting that considers the implications of sinkhole “management.” Structures to be placed in collapse-prone areas must be adapted to sinkhole terrain. Minimizing disturbance of the land surface during site preparation and construction is important. The amount of disturbance that can be accommodated involves a number of variables, including type of structure, depth of excavation required, and foundation settlement allowed, fill requirements to bring area up to grade, and the effectiveness of the natural surface drainage.

Development is not permitted over or even at the edge of a known sinkhole, and certainly not over fill placed in a sinkhole to bring development areas to grade. Natural surface drainage paths should be maintained or if modified, should be channeled to areas least likely to generate problems. These requirements must be enforced by permitting and code enforcement activities. Acquisition and demolition (or property owner sponsored demolition) may be the only alternative for some sinkhole events.



3.6 Hazardous Materials

The Stafford Act, amended by DMA 2000, does not require local hazard mitigation plans to cover human-caused hazards such as hazardous materials. However, the Montgomery County Multi-Jurisdictional Hazard Mitigation Planning Team has determined that such coverage is important to raise awareness and to act as a catalyst for efforts to improve the safety and resilience of our community.

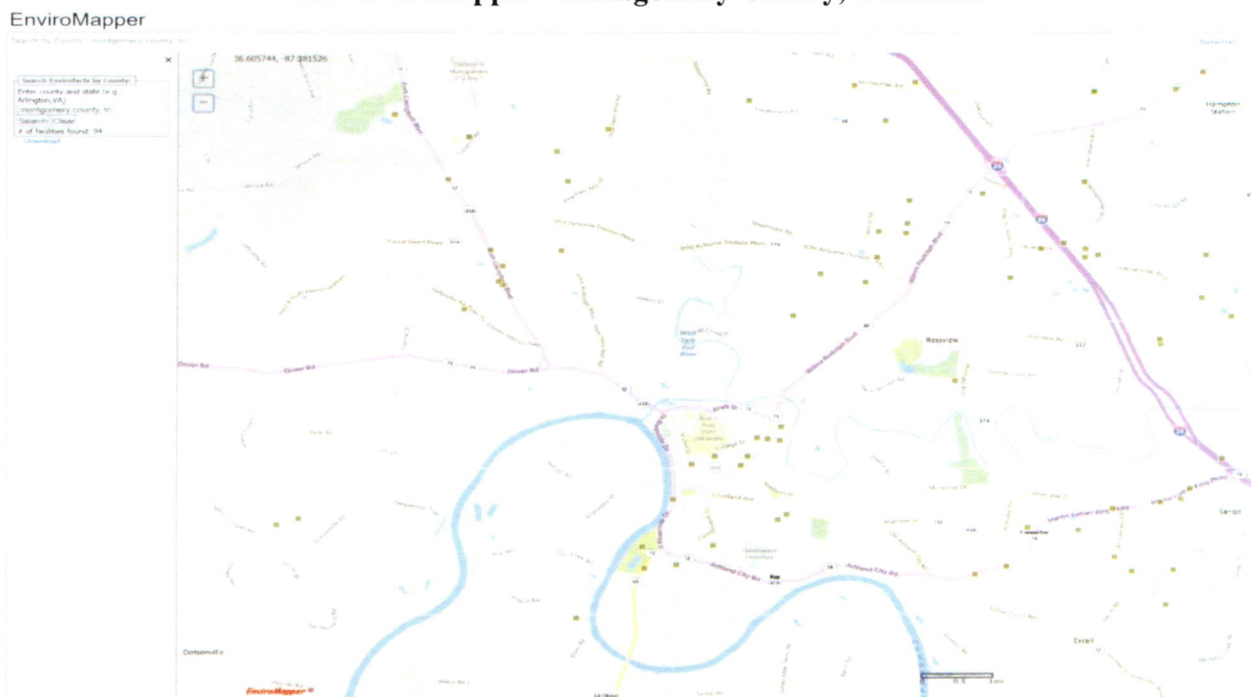
Hazardous materials are found in every community. They range from the gasoline at the local convenience store to the ammonia used in agricultural operations. They are found everywhere from our homes to the largest local industry and even the local fire department. Hazardous materials are part of our everyday life and they are often taken for granted.

3.6.1 Probability and Frequency

A November 8, 2019, report from the U.S. Department of Transportation Hazardous Materials Information System recorded 2728 HAZMAT events from 2008 to 2019. Approximately 86% are highway events, the remaining are primarily railroad events, and less than 1% by air. These events may involve collisions (or derailments), spills, leakage from container vehicles, or violation(s) of regulations.

Best estimates from TEMA are that approximately 250,000 shipments of hazardous materials cross Tennessee annually. Major incidents are not common, but do occur at the rate of about 50 per year for the state. Fixed facility events are even rarer, with incidents that require evacuation occurring at the rate of six per year in Tennessee. There are many hazardous materials calls each year, most involving small amounts of fuel spilled. There are also calls involving tractor trailer accidents hauling chemicals and some industrial releases. There are 74 manufacturing sites that contain hazardous materials throughout Montgomery County.

EPA EnviroMapper - Montgomery County, Tennessee



Retrieved from EPA EnviroMapper Website, 11/7/19



Transportation hazardous materials incidents are likely, as are events at the many fixed facilities in Montgomery County (Including The City of Clarksville, and The Clarksville-Montgomery County School System). Prediction of the frequency and probability is virtually impossible due to the number of uncontrollable variables.



Oil Tanker – April 4, 2013 (Photo provided by Montgomery County EMA)

3.6.2 Exposure and Impact

An interstate, various state and local highways, two railroads, and two pipelines cross Montgomery County (Including The City of Clarksville, and The Clarksville-Montgomery County School System). Four barge terminals, including a large amount of barge traffic, operate on the Cumberland River in Montgomery County. All transport hazardous materials whether it is just passing through or being delivered to or shipped from a local industry.

With nearly 3,000 acres of industrial sites, the potential for additional HAZMAT events exists. An example of the types and amounts of hazardous materials which traverse the County (Including The City of Clarksville, and The Clarksville-Montgomery County School System) on a daily basis are those that are shipped from a zinc refining operation located on the Cumberland River. This facility has both an onsite barge off-loading point and a railroad line which crosses the property. On a daily basis this rail line transports substantial quantities of sulfuric acid (approximately 400 tons) across the Cumberland and Red Rivers, through the downtown Clarksville area (the seat of City and County government), and then continues through the County. Each trip holds a significant, potential risk to not only the residents, but to the environment, if a mishap were to occur.

Due to the large agricultural base in the County a large amount of pesticides, herbicides and fertilizers (all with toxic potential) are transported throughout the county on a regular basis. These products are then stored at



commercial agricultural supply houses as well as in tanks and/or warehouses located on farms throughout the County. Add to this, the numerous service stations receiving and dispensing fuel and the number of water treatment plants within the county where large amounts of chlorine are stored, and the potential exposure is substantive.

The extent of damage using the low, medium, and high scale, with “low” equals a small fuel spill at a service station that closed the business for a few hours while the cleanup operation was completed. An evacuation of residents and businesses downwind from the release of a hazardous chemical at a bulk container for an extended period of time would equals “high” on the scale. High would be a worst case scenario type of event.

Montgomery County has had a relatively low rate of exposure of the general population to hazardous materials to date. Clarksville Fire Rescue and the County Fire Service, in addition to plant personnel, and the Department of Defense at Ft. Campbell provide trained personnel and equipment for hazmat event response to reduce significant incident impact in both the community and the region.

Additionally, law enforcement agencies are continuously contending through aggressive enforcement activities with the growth and expansion of meth labs, both mobile and fixed, in an attempt to reduce potential community exposure to the dangers of the manufacturing process.

3.6.3 Consequences

The consequences of a HAZMAT event can be as varied as the nature of the hazardous material involved. In the worst case scenario, a HAZMAT incident could lead to the loss of life, or the long-term disability of personnel exposed to the substance.



July 8, 2014- Photo provided by Montgomery County EMA



3.6.4 Loss Estimation

A “typical” event for a non-plant site with built-in containment facilities, which involves a Level A entry team, a decontamination team, engine and rescue companies, EMS units, police/sheriff patrols for traffic and security, plus expended supplies and equipment can easily generate \$20,000-\$25,000 in costs for a low to moderate level event. Not measurable for such a “typical” event is the loss of business revenue, the down-time, the inconvenience time for re-routed travelers, or the medical expenses of one or more victims.

Loss estimation for HAZMAT events in the Montgomery County (Including the City of Clarksville, and The Clarksville-Montgomery County School System area does not include the potential loss of life.

Loss estimation for illicit drug events such as containment, dismantling and destruction of a meth lab, may approach \$35,000, depending on the site, the quantity, the nature of the operation, and the agencies involved.

Industrial facilities are required by 40 CFR Part 355 to maintain worst case scenario plans in the event of a catastrophic release of chemicals. There is a potential for having to evacuate homes and businesses due to hazardous materials releases, but the potential for destruction of Building lifeline inventories is remote.

Loss estimations in terms of vulnerability to damage from hazardous materials are difficult to predict because there are a multitude of potential scenarios where buildings would need to be decontaminated or could be destroyed or rendered unusable due to a hazardous materials release, and hundreds plume maps could be developed for these scenarios. There is also the possibility of terrorist strikes at the major military post that borders the three jurisdictions. A first strike scenario to incapacitate this major military post although slight is still a potential.

3.6.5 Mitigation Approaches

Avoidance of HAZMAT events can come from two types of efforts: physical and sociological. Physical adjustments to avoid HAZMAT events precipitated by the impact of natural hazards include design and construction to withstand prevalent natural hazards, identification, and avoidance of potential event locations, and natural hazard prediction efforts.

Social adjustments to avoid impacts associated with natural hazards include land use restrictions, activity by the Local Emergency Planning Committee, initiation of public awareness programs in areas where hazardous materials are present, design of emergency preparedness and evacuation plans to protect life and property, creating emergency notification systems (including the use of the early warning siren system within the city), and spreading economic loss through a larger segment of the population through insurance and taxation efforts.



Section 4: Capability Assessment

4.1 Incorporation of Mitigation into Existing Plans and Policies

The mitigation strategies in the original plan were incorporated into other existing mitigation planning mechanisms, such as policies, procedures, or other plans through the corresponding legislative bodies that are part of the multi-jurisdictional plan. The multi-jurisdictional hazard mitigation plan will continue to be used as the primary mitigation guidance document and incorporated into future policies, procedures, or other plans when feasible.

4.2 Existing Mitigation Policies

Existing policies, plans, resolutions, and programs were reviewed by the Hazard Mitigation Team for applicability to Hazard Mitigation. Those that were deemed related are listed below. All information from these sources that is applicable to Hazard Mitigation has been included in this plan.

- **National Flood Insurance Program (NFIP):** Montgomery County and the City of Clarksville are participants in the National Flood Insurance Program which provides flood insurance to homes and a business located in floodplains at a reasonable cost, and encourages the location of new development away from the floodplain. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce that risk, primarily through guidance of new development in floodplains.
- **The City and County Building & Codes offices:** will not perform final inspections on structures within the floodplain without an elevation certificate signed by an engineer or surveyor stating that the structure was built to NFIP standards. All other applicable information is included in this plan.
- **Montgomery County Emergency Management Agency:** The Montgomery County Emergency Management Agency was created by Montgomery County for the purpose of developing plans and procedures that would provide the most effective and efficient coordination of resources available in the mitigation of, planning and preparedness for, response to and recovery from emergencies and disasters. The agency is also responsible for helping prepare the citizens of Montgomery County to deal with emergencies and their consequences.
- **Montgomery County Emergency Operations Plan:** This plan establishes the framework for the development of a comprehensive emergency management program within and for Montgomery County and its various political subdivisions.
- The emergency management program's purpose is to mitigate the potential effects of the various hazards that might impact the county, to prepare for the implementation of measures which will preserve life and minimize damage, to respond effectively to the needs of the citizens and local jurisdictions during emergencies, and to provide a recovery system to return the county and its communities to a normal status as soon as possible after such emergencies. This plan defines the roles and responsibilities associated with the mitigation, preparedness, response, and recovery efforts directed at natural disasters, technological accidents, enemy attacks, and other major events that might impact Montgomery County.



- **Clarksville Fire Rescue Hazardous Materials Team (HAZMAT):** The Clarksville Fire Rescue Hazardous Materials Team was established with funds from the City of Clarksville to provide response for hazardous materials situations for the City of Clarksville and neighboring entities if requested. (Clarksville Fire Rescue and Montgomery County Fire Service HAZMAT personnel train yearly as a combined team for larger incidents).
- **Montgomery County Fire Service Hazardous Materials Team (HAZMAT):** The Montgomery County Hazardous Materials Team was established with funds from Montgomery County to provide response for hazardous materials situations for Montgomery County and neighboring entities if requested. (Clarksville Fire Rescue and Montgomery County Fire Service HAZMAT personnel train yearly as a combined team for larger incidents).
- **Montgomery County Emergency Medical Services HAZMAT Support:** The Montgomery County Emergency Medical Services personnel provide dedicated medical support throughout any hazardous materials response operations within Clarksville and Montgomery County.
- **Warning System:** Warning sirens have been installed in the City of Clarksville to alert the citizens when natural or manmade emergencies occur that require rapid dissemination to the populace (tornado warning, hazardous material release, etc.). The warning system is tested on a regular basis to ensure that each siren is working properly.
- **Geographic Information Systems (GIS):** Montgomery County began GIS in 1997, when the county learned it would be one of the first in the state to participate in the Tennessee Base Mapping Program. As a result of the project, Montgomery County has high-quality GIS data and is well ahead of most counties in Tennessee. The GIS Center is responsible for coordinating GIS data sharing and creating base map layers for use by these agencies and the public. The GIS Center is located at Austin Peay State University in Clarksville and is manned by employees of Austin Peay State University, and some student workers.
- **American Red Cross:** Clarksville and Montgomery County are served by the Mid-South Chapter of the American Red Cross, which provides emergency preparedness and disaster awareness programs relating to floods, severe storms, tornadoes, earthquakes and other disasters that might affect Clarksville and Montgomery County.
- **The National Weather Service (NWS):** The National Weather Service provides weather, hydrologic, and climate forecasts and warnings for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.
- **NOAA Alert System:** NOAA, the voice of the National Weather Service, provides up to date weather information, 24 hours a day, every day of the year. Watches, Warnings, and weather statements from the NWS are given out over the NOAA Alert System. It is also a major part of the Emergency Alert System that speeds critical information through commercial broadcast outlets. A tower was constructed in Montgomery County to increase the coverage of the NOAA alert system.



- **The Central United States Earthquake Consortium (CUSEC):** CUSEC is an organization of 7 states (Tennessee, Arkansas, Illinois, Indiana, Kentucky, Missouri, and Mississippi) dedicated to earthquake awareness, hazard reduction, and research.

CUSEC's goal is to ensure that planners, developers, building officials, lenders, insurance representatives and other key players understand the potential consequences of earthquakes, and begin to incorporate mitigation into the daily decisions that are made on siting, design, and construction of buildings and lifelines.

- **Department of Agriculture (USDA):**

Forest Service – Their primary responsibility lies in prevention and suppression of wild land fires on all land outside of municipalities. All activities are aimed at reducing the number of fires and the acres burned through fire prevention, fire suppression, training, and working with rural fire departments.

Soil Conservation Service – The SCS can provide technical assistance in the conservation, development, and productive use of soil and water resources. Their activities include:

(1) Watershed Protection and Flood Prevention

The SCS provides technical and financial assistance to local organizations to plan and install works of improvement for watershed protection, flood prevention, agricultural water management, and other approved purposes. (Watershed Protection and Flood Protection Act, Public Law 83-566)

(2) Floodplain Management Studies

Assistance for cooperative floodplain management studies is provided to local communities or units of government to provide information and large-scale mapping needed in alleviating potential flood dangers. Funding is 80/20. (Public Law 83-566, Section 6)

(3) Emergency Watershed Protection

Emergency watershed protection assistance is provided to reduce hazards to life and property in watersheds damaged by severe natural events. (Section 403-405, Agricultural Credit Act of 1978; Section 216, Flood Control Act of 1950, Public Law 81-576)

(4) Conservation Technical Assistance

In addition to the specific program activities, the SCS can provide technical assistance to land users in the planning and application of conservation treatments to control erosion and reduce upstream flooding along with other purposes such as sediment reduction. (Public Law 74-46)

- **Clarksville-Montgomery County Regional Planning Commission:** The C-MC Regional Planning Commission consists of a 9 member board appointed by the Montgomery County Commission and the Clarksville City Council. The commission promotes orderly growth and development in The City of Clarksville and Montgomery County by maintaining a comprehensive planning program which



minimizes land use conflicts, coordinates the provision of public service, and optimizes the quality of life for all county residents.

- **Montgomery County Building & Codes:** A Resolution which regulates the location, height, bulk, number of stories and size of buildings and other structures, the percentage of the lot which may be occupied, the sizes of yards, courts and other open spaces, the density of population, and the use of buildings, structures and land for trade, industry, residence, recreation, agriculture, forestry, soil and water conservation, public activities and other purposes including areas subject to flooding in the portion of Montgomery County outside the limits of the City of Clarksville.
- **City of Clarksville Building & Codes:** An Ordinance which regulates the location, height, bulk, number of stories and size of buildings and other structures, the percentage of the lot which may be occupied, the sizes of yards, courts and other open spaces, the density of population, and the use of buildings, structures and land for trade, industry, residence, recreation, agriculture, forestry, soil and water conservation, public activities and other purposes including areas subject to flooding within the limits of the City of Clarksville.
- **U.S. Army Corps of Engineers (USACE):** The Civil Works Program of the Corps encompasses a broad range of resource development activities for navigation, flood control, major drainage, shore and beach restoration and protection, flood protection, related hydroelectric power development, water supply, water quality control, fish and wildlife conservation and enhancement, outdoor recreation, and development, including consideration of environmental impacts of proposals and alternatives.
- **Tennessee Department of Economic and Community Development (TDECD):** The Tennessee Floodplain Management Coordinator for the National Flood Insurance Program is housed in the TDECD. The Coordinator assists communities with preparation, adoption, and administration of floodplain management ordinances or resolutions and integrates floodplain management into comprehensive community planning documents and processes. (Executive Orders, TCA Title 13)
- **Tennessee Department of Commerce and Insurance (TDCI), State Fire Marshal's Office:** The State Fire Marshal's Office investigates and prosecutes arson; enforces fire and building codes (including seismic codes); regulates users of explosives; regulates LP gas facilities; inspects electrical installations; coordinates Public Fire Education campaigns through the dissemination of educational videos and literature and produces and designs "Duck and Cover" and Fire Safety videos for schools and civic groups.
- **Tennessee Department of Transportation (TDOT):** Primary mitigation responsibility involves strengthening and hardening of roads and bridges as a result of repair or replacement. TDOT maintains an inventory of barricades and high water signs for use in the event of roadway flooding; personnel monitor streams as flood warnings dictate. TDOT maintains personnel and equipment to clear roadways in the event of blockage from storms, tornadoes, winter storms, and landslides. Engineers from the city, county, state, and railroads inspect the bridges in the three jurisdictions.
- **Environmental Protection Agency (EPA) Clean Water Act Phase II Regulations** – Both the City and County must meet these requirements. These regulations dictate that a program must be put in place for the review of drainage and construction plans in regards to quality and quantity. Both the City and County passed Storm Water Management Ordinances to address these issues. Plans for projects



disturbing one acre or more are reviewed for completeness and accuracy, after approval these plans are used in inspections of the project to ensure that the approved plans are being followed; the project is then signed off by the inspector for release for further development. The project must then be released by a final inspection before any lots can be sold or the land can be occupied.

** It should be noted that the Montgomery County Highway Department reviews plans for items within the right-of-way as these are located within their jurisdiction. Montgomery County Building & Codes reviews all other structures and is responsible for the overall compliance of Montgomery County with the above mentioned regulations.

- **Monthly Site Plan and Plat Reviews** – Monthly meetings are held by the Regional Planning Commission at which water, electric, sewer, natural gas, street, and drainage officials from both the City and County are present. All plans and property plats submitted for that month are then reviewed in the presence of the owner or their agent and must be signed off by each of the entities before the plan can go any further. This allows City and County officials and the owner to each be aware of the other's concerns.
- **Project approval process** – After the site review meeting all adjoining property owners are contacted to make them aware of the project and to advise them the date of the next RPC meeting. The Regional Planning Commission then meets and will either approve or disapprove the project after taking into consideration the concerns that are brought up in the site review and also after a public hearing at which members of the general public can speak for or against the project.

No matter the outcome of the RPC hearing the project can then go in front of the County Commission or City Council (depending on location of project) for another public hearing and final approval or disapproval.

- **National Flood Insurance Program (NFIP) Participation** – Clarksville and Montgomery County have been part of the National Flood Insurance Program since 1984.
- **Building Code Compliance** – Through the adoption and enforcement of various building related codes both the City and County Building Codes Departments work to ensure that all structures are built to wind, snow, and earthquake design loads for the area. Both Departments employ several certified building Inspectors. As stated earlier, these Departments also enforce flood plain regulations.

4.3 Risk Exacerbating Policies

Montgomery County developed a Karst Feature Policy that encourages isolation of sinkholes, and discourage the use of injection wells to drain area runoff. This policy limits the possibility of groundwater contamination to existing injection wells that can be more easily monitored. Maintenance policies for sinkholes and injection wells have also been implemented help increase the stability of these structures.

Currently, construction in floodplains may occur if an elevation certificate showing that the structure is at least one foot above 100 yr. flood elevation is provided during or after construction.



4.4 Potential Mitigation Policy under Existing Authority

Storm Water Regulations: The City and County both were required under Phase II of the Environmental Protection Agency Clean Water Act to create and adopt guidelines related to the quality and quantity of storm water discharge from their respective jurisdiction. These regulations assign maintenance responsibility for storm water structures to the individual landowner. While the County has jurisdiction to go off the right-of-way for drainage structure maintenance, financial constraints limit this option.

The Clean Water Act requires both the City and the County to map the storm water systems, and both jurisdictions have ongoing mapping programs to fulfill this requirement



Section 5: Goals, Objectives, and Strategies

5.1 Recap on Hazards

Flood Hazards: The jurisdictions can expect three or four flood/flash flood events annually. In 100 year flood zones, an estimated 2,035 residential and 253 non-residential parcels are at risk while only 412 NFIP policies are in effect in Montgomery County as of November 7, 2019 per TEMA Mitigation Section. Non-riverine, run-off flooding due to blocked drainage, improper building and development, etc. appears to be the biggest flooding problem. With continued development in all jurisdictions generating greater areas of impermeable surfaces, the use of sinkholes for drainage and the problems related to their use, the frequency and extent of loss due to flooding, riverine or otherwise may be expected to increase. Inundation flooding from failure of upstream flood control dams is a low probability event, but should it occur, worst case scenarios indicate catastrophic results.

Wind, Tornado and Winter Storm Hazards: Over a number of years, climatology records indicate a frequency of severe wind/thunderstorms can be expected about 9 times annually, primarily during late spring. Averaging tornadic event frequency for over 59 years would lead us to expect such events less than once per year. However, more recent data moves that frequency closer to one event per year, due either to a shift in the jet stream or better recognition and reporting, or both. Fourteen years of reporting data lead us to expect one major winter storm annually. Of this set of events, our greatest vulnerability is to wind-related hazards.

Earthquake Hazards: The probability of an earthquake event in Clarksville-Montgomery County is relatively low due to the absence of active subsurface faults and the infrequency of large magnitude quakes in upper Middle Tennessee. The county does, however, lie in a high seismic risk area due to its proximity to the New Madrid event area. The State Geologist classifies Montgomery County as being in a Moderate Risk status. Data are limited, but it is safe to hypothesize that few property owners carry risk insurance for earthquake event losses.

Subsidence (Sinkhole) Hazards: Clarksville and Montgomery County sit within the State of Tennessee's most vulnerable areas for sinkhole events. The probability of new sinkhole development is significant as land use changes and as rapid urban development occurs forcing rainfall and snow melt to seek alternate routes of entry into the karst underlayment. The City of Clarksville already manages over 460 sinkholes within its 96 square mile corporate limits. With structural density increasing and expansion into more sinkhole prone areas, vulnerability exposure is increasing.

Hazardous Materials: Hazardous materials are a fact of life in the Clarksville-Montgomery County area. As an agricultural area and at the center of the fastest growing, and one of the largest industrial centers in the Southeastern United States, the potential exists for HAZMAT incidents. Couple these variables with the area being a focal point for land, air and water transportation and the opportunities are magnified.

5.2 Goals

The goals of local hazard mitigation fit the public welfare mission of all jurisdictions, and are intended to include existing and future new buildings and infrastructure. They include the following to the extent possible within the constraints for available resources and jurisdictional capabilities:

- Reduction of future damages to current buildings and infrastructure due to natural hazards.



- Reduction of future damages including new buildings and infrastructure due to natural hazards.
- Reduction of future damages due to man-made hazards.
- Adoption of hazard analysis and mitigation in land use and development planning and approval.
- Promotion of public awareness to natural hazards and their effects.
- Promotion of public awareness to man-made hazards and their effects.
- Promotion of individual activities which can lessen exposure to these hazards.
- Provide the residents and students of all jurisdictions a safe environment through minimum exposure to the risks of natural hazards.
- Provide safe areas as part of all new construction for government offices, schools, and outdoor training areas.

5.3 Objectives

Hazard mitigation objectives outlined with this plan have been identified to aid in achievement of the goals established by the officials of all jurisdictions.

- To create an ongoing community-wide public information program targeting natural hazard preparedness.
- To continue as members in good standing with the National Flood Insurance Program through enforcement of local codes and regulations.
- To identify, annually evaluate, and implement a hazard mitigation planning process for the purpose of eliminating risks associated with natural and manmade hazards.
- To provide for maintenance and construction of the community's storm water drainage system.
- To require new structures in the flood plain be elevated above the 100 year flood level.
- To retrofit existing utility structures to ensure continued operation can occur during extended power outages and flooding.
- To enforce standards and codes related to building and land use, and work to adopt the latest editions of said codes.

5.4 Strategies

These strategies have been developed by the Hazard Mitigation Team and have been prioritized according to need and possible funding sources. Benefit Cost Analysis (BCA) have not been performed at this time. These strategies should not be construed as being the final list of strategies as problems will arise which require new strategies and new projects. All future strategies and projects will also come through the Hazard Mitigation Team before insertion into the Multi-Jurisdictional Hazard Mitigation Plan. If the strategy encompasses all jurisdictions, the lead agency for each entity is listed for the strategy.

FEMA's Benefit-Cost-Analysis software will be used in the preparation of grant applications for specific projects. The Benefit-Cost-Analysis for these projects may change the prioritization schedule for the listed projects and will exclude strategies and projects from FEMA Hazard Mitigation Grant funding if they are found to not be cost-effective. Detailed budget estimates as well as the above Benefit Cost Analysis will be included with applications to request funding for specific projects. All projects will be reviewed to maintain compliance with NFIP standards as part of project development.

The mitigation strategies from the original plan had status checks performed on them during the plan maintenance and update process. Some of the strategies such as the one involving updating the flood maps for



Montgomery County were completed. Others fall into a category that is designated as implemented and ongoing which indicates that the process is continuous and will likely not reach a “completed” status during the next plan cycle. A few of the strategies after thorough review and analysis by the hazard mitigation team were removed due to being not feasible for various reasons. The original strategies are bench marks for progress since the approval of the original plan.

A complete listing of the original strategies and their status is listed in Appendix 9 of this plan.

The strategies listed during the update process are new, along with the implemented and ongoing strategies, which will be used as bench marks for progress in the next plan cycle.



Flooding Mitigation Projects

Project 1:

Problem Statement:

Drainage structures are not being properly maintained. These structures are usually left up to the property owner to maintain but they lack the training to do this. Improper maintenance contributes to flooding problems and also health issues related to stagnant water and the dangers of having a large body of water in a residential development. There is also the problem of property changing hands and having to educate new owners.

Mitigation Strategy:

Continue to educate the owners of property where drainage structures are located on care for the structures such as removing trash and debris. Educate property owners about the National Flood Insurance Program (NFIP). Post information regarding drainage structure care on websites for easy public access. Continue to make use of public outreach programs to teach mitigation actions to stop blockages before they occur.

Lead Agency for each Jurisdiction:

- Montgomery County Building and Codes Department Storm Water Division.
- City of Clarksville Street Department would implement the policy within the city limits.

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

City/County General Funds

Estimated Cost: \$10,000 per year

2020 Update: This project is current and the need to continue to educate the public on how to properly maintain the drainage structures is still an ongoing process.



Flooding Mitigation Projects (cont.)

Project 2:

Problem Statement:

Use of sinkholes to drain developed areas may be overloading the underground drainage system thereby causing flooding and land subsidence

Mitigation Strategy:

Continue to monitor known sinkholes and add new sinkholes as they are encountered. Perform an annual sinkhole map/location update from the information provided by all jurisdictional agencies that have new information.

Lead Agency for each Jurisdiction:

- Montgomery County Building and Codes – Storm Water Division
- City of Clarksville Street Department

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

City/County General Funds

Estimated Cost: \$50,000 per year

2020 Update: This project is current and known sinkhole locations are continuing to be monitored.



Flooding Mitigation Projects (cont.)

Project 3:

Problem Statement:

Structures in the floodplain must be built to NFIP requirements.

Mitigation Strategy:

Continue to enforce NFIP requirements when structures are built in the floodplain. All projects will be reviewed and prioritized based on a benefit-cost analysis study to maximize benefits.

Lead Agency for each Jurisdiction:

- Montgomery County Building and Codes
- City of Clarksville Building and Codes

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding: City/County General Funds

Estimated Cost: \$10,000 per year

2020 Update: This project is current and NFIP requirements are continuing to be enforced when building new structures in floodplain areas.



Tornado/High Wind Hazards Mitigation Projects

Project 1:

Problem Statement:

All three jurisdictions are subject to the same hazards, but currently there are only 13 warning sirens, which are very old and only located in the city at some schools and a couple of fire stations. Since these systems were installed the population has increased significantly along with many more schools, parks, and community gathering locations. There is a great need to expand the amount of warning sirens within all three jurisdictions to enhance the ability to provide early warning capabilities at all school complexes, recreational facilities, and other locations.

Mitigation Strategy:

Begin installing warning sirens on all of the Clarksville-Montgomery County School System (CMCSS) complexes to allow for warning of impending hazards as soon as possible.

Lead Agency for each Jurisdiction:

- Clarksville-Montgomery County School System Operations
- City of Clarksville Parks & Recreation
- Montgomery County Parks & Recreation

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing schools, parks, and other locations, but will be prioritized in order to maximize the effectiveness of future additions.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City, County and CMCSS

Estimated Cost: \$35,000 for each installation

2020 Addition/Revision: This project is an addition/revision to the 2020 plan update.



Tornado/High Wind Hazards Mitigation Projects (cont.)

Project 2:

Problem Statement:

All three jurisdictions have buildings that have a significant amount of windows that will not withstand impacts of flying debris that is associated with straight - line winds, tornados, and other man-made hazards. Population growth dictates services growth, but older buildings and most new construction do not have adequate protection from flying glass or other debris if the windows in them fail. Unfortunately, there is minimal funding available replace all of these windows.

Mitigation Strategy:

Use protective safety film applied to existing windows that is designed to mitigate the dangers of flying glass from natural and manmade hazards.

Lead Agency:

- Montgomery County Emergency Management Agency
- Jurisdiction Risk Management personnel, Engineers, and Facilities Maintenance Staff

Implementation Schedule:

This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City, County and CMCSS

Estimated Cost: \$30,000 - \$ 100,000 per building

2020 Addition/Revision: This project is an addition/revision to the 2020 plan update.



Tornado/High Wind Hazards Mitigation Projects (cont.)

Project 3:

Problem Statement:

All three jurisdictions have buildings that that a significant amount of windows that will not withstand impacts of flying debris that is associated with severe storms with straight - line winds or tornados. Population growth dictates services growth, but older buildings and most new construction do not have adequate protection from flying glass or other debris if the windows in them fail. Unfortunately, there is minimal funding available replace all of these windows.

Mitigation Strategy:

Replace the windows with storm windows designed to withstand most high wind or tornadic events when possible on existing buildings to provide a higher degree of safety for employees and the citizens doing business and children attending school or school functions.

Lead Agency:

- Montgomery County Emergency Management Agency
- Jurisdiction Risk Management personnel, Engineers, and Facilities Maintenance Staff

Implementation Schedule:

This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City, County and CMCSS

Estimated Cost: \$300,000 - \$ 2,000,000

2020 Addition: This project is an addition to the 2020 plan update.



Tornado/High Wind Hazards Mitigation Projects (cont.)

Project 4:

Problem Statement:

All three jurisdictions have limited access to safe rooms that can provide proven protection by design and construction, from high winds or tornados. These natural hazards threats are increasingly common and destructive due in large part to the number of events in conjunction with the increases in the amount of new schools, emergency services facilities, government offices and other critical infrastructure locations serving citizens that must also be protected while conducting business. Population growth dictates services growth, but older buildings and most new construction do not have adequate safe spaces. Unfortunately, there is minimal funding available for the construction of safe rooms in new construction budgets or retrofits.

Mitigation Strategy:

Build new safe rooms designed to withstand most high wind or tornadic events where possible on existing buildings and retrofit locations where new constructions is not feasible.

Lead Agency:

- Montgomery County Emergency Management Agency
- Jurisdiction Risk Management personnel

Implementation Schedule:

This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City, County and CMCSS

Estimated Cost: \$300,000 - \$ 2,000,000

2020 Addition/Revision: This project is an addition/revision to the 2020 plan update.



Tornado/High Wind Hazards Mitigation Projects (cont.)

Project 5:

Problem Statement:

Frequent severe storms with damaging winds and tornadoes are common in the city and county. Many times the amount of downed trees and power lines can cause significant delays for emergency personnel and other support services such as the Red Cross. In February 2018, two near simultaneous tornadoes hit opposite sides of the county outside of the city limits. Both areas had limited access into the subdivisions. One of them had one way in and full access to large vehicles was delayed for several hours until dozens of trees, power lines, and other debris was removed from the roadway. Emergency personnel had to walk a significant distance to reach the area and check on the residents. Firefighters estimated about ten houses damaged in the subdivision that was completely cut off when the real number was much higher. Fortunately, injuries were minor even with dozens of homes sustaining major damage and many destroyed. The ability to deploy a self-sustained UAS damage assessment support trailer would give responders the ability to assess the situational hazards despite being blocked by trees, power lines, and other debris, while conducting the initial damage assessment from a safe distance. The same trailer would also have reduced the normal damage assessment needs for a potential declaration from about 5 days to a couple of days. The cost associated with this buying this type of resource will likely not make it through city or county budget processes that are already stretched to get the equipment.

Mitigation Strategy:

Purchase and equip and self-sustained trailer for with UAS capabilities to assist responders not only in a response role, but more so in the recovery role to cut down on damage assessment manpower and time need to complete the assessments.

Lead Agency for each Jurisdiction:

- Montgomery County Emergency Management Agency

Implementation Schedule:

This strategy was developed for future severe weather events.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General funds

Estimated Cost: \$75,000

2020 Addition: This project is an addition to the 2020 plan update.



Tornado/High Wind Hazards Mitigation Projects (cont.)

Project 6:

Problem Statement:

Structures need to be built to meet applicable building codes including wind load requirements, strapping, etc.

Mitigation Strategy:

Continue to enforce building codes to ensure structures are built to the requirements of the local adopted building code.

Lead Agency for each Jurisdiction:

- Montgomery County Building and Codes
- City of Clarksville Building and Codes

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

City/County General funds

Estimated Cost: \$10,000 per year

2020 Update: This project is current and new building structures are being monitored to ensure they are built to meet applicable building codes.



Tornado/High Wind Hazards Mitigation Projects (cont.)

Project 7:

Problem Statement:

Dead, overhanging, and otherwise dangerous trees located in the right-of-way fall into the roadways during severe weather causing road closures and driving hazards.

Mitigation Strategy:

Continue programs to trim and/or remove trees/limbs which appear to be as described above.

Lead Agency for each Jurisdiction:

- Montgomery County Highway Department
- City of Clarksville Street Department
- Clarksville Department of Electricity
- Cumberland Electric Membership Corporation

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

City/County General funds, Maintenance funds for electric companies

Estimated Cost: \$50,000 - \$100,000 per year

2020 Update: This project is current and programs are continuing to trim and remove trees that are located in areas that are potential to dangerous hazard conditions during severe weather.



Tornado/High Wind Hazards Mitigation Projects (cont.)

Project 8:

Problem Statement:

Some of the older school complexes in the Clarksville-Montgomery County School System need to be retrofitted with storm safe rooms that are built to current technical standards.

Mitigation Strategy:

Retrofit the older schools with safe rooms within quick access to all students and staff.

Lead Agency:

- Clarksville-Montgomery County School System

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), FEMA's Pre-Disaster Mitigation (PDM) Program, Construction budget

Estimated Cost: In excess of \$5,000,000 to retrofit all of the current schools

2020 Update: This project is current, however at this point the costs to fund this project is not available.



Winter Storm Mitigation Projects

Project 1:

Problem Statement:

The limited locations of the salt sheds located throughout the city and county cause significant delays in transporting the salt to the affected roads in a timely manner.

Mitigation Strategy:

There is a need to construct additional salt sheds throughout the city and county. This will allow shorter distance the trucks travel for supplies when clearing the roads and streets. This would also reduce overtime and fuel costs during these winter storms.

Lead Agency:

- Montgomery County Highway Department
- Clarksville Street Department

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

City/County General Funds

Estimated Cost: \$25,000 - \$50,000 per year

2020 Addition: This project is an addition to the 2020 plan update.



Earthquake Mitigation Projects

Project 1:

Problem Statement:

Structures need to be built to meet applicable building codes that relate to seismic activity (i.e., anchor bolt placement, footing requirements)

Mitigation Strategy:

Continue to enforce building codes to ensure structures are built to the requirements of the local adopted building code.

Lead Agency for each Jurisdiction:

- Montgomery County Building and Codes
- City of Clarksville Building and Codes
- Clarksville-Montgomery County School System

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

City/County General Funds

Estimated Cost: \$10,000 per year

2020 Update: This project is current and new building structures are being monitored to ensure they are built to meet applicable building codes.



Earthquake Mitigation Projects (cont.)

Project 2:

Problem Statement:

The area of Clarksville and Montgomery County has a high population of military personnel and new community members that move to the area for jobs for new industries and such. Many of these people do not realize that the area is susceptible to damage to an earthquake.

Mitigation Strategy:

Continue public education through outreach programs to keep people aware of the earthquake hazard that this area is susceptible to.

Lead Agency for each Jurisdiction:

- Montgomery County Building and Codes
- City of Clarksville Building and Codes
- Clarksville-Montgomery County School System

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

City/County General Funds

Estimated Cost: \$5,000 per year

2020 Update: This project is current and public outreach programs are being still being carried out to educate people on the hazards of earthquakes.



Land Subsidence (Sinkholes) Mitigation Projects

Project 1:

Problem Statement:

Use of sinkholes to drain developed areas may be overloading the underground drainage system thereby causing flooding and land subsidence

Mitigation Strategy:

Continue to monitor known sinkholes and add new sinkholes as they are encountered. Perform an annual sinkhole map update from the information provided by all jurisdictional agencies that have new information. Continue to enforce land use through codes permitting actions.

Lead agency for each Jurisdiction:

- Montgomery County Building and Codes – Storm Water Division
- City of Clarksville Building and Codes
- Clarksville-Montgomery County School System

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

City/County General Funds

Estimated Cost: \$10,000 per year

2020 Update: This project is current and sinkholes are being monitored with updated information from all jurisdictions. Codes on land use are continuing to be enforced.



Hazardous Materials Mitigation Projects

Project 1:

Problem Statement:

Facilities that use or store hazardous materials should be constructed to meet applicable building codes and other federal and state requirements related to hazardous material storage and use.

Mitigation Strategy:

Continue to enforce building codes to ensure structures are built to the requirements of the local adopted building code. All non-bulk chemicals in the structures will be stored in accordance with 29 CFR. Each agency will be responsible for maintaining storage in accordance with 29 CFR standards.

Lead Agency for each Jurisdiction:

- Montgomery County Building and Codes / and Risk Management
- City of Clarksville Building and Codes / and Risk Management
- Clarksville-Montgomery County School System Risk Management

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding: FEMA's Hazard Mitigation Grant Program (HMGP), City, County and CMCSS

Estimated Cost: \$10,000 per year

2020 Update: This project is current and building codes is ensuring structures are being built to proper requirements. Agencies are being enforced to maintain a proper protocol of storing hazardous materials.



Hazardous Materials Mitigation Projects (cont.)

Project 2:

Problem Statement:

The need to maintain and update training and equipment for Clarksville Fire Rescue and Montgomery County Fire Service Hazardous Materials Teams and recruit and prepare new members. Also, train senior HAZMAT technicians up to the HAZMAT Specialist level.

Mitigation Strategy:

Continue with the current programs that are in place to maintain the training and equipping of hazardous materials technicians from all jurisdictions.

Lead Agency for each Jurisdiction:

- Montgomery County Emergency Management Agency
- Montgomery County Emergency Fire Service
- Clarksville Fire Rescue

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

City/County General Funds, Assistance to Firefighter grants

Estimated Cost: \$50,000 per year

2020 Update: This project is current and trainings are continuously being held to educate hazardous material technicians in all jurisdictions.



Hazardous Materials Mitigation Projects (cont.)

Project 3:

Problem Statement:

There is a need for more public safety personnel to be trained to the Hazardous Materials Awareness Level to assist with initial response to hazardous material incidents. Many times emergency medical service and law enforcement are often the first units to the scene. Training them to awareness level will help ensure their own safety as well as the public's safety by knowing how to respond and secure a hazardous materials incident site.

Mitigation Strategy:

Continue to train all emergency services public service personnel to the Awareness Level to aid in their response to hazardous incidents.

Lead Agency for each Jurisdiction:

- Montgomery County Emergency Management Agency
- Montgomery County Emergency Fire Service
- Montgomery County Emergency Medical Services
- City of Clarksville Fire Rescue

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General Funds

Estimated Cost: \$20,000 per year

2020 Update: This project is current and continuous training opportunities on the Hazardous Materials Awareness Course are available to emergency responders. This ensures their safety and the safety of the public when responding to Hazardous Materials Incidents.



Hazardous Materials Mitigation Projects (cont.)

Project 4:

Problem Statement:

There is a rising need to have hazardous materials technicians and specialists from the city and county fire departments that can operate boats safely and properly deploy spill response equipment. Due to the continued growth in manufacturing and commodities distribution in and around Montgomery County, the transportation of bulk materials such as fuel on the Cumberland River will be increasing. The increase in barge traffic containing hazardous materials will add to the potential for a hazardous material release into the river. The Montgomery County Rescue Squad Members and Clarksville Fire Rescue boat personnel provide boat operations within Montgomery County, but most of the members are not hazardous materials technicians. The Montgomery County Rescue Squad is centrally located within the City of Clarksville at the mouth of the Red River and the Cumberland River. Having the hazardous materials technicians from the city and county fire departments trained as boat operators could potentially allow for a faster launch time for the boats due to more trained personnel in the vicinity of the rescue squad.

Mitigation Strategy:

Train the city and county hazardous materials technicians for enhanced responses to river releases and deployment of spill response equipment. The ability to rapidly respond to a hazardous materials release with properly trained and equipped personnel will decrease the extent of the release and the impact on the environment.

Lead Agency:

- Montgomery County Emergency Management Agency
- Montgomery County Fire Service
- Montgomery County Emergency Medical Services
- Clarksville Fire Rescue

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General Funds and Port Security Grant Funds

Estimated Cost: \$300,000

2020 Update: This project is current and the continued need to train city and county hazardous materials technicians as boat operators is still an ongoing need.



Hazardous Materials Mitigation Projects (cont.)

Project 5:

Problem Statement:

A new Regional Waterway Intermodal Facility on the Cumberland River is being developed that will increase the amount of potential hazardous materials that are now delivered by truck from Nashville ports to Montgomery County by barge. Many of these materials will now be shipped by rail or truck through the city to destinations at the industrial park on the opposite side of the county. The products that pass through the barge port could also be shipped to other businesses outside of the county that would benefit from the lower cost of transportation from this location rather than those ports farther away. This increased truck traffic raises the possibility of incidents within the city that were formally in more rural areas on the interstate and state highways. With the increased risk from amount and types of products that could pass through the intermodal port comes a need for additional specialized HAZMAT equipment to handle spill response both on and off the waterway.

Mitigation Strategy:

Equip the city and county HAZMAT team technicians and specialists for enhanced responses to river and land releases including deployment of specialized spill response and monitoring equipment. The ability to rapidly respond to a hazardous materials release with properly trained and equipped personnel will decrease the extent of the release and the impact on the environment.

Lead Agency:

- Montgomery County Emergency Management Agency
- Montgomery County Fire Service
- Montgomery County Emergency Medical Services
- Clarksville Fire Rescue

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General Funds and Port Security Grant Funds

Estimated Cost: \$30,000

2020 Update: DELETED. This plan fell through.



All Hazards Mitigation Projects

Project 1:

Problem Statement:

Lack of public awareness about the impact of natural and man-made hazards on our community and the actions to take to protect their homes, their property, and their lives.

Mitigation Strategy:

Continue with Public Awareness programs to inform the public of the dangers of these hazards and actions to take to protect themselves, their families, and their property.

Lead Agency:

- Montgomery County Emergency Management Agency

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

City/County General Funds

Estimated Cost: \$5,000 - \$10,000 per year

2020 Update: This project is current and the continued need for public awareness outreach programs to inform the public about natural and man-made hazards is still a critical key that needs to be made.



All Hazards Mitigation Projects (cont.)

Project 2:

Problem Statement:

The Hazard Mitigation Planning capabilities need to be continually upgraded with training and equipment.

Mitigation Strategy:

Continually evaluate (at least annually), improve, and implement the current local Hazard Mitigation Planning process for the purpose of eliminating risks associated with natural and manmade hazards. Purchase equipment, software, training, and other needs to support the Montgomery County Hazard Mitigation Committee and their mission.

Lead Agency:

- Montgomery County Emergency Management Agency

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General Funds

Estimated Cost: \$20,000 per year

2020 Update: This project is current and the continued need for upgrades and training is needed to support the Montgomery County Hazard Mitigation Committee and their mission.



All Hazards Mitigation Projects (cont.)

Project 3:

Problem Statement:

Montgomery County is part of the Tennessee Homeland Security District 7. Montgomery County is the most populated county in the 7 county district and as such functions as the host county. The district is working to train and equip a type 2 regional search and rescue (SAR) team.

Mitigation Strategy:

Continue to build on existing equipment and personnel, and attain needed training and refresher courses as they become available. Each county involved with the SAR team is providing personnel and storage space for equipment.

Lead Agency:

- Montgomery County Emergency Management Agency
- Montgomery County Fire Service
- Montgomery County Emergency Medical Services
- Clarksville Fire Rescue

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities.

Source of Funding:

Homeland Security Grant Funds, City and County funds as available from district agencies

Estimated Cost: \$100,000 - \$250,000 for initial costs and training

2020 Update: This project is current and the need to train and equip a type 2 regional search and rescue team for Montgomery County is still in progress.



All Hazards Mitigation Projects (cont.)

Project 4:

Problem Statement:

All three jurisdictions have limited access to safe rooms that can provide proven protection by design and construction, from imminent threats. These threats include natural hazards such as sudden tornados, as well as the unfortunate rising threats from domestic problems in households that erupt in public locations, and the increasingly common active shooter threat. The active shooter component of hazards has become so common that every agency, department, school, and most other offices and facilities now plan for an active shooter possibility. Unfortunately, there is minimal funding available for the construction of safe rooms or barriers that can provide the ballistic protection along with delaying access to the facility occupants until law enforcement personnel arrive.

Mitigation Strategy:

Continue to educate and train personnel on the safest locations and delaying tactics for imminent threats. When possible build multi-purpose safe rooms that could provide a safer location for natural hazards and the ballistic protection from an active shooter.

Lead Agency:

- Montgomery County Emergency Management Agency
- Jurisdiction Risk Management personnel

Implementation Schedule:

Implemented and ongoing/deferred, based on general cost effectiveness and funding priorities. This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

Homeland Security Grant Funds, FEMA's Hazard Mitigation Grant Program (HMGP), City, County and CMCSS

Estimated Cost: \$100,000 - \$250,000

2020 Update: This project is current and the continued need to train and educate personnel on the safest locations when imminent threats arise are still needed.



All Hazards Mitigation Projects (cont.)

Project 5:

Problem Statement:

Frequent power failure during severe weather events causes disruptions to critical infrastructure and other facilities. During long – term power losses government operations are severely impacted.

Mitigation Strategy:

Purchase backup power generators for these facilities along with the automated switching systems for them.

Lead Agency for each Jurisdiction:

- Montgomery County Facilities Maintenance
- City of Clarksville Facilities Maintenance
- Clarksville – Montgomery County School System Operations

Implementation Schedule:

This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General funds

Estimated Cost: \$500,000 – 1,000,000

2020 Addition: This project is an addition to the 2020 plan update.



All Hazards Mitigation Projects (cont.)

Project 6:

Problem Statement:

Frequent power failure during severe weather events causes disruptions to critical infrastructure and other facilities. During long – term power losses government operations are severely impacted.

Mitigation Strategy:

Purchase backup portable power generators that can be transported to these facilities to allow for rapid restoration of power during a prolonged power outage.

Lead Agency for each Jurisdiction:

- Montgomery County Facilities Maintenance
- City of Clarksville Facilities Maintenance
- Clarksville – Montgomery County School System Operations

Implementation Schedule:

This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General funds

Estimated Cost: \$100,000 – 500,000

2020 Addition: This project is an addition to the 2020 plan update.



All Hazards Mitigation Projects (cont.)

Project 7:

Problem Statement:

Frequent power failure during severe weather events causes disruptions to critical infrastructure and other facilities. During long – term power losses government operations are severely impacted. The schools in the city and county serve as shelter locations during disasters and

Mitigation Strategy:

Purchase power transfer switches for installation in buildings so that portable generators can quickly be connected to these facilities to get them open again. This will also serve as a mitigation component for facilities where generators fail and minimize rewiring time from several hours or more to minimal timeframe by bypassing the failed generator.

Lead Agency for each Jurisdiction:

- Montgomery County Facilities Maintenance
- City of Clarksville Facilities Maintenance
- Clarksville – Montgomery County School System Operations

Implementation Schedule:

This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General funds

Estimated Cost: \$ 4,000 – 10,000 per facility

2020 Addition: This project is an addition to the 2020 plan update.



All Hazards Mitigation Projects (cont.)

Project 8:

Problem Statement:

Frequent power failure during severe weather events causes disruptions to critical infrastructure and other facilities. During long – term power losses government operations are severely impacted.

Mitigation Strategy:

Purchase and install solar power systems for facilities along with the automated switching systems for them where they are a feasible alternative.

Lead Agency for each Jurisdiction:

- Montgomery County Facilities Maintenance
- City of Clarksville Facilities Maintenance
- Clarksville – Montgomery County School System Operations

Implementation Schedule:

This strategy was developed for existing buildings and infrastructure, but will be a priority on new buildings and infrastructure design and construction where possible.

Source of Funding:

FEMA's Hazard Mitigation Grant Program (HMGP), City/County General funds

Estimated Cost: \$500,000 – 1,000,000

2020 Addition: This project is an addition to the 2020 plan update.



Section 6: Plan Maintenance

The Disaster Mitigation Act (DMA) of 2000 requires that local plans be monitored, evaluated, and updated within a five-year cycle. The Montgomery County Emergency Management Agency as the lead agency for the Hazard Mitigation Team will continuously monitor and evaluate the Hazard Mitigation Plan. In an effort to comply with the requirements of the DMA 2000, Montgomery County Emergency Management Agency will call meetings of the Hazard Mitigation Team at one the following times:

- Annually
- Following disaster events
- In the event of emerging hazards

Evaluation of this plan update began with a plan review by the Montgomery County Emergency Management Agency Planner, following the "Local Mitigation Handbook, March 2013) protocol established by FEMA. As components of the plan update unfolded and were developed, each jurisdiction reviewed critical dimensions of the plan with senior management personnel within their jurisdictional agencies to insure that the leadership of the agencies was part of the process.

The following are some of the criteria that the Montgomery County Emergency Management Agency planner used as part of the evaluation of the plan during the scheduled hazard mitigation team meetings (annually, following a disaster, in the event of emerging hazards) :

- Are the goals and objectives addressed still current and in line with conditions?
- Have the nature, magnitude, and/or type of risks changed since the plan was approved?
- Are the current resources still appropriate as when the plan was implemented?
- Are there any implementation problems, technical, political, legal, or coordination issues with other agencies that need to be addressed?
- Are the hazard mitigation team members and other partners participating as intended?
- Are the requirements of the Local Mitigation Plan Review Crosswalk met?
- Has the Local Multi-Hazard Mitigation Planning Guidance requirements been addressed?

The information gathered from the above evaluation criteria will be used as part of the monitoring and evaluation process that will be incorporated into the plan maintenance and update processes.

The Hazard Mitigation Team will meet a minimum of once a year, while in some years it may be necessary to hold multiple meetings. Participation in mitigation planning training and continued modeling with HAZUS-MH and benefit-cost analyses will assist the Hazard Mitigation Team in refining the plan and modifying the plan to fit emerging needs.

Public involvement will be encouraged throughout the plan maintenance process and in future mitigation project planning through public hearings. Also, the public will be invited to attend the meetings of Hazard Mitigation Team. These meetings and public hearings for projects will be advertised to the public through public notices and advertisements.

Should it be deemed necessary to modify the plan such modifications will be appended to the plan upon agreement of the Hazard Mitigation Team and TEMA officials. The modifications will then be submitted to TEMA and FEMA for inclusion in the current plan.



It is our intention to initiate the plan update process approximately 12 months prior to plan expiration. The Montgomery County Emergency Management Agency Planner will initiate the process, involving the partners' staff personnel designated by the various participating jurisdictions. The process will follow the then current protocol for plan revision activity, and will integrate the evaluative indicators suggested through the preceding four years' annual evaluations, plus additional expectations levied by the approving agency. Some of the update processes are listed below:

- Meetings of the Hazard Mitigation Team
- Information gathered from Hazard Mitigation Team monitoring or evaluation meetings (Annually, following a disaster, in the event of emerging hazards) during the current plan cycle.
- Information gathered from opportunities provided for the general public, businesses, academia, and any others with an interest in the hazard mitigation plan to review and comment on the plan.
- An updated evaluation of the plan
- The updated plan process should be completed and submitted for approval six months prior to the expiration of the current plan.



Section 7: Plan Adoption

Montgomery County Resolution to Adopt



City of Clarksville Resolution to Adopt



Clarksville - Montgomery County School System Resolution to Adopt



Section 8: Appendix's

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APPENDIX 1

Hazard Mitigation Team

1. Rodney Grimsley – Montgomery County Emergency Management Agency (Assistant Director)
2. Amanda Sacoto-Dunbar- Montgomery County Emergency Management Agency (Planner)
3. Bronson Gibbs – Clarksville Gas & Water (Safety/Risk Management)
4. Chris Lambert - Clarksville Gas & Water (Water/Wastewater Operations Manager)
5. Chuck Frost – Montgomery County Highway Department (General Foreman)
6. David Abernathy – Cumberland Electric Membership Corporation (Operations Manager)
7. David Shepard – Clarksville Street Department (Director)
8. Debbie Smith – City of Clarksville (Grants Analyst)
9. Derek Oliver (SGT) - Austin Peay State University Police Department (Sergeant)
10. Douglas Catellier - Austin Peay State University GIS Center (Project Manager)
11. Dustin Haas – Montgomery County EMS (Lt. – SORT Team Commander)
12. Earl Snyder – Clarksville Department of Electricity (Vice President of Operations)
13. Emily Bowers – Clarksville-Montgomery County School System (Safety & Health)
14. Eric Salmon – City of Clarksville (NPDES Coordinator)
15. Fred Gilman – Coast Guard Auxiliary
16. James Halford – City of Clarksville (Chief of Staff)
17. James Perras – Tennova Healthcare Clarksville (Emergency Manager)
18. Jeff Bryant – City of Clarksville (Storm Water & Civil Engineer)
19. Jennifer Hood - Montgomery County Government (Safety & Risk Manager)
20. Jennifer Letourneau – Clarksville Parks & Recreation (Director)
21. Jimmy Edwards – Montgomery County Emergency Services (Director)
22. John Doss – Montgomery County Codes (Storm Water Coordinator)
23. John Eskew – City of Clarksville (Risk Manager)
24. Kimberly Kassander – TEMA (Middle Regional Planner)
25. Kyle Johnson – Montgomery County (Chief of Staff)
26. Mike Frost – Montgomery County Highway Department (Supervisor)
27. Mike Wilson – Austin Peay State University GIS Center (Manager)
28. Monty Fleet – Montgomery County Highway Department (Assistant Highway Supervisor)
29. Phillip Whittinghill - Clarksville Gas & Water (Water Treatment Plant Superintendent)
30. Rod Streeter – Montgomery County Building & Codes (Commissioner)
31. Scott Audet – Clarksville Transit System (Transportation Supervisor)
32. Tom Heath – Clarksville Gas & Water
33. Tommy Butler - Clarksville-Montgomery County School System (Safety & Health)
34. Steve Batten- Clarksville Fire Rescue (Deputy Chief)



APPENDIX 2

Hazard Mitigation Team Meeting Sign-In Rosters

December 13, 2016 Hazard Mitigation Plan Meeting

Name	Agency
1. Dorian Hines	Montgomery County E-45
2. [unclear]	Montgomery County E-45
3. [unclear]	Building & Safety - City
4. Mike Rocco	City - Public Works
5. [unclear]	City - Public Works
6. [unclear]	Montgomery County E-45
7. Ginger Bello-Parker	County Risk Mgmt
8. [unclear]	EMA
9. [unclear]	Building & Safety (County)
10. [unclear]	Montgomery County Building & Safety
11. [unclear]	APSO E-45
12. [unclear]	City - Public Works
13. [unclear]	City - Public Works
14. ASHLEY ROBERT	Sweet Dept. - Clarksville
15. [unclear]	Sweet Dept. - Clarksville
16. [unclear]	EMA
17. [unclear]	EMA
18. [unclear]	EMA
19. [unclear]	EMA
20. [unclear]	EMA

December 14, 2017

[illegible]

November 8, 2018

May 2020

Montgomery County
Multi-Jurisdictional All Hazards Mitigation Plan



2019
Hazard Mitigation Team Meeting
September 12, 2019

Name	Organization	Email
Rodney Grimsley	EMA	ragrimsley@mcgtn.net
Tommy Butler	CMCSS	
Deerick G. Oliver	APSPD	oliverd@apsu.edu
David Shepherd	CSD	d.shepherd@cityofclarksville.com
Scott Bibb	CSD	SBibb@cityofclarksville.com
Lauren Richmond	CMCSS	lauren.richmond@cmcss.net
Emily Bowers	CMCSS	emily.bowers@cmcss.net
Debbie Smith	City of Clarksville	Debbie.Smith@cityofclarksville.com
Angelia Koski	mcgill	akoski@mcgtn.net
Shane Coivens	Mont co F911	dsgivens@mcgtn.net
Wesley Gulden	City of Clarksville	Wes.gulden@cityofclarksville.com
John Eskew	City of Clarksville	john.eskew@cityofclarksville.com
James Perras	Tennova Healthcare Clarksville	james.perras@mytennova.com
Jennifer Letourneau	City of Clks Parks/Rec	jennifer.letourneau@cityofclarksville.com
Dennis E. Holden	TEMA	dennis.holden@tn.gov
Kurti Cochran	TEMA	kurti.m.cochran@tn.gov



APPENDIX 2A

Public Review- HAZMIT TEAM/Public Comments Sign-In Sheet

Draft 1st Review- No Comments Received

Final Draft 2nd Review- No Comments Received



APPENDIX 3

2020 Plan Update- Public Briefing Notice 1st Review (Draft)

The screenshot shows a webpage from Clarksville Now. At the top is a red navigation bar with links: HOME, NEWS, LIFESTYLE, EVENTS, SPORTS, ABOUT. Below this is a banner for "MRS. SANTA'S COOKIE AND CANDY ..." dated Dec 7 at The Way Christian Youth Center in Cadiz, KY. The main content area features a "Hazard Mitigation Plan Update" event listing for Monday, December 9, 2019, from 1:00 pm to 3:00 pm. It includes a map of the location at 130 South 1st St in Clarksville, TN, and contact information for the Montgomery County Emergency Management Agency. To the right, there are two smaller news snippets: "APSU tops 11,000 students for first time in University history" and "MMA fighter Kilburn excited to put Clarksville on the map in UFC debut".

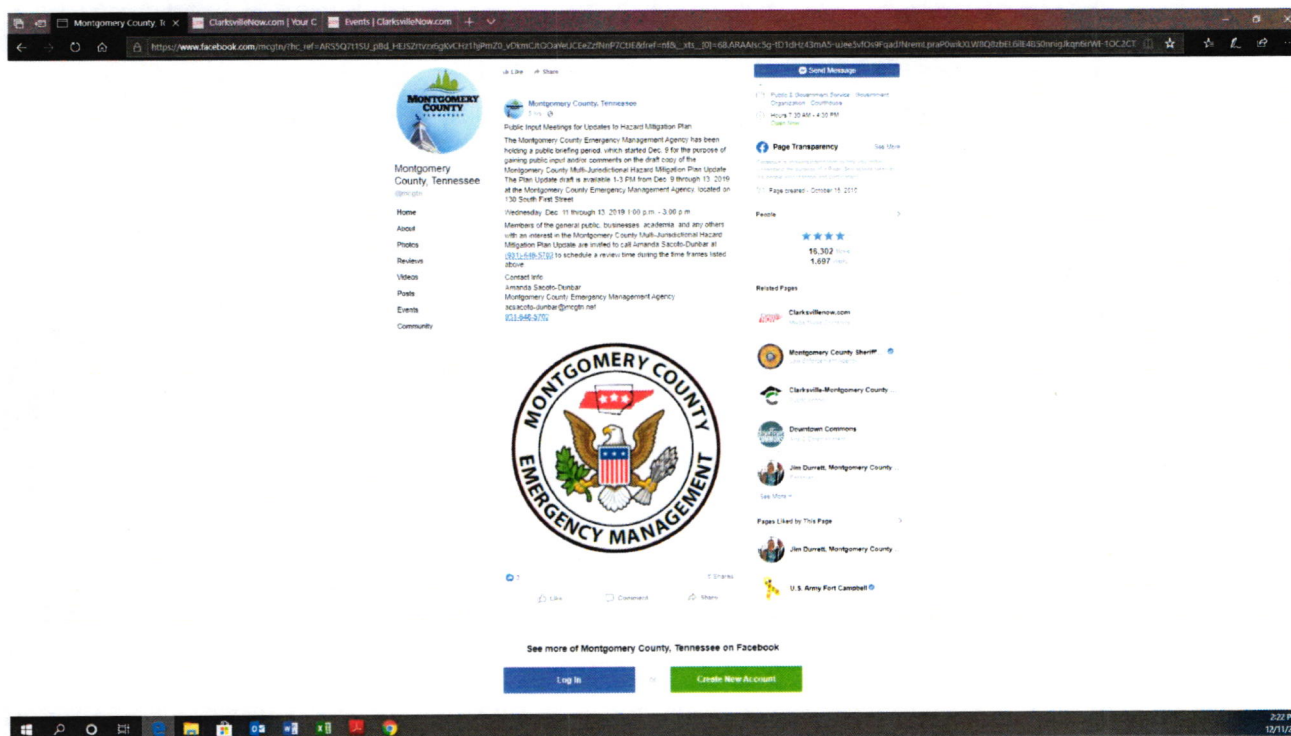
Clarksville Now Website

The screenshot shows the official Montgomery County website. The header includes the county logo and navigation links for Visitors, Residents, Business, Services, and Government. The "County News" section features a headline: "Public Input Meetings for Updates to Hazard Mitigation Plan". Below the headline, it states that the Montgomery County Emergency Management Agency is holding a public briefing period for the purpose of getting public input and/or comments on the draft copy of the Montgomery County Multi-Jurisdictional Hazard Mitigation Plan Update. The plan update draft will be available 1-3 PM from December 9, 2019 through December 13, 2019. A list of meeting dates and times is provided: Monday, December 9, 2019 1:00 pm - 3:00 pm; Tuesday, December 10, 2019 1:00 pm - 3:00 pm; Wednesday, December 11, 2019 1:00 pm - 3:00 pm; Thursday, December 12, 2019 1:00 pm - 3:00 pm; Friday, December 13, 2019 1:00 pm - 3:00 pm. The location is 130 South First Street, Clarksville, TN 37043. Contact information for Amanda Sacoto-Dunbar is also listed. The footer includes social media links and a "Connect with Montgomery County" section.

Montgomery County Website



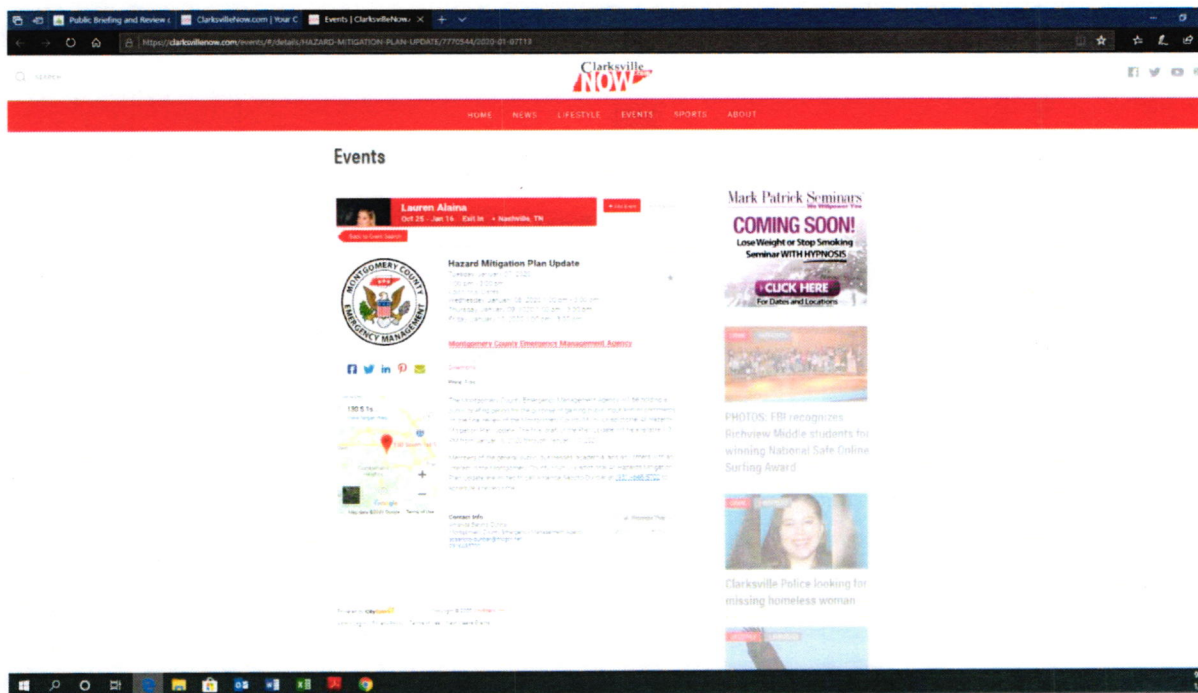
2020 Plan Update- Public Briefing Notice (Draft) (cont.)



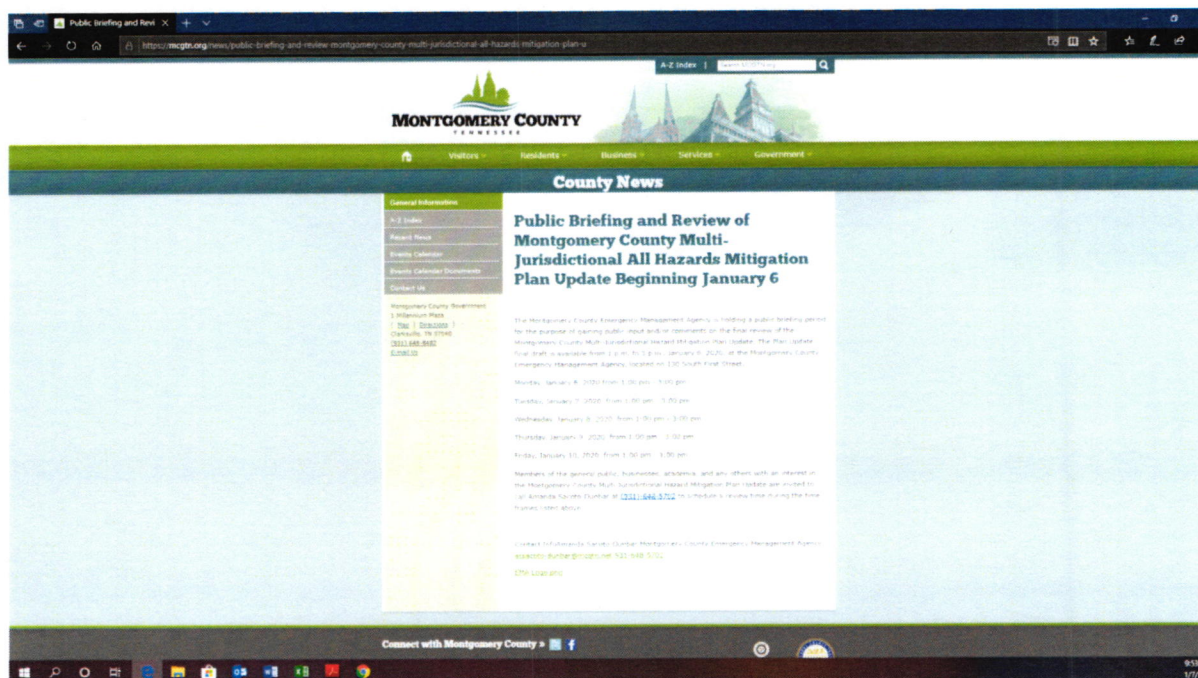
Montgomery County Facebook Page



2020 Plan Update- Public Briefing Notice 2nd Review (Final Draft)



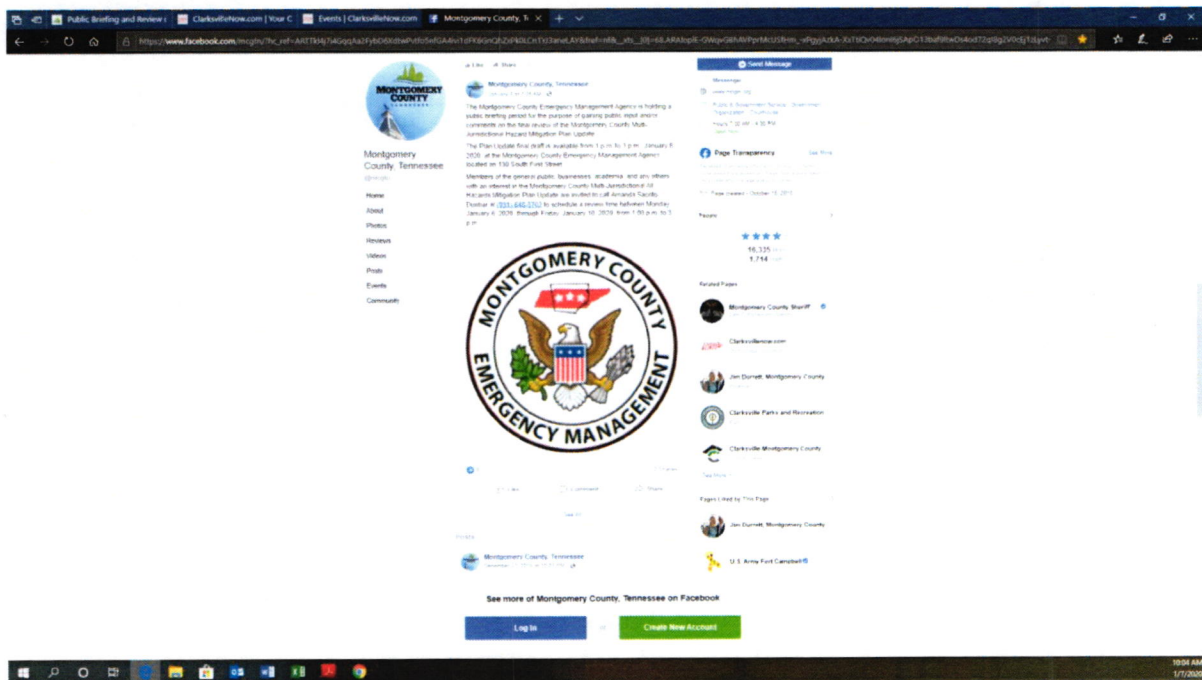
Clarksville Now Website



Montgomery County Website



2020 Plan Update- Public Briefing Notice 2nd Review (Final Draft) (cont.)



Montgomery County Facebook Page

2015 Public Notice Information



Montgomery County Website



The Montgomery County Emergency Management Agency will be holding a public briefing period for the purpose of gaining public input and/or comments on the final draft copy of the Montgomery County Multi-Jurisdictional Hazard Mitigation Plan Update. The Plan Update final draft will be available from 1 to 3 p.m. from September 22, 2014 through September 26, 2014.

Members of the general public, businesses, academia, and any others with an interest in the Montgomery County Multi-Jurisdictional Hazard Mitigation Plan Update are invited to call Rodney Grimsley at 648-5702 to schedule a review time.

Like Comment Share

Montgomery County Facebook Page



Public Notice Information- 2015 Plan Update (cont.)

COMMUNITY

MONDAY, SEPT. 22, 2014 • THE LEAF-CHRONICLE • CLARKSVILLE, TN

WHAT'S HAPPENING

Hazard Mitigation Plan Update

What: Montgomery County Emergency Management Agency public briefing period on final draft of Multi-Jurisdictional Hazard Mitigation Plan Update

When: 1-3 p.m. Sept. 22-26

Call: Rodney Grimsley at 648-5702 to schedule a review time.

The Leaf Chronicle Newspaper



APPENDIX 4

Flood Hazard History Data-2020 Plan Update

Location	State	Date	Time	Type	Deaths	Injuries	Property Damage
OAKWOOD	TN	12/23/2017	4:00	Flash Flood	0	0	0.00K
PORT ROYAL	TN	9/1/2017	2:00	Flash Flood	0	0	20.00K
FT CAMPBELL	TN	6/4/2017	23:50	Flash Flood	0	0	0.00K
KENWOOD	TN	7/28/2016	3:00	Flood	0	0	0.00K
OAKWOOD	TN	7/7/2016	2:00	Flash Flood	0	0	1.000M
FT CAMPBELL	TN	5/25/2016	17:00	Flood	0	0	0.00K
OAKWOOD	TN	7/5/2013	20:15	Flash Flood	0	0	2.00K
OAKWOOD	TN	4/27/2013	19:00	Flash Flood	0	0	1.000M
BRIARWOOD	TN	3/8/2012	16:56	Flash Flood	0	0	1.00K
WOODLAWN	TN	2/28/2011	6:50	Flash Flood	0	0	1.00K
KENNEDY	TN	2/24/2011	22:15	Flood	0	0	1.00K
CLARKSVILLE	TN	5/20/2010	10:19	Flash Flood	0	0	50.00K
FT CAMPBELL	TN	5/1/2010	15:40	Flood	1	0	1.900M
OAKRIDGE	TN	9/22/2009	11:00	Flood	0	0	25.00K
HAMPTON STATION	TN	7/30/2009	21:18	Flash Flood	0	0	5.00K
CLARKSVILLE	TN	5/9/2009	1:40	Flash Flood	0	0	300.00K
CLARKSVILLE	TN	12/7/2004	3:43	Flash Flood	0	0	1.00K
CLARKSVILLE	TN	8/4/2004	21:40	Flash Flood	0	0	1.00K
CLARKSVILLE	TN	8/4/2004	21:35	Flash Flood	0	0	10.00K
COUNTYWIDE	TN	6/18/2003	4:00	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	6/18/2003	3:30	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	5/7/2003	0:25	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	9/27/2002	0:12	Flood	1	0	0.00K
SOUTH PORTION	TN	3/20/2002	6:00	Flash Flood	0	0	0.00K
COUNTYWIDE	TN	3/17/2002	23:00	Flash Flood	0	0	0.00K
MONTGOMERY (ZONE)	TN	12/12/2001	16:55	Flood	0	0	0.00K
WEST PORTION	TN	11/29/2001	2:00	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	5/4/2000	19:00	Flash Flood	0	0	0.00K
ST BETHLEHEM	TN	7/2/1999	10:00	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	7/2/1999	8:15	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	5/5/1999	22:00	Flash Flood	0	0	50.00K
ST BETHLEHEM	TN	1/22/1999	16:30	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	7/23/1998	19:43	Flash Flood	0	0	50.00K



CLARKSVILLE	TN	6/10/1998	10:10	Flash Flood	0	0	0.00K
PORT ROYAL	TN	6/10/1998	10:10	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	6/30/1997	14:05	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	6/28/1997	8:33	Flash Flood	0	0	10.00K
CLARKSVILLE	TN	6/13/1997	23:30	Flash Flood	0	0	0.00K
COUNTYWIDE	TN	3/5/1997	13:00	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	3/2/1997	15:15	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	3/2/1997	0:30	Flash Flood	0	0	500.00K
MONTGOMERY (ZONE)	TN	3/2/1997	0:00	Flood	0	0	500.00K
COUNTYWIDE	TN	3/1/1997	21:20	Flash Flood	0	0	10.00K
COUNTYWIDE	TN	3/1/1997	15:00	Flash Flood	0	0	0.00K
COUNTYWIDE	TN	2/4/1997	5:45	Flash Flood	0	0	0.00K
COUNTYWIDE	TN	2/4/1997	3:06	Flash Flood	0	0	0.00K
CLARKSVILLE	TN	2/4/1997	1:40	Flash Flood	0	0	10.00K
CLARKSVILLE	TN	12/16/1996	22:35	Flash Flood	0	0	0.00K

Flood Hazard History Data- 2015 Plan Update

Location	County/Zone	St.	Date	Time	Type	Dth	Inj	PrD
CLARKSVILLE	MONTGOMERY CO.	TN	5/4/2000	19:00	Flash	0	0	0.00K
WEST PORTION	MONTGOMERY CO.	TN	11/29/2001	2:00	Flash	0	0	0.00K
MONTGOMERY (ZONE)	MONTGOMERY (ZONE)	TN	12/12/2001	16:55	Flood	0	0	0.00K
COUNTYWIDE	MONTGOMERY CO.	TN	3/17/2002	23:00	Flash	0	0	0.00K
SOUTH PORTION	MONTGOMERY CO.	TN	3/20/2002	6:00	Flash	0	0	0.00K
CLARKSVILLE	MONTGOMERY CO.	TN	9/27/2002	0:12	Flood	1	0	0.00K
CLARKSVILLE	MONTGOMERY CO.	TN	5/7/2003	0:25	Flash	0	0	0.00K
CLARKSVILLE	MONTGOMERY CO.	TN	6/18/2003	3:30	Flash	0	0	0.00K
COUNTYWIDE	MONTGOMERY CO.	TN	6/18/2003	4:00	Flash	0	0	0.00K
CLARKSVILLE	MONTGOMERY CO.	TN	8/4/2004	21:35	Flash	0	0	10.00K
CLARKSVILLE	MONTGOMERY CO.	TN	8/4/2004	21:40	Flash	0	0	1.00K
CLARKSVILLE	MONTGOMERY CO.	TN	12/7/2004	3:43	Flash	0	0	1.00K

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CLARKSVILLE	MONTGOMERY CO.	TN	5/9/2009	1:40	Flash	0	0	300.00K
HAMPTON STATION	MONTGOMERY CO.	TN	7/30/2009	21:18	Flash	0	0	5.00K
OAKRIDGE	MONTGOMERY CO.	TN	9/22/2009	11:00	Flood	0	0	25.00K
FT CAMPBELL	MONTGOMERY CO.	TN	5/1/2010	15:40	Flood	1	0	1.900M
CLARKSVILLE	MONTGOMERY CO.	TN	5/20/2010	10:19	Flash	0	0	50.00K
KENNEDY	MONTGOMERY CO.	TN	2/24/2011	22:15	Flood	0	0	1.00K
WOODLAWN	MONTGOMERY CO.	TN	2/28/2011	6:50	Flash	0	0	1.00K
BRIARWOOD	MONTGOMERY CO.	TN	3/8/2012	16:56	Flash	0	0	1.00K
OAKWOOD	MONTGOMERY CO.	TN	4/27/2013	19:00	Flash	0	0	1.000M
OAKWOOD	MONTGOMERY CO.	TN	7/5/2013	20:15	Flash	0	0	2.00K



APPENDIX 5

Tornado Hazard History Data- 2020 Plan Update

Location	State	Date	Type	Mag.	Dth.	Inj.	Prop. Dam.
MC ALLISTERS XRDS	TN	6/19/2019	Tornado	EF0	0	0	15.00K
ST BETHLEHEM	TN	2/24/2018	Tornado	EF2	0	2	7.000M
DOTSONVILLE	TN	2/24/2018	Tornado	EF1	0	0	1.000M
EXCELL	TN	10/13/2014	Tornado	EF1	0	0	50.00K
CUMBERLAND HGTS	TN	5/2/2008	Tornado	EF1	0	0	100.00K
PALMYRA	TN	5/2/2008	Tornado	EF1	0	3	20.00K
SHILOH	TN	5/2/2008	Tornado	EF1	0	0	20.00K
SHILOH	TN	5/2/2008	Tornado	EF1	0	0	5.00K
CLARKSVILLE	TN	9/23/2006	Tornado	F0	0	0	40.00K
CLARKSVILLE	TN	11/15/2005	Tornado	F2	0	0	500.00K
CUNNINGHAM	TN	11/15/2005	Tornado	F0	0	0	0.00K
CUNNINGHAM	TN	11/15/2005	Tornado	F1	0	0	600.00K
SHILOH	TN	11/15/2005	Tornado	F1	0	0	500.00K
CLARKSVILLE	TN	5/4/2003	Tornado	F3	0	1	750.00K
PORT ROYAL	TN	11/10/2002	Tornado	F1	2	0	100.00K
CLARKSVILLE	TN	11/10/2002	Tornado	F0	0	0	0.00K
CLARKSVILLE	TN	5/27/2000	Tornado	F0	0	0	0.00K
CLARKSVILLE	TN	5/5/1999	Tornado	F0	0	0	0.00K
CLARKSVILLE	TN	1/22/1999	Tornado	F3	0	5	72.700M
WOODLAWN	TN	1/17/1999	Tornado	F1	0	0	20.00K
PORT ROYAL	TN	4/16/1998	Tornado	F2	0	0	10.00K
HILLTOP	TN	4/3/1998	Tornado	F2	0	0	100.00K
FT CAMPBELL	TN	6/17/1997	Tornado	F0	0	0	130.00K
MONTGOMERY CO.	TN	8/30/1985	Tornado	F1	0	0	0.25K
MONTGOMERY CO.	TN	5/7/1984	Tornado	F1	0	0	0.00K
MONTGOMERY CO.	TN	5/22/1973	Tornado	F1	0	0	0.00K
MONTGOMERY CO.	TN	5/7/1971	Tornado	F0	0	0	0.00K
MONTGOMERY CO.	TN	7/3/1970	Tornado	F1	0	1	25.00K
MONTGOMERY CO.	TN	4/27/1970	Tornado	F4	0	0	2.500M
MONTGOMERY CO.	TN	4/25/1961	Tornado	F2	0	2	25.00K
MONTGOMERY CO.	TN	11/18/1957	Tornado	F1	0	0	2.50K



Tornado Hazard History Data- 2015 Plan Update

Location	County/Zone	Date	Time	Type	Mag	Dth	Inj	Prd
	MONTGOMERY CO.	11/18/1957	04:00	Tornado	F1	0	0	3.00K
	MONTGOMERY CO.	4/25/1961	18:15	Tornado	F2	0	2	25.00K
	MONTGOMERY CO.	4/27/1970	14:00	Tornado	F4	0	0	2.500M
	MONTGOMERY CO.	7/3/1970	18:50	Tornado	F1	0	1	25.00K
	MONTGOMERY CO.	5/7/1971	2115	Tornado	F0	0	0	0.00K
	MONTGOMERY CO.	5/22/1973	19:15	Tornado	F1	0	0	0.00K
	MONTGOMERY CO.	5/7/1984	13:00	Tornado	F1	0	0	0.00K
	MONTGOMERY CO.	8/30/1985	19:00	Tornado	F1	0	0	0.00K
FT CAMPBELL	MONTGOMERY CO.	6/17/1997	18:13	Tornado	F0	0	0	130.00K
HILLTOP	MONTGOMERY CO.	4/3/1998	14:10	Tornado	F2	0	0	100.00K
PORT ROYAL	MONTGOMERY CO.	4/16/1998	9:18	Tornado	F2	0	0	10.00K
WOODLAWN	MONTGOMERY CO.	1/17/1999	19:28	Tornado	F1	0	0	20.00K
CLARKSVILLE	MONTGOMERY CO.	1/22/1999	4:15	Tornado	F3	0	5	72.700M
CLARKSVILLE	MONTGOMERY CO.	5/5/1999	17:58	Tornado	F0	0	0	0.00K
CLARKSVILLE	MONTGOMERY CO.	5/27/2000	14:10	Tornado	F0	0	0	0.00K
CLARKSVILLE	MONTGOMERY CO.	11/10/2002	0:50	Tornado	F0	0	0	0.00K
PORT ROYAL	MONTGOMERY CO.	11/10/2002	1:00	Tornado	F1	2	0	100.00K
CLARKSVILLE	MONTGOMERY CO.	5/4/2003	23:53	Tornado	F3	0	1	750.00K
SHILOH	MONTGOMERY CO.	11/15/2005	16:35	Tornado	F1	0	0	500.00K
CUNNINGHAM	MONTGOMERY CO.	11/15/2005	16:36	Tornado	F1	0	0	600.00K
CUNNINGHAM	MONTGOMERY CO.	11/15/2005	16:37	Tornado	F0	0	0	0.00K
CLARKSVILLE	MONTGOMERY CO.	11/15/2005	16:44	Tornado	F2	0	0	500.00K
CLARKSVILLE	MONTGOMERY CO.	9/23/2006	3:00	Tornado	F0	0	0	40.00K

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SHILOH	MONTGOMERY CO.	5/2/2008	22:57	Tornado	EF1	0	0	5.00K
SHILOH	MONTGOMERY CO.	5/2/2008	23:00	Tornado	EF1	0	0	20.00K
PALMYRA	MONTGOMERY CO.	5/2/2008	23:05	Tornado	EF1	0	3	20.00K
CUMBERLAND HGTS	MONTGOMERY CO.	5/2/2008	23:10	Tornado	EF1	0	0	100.00K



APPENDIX 6

Winter Storm Hazard History Data- 2020 Plan Update

Location	State	Date	Time	Type	Deaths	Injuries	Property Damage
MONTGOMERY (ZONE)	TN	1/15/2018	19:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/12/2018	0:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/21/2016	21:00	Winter Storm	0	0	10.00K
MONTGOMERY (ZONE)	TN	3/4/2015	15:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	2/20/2015	12:00	Winter Storm	0	0	10.00K
MONTGOMERY (ZONE)	TN	2/16/2015	0:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	3/2/2014	16:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	12/7/2013	21:00	Ice Storm	0	0	20.00K
MONTGOMERY (ZONE)	TN	12/6/2013	16:00	Ice Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/15/2013	17:00	Ice Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	2/9/2011	13:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	2/7/2011	9:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/26/2011	1:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	12/24/2010	19:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	2/8/2010	17:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/29/2010	8:00	Heavy Snow	0	0	250.00K
MONTGOMERY (ZONE)	TN	1/27/2009	0:00	Ice Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	3/7/2008	18:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	2/10/2006	22:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	12/22/2004	20:00	Winter Storm	0	6	0.00K
MONTGOMERY (ZONE)	TN	2/9/2003	21:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/16/2003	11:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	12/4/2002	6:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/22/2000	14:30	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	12/24/1998	9:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	3/19/1996	1:00	Heavy Snow	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/6/1996	17:00	Winter Storm	0	0	0.00K
MONTGOMERY (ZONE)	TN	1/6/1996	5:50	Winter Storm	0	0	0.00K

Winter Storm Hazard History Data- 2015 Plan Update

County/Zone	Date	Time	Type	Dth	Inj	PrD
MONTGOMERY	1/22/2000	14:30	Winter Storm	0	0	0.00K
MONTGOMERY	12/4/2002	6:00	Winter Storm	0	0	0.00K
MONTGOMERY	1/16/2003	11:00	Heavy Snow	0	6	0.00K
MONTGOMERY	2/9/2003	21:00	Heavy Snow	0	0	0.00K
MONTGOMERY	12/22/2004	20:00	Winter Storm	0	0	0.00K

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MONTGOMERY	2/10/2006	22:00	Heavy Snow	0	0	0.00K
MONTGOMERY	3/7/2008	18:00	Winter Storm	0	0	0.00K
MONTGOMERY	1/27/2009	0:00	Ice Storm	0	0	20.00K
MONTGOMERY	1/29/2010	8:00	Heavy Snow	0	0	0.00K
MONTGOMERY	2/8/2010	17:00	Heavy Snow	0	0	0.00K
MONTGOMERY	12/24/2010	19:00	Heavy Snow	0	0	0.00K
MONTGOMERY	1/26/2011	1:00	Heavy Snow	0	0	250.00K
MONTGOMERY	2/7/2011	9:00	Heavy Snow	0	0	0.00K
MONTGOMERY	2/9/2011	13:00	Heavy Snow	0	0	0.00K
MONTGOMERY	1/15/2013	17:00	Ice Storm	0	0	0.00K
MONTGOMERY	12/6/2013	16:00	Ice Storm	0	0	0.00K
MONTGOMERY	12/7/2013	21:00	Ice Storm	0	0	0.00K



APPENDIX 7

Thunderstorm/High Wind Hazard History Data- 2020 Plan Update

Location	Date	Time	Type	Deaths	Injuries	Property Damage
SHADY GROVE	6/22/2019	14:54	Thunderstorm Wind	0	0	3.00K
SANGO	6/22/2019	14:45	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	6/22/2019	14:43	Thunderstorm Wind	0	0	5.00K
ST BETHLEHEM	6/22/2019	14:37	Thunderstorm Wind	0	0	3.00K
CLARKSVILLE	6/22/2019	14:34	Thunderstorm Wind	0	0	5.00K
ST BETHLEHEM	6/22/2019	14:32	Thunderstorm Wind	0	0	2.00K
KENNEDY	6/22/2019	14:28	Thunderstorm Wind	0	0	15.00K
CLARKSVILLE	6/21/2019	18:03	Thunderstorm Wind	0	0	15.00K
ST BETHLEHEM	6/21/2019	17:59	Thunderstorm Wind	0	0	2.00K
SANGO	12/31/2018	13:33	Thunderstorm Wind	0	0	3.00K
BRIARWOOD	12/31/2018	13:23	Thunderstorm Wind	0	0	25.00K
BRIARWOOD	12/31/2018	13:22	Thunderstorm Wind	0	0	5.00K
STRINGTOWN	7/5/2018	16:16	Thunderstorm Wind	0	0	5.00K
HILLTOP	5/20/2018	17:55	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	2/24/2018	21:00	Thunderstorm Wind	0	0	25.00K
DOTSONVILLE	11/18/2017	15:49	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	5/27/2017	17:12	Thunderstorm Wind	0	0	5.00K
STRINGTOWN	5/27/2017	17:07	Thunderstorm Wind	0	0	3.00K
MONTGOMERY (ZONE)	4/3/2017	1:08	High Wind	0	0	0.00K
SANGO	3/1/2017	6:41	Thunderstorm Wind	0	0	1.00K
ST BETHLEHEM	3/1/2017	6:36	Thunderstorm Wind	0	0	1.00K
ROUND POND	3/1/2017	6:35	Thunderstorm Wind	0	0	1.00K
ST BETHLEHEM	3/1/2017	6:35	Thunderstorm Wind	0	0	2.00K
KENNEDY	3/1/2017	6:34	Thunderstorm Wind	0	0	1.00K
HILLTOP	3/1/2017	6:33	Thunderstorm Wind	0	0	2.00K
CLARKSVILLE	3/1/2017	6:33	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE ARPT	3/1/2017	6:31	Thunderstorm Wind	0	0	0.00K
BEL AIR ESTATES	3/1/2017	6:28	Thunderstorm Wind	0	2	40.00K
CLARKSVILLE	12/17/2016	20:26	Thunderstorm Wind	0	0	1.00K
HAMPTON STATION	11/28/2016	17:29	Thunderstorm Wind	0	0	1.00K
SHADY GROVE	11/28/2016	17:17	Thunderstorm Wind	0	0	1.00K
OAKWOOD	9/10/2016	14:18	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	8/3/2016	12:55	Thunderstorm Wind	0	0	1.00K

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SAILORS REST	8/1/2016	15:36	Thunderstorm Wind	0	0	3.00K
EXCELL	7/19/2016	14:03	Thunderstorm Wind	0	0	2.00K
CLARKSVILLE	7/19/2016	14:00	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	7/8/2016	19:09	Thunderstorm Wind	0	0	1.00K
STRINGTOWN	7/8/2016	18:58	Thunderstorm Wind	0	0	2.00K
KENWOOD	7/6/2016	14:13	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	6/28/2016	14:35	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	6/28/2016	14:30	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	6/15/2016	14:22	Thunderstorm Wind	0	0	10.00K
ST BETHLEHEM	6/15/2016	14:21	Thunderstorm Wind	0	0	1.00K
SANGO	5/1/2016	14:55	Thunderstorm Wind	0	0	3.00K
CLARKSVILLE	4/27/2016	16:25	Thunderstorm Wind	0	0	1.00K
OAKRIDGE	4/27/2016	16:09	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	2/2/2016	15:55	Thunderstorm Wind	0	0	3.00K
MC ALLISTERS XRDS	7/7/2015	15:31	Thunderstorm Wind	0	0	3.00K
ST BETHLEHEM	5/30/2015	16:13	Thunderstorm Wind	0	0	50.00K
ST BETHLEHEM	5/30/2015	16:10	Thunderstorm Wind	0	0	5.00K
ST BETHLEHEM	10/13/2014	17:15	Thunderstorm Wind	0	0	3.00K
BEL AIR ESTATES	10/13/2014	17:10	Thunderstorm Wind	0	0	5.00K
ST BETHLEHEM	10/13/2014	17:10	Thunderstorm Wind	0	0	5.00K
OAKRIDGE	10/13/2014	16:50	Thunderstorm Wind	0	0	3.00K
SHILOH	10/13/2014	16:45	Thunderstorm Wind	0	0	3.00K
CLARKSVILLE	8/20/2014	15:44	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE ARPT	8/20/2014	15:40	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE ARPT	8/20/2014	15:23	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE ARPT	8/20/2014	15:21	Thunderstorm Wind	0	0	0.00K
WOODLAWN	6/4/2014	21:50	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE ARPT	12/21/2013	20:19	Thunderstorm Wind	0	0	0.00K
KENWOOD	11/17/2013	17:41	Thunderstorm Wind	0	0	1.00K
SHILOH	7/18/2013	16:01	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE ARPT	7/18/2013	15:38	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE ARPT	7/18/2013	15:33	Thunderstorm Wind	0	0	1.00K
WOODLAWN	4/27/2013	18:20	Thunderstorm Wind	0	0	3.00K
EXCELL	9/7/2012	22:53	Thunderstorm Wind	0	0	5.00K
DOTSONVILLE	9/7/2012	22:43	Thunderstorm Wind	0	0	25.00K
PALMYRA	9/7/2012	22:40	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	8/16/2012	20:20	Thunderstorm Wind	0	0	1.00K

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BELDON	8/5/2012	18:50	Thunderstorm Wind	0	0	2.00K
ROUND POND	7/19/2012	23:45	Thunderstorm Wind	0	0	25.00K
BRIARWOOD	7/19/2012	23:40	Thunderstorm Wind	0	0	25.00K
KENWOOD	7/19/2012	23:35	Thunderstorm Wind	0	0	1.00K
MC ALLISTERS XRDS	7/18/2012	16:15	Thunderstorm Wind	0	0	10.00K
SANGO	7/18/2012	15:35	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	7/8/2012	19:30	Thunderstorm Wind	0	0	25.00K
CLARKSVILLE ARPT	7/6/2012	13:05	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE ARPT	7/6/2012	13:04	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE ARPT	7/6/2012	12:36	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/5/2012	15:55	Thunderstorm Wind	0	0	25.00K
HICKORY PT	7/4/2012	16:15	Thunderstorm Wind	0	0	20.00K
EXCELL	7/4/2012	15:50	Thunderstorm Wind	0	0	50.00K
RINGGOLD	6/11/2012	16:19	Thunderstorm Wind	0	0	8.00K
SHILOH	5/29/2012	16:15	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	5/29/2012	16:00	Thunderstorm Wind	0	0	5.00K
KENNEDY	5/29/2012	16:00	Thunderstorm Wind	0	0	10.00K
PORT ROYAL	5/29/2012	15:55	Thunderstorm Wind	0	0	30.00K
PARK LANE	5/29/2012	15:50	Thunderstorm Wind	0	0	30.00K
CLARKSVILLE	1/23/2012	0:30	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	1/23/2012	0:30	Thunderstorm Wind	0	0	25.00K
NEW PROVIDENCE	8/21/2011	1:35	Thunderstorm Wind	0	0	50.00K
KENNEDY	6/28/2011	2:05	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	5/25/2011	21:20	Thunderstorm Wind	0	0	25.00K
ST BETHLEHEM	4/26/2011	0:05	Thunderstorm Wind	0	0	20.00K
CLARKSVILLE	4/26/2011	0:04	Thunderstorm Wind	0	0	0.00K
SANGO	4/20/2011	0:10	Thunderstorm Wind	0	0	11.00K
SHADY GROVE	4/19/2011	23:58	Thunderstorm Wind	0	0	5.00K
WOODLAWN	4/19/2011	23:44	Thunderstorm Wind	0	0	50.00K
BELDON	2/24/2011	21:15	Thunderstorm Wind	0	0	10.00K
KENWOOD	2/24/2011	21:15	Thunderstorm Wind	0	0	25.00K
HAMPTON STATION	11/25/2010	15:45	Thunderstorm Wind	0	0	100.00K
KENNEDY	11/25/2010	15:30	Thunderstorm Wind	0	0	10.00K
BELDON	10/26/2010	10:15	Thunderstorm Wind	0	0	0.00K
SALEM	7/11/2010	16:05	Thunderstorm Wind	0	0	50.00K
CLARKSVILLE	6/17/2010	14:29	Thunderstorm Wind	0	0	15.00K
HAMPTON STATION	4/24/2010	16:03	Thunderstorm Wind	0	0	5.00K

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CLARKSVILLE	4/24/2010	15:53	Thunderstorm Wind	0	2	18.00K
KENNEDY	8/4/2009	18:30	Thunderstorm Wind	0	0	25.00K
DOTSONVILLE	7/15/2009	14:04	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	7/12/2009	17:35	Thunderstorm Wind	0	0	50.00K
SALEM	7/4/2009	18:30	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	6/17/2009	18:05	Thunderstorm Wind	0	0	50.00K
ST BETHLEHEM	6/16/2009	12:35	Thunderstorm Wind	0	0	7.00K
ROUND POND	5/9/2009	0:35	Thunderstorm Wind	0	0	150.00K
CLARKSVILLE	5/9/2009	0:30	Thunderstorm Wind	0	0	100.00K
CLARKSVILLE	7/22/2008	9:00	Thunderstorm Wind	0	0	0.50K
CLARKSVILLE	7/7/2008	15:25	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	6/12/2008	13:10	Thunderstorm Wind	0	0	0.20K
CLARKSVILLE	4/10/2008	23:35	Thunderstorm Wind	0	0	0.50K
CLARKSVILLE	2/5/2008	21:43	Thunderstorm Wind	0	0	100.00K
MONTGOMERY (ZONE)	1/29/2008	18:45	High Wind	0	0	60.00K
OAKWOOD	1/29/2008	18:22	Thunderstorm Wind	0	0	20.00K
MONTGOMERY (ZONE)	1/29/2008	18:10	High Wind	0	0	0.00K
WOODLAWN	10/18/2007	21:34	Thunderstorm Wind	0	0	0.00K
RINGGOLD	10/18/2007	21:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	6/24/2007	12:57	Thunderstorm Wind	0	0	0.20K
WOODLAWN	6/2/2007	16:15	Thunderstorm Wind	0	0	0.50K
CLARKSVILLE	5/15/2007	18:45	Thunderstorm Wind	0	0	0.30K
CLARKSVILLE	4/24/2007	12:25	Thunderstorm Wind	0	0	0.00K
PALMYRA	4/24/2007	12:17	Thunderstorm Wind	0	0	0.20K
CLARKSVILLE	2/20/2007	21:45	Thunderstorm Wind	0	0	0.00K
WOODLAWN	9/27/2006	21:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	9/23/2006	3:00	Thunderstorm Wind	0	0	0.00K
CUNNINGHAM	9/23/2006	2:50	Thunderstorm Wind	0	0	50.00K
CLARKSVILLE	8/14/2006	20:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/14/2006	20:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/2/2006	23:00	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	4/2/2006	22:55	Thunderstorm Wind	0	0	2.00K
CUNNINGHAM	4/2/2006	22:55	Thunderstorm Wind	0	0	0.00K
WOODLAWN	4/2/2006	22:50	Thunderstorm Wind	0	0	4.00K
WOODLAWN	4/2/2006	19:14	Thunderstorm Wind	0	0	5.00K
CUMBERLAND HGTS	4/2/2006	19:14	Thunderstorm Wind	0	0	2.00K

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CLARKSVILLE	11/6/2005	3:45	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/19/2005	12:52	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/19/2005	12:40	Thunderstorm Wind	0	1	50.00K
CLARKSVILLE	1/13/2005	7:30	Thunderstorm Wind	0	0	0.00K
SANGO	10/14/2004	16:32	Thunderstorm Wind	0	0	10.00K
HILLTOP	10/14/2004	16:22	Thunderstorm Wind	0	0	5.00K
PALMYRA	10/14/2004	16:16	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	7/13/2004	20:15	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	7/6/2004	14:50	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/4/2004	14:25	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	3/20/2004	13:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/29/2003	19:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/28/2003	17:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/28/2003	17:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/28/2003	17:25	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/7/2003	0:25	Thunderstorm Wind	0	0	250.00K
CLARKSVILLE	5/5/2003	0:15	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/4/2003	23:44	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	11/10/2002	18:00	Thunderstorm Wind	0	0	0.00K
FT CAMPBELL	7/10/2002	12:35	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/3/2002	14:54	Thunderstorm Wind	0	0	0.00K
DOTSONVILLE	7/2/2002	23:35	Thunderstorm Wind	0	0	0.00K
SOUTH PORTION	7/2/2002	23:19	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/2/2002	12:45	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	5/13/2002	8:20	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/28/2002	4:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	11/24/2001	9:10	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	10/24/2001	18:15	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	9/6/2001	18:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/26/2001	20:00	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	7/18/2001	16:50	Thunderstorm Wind	0	0	0.00K
WOODLAWN	6/27/2001	14:41	Thunderstorm Wind	0	0	0.00K
MONTGOMERY (ZONE)	6/4/2001	19:58	High Wind	0	0	0.00K
COUNTYWIDE	5/20/2001	4:00	Thunderstorm Wind	0	0	0.00K
WOODLAWN	5/7/2001	15:40	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	2/24/2001	23:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	11/9/2000	11:05	Thunderstorm Wind	0	0	0.00K

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CLARKSVILLE	8/4/2000	3:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/3/2000	18:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/3/2000	18:05	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/12/2000	12:45	Thunderstorm Wind	0	0	0.00K
HILLTOP	5/27/2000	14:20	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	5/26/2000	18:10	Thunderstorm Wind	0	0	5.00K
COUNTYWIDE	5/24/2000	20:42	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/13/2000	1:45	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/20/2000	16:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/17/2000	1:00	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	2/18/2000	18:20	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	7/1/1999	22:35	Thunderstorm Wind	0	0	50.00K
CLARKSVILLE	7/1/1999	20:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	6/28/1999	13:45	Thunderstorm Wind	0	0	0.00K
CUNNINGHAM	6/4/1999	22:23	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	6/4/1999	22:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	6/4/1999	21:57	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	6/4/1999	21:30	Thunderstorm Wind	0	0	0.00K
SANGO	2/7/1999	4:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	1/17/1999	19:53	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	11/10/1998	9:45	Thunderstorm Wind	0	0	1.00K
MC ALLISTERS XRDS	5/31/1998	21:30	Thunderstorm Wind	0	0	0.00K
WOODLAWN	5/25/1998	18:20	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/21/1998	17:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/21/1998	17:00	Thunderstorm Wind	0	0	80.00K
NORTHWEST PORTION	4/8/1998	11:05	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/8/1998	11:00	Thunderstorm Wind	0	0	0.00K
HILLTOP	4/3/1998	14:20	Thunderstorm Wind	0	0	100.00K
CLARKSVILLE	7/28/1997	17:40	Thunderstorm Wind	0	0	0.00K
PORT ROYAL	7/14/1997	20:15	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/14/1997	20:15	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/4/1997	3:25	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	7/4/1997	3:00	Thunderstorm Wind	0	0	15.00K
CLARKSVILLE	6/13/1997	18:00	Thunderstorm Wind	0	0	20.00K
CUNNINGHAM	5/26/1997	8:55	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	2/21/1997	7:40	Thunderstorm Wind	0	0	0.00K

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CLARKSVILLE	11/7/1996	12:30	Thunderstorm Wind	0	0	0.50K
COUNTYWIDE	9/27/1996	2:45	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/29/1996	10:45	Thunderstorm Wind	0	0	0.30K
CLARKSVILLE	7/21/1996	19:33	Thunderstorm Wind	0	0	3.00K
CLARKSVILLE	6/23/1996	20:05	Thunderstorm Wind	0	0	0.00K
DOTSONVILLE	6/23/1996	19:58	Thunderstorm Wind	0	0	0.50K
CLARKSVILLE	6/15/1996	17:25	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/27/1996	13:30	Thunderstorm Wind	0	0	0.00K
WOODLAWN	4/20/1996	1:45	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	4/20/1996	1:40	Thunderstorm Wind	0	0	0.00K
PORT ROYAL	3/16/1996	14:00	Thunderstorm Wind	0	0	20.00K
CLARKSVILLE	3/16/1996	13:45	Thunderstorm Wind	0	0	1.00K
Clarksville	8/8/1995	11:10	Thunderstorm Wind	0	0	0.10K
Clarksville	7/24/1995	13:15	Thunderstorm Wind	0	0	5.00K
Clarksville	7/22/1995	13:45	Thunderstorm Wind	0	0	10.00K
Clarksville	6/7/1995	17:50	Thunderstorm Wind	0	0	2.00K
Clarksville	6/6/1995	15:45	Thunderstorm Wind	0	0	5.00K
Clarksville	5/14/1995	16:30	Thunderstorm Wind	0	0	5.00K
Clarksville	6/22/1994	0:15	Thunderstorm Wind	0	0	0.50K
Clarksville	6/21/1994	12:22	Thunderstorm Wind	0	0	0.50K
Clarksville	5/6/1993	17:30	Thunderstorm Wind	0	0	5.00K
MONTGOMERY CO.	9/10/1992	2:20	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	7/3/1992	1:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/25/1992	17:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	5/12/1992	17:10	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/4/1991	13:20	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	4/9/1991	11:45	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	9/7/1990	15:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/6/1990	17:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/3/1990	3:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/12/1989	13:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	11/4/1988	16:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	7/5/1987	16:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	10/2/1986	14:45	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	7/5/1985	14:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/23/1984	10:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	3/24/1984	21:00	Thunderstorm Wind	0	0	0.00K



MONTGOMERY CO.	8/28/1983	17:20	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	12/25/1982	18:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	5/28/1982	20:20	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	5/22/1982	16:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	7/13/1978	11:15	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/12/1977	16:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	3/20/1976	19:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	3/20/1976	18:45	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	1/10/1975	13:40	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	7/19/1974	23:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	7/7/1974	17:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	6/22/1974	15:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	7/27/1972	23:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	11/19/1970	22:40	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	9/16/1965	2:00	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	1/19/1964	22:15	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	8/7/1962	8:30	Thunderstorm Wind	0	0	0.00K
MONTGOMERY CO.	3/20/1955	16:00	Thunderstorm Wind	0	0	0.00K

Thunderstorm/High Wind Hazard History Data- 2015 Plan Update

Location	Date	Time	Type	Dth	Inj	PrD
COUNTYWIDE	2/18/2000	18:20	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/17/2000	1:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/20/2000	16:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/13/2000	1:45	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	5/24/2000	20:42	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/26/2000	18:10	Thunderstorm Wind	0	0	5.00K
HILLTOP	5/27/2000	14:20	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	7/12/2000	12:45	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/3/2000	18:05	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/3/2000	18:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/4/2000	3:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	11/9/2000	11:05	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	2/24/2001	23:30	Thunderstorm Wind	0	0	0.00K
WOODLAWN	5/7/2001	15:40	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	5/20/2001	4:00	Thunderstorm Wind	0	0	0.00K
WOODLAWN	6/27/2001	14:41	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/18/2001	16:50	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/26/2001	20:00	Thunderstorm Wind	0	0	5.00K

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CLARKSVILLE	9/6/2001	18:00	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	10/24/2001	18:15	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	11/24/2001	9:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/28/2002	4:00	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	5/13/2002	8:20	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/2/2002	12:45	Thunderstorm Wind	0	0	0.00K
SOUTH	7/2/2002	23:19	Thunderstorm Wind	0	0	0.00K
DOTSONVILLE	7/2/2002	23:35	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/3/2002	14:54	Thunderstorm Wind	0	0	0.00K
FT CAMPBELL	7/10/2002	12:35	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	11/10/2002	18:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/4/2003	23:44	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/5/2003	0:15	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/7/2003	0:25	Thunderstorm Wind	0	0	250.00K
CLARKSVILLE	7/28/2003	17:25	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/28/2003	17:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/28/2003	17:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/29/2003	19:00	Thunderstorm Wind	0	0	0.00K
COUNTYWIDE	3/20/2004	13:10	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/4/2004	14:25	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/6/2004	14:50	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/13/2004	20:15	Thunderstorm Wind	0	0	5.00K
PALMYRA	10/14/2004	16:16	Thunderstorm Wind	0	0	5.00K
HILLTOP	10/14/2004	16:22	Thunderstorm Wind	0	0	5.00K
SANGO	10/14/2004	16:32	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	1/13/2005	7:30	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/19/2005	12:40	Thunderstorm Wind	0	1	50.00K
CLARKSVILLE	5/19/2005	12:52	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	11/6/2005	3:45	Thunderstorm Wind	0	0	0.00K
CUMBERLAND HGTS	4/2/2006	19:14	Thunderstorm Wind	0	0	2.00K
WOODLAWN	4/2/2006	19:14	Thunderstorm Wind	0	0	5.00K
WOODLAWN	4/2/2006	22:50	Thunderstorm Wind	0	0	4.00K
CUNNINGHAM	4/2/2006	22:55	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	4/2/2006	22:55	Thunderstorm Wind	0	0	2.00K
CLARKSVILLE	4/2/2006	23:00	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	8/14/2006	20:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	8/14/2006	20:00	Thunderstorm Wind	0	0	0.00K
CUNNINGHAM	9/23/2006	2:50	Thunderstorm Wind	0	0	50.00K
CLARKSVILLE	9/23/2006	3:00	Thunderstorm Wind	0	0	0.00K
WOODLAWN	9/27/2006	21:00	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	2/20/2007	21:45	Thunderstorm Wind	0	0	0.00K
PALMYRA	4/24/2007	12:17	Thunderstorm Wind	0	0	0.20K
CLARKSVILLE	4/24/2007	12:25	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	5/15/2007	18:45	Thunderstorm Wind	0	0	0.30K
WOODLAWN	6/2/2007	16:15	Thunderstorm Wind	0	0	0.50K
CLARKSVILLE	6/24/2007	12:57	Thunderstorm Wind	0	0	0.20K
RINGGOLD	10/18/2007	21:30	Thunderstorm Wind	0	0	0.00K
WOODLAWN	10/18/2007	21:34	Thunderstorm Wind	0	0	0.00K

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OAKWOOD	1/29/2008	18:22	Thunderstorm Wind	0	0	20.00K
CLARKSVILLE	2/5/2008	21:43	Thunderstorm Wind	0	0	100.00K
CLARKSVILLE	4/10/2008	23:35	Thunderstorm Wind	0	0	0.50K
CLARKSVILLE	6/12/2008	13:10	Thunderstorm Wind	0	0	0.20K
CLARKSVILLE	7/7/2008	15:25	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	7/22/2008	9:00	Thunderstorm Wind	0	0	0.50K
CLARKSVILLE	5/9/2009	0:30	Thunderstorm Wind	0	0	100.00K
ROUND POND	5/9/2009	0:35	Thunderstorm Wind	0	0	150.00K
ST B	6/16/2009	12:35	Thunderstorm Wind	0	0	7.00K
CLARKSVILLE	6/17/2009	18:05	Thunderstorm Wind	0	0	50.00K
SALEM	7/4/2009	18:30	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	7/12/2009	17:35	Thunderstorm Wind	0	0	50.00K
DOTSONVILLE	7/15/2009	14:04	Thunderstorm Wind	0	0	10.00K
KENNEDY	8/4/2009	18:30	Thunderstorm Wind	0	0	25.00K
CLARKSVILLE	4/24/2010	15:53	Thunderstorm Wind	0	2	18.00K
HAMPTON STAT	4/24/2010	16:03	Thunderstorm Wind	0	0	5.00K
CLARKSVILLE	6/17/2010	14:29	Thunderstorm Wind	0	0	15.00K
SALEM	7/11/2010	16:05	Thunderstorm Wind	0	0	50.00K
BELDON	10/26/2010	10:15	Thunderstorm Wind	0	0	0.00K
KENNEDY	11/25/2010	15:30	Thunderstorm Wind	0	0	10.00K
HAMPTON	11/25/2010	15:45	Thunderstorm Wind	0	0	100.00K
KENWOOD	2/24/2011	21:15	Thunderstorm Wind	0	0	25.00K
BELDON	2/24/2011	21:15	Thunderstorm Wind	0	0	10.00K
WOODLAWN	4/19/2011	23:44	Thunderstorm Wind	0	0	50.00K
SHADY GROVE	4/19/2011	23:58	Thunderstorm Wind	0	0	5.00K
SANGO	4/20/2011	0:10	Thunderstorm Wind	0	0	11.00K
CLARKSVILLE	4/26/2011	0:04	Thunderstorm Wind	0	0	0.00K
ST BETHLEHEM	4/26/2011	0:05	Thunderstorm Wind	0	0	20.00K
CLARKSVILLE	5/25/2011	21:20	Thunderstorm Wind	0	0	25.00K
KENNEDY	6/28/2011	2:05	Thunderstorm Wind	0	0	10.00K
NEW PROVIDENCE	8/21/2011	1:35	Thunderstorm Wind	0	0	50.00K
CLARKSVILLE	1/23/2012	0:30	Thunderstorm Wind	0	0	25.00K
CLARKSVILLE	1/23/2012	0:30	Thunderstorm Wind	0	0	10.00K
PARK LANE	5/29/2012	15:50	Thunderstorm Wind	0	0	30.00K
PORT ROYAL	5/29/2012	15:55	Thunderstorm Wind	0	0	30.00K
KENNEDY	5/29/2012	16:00	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	5/29/2012	16:00	Thunderstorm Wind	0	0	5.00K
SHILOH	5/29/2012	16:15	Thunderstorm Wind	0	0	5.00K
RINGGOLD	6/11/2012	16:19	Thunderstorm Wind	0	0	8.00K
EXCELL	7/4/2012	15:50	Thunderstorm Wind	0	0	50.00K
HICKORY PT	7/4/2012	16:15	Thunderstorm Wind	0	0	20.00K
CLARKSVILLE	7/5/2012	15:55	Thunderstorm Wind	0	0	25.00K
CLARKSVILLE	7/6/2012	12:36	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/6/2012	13:04	Thunderstorm Wind	0	0	0.00K
CLARKSVILLE	7/6/2012	13:05	Thunderstorm Wind	0	0	10.00K
CLARKSVILLE	7/8/2012	19:30	Thunderstorm Wind	0	0	25.00K
SANGO	7/18/2012	15:35	Thunderstorm Wind	0	0	5.00K
MC ALLISTERS	7/18/2012	16:15	Thunderstorm Wind	0	0	10.00K

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KENWOOD	7/19/2012	23:35	Thunderstorm Wind	0	0	1.00K
BRIARWOOD	7/19/2012	23:40	Thunderstorm Wind	0	0	25.00K
ROUND POND	7/19/2012	23:45	Thunderstorm Wind	0	0	25.00K
BELDON	8/5/2012	18:50	Thunderstorm Wind	0	0	2.00K
CLARKSVILLE	8/16/2012	20:20	Thunderstorm Wind	0	0	1.00K
PALMYRA	9/7/2012	22:40	Thunderstorm Wind	0	0	1.00K
DOTSONVILLE	9/7/2012	22:43	Thunderstorm Wind	0	0	25.00K
EXCELL	9/7/2012	22:53	Thunderstorm Wind	0	0	5.00K
WOODLAWN	4/27/2013	18:20	Thunderstorm Wind	0	0	3.00K
CLARKSVILLE	7/18/2013	15:33	Thunderstorm Wind	0	0	1.00K
SHILOH	7/18/2013	16:01	Thunderstorm Wind	0	0	1.00K
KENWOOD	11/17/2013	17:41	Thunderstorm Wind	0	0	1.00K
CLARKSVILLE	12/21/2013	20:19	Thunderstorm Wind	0	0	0.00K



APPENDIX 8

Summary of Changes- 2015 Plan Update

Cover Page

- Changed

Executive Summary

- Added

Section I

- All section 1 information was updated to match current information including, development trends, new business information, census data, maps, etc.

Section II

- Section 2 information was updated to reflect the current information including changes in the hazard mitigation team and how the planning team method of approach for this 5 year update process.

Section III

- Section 3 risk assessment information was updated with current statistics; maps, graphics, and a current HAZUS run. Loss estimations in some sections that were formally set at the “worst case” scenario from an unrealistic “total destruction” to a more realistic worst case value of 30%. The 30% value is still probably high, but it is based on one of the highest population growth areas of the county which also has the highest concentration of retail, food, commercial businesses, several schools and business colleges, the hospital, and the industrial park. This area also has a large amount of infrastructure as well as city and county emergency services assets due to the population density, businesses, and the industrial park. The hazard mitigation team evaluated this from several perspectives and agrees that 30% is a more realistic worst case value to work with.

Section IV

- Section 4 was reviewed and minor changes were made in the structure.
- Montgomery County Emergency Medical Services was added as a component of emergency services that had not been included before. They also are a critical and required component of any hazardous materials response.

Section V

- Section 5 was reviewed to insure that the existing goals objectives and strategies were still relevant.
- Flooding – Objective 3 & 4 will be deleted
- Severe Storms – All objectives are current and continuing



- Earthquake – Objective 2 is new
- Land Subsidence - All objectives are current and continuing
- Hazardous Materials – Objective 4 was updated to more accurately reflect current conditions.
- Objective 5 is new
- All Hazards
- Objective 5 & 6 are new

Section VI

- Section 6 was reviewed and minor changes to reference material dates and grammar changes were made.

Section VII

- Section 7 is in place for approval letters and resolutions one an approved pending adoption is received from FEMA.

Section VIII

- All appendixes were updated with current information
- Appendix 8A was added as the 2015 changes in the plan update process
- Appendix 9 changed to 2010 strategy status
- Appendix 10 was added – pictures from flood buy-out properties
- Appendix 11 was added – this shows the reconstruction and mitigation work at the waste water plant after the 2010 flood. Photos of some the pump station elevation and upgrade projects are here as well.
- Appendix 12 was added as the bibliography and references. This includes previous references and new ones.
- Appendix 13 was added as a whole community partnership/outreach section references.



APPENDIX 8a

Summary of Changes- 2020 Plan Update

- **Cover Page:** Changed the plans title from Montgomery County Multi-Jurisdictional Hazard Mitigation Plan to Montgomery County Multi-Jurisdictional All Hazards Mitigation Plan. Changed photo with February 2018 Tornado damage path. Incorporated all three jurisdictions logos (Montgomery County EMA, City of Clarksville and CMCSS).
- **Executive Summary:** Added information about the EF1 and EF2 February 2018 tornadoes.
- **Section 1:**
 - The Community-** Updated all pertinent information with current numbers on census data such as population (US Census Bureau), school data such as graduation rates and scholarship amounts for the most recent year (CMCSS), new businesses data (Hankook Tire, Google, LG Electronics) and maps were updated.
 - Agriculture-** Updated agriculture data to include use and revenue (USDA).
 - Challenges and Limitations-** Updated with current challenges faced in 2020 plan update.
 - New Benefits and Capabilities-** Updated with new partners.
- **Section 2:**
 - Hazard Mitigation Planning Team-** Updated with new members and deleted members that are no longer with the Hazard Mitigation Planning Team
 - Planning Team-Method of Approach-** Updated with new processes and recommendations.
- **Section 3:**
 - Flood Hazards-** Updated new maps.
 - Probability and Frequency-** Updated flood hazards history and total amount of damaged property.
 - Exposure and Impact-** Updated water treatment plant completion date. Updated NFIP data and charts, RL properties, buyouts and total amount in losses for properties.
 - Loss Estimation-** Updated HAZUS data and maps for 2020 plan update.
 - Flood Hazards from Inundation Due to Dam Failure-** This risk was removed from the plan as it was no longer a threat.
 - Tornado/High Wind Hazards-** Updated Wind Zones Map. Added Fujita and Enhanced Fujita Scale for comparison and reference. Updated tornado hazards history and total amount of damage. Added High Wind Storm Damage information.



Probability and Frequency- Added new photos of High Wind Storm Damage (October 2019) and Tornado Damage (February 2018) (Montgomery County EMA).

Winter Storm Hazards-

Probability and Frequency- Updated Winter Storm events with most current information.

Earthquake Hazards- Updated the Seismic Activities Map 2010-2018 (USGS).

Land Subsidence (Sinkhole) Hazards-

Consequences- Updated photo with most recent sinkhole event (Montgomery County EMA).

Loss Estimation- Updated Clarksville & Sango Area Sinkholes Map (APSU GIS).

Hazardous Materials-

Probability and Frequency- Updated HAZMAT data with most current data to date (TEMA).

Updated the EPA Enviromapper for Montgomery County, TN. (EPA Enviromapper).

Consequences- Updated HAZMAT incident photos.

- **Section 4:**

Risk Exacerbating Policies- Updated the karst policy information as Montgomery County has developed one.

- **Section 5:**

Goals, Objectives and Strategies- Updated a total of 28 Hazard Mitigation Projects (Flood, Severe Storms; Tornado/High Wind, Winter Storm, Earthquake, Land Subsidence (Sinkhole), Hazardous Materials and All-Hazards). This update included incorporating new mitigation projects, deleting obsolete projects and updating the current projects from the 2015 plan update.

- **Section 6:**

The Plan Maintenance has been reviewed with minor changes to the wording.

- **Section 7: Pending**

The Plan Adoption has been updated with all jurisdictions letters for the 2020 Plan Update.

- **Section 8:**

The appendix's have been updated with all changes and additions.

Appendix 1- The Hazard Mitigation Team Members List has been updated.

Appendix 2- The Hazard Mitigation Team Meeting Sign-In Rosters have been added for 2016, 2017, 2018 and 2019.

Appendix 2a- The HAZMIT/Public Comments Sign-In Sheet for 2020 Plan Update has been added.

Appendix 3- The 2020 Public Briefing Notices have been added.



Appendix 4- 2020 Flood Hazard History Data has been added. 2010 data has been deleted.

Appendix 5- 2020 Tornado Hazard History Data has been added. 2010 data has been deleted.

Appendix 6 -2020 Winter Storm History Data has been added. 2010 data has been deleted.

Appendix 7- 2020 Thunderstorm/High Wind History Data has been added. 2010 data has been deleted.

Appendix 8- Summary of changes from the 2015 plan update.

Appendix 8a- Summary of changes from the 2020 plan update.

Appendix 9- All references have been updated. All out of date sources that are no longer available have been deleted and resources with the most current information has been added.

Note Throughout the entire 2020 Plan Update a new format has been made from the 2015 Plan Update. There have also been grammar and punctuation updates.



APPENDIX 9

References

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FEMA Approval Letter

ORDINANCE 22-2020-21

AN ORDINANCE AMENDING THE OFFICIAL CODE OF THE CITY OF CLARKSVILLE, PART II (CODE OF ORDINANCES), TITLE 14 (BUILDING, UTILITY, AND HOUSING CODES), CHAPTER 6 (PROPERTY MAINTENANCE CODE), SECTION 4-603. MINIMUM STANDARDS FOR BASIC EQUIPMENT AND FACILITIES, REGARDING STORAGE OF INOPERABLE VEHICLES ON COMMERCIAL ZONED PROPERTY

WHEREAS, the City Council finds that long term storage of inoperable vehicles on commercially zoned properties can create a nuisance, is attractive to criminal elements, and creates an unsightly appearance without proper fencing or screening; and

WHEREAS, the City Council finds it to be in the best interest of the City and public safety, health, and welfare to adopt fencing and / or screening requirements with regard to commercially zoned properties where inoperable vehicles are stored.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF CLARKSVILLE, TENNESSEE:

(1) That **Title 14 (Building, Utility, And Housing Codes), Chapter 6 (Property Maintenance Code), Section 4-603. Minimum Standards For Basic Equipment And Facilities, sub-section (g) *Sanitation requirements*, Sub-sub-section (4) *Care of premises***, is hereby deleted in its entirety, and a new sub-sub-section (4) is substituted therefore as follows:

Title 14 (Building, Utility, And Housing Codes)

Chapter 6 (Property Maintenance Code)

Section 4-603. Minimum Standards For Basic Equipment And Facilities

Sub-section (g) *Sanitation requirements*

Sub-sub-section (4) *Care of premises*

- i. It shall be unlawful for the owner or occupant of a residential / nonresidential building, structure, or premises to utilize the property for open storage of any inoperable motor vehicle, ice box, refrigerator, stove, glass, building material(s), building rubbish or similar items. ~~It shall be the duty and responsibility of~~ Every owner or occupant ~~to~~ shall keep the premises of such property clean and ~~to~~ shall remove from the premises all such ~~abandoned~~ items as listed above, including but not limited to weeds, dead trees, trash, garbage, etc., upon notice from the housing official. ~~The provisions of this section shall not apply to prohibit any activity lawfully permitted by zoning regulations applicable to a parcel of property.~~

ii. In commercially zoned properties, to include Automotive Repair Facilities, such inoperable vehicles shall not be stored on the lot for more than ninety (90) days: All unclaimed vehicles will be granted additional storage time with applicable documentation from the state, and the owner or operator of the facility shall maintain a register listing the owner of each vehicle, date of arrival and date of departure, and description (year, make, VIN). The register shall at all times be kept open for the inspection and examination by authorized persons such as police, insurance investigators, and city officials. The storage and parking lot for all such vehicles shall be screened from off-site view by placement in an enclosed building or behind a wall or fence at least six (6) feet in height. Any chain link fence used to satisfy the requirements of this subsection shall contain slats of at least one-fourth ($\frac{1}{4}$) inch thick, which shall be installed over no less than two-thirds ($\frac{2}{3}$) of the surface area of the fence. Slat shall be made of plastic, vinyl, or metal. Natural objects such as trees or other plantings may also be used to satisfy the screening requirements, as shown on an approved Landscape Plan. Fences and screening shall be maintained in good condition. All commercially owned properties in existence upon the effective date of the ordinance from which this section derives shall have (one hundred twenty (120) days from that date to be in compliance with all provisions contained herein.

iii. The provisions of this sub-section shall not apply to prohibit any activity lawfully permitted by zoning regulations applicable to a parcel of property.

FIRST READING:

SECOND READING:

EFFECTIVE DATE: