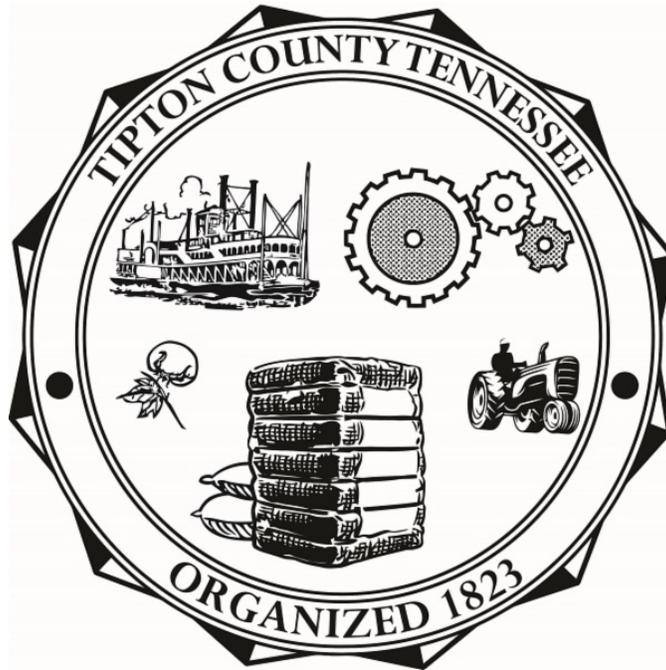


Tipton County Hazard Mitigation Plan



2015 Update

Prepared By:

**Tipton County Hazard Mitigation Committee
Tipton County Emergency Management**

Assistance Provided By:

Tennessee Emergency Management Agency
as part of the Tennessee Mitigation Initiative

U.S. Department of Homeland Security
FEMA Region IV
3003 Chamblee Tucker Road
Atlanta, GA 30341



September 20, 2016

Mr. Doug Worden
State Hazard Mitigation Officer
Tennessee Emergency Management Agency
3041 Sidco Drive
Nashville, Tennessee 37204

Reference: Tipton County Hazard Mitigation Plan Update

Dear Mr. Worden:

We are pleased to inform you that the revisions to the Tipton County Hazard Mitigation Plan Update is in compliance with the Federal hazard mitigation planning requirements resulting from the Disaster Mitigation Act of 2000, as contained in 44 CFR 201.6. The plan is approved for a period of five (5) years, to September 19, 2021.

This Plan approval extends to the following participating jurisdictions that provided copies of their resolutions adopting the Plan:

- Tipton County, Unincorporated
- City of Garland
- City of Mason
- City of Munford
- City of Covington
- Town of Atoka
- Town of Gilt Edge
- Town of Brighton

The approved participating jurisdictions are hereby eligible applicants through the State for the following mitigation grant programs administered by the Federal Emergency Management Agency (FEMA):

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

National Flood Insurance Program (NFIP) participation is required for some programs.

We commend Tipton County for development of a solid, workable plan that will guide hazard mitigation activities over the coming years. Please note, all requests for funding will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted. For example, a specific mitigation activity or project identified in the plan may not meet the eligibility requirements for FEMA funding, and even eligible mitigation activities are not automatically approved for FEMA funding under any of the aforementioned programs.

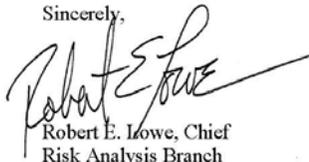
We strongly encourage each community to perform an annual review and assessment of the effectiveness of their hazard mitigation plan; however, a formal plan update is required at least every five (5) years. We also encourage each community to conduct a plan update process within one (1) year of being included within a Presidential Disaster Declaration or of the adoption of major modifications to their local Comprehensive Land Use Plan or other plans that affect hazard mitigation or land use and development.

When the plan is amended or revised, it must be resubmitted through the State as a "Plan Update" and is subject to a formal review and approval process by our office. If the plan is not updated prior to the required five (5) year update, please ensure that the Draft update is submitted at least six (6) months prior to expiration of this plan approval.

The State and Tipton County should be commended for their close coordination and communications with our office in the review and subsequent approval of the plan.

If you or Tipton County have any questions or need any additional information, please do not hesitate to contact Valerie Anderson of the Hazard Mitigation Assistance Branch, at (229) 225-4571 or Linda L. Byers of my staff, at (770) 220-5498.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert E. Lowe", with a long horizontal flourish extending to the right.

Robert E. Lowe, Chief
Risk Analysis Branch
Mitigation Division

Executive Summary

Over the past two decades, hazard mitigation has gained increased national attention due to the large number of natural disasters that have occurred throughout the U.S. and the rapid rise in costs associated with those disaster recoveries. It has become apparent that money spent mitigating potential impacts of a disaster event can result in substantial savings of life and property. With these benefit cost ratios being extremely advantageous, the Disaster Mitigation Act of 2000 was developed as U.S. Federal legislation that reinforces the importance of pre-disaster mitigation planning by calling for local governments to develop mitigation plans (*44 CFR 201*).

The purpose of a local hazard mitigation plan is to identify the community's notable risks and specific vulnerabilities, and then to create/implement corresponding mitigation projects to address those areas of concern. This methodology helps reduce human, environmental, and economical costs from natural and man-made hazards through the creation of long-term mitigation initiatives.

The advantages of developing a local hazard mitigation plan are numerous including improved post-disaster decision making, education on mitigation approaches, an organizational method for prioritizing mitigation projects, etc. It has been noted that communities who successfully complete and maintain a mitigation plan receive larger amounts of Federal and State funding to be used on mitigation projects, and receive these funds faster, than communities who do not have a plan. Such funding sources that the plan caters to are Pre-Disaster Mitigation, Flood Mitigation Assistance, Severe Repetitive Loss, and Hazard Mitigation Grant Programs.

The 2015 update of the Tipton County Hazard Mitigation Plan was created to act as a well thought-out guide to be used by, and for, the people of Tipton County. For this plan to be successful, each jurisdiction within the county participated in the drafting and preparation of the plan update. These participating jurisdictions include:

- Tipton County (unincorporated)
- City of Covington
- City of Munford
- Town of Atoka
- Town of Brighton
- Town of Burlison
- Town of Garland

- Town of Gilt Edge
- Town of Mason

In reference to federal code title *44 CFR 201*, an updated hazard mitigation plan is required to be submitted to both TEMA (State) and FEMA (Federal) for review every five years to be reapproved. When the plan is deemed “approval pending adoption” by FEMA (*44 CFR 201.6(c)5*), each of the participating jurisdictions will adopt the plan through a local resolution.

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Section 1: Planning Process

Planning Process Update

The original Tipton County Hazard Mitigation Plan was approved by FEMA on January 10th, 2011. Per federal requirements stated in *44 CFR 201*, all local hazard mitigation plans are required to go through a FEMA update review every 5 years to remain eligible for hazard mitigation grants. This update methodology was developed to assure that local governments are continuing to re-evaluate their risks and to regularly implement mitigation projects that can reduce community vulnerabilities.

The beginning of the plan's five year update process took place at a meeting on April 15th, 2015 (See [Appendix 1](#) for the meeting's attendance sheet). At this meeting Tipton County Emergency Management stated that they would continue the role of leading staff and interested persons in updating their mitigation plan. The tasks to be undertaken by Tipton County Emergency Management consisted of continuing to get agencies and the public involved in the county's mitigation efforts, performing the written plan's required 5-year update, and soliciting for new mitigation actions/projects to be added to the plan.

Prior to this meeting Tipton County began reorganizing the county-wide hazard mitigation committee. Realizing that a successful mitigation committee includes a number of representatives, specialists, and individuals who can give valuable/unique insights that local emergency management staff may not have considered; invites to be a part of this plan update included open invitation to elected officials, county and city staff, representatives of the jurisdictions, neighboring counties, local businesses, state agencies, private organizations, academia, non-profits, and other noticeable persons.

The Tipton County Hazard Mitigation Committee for the plan update consists of the following members:

Name	Title	Organization
Tommy Dunavant (Chairman)	Director	Tipton County Emergency Management Agency
Brent Phillips	Emergency Management Planner	Tennessee Emergency Management Agency
Danny Daniel	District Coordinator	Tennessee Emergency Management Agency
Ben Little	Mayor	Garland
Alan Barkelew	Fire Chief	Munford

Brian Koral	Town Admin	Atoka
Glenn Turner	Energy Facilities Manager	Tipton County Schools
Robert Simpson	Public Works Director	Covington
Jim Kenny	Mayor	Burlison
W.T. Bailey	Finance Director	Tipton County
Shannon Reed	Public Works Director	Tipton County
William Veazey	Planning Director	Tipton County
Donnie Wallace	Maintenance Supervisor	Tipton County Schools
Shawn Anderson	GIS Director	Tipton County
W. Daryl Walker	Mayor	Atoka
Steve Fletcher	Mayor	Gilt Edge
Danny Hernandez	Code Enforcement	Brighton
Norma Davis	Mayor	Mason
Brandon Fletcher	Deputy Fire Chief	Gilt Edge

The Tipton County Hazard Mitigation Committee continues to be the county's lead in all mitigation efforts and in the development of the county's mitigation plan. The committee member's efforts in the plan update were broken down into five stages: **1)** analysis of the original plan (*the plan as it stood prior to the updates*), **2)** updating of the plan, **3)** public participation, **4)** review of the final updated plan, and **5)** adoption of the plan.

Stage 1: During the analysis of the plan, Tipton County Emergency Management reviewed the original county plan and made notes on what sections would require the main updates. Tipton County Emergency Management suggested that the two core areas for needed updates were in the risk/vulnerability assessment and in the restructuring of the county's listed hazard mitigation projects. Additionally, each jurisdiction's capabilities were evaluated for the plan update.

Stage 2: From there the committee started making the updates to the plan. A large amount of this effort took place at the second Tipton County Hazard Mitigation Committee meeting that was held on May 13th, 2015. Tasks included re-evaluating the plan's hazards, re-assessing their risks, re-calculating each jurisdiction's vulnerable areas, and re-establishing the county's mitigation goals. TEMA personnel were present at this meeting to answer mitigation planning and grant questions. [Appendix 2](#) provides a copy of the meeting's attendance sheet.

This meeting was followed by a third committee meeting which took place on June 10th, 2015. The purpose of this gathering was to examine the status of mitigation projects listed in the original plan, finalize the county's mitigation project chart and to prioritize the projects listed. [Appendix 3](#) provides a copy of the meeting's attendance sheet.

The committee met on July 8th, 2015, to conduct a final review of the hazard mitigation plan prior to submission to FEMA. [Appendix 4](#) provides a copy of the meeting's attendance sheet.

Stage 3: To encourage public involvement, the Tipton County Hazard Mitigation Committee meetings were given public notice. [Appendix 5](#) presents a copy of the public notices.

Stage 4: Next the committee evaluated the written updates of the plan against FEMA's crosswalk requirements via email correspondence. This also included having the jurisdictions review the drafts that specifically addressed aspects of their jurisdiction before the plan is sent to FEMA for review.

Stage 5: Upon receiving the "Approval Pending Adoption" designation from FEMA's review, the public will be given a chance to comment on the final draft of the update plan prior to its adoption by each local jurisdiction. This opportunity will take place at a local board meeting for each jurisdiction before the updated plan adoption decision takes place. The opportunity for final public comment will therefore be documented through the receipt of a signed adoption resolution.

Review of Existing Information

A preliminary review of existing plans, reports, and information was conducted during the initial phase of creating the Tipton County Hazard Mitigation Plan. The primary purpose of reviewing this information was to identify local hazards, recognizing local risks, and understanding different local vulnerabilities. The following list of sources identifies some of the existing studies that were reviewed:

- State of Tennessee Hazard Mitigation Plan
- Tennessee Emergency Management Plan (TEMP)
- U.S. Census Bureau
- FEMA Mitigation "How to" Guides
- NOAA National Climatic Data Center (NCDC) storm reports
- Tipton County BEOP
- Catastrophic Plan Annex

- Tennessee Three Star Economic Development Plan
- Tipton County School District Emergency Plans
- Tipton County Highway Department Plan

All of the listed plans, studies, and data sources were incorporated into the Tipton County Hazard Mitigation Plan. These sources developed the plan's hazard, risk, and vulnerability assessment sections that in return led to the establishment of meaningful mitigation actions.

Updates within the Plan

It is important to note that this countywide plan was entirely reorganized and updated head-to-toe from the original Tipton County Hazard Mitigation Plan. Tipton County reviewed and analyzed each section of the original plan and made updates in the following ways:

Section 1: Planning Process

Tipton County updated the original plan's description of the planning process to include the new or no longer participating committee members, the most recent countywide mitigation meetings that took place for the plan's update, and the latest opportunity for the public to get involved. Tipton County also compiled a new list of existing documents that they reviewed in updating their sections in the plan.

Section 2: County Profile

Tipton County created a new development trends section in this plan update.

Section 3: Risk Assessment

Tipton County kept all of their listed natural hazards from the original hazard mitigation plan the same, but decided to remove Hazardous Materials. The hazard "Hazardous Materials" was removed because it was deemed a hazard that should be fully profiled in the County's Basic Emergency Operations Plan (BEOP) instead of the mitigation plan.

As part of the plan update, Tipton County updated their previous occurrence hazard listings to cover the most recent five years and re-evaluated each hazard's extent, probability, and potential impacts. The county then decided to use a different method for determining vulnerabilities/risks because this new method was considered superior to the older plan's method. Also, the plan now has a HAZUS-flood model study and simplified countywide

floodplain maps for the first time, (as seen in the plan's appendices).

Section 4: Mitigation Strategy

Tipton County has updated their mitigation goals to address a more inclusive range of countywide aims and has utilized a new method for prioritizing mitigation projects, (thought to be superior to the previous method). Tipton County also has brainstormed some new mitigation projects that were added to the list, used a new chart method to profile project details, and developed a system to describe where their previous plan's projects are in terms of being implemented.

Section 5: Plan Maintenance

Tipton County updated how they would work with the other jurisdictions in monitoring, evaluating, and updating the plan; provided an updated list of mechanisms they could incorporate mitigation within; stated that now the Tipton County BEOP has mitigation concepts incorporated into it; and updated how all the jurisdictions would keep the public involved in updating processes.

Section 2: County Profile

Development Trends

Tipton County and its jurisdictions can be found in the western portion of west Tennessee. It is bordered by the Mississippi River and Arkansas to the west, Lauderdale County to the north, Haywood County to the east, Fayette County to the southeast, and Shelby County to the south. It has a population of 61,122 (2010 census) and is a mixture of rural and suburban. Covington is the largest city with 9,022 residents, Atoka with 8,523, Munford with 5,951, Brighton with 2,888, and Mason with 1,610. Burlison, Garland and Gilt Edge each have populations of less than 500.

Tipton County is bordered to the west by the Mississippi River, which is the major aquatic shipping lane for the central United States.

Covington is the focal point for local employment, with Memphis in Shelby County providing regional employment, dining and entertainment. There is a moderate manufacturing and industrial base, and their support services in the county, to include production of candy, ice cream, and small scale metal production. Industry in Tipton County has been growing for the last ten years. Tipton County is centrally located to all major U.S. markets with transportation access.

Due to current land use trends, the Tipton County Hazard Mitigation Committee predicts future growth in the areas of residential, commercial, and industry. There has been recent growth in industry with the construction of the Rialto Industrial Park and Unilever locating within the county. Residential growth has been particularly explosive over the last 10 years, specifically in Atoka and Munford. This growth has caused, or has the potential to cause, increased flooding risk due to this development.

All of these stated development trends have not increased hazard vulnerabilities across the county as of yet, but continued growth could potentially lead to an increase. To counter this potential negative effect all jurisdictions are taking actions to reduce the possibility of this occurring through instituting governmental planning mechanisms.

Tipton County has been aggressive in many areas of emergency preparedness. As an example, the county has used local funds to purchase and utilize a LiDAR system, which gives a more accurate picture of flood plains than the FIRM panels provided by FEMA. Additionally, Tipton County requires 3 feet of free board over base flood elevation.

These approaches have resulted in local projects being initiated that have prevented and mitigated problems due to flooding.

Jurisdictional Capabilities

Currently, all jurisdictions enforce building codes to make sure structures are built in accordance to national standards. Tipton County, Brighton, Covington, Gilt Edge, Mason and Munford enforce floodplain ordinances as part of adopting into the National Flood Insurance Program (NFIP). Burlison and Garland are not NFIP participants. Each of these jurisdictions are very small, with only a mayor and a board of elected officials. They lack the capacity to pursue NFIP enrollment. Additionally, all jurisdictions except Burlison have zoning codes to lead to sensible growth and land development patterns. These instituted planning mechanisms help guide growth away from floodplains and other identified hazardous areas, thus reducing vulnerabilities to the jurisdictions.

Tipton County Subdivision Regulations:

The Tipton County Subdivision Regulations were last adopted on January 2, 2001 and the document has been reprinted on May 18, 2009.

Tipton County Zoning Resolution:

The first County Zoning Resolution was adopted in May of 1983. There was a major update in March of 1997. A complete rewrite of the entire document was adopted on November 10, 2003, and the document has been reprinted on January 12, 2006. The current County Zoning Resolution was adopted February 10, 2014.

Tipton County Zoning Map:

The Tipton County Zoning Map was readopted in its entirety on February 10, 2014 and recorded in Plat Cabinet H Slide 900.

Tipton County Transportation Plan:

The Tipton County Transportation Plan was adopted on January 2, 2001 (recorded in Plat Cabinet F Slide 175) and was readopted on October 27, 2014 and recorded in Plat Cabinet H Slide 939.

Gilt Edge Zoning Ordinance & Subdivision Regulations:

The City of Gilt Edge contracts their Planning, Zoning, Building Inspection and Code Enforcement services through Tipton County. Gilt Edge has their own [Zoning Ordinance](#) (adopted 6/8/10), [Map](#) (recorded in Plat Cabinet H Slide 737) and Board of Zoning Appeals. The County acts as the City's Planning Commission for subdivision plat approval and rezoning issues and has approved [Subdivision Regulations](#) (adopted 4/27/09) and a [Transportation Plan](#) (adopted 4/27/09 and recorded in Plat Cabinet H Slide 660) for the City of Gilt Edge.

Code Enforcement:

Currently, code enforcement includes the enforcement of building codes, zoning codes and subdivision regulations. Complaints are taken via phone, postal mail or in person.

Read more at

http://www.tiptonco.com/planning_and_development/index.php#FXU49C48uasR1ssS.99

Legal & Regulatory Capability

Regulatory Tools/Plans	Regulatory Type: Ordinance Resolution Codes Plans, Etc.	Tipton County	Brighton	Covington	Gilt Edge	Mason	Munford	Burlison	Garland
Building Codes	Municipal Code	Y	Y	Y	Y	Y	Y	Y	Y
Zoning		Y	Y	Y	Y	Y	Y	N	Y
Emergency Response Plan	Basic Emergency Operations Plan (BEOP)	Y	Y	Y	Y	Y	Y	Y	Y
National Flood Insurance Program Participant		Y	Y	Y	Y	Y	Y	N	N
Post-Disaster Recovery Plan	BEOP	Y	Y	Y	Y	Y	Y	Y	Y

Section 3: Risk Assessment

Hazard Identification

To begin to assess Tipton County's risk to natural hazards and identify the community's areas of highest vulnerability, the mitigation committee had to identify which hazards have or could impact the county. This hazard identification process began with researching previous hazard events that have occurred in Tipton County by going through newspaper articles, Tipton County Emergency Management records, and recalling personal experiences. From there Emergency Management staff also analyzed hazard events that could occur in the county by reviewing scientific studies and the State of Tennessee Hazard Mitigation Plan. The following hazards have been identified as hazards of concern by the Tipton County mitigation committee within the update process.

Flooding

Flooding events occur when excess water from rivers and other bodies of water overflow onto riverbanks and adjacent floodplains. In addition, lower lying regions can collect water from rainfall and poorly drained land can accumulate rainfall through ponding on the surface. Floods in Tipton County are usually caused by rainfall, but may also be caused by snowmelt and man-made incidents. The below charts explain common ways flooding occurs and common factors that contribute toward the severity of floods.

Common Ways Flooding Occurs	
Methods	Description
Overland Flow	
(a) Infiltration	-Excess overland flow occurs when the rain is falling more rapidly that it infiltrates into the soil.
(b) Saturation	-Excess overland flow occurs when soil spaces are so full of water that no more rain can be absorbed.
Throughflow	-Rainwater which has infiltrated into unsaturated soil can move horizontally to the river channel. <u>This process is slower than overland flow but faster than base flow.</u>
Baseflow	-Rainwater which has percolated to the aquifer can seep into the river channel. This is the slowest process.

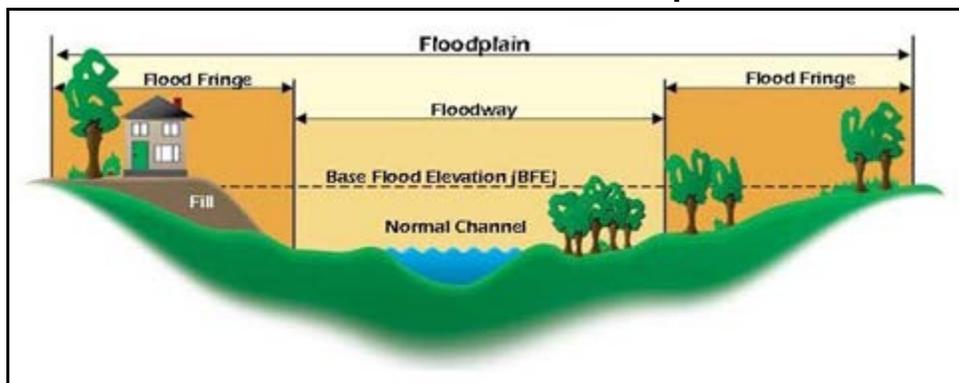
Source: The Field Studies Council

Common Causes of Flooding	
Factor	Effect on Flooding
Geology	Impermeable rocks are saturated more quickly than porous and pervious rocks. Saturation excess overland flow is more common. Sandy soils have larger pore spaces than clay soils. Infiltration is most rapid in sandy soils.
Relief	Water reaches the channel more rapidly in a steeper basin as water is travelling more quickly downhill.
Vegetation	Vegetation intercepts a large proportion of rainfall. Where trees are deciduous, discharge is higher in a forested basin in winter as there is less interception.
Meteorological Factors	Where rain is falling faster than the infiltration rate, there is infiltration-excess overland flow. This is common after a summer storm. Snow does not reach the channel but is stored on the ground surface. As snow melts, the meltwater will reach the channel quickly as infiltration is impeded if the ground is still frozen.
Catchment Shape	It takes less time for water to reach the channel in a circular basin as all extremities are roughly equidistant from the channel.
Land Use	Surface runoff is higher in urban areas because there are more urban surfaces (concrete & tarmac) and sewers take water rapidly to rivers. There is less interception and evapotranspiration and more surface runoff in a deforested catchment.
Catchment Size	Water reaches the channel more rapidly in a smaller basin as water has a shorter distance to travel.
Antecedent Conditions	The level of discharge before the storm is called the antecedent discharge. Even a small amount of rain can lead to flooding.

Source: The Field Studies Council

In Tipton County some areas are more flood-prone than others. One of the ways of identifying these flood-prone areas is through determining the county's 100- and 500-year floodplains. 100-year floods are calculated to be the level of flood water expected to be equaled or exceeded every 100 years on average, meaning a flood that has a 1% chance of being equaled or exceeded in magnitude in any single year. A 500-year floodplain has a 0.2% chance. A 100-year floodplain would include the areas adjoining a stream, river, or watercourse that would be covered by water in the event of a 100-year flood (see diagram below).

Characteristics of a Floodplain



Source: FEMA

In Tipton County, all jurisdictions are susceptible to smaller localized flooding. Areas in the county known to flood more often include:

- Big Creek at the following points: Highway 51, Tracy Road, Meade Lake Road, McCormack Road, Watson Road, and Quentin Drive
- Beaver Creek at the following points: Lucado Road, Fain Road, Mason Malone Road, Highway 54, Jack Pond Road, Gainesville Road, Beaver Creek Road, Indian Creek Canal at Holly Grove, Gin Road, Candy Lane, and Curry Jones Road
- Groggins Creek at the following points: Plantation Road and Double Bridges Road
- South College Street just north of Mueller Brass
- Gilt Edge Road and Lindsey Avenue
- Highway 51 at Mid-South Construction Company
- Highway 51 at Town Creek
- Watson Road and Quentin Drive
- Highway 54E at Hope Street
- Conn Valley Road levy
- Highway 59W east of canal bridge
- 9000 block of SR 178
- Areas adjacent to the Mississippi river
- Lucy Street and Main Street
- Washington Street and Main Street
- L&N Railroad Street – complete length adjacent to the railroad intersecting Main Street
- Washington Avenue
- Front Street adjacent to the railroad
- Foxtail Avenue and Cottontail Avenue near the intersection of Brookside Avenue
- South of Finde Naifeh and west of Highway 70/79
- Areas of Main Street east of L&N Railroad
- Areas south of Lucy Street north of Front Street
- Areas near the intersection of Lucy Street and Front Street
- Areas near the intersection of Lucy Street and Front Street
- Areas near the intersection of Jones Street and Front Street

Detailed Flood Insurance Rate Maps (FIRMs) are also included in [Appendix 6](#), which shows where FEMA has placed the 100-year floodplain for each jurisdiction.

Tipton County historically has had many flood events in the past. Based on NOAA NCDC data, the following charts provide a list of flood events occurring in Tipton County from January 2000 to August 2014 and a list of floods with descriptions of their impacts imposed on the community.

Flood Events in Tipton County: January 2000–September 2014

Location	Date	Type	Deaths	Injuries	Property Damage
MUNFORD	6/4/2001	Flash Flood	0	0	10.00K
COVINGTON	11/26/2001	Flash Flood	0	0	5.00K
TIPTON (ZONE)	11/28/2001	Flood	0	0	100.00K
TIPTON (ZONE)	12/12/2001	Flood	0	0	1.00K
BRIGHTON	3/29/2002	Flood	0	0	1.00K
COVINGTON	11/9/2002	Flash Flood	0	0	1.00K
COVINGTON	11/10/2002	Flash Flood	0	0	1.00K
COVINGTON	12/18/2002	Flash Flood	0	0	1.00K
COVINGTON	12/19/2002	Flood	0	0	0.50K
MUNFORD	12/19/2002	Flood	0	0	0.50K
COVINGTON	5/10/2003	Flash Flood	0	0	1.00K
ATOKA	5/16/2003	Flash Flood	0	0	1.00K
MUNFORD	5/16/2003	Flash Flood	0	0	10.00K
COVINGTON	4/23/2004	Flash Flood	0	0	1.00K
ATOKA	7/19/2005	Flash Flood	0	0	1.00K
COVINGTON	11/15/2005	Flash Flood	0	0	1.00K
COVINGTON	4/4/2008	Flash Flood	0	0	0.00K
MASON	5/10/2008	Flash Flood	0	0	0.00K
MUNFORD	5/9/2009	Flash Flood	0	0	30.00K
COVINGTON	5/9/2009	Flash Flood	0	0	0.00K
MASON	12/8/2009	Flash Flood	0	0	0.00K
DETROIT	5/1/2010	Flash Flood	1	0	20.500M
MUNFORD	7/3/2010	Flash Flood	0	0	0.00K
DIXONVILLE	5/1/2011	Flood	0	0	750.00K
CANAAN GROVE	5/23/2011	Flash Flood	0	0	0.00K
WALNUT GROVE	1/30/2013	Flash Flood	0	0	20.00K
BRIGHTON CATES ARPT	4/27/2013	Flash Flood	0	0	0.00K
MUNFORD	12/21/2013	Flash Flood	0	0	0.00K
HOLLY GROVE	4/28/2014	Flash Flood	0	0	0.00K
JAMESTOWN	9/11/2014	Flash Flood	0	0	0.00K

Flood Impacts in Tipton County: January 2000–September 2014

Location	Date	Impact Description
MUNFORD	6/4/2001	Four homes had water in them after locally heavy rains produced flooding in the Munford area.
COVINGTON	11/26/2001	Several buildings had water in their basements. A dozen roads were flooded.
TIPTON (ZONE)	11/28/2001	Rainfall of between 5 and 11 inches fell on West Tennessee between November 26 and November 29. This produced widespread flooding across the region. Numerous roads were closed. Numerous homes and businesses flooded with as much as 6'

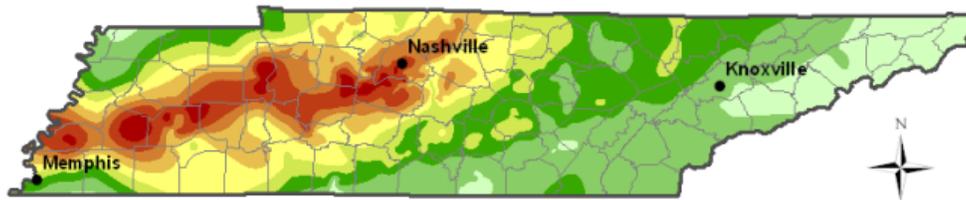
		of water in some houses. Five bridges washed out. Nearly 500 people had to be evacuated, most of them in Shelby county. Several people were trapped in vehicles and were rescued. One woman was killed in McNairy county when she drove her car into flowing water.
TIPTON (ZONE)	12/12/2001	A few roads were under water.
BRIGHTON	3/29/2002	A couple of roads had water over them.
COVINGTON	11/9/2002	Several roads were flooded as Town Creek went over its banks.
COVINGTON	11/10/2002	Several roads and ditches were flooded.
COVINGTON	12/18/2002	A few streets were flooded.
COVINGTON	12/19/2002	Some minor street flooding occurred in Covington.
MUNFORD	12/19/2002	Some minor street flooding occurred in Munford.
COVINGTON	5/10/2003	Several streets were flooded.
ATOKA	5/16/2003	A few roads were flooded.
MUNFORD	5/16/2003	A home and a business were flooded. Some people had to be rescued by boat.
COVINGTON	4/23/2004	One bridge was about one foot under water.
ATOKA	7/19/2005	Several roads and fields were flooded.
COVINGTON	11/15/2005	Some roads were flooded.
COVINGTON	4/4/2008	Heavy rain produced flash flooding along Highway 51 in Covington as a stream overflowed its bank.
MASON	5/10/2008	Heavy rain produced street flooding along Highway 70 and Highway 59. Six to eight inches of water covered the road.
MUNFORD	5/9/2009	A few roads were flooded.
COVINGTON	5/9/2009	Heavy rain produced flash flooding in and around Atoka. A home was severely damaged by flooding on Kearns Circle.
MASON	12/8/2009	Heavy rain produced flash flooding just west of Mason. Highway 70 was closed as a result.
DETROIT	5/1/2010	Very heavy rain produced widespread flash flooding across Tipton County. Up to 20 inches of rain fell causing devastating damage to homes, businesses, roads and bridges. In fact, 40 roads were impassable in Tipton County due to the flooding. Twenty-one of those roads and 14 bridges were washed out as a result of the flooding. Other roads received damage just from the heavy rain. Damage was particularly bad in Atoka and Mason. Numerous vehicles were completely submerged in water. Two apartment complexes in Covington sustained major damage. In total, 309 homes received damage from the flooding. Of those, 96 homes were completely

		destroyed. As many as 93 businesses were flooded and of those 21 were completely destroyed. Nineteen mobile homes were flooded with 14 being destroyed. Many other structures or buildings were flooded as well. One fatality occurred in Mason. The flash flooding event transitioned into a flood event as rivers rose rapidly and overflowed their banks.
MUNFORD	7/3/2010	Heavy rain produced flash flooding southwest of Munford. Portions of McCormick Road were closed due to flooding as a result.
DIXONVILLE	5/1/2011	The Mississippi River rose to near record levels during the beginning to middle part of May. A few homes along the river were flooded and sustained damage. Several thousand acres of agriculture fields were flooded. Several roads were flooded and/or damaged. The river remained above flood stage through the end of the month.
CANAAN GROVE	5/23/2011	Heavy rain produced flash flooding along Highway 59 between Covington and Mason. The highway was covered by a foot of water in places.
WALNUT GROVE	1/30/2013	Heavy rain caused flash flooding in parts of Tipton County. Brighton-Clopton Road was flooded near Brighton. A few homes on Hall Road were flooded with up to one foot of water. Walnut Grove Road and Gay Road were flooded near Burlison.
BRIGHTON CATES ARPT	4/27/2013	Heavy rain produced flash flooding in Brighton. Old Highway 51 was covered with eight to ten inches of water near the Brighton Elementary School. Other roads in Tipton County also were covered by several inches of water.
MUNFORD	12/21/2013	Heavy rain produced widespread street flooding across Tipton County.
HOLLY GROVE	4/28/2014	Heavy rain resulted in flash flooding in the Brighton area. Several roads were underwater and impassable.
JAMESTOWN	9/11/2014	Showers and thunderstorms trained over Southern Tipton County for several hours including the cities of Covington, Brighton, and Atoka. Widespread 4-5 inches of rain fell over this particular area. Numerous roads were closed due to flash flooding including Jack Bennett Road and Brighton Road.

Small localized flood events are likely to occur roughly three times per year in Tipton County. The severity of flooding that may occur in the county is measured by inches of rainfall and by feet of flooding. Based on previous occurrences, in a worst case scenario it is possible for the extent of a flooding event to exceed 6 inches of rainfall and cause localized

flooding in the span of two days. As seen with the May 2010 Tennessee Flood Event (*DR-1909*), it is possible for 12 inches or more of rainfall to amass within two days (see following map).

Weekend Rainfall Totals - May 1st & 2nd, 2010 Tennessee



Source: CoCoRaHS



Precipitation Contours	
In Inches	
0.01" - 2.00"	8.01" - 10.00"
2.01" - 4.00"	10.01" - 12.00"
4.01" - 6.00"	12.01" - 14.00"
6.01" - 8.00"	14.01" - 16.00"
	16.01" - 20.00"

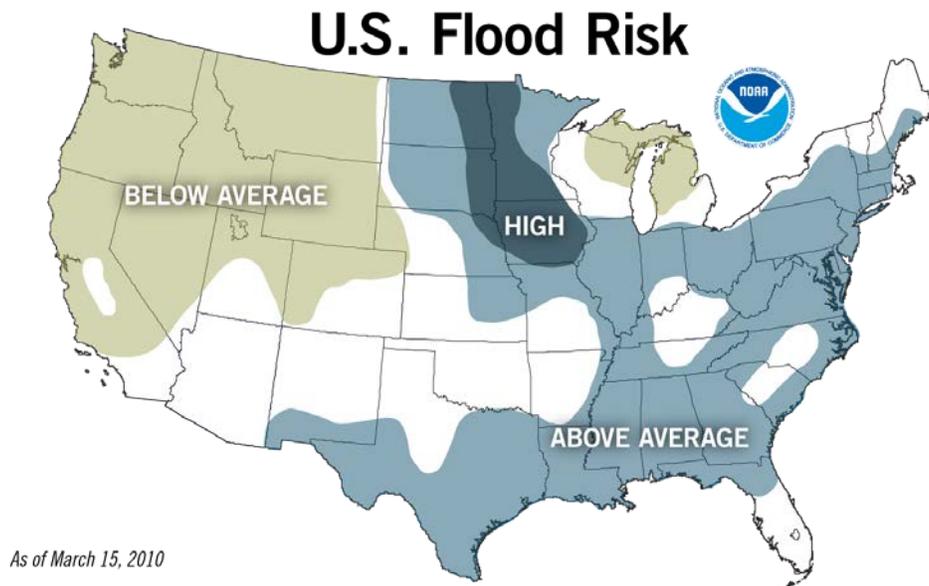


This map is an interpolation of actual reported values, but should be considered an estimation only.

Created by the National Weather Service Forecast Offices Nashville, Tennessee & Louisville, Kentucky

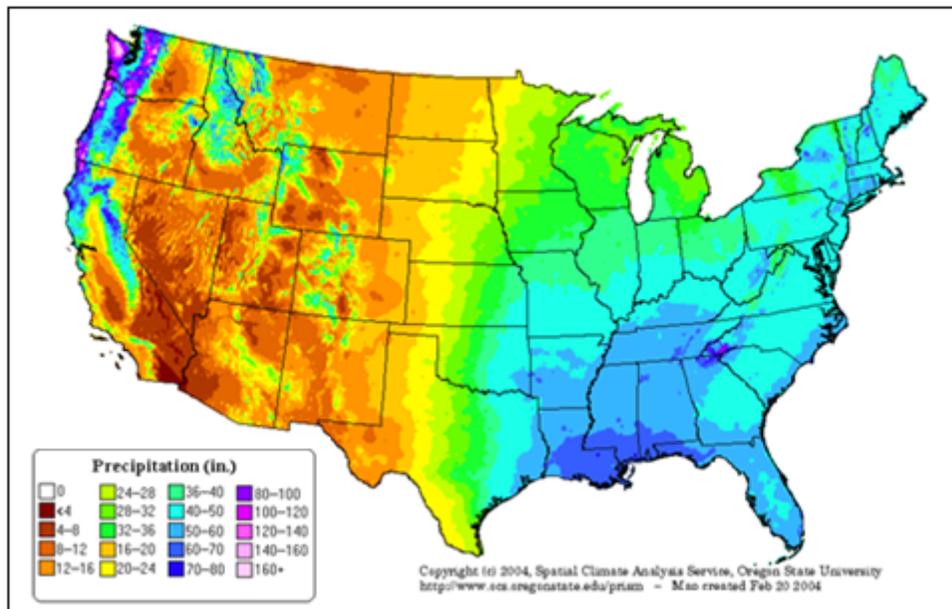
Source: National Weather Service

According to a NOAA Flood Risk Map (see map below), the majority of Tennessee was located in an "above average" risk of flooding zone during spring 2010. This proposed vulnerability is coupled with the fact that on average Tennessee usually acquires over 50-60 inches of rainfall a year (see following map).



Source: NOAA

Average Annual Precipitation per Year (1971-2000)



Source: Spatial Climate Analysis Service, Oregon State University

Tipton County uses a ranking system to determine each jurisdiction’s vulnerability to flooding events. This system is based off simple arithmetic which analyzes potential impacts to determine vulnerabilities and then analyzes the probability of a flood event occurring to calculate a flood risk ranking for each jurisdiction.

Flooding

Jurisdiction	Impacts			Vulnerability <i>H+P+B=#; #/3= V</i>
	Human	Property	Business	
Tipton County	2	5	3	3.33
Covington	2	3	3	2.67
Munford	2	5	4	3.67
Atoka	3	4	3	3.33
Brighton	1	2	1	4.00
Burlison	1	1	1	1.00
Garland	1	2	1	1.33
Gilt Edge	1	2	1	1.33
Mason	1	1	1	1.00

Jurisdiction	Vulnerability	Probability	Risk <i>V+P=R</i>	
Tipton County	3.33	3	6.33	Medium
Covington	2.67	2	4.67	Moderate
Munford	3.67	2	5.67	Medium
Atoka	3.33	4	7.33	High
Brighton	4.00	2	6.00	Medium
Burlison	1.00	1	2.00	Low
Garland	1.33	1	2.33	Low
Gilt Edge	1.33	2	3.33	Low
Mason	1.00	2	3.00	Low

Scale	
Low	2-3.6
Moderate	3.7-5.2
Medium	5.3-6.8
High	6.9-8.4
Severe	8.5-10

Human	
<i>Risk of Injuries and Death from the Hazard</i>	
1	Death very unlikely, injuries are unlikely
2	Death unlikely, injuries are minimal
3	Death unlikely, injuries may be substantial
4	Death possible, injuries may be substantial
5	Deaths probable, injuries will likely be substantial

Property	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
<i>Amount of Business Damage Associated from the Hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

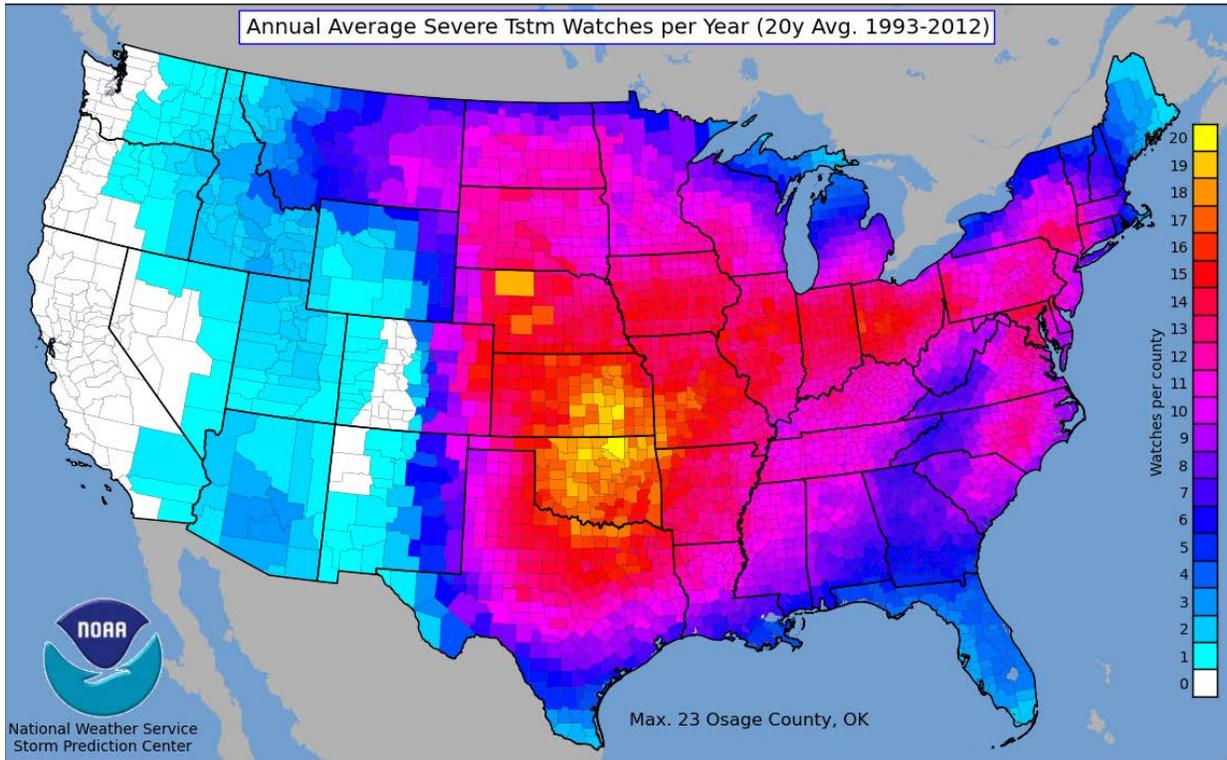
Probability	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

For further information about flooding hazards in Tipton County, see the HAZUS vulnerability study in [Appendix 7](#).

Tornadoes/Severe Storms

According to the National Weather Service, to consider a storm severe it must encompass one of three traits: produce winds greater than 58 miles per hour (50.4 knots), produce hail $\frac{3}{4}$ of an inch or greater in diameter, or produce tornadoes. On average, a typical county in Tennessee has about 10 severe storm watches per year (see map below).

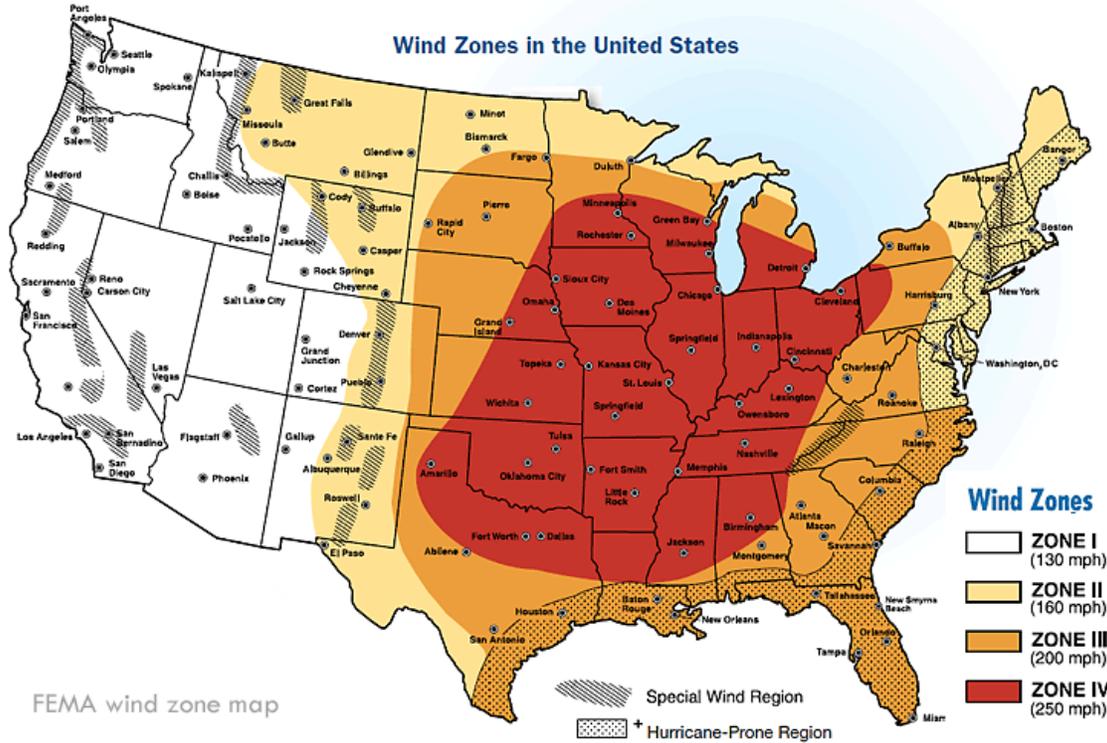
Average Severe Storm Watches Per Year (1993-2012)



Source: NOAA/NWS Storm Prediction Center

A tornado is a violently rotating column of air that extends from a thunderstorm, etc. down to the ground, and can reach wind speeds of 40 mph to 250 mph and higher. Tornadoes paths, lengths, and widths can vary greatly. In Tipton County, all jurisdictions are vulnerable to tornado threats. The following map places much of Tennessee in the highest wind zone (see following map).

Wind Zones in the United States



FEMA wind zone map

Source: FEMA

Tipton County historically has had a few tornado events in the past. Based on NOAA NCDC data, the following chart provides a list of tornado events occurring in Tipton County from January 1950 to August 2014.

Tornado Events in Tipton County: January 1964–August 2014

Location	Date	Extent	Deaths	Injuries	Property Damage
TIPTON CO.	3/4/1964	F2	0	3	25.00K
TIPTON CO.	5/31/1967	F1	1	1	25.00K
TIPTON CO.	4/3/1968	F3	4	28	2.500M
TIPTON CO.	9/3/1970	F0	0	0	0.25K
TIPTON CO.	6/7/1974	F1	1	1	25.00K
TIPTON CO.	2/22/1975	F1	0	2	25.00K
TIPTON CO.	4/25/1975	F1	1	1	25.00K
TIPTON CO.	3/29/1976	F1	0	0	25.00K
TIPTON CO.	1/7/1978	F1	0	0	250.00K
TIPTON CO.	12/7/1978	F0	0	0	25.00K
TIPTON CO.	5/9/1981	F0	0	0	0.03K
TIPTON CO.	6/4/1989	F0	0	0	0.25K

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Detroit	11/27/1994	F1	0	0	50.00K
COVINGTON	9/16/1996	F0	0	0	0.00K
RANDOLPH	11/9/2002	F2	0	1	6.000M
GAINESVILLE	2/5/2008	EF0	0	0	5.00K
CANAAN GROVE	2/5/2008	EF0	0	0	7.00K
CHARLESTON	2/5/2008	EF1	0	0	75.00K
ANTIOCH	2/5/2008	EF1	0	0	50.00K
AVRETT	5/31/2013	EF1	0	0	180.00K

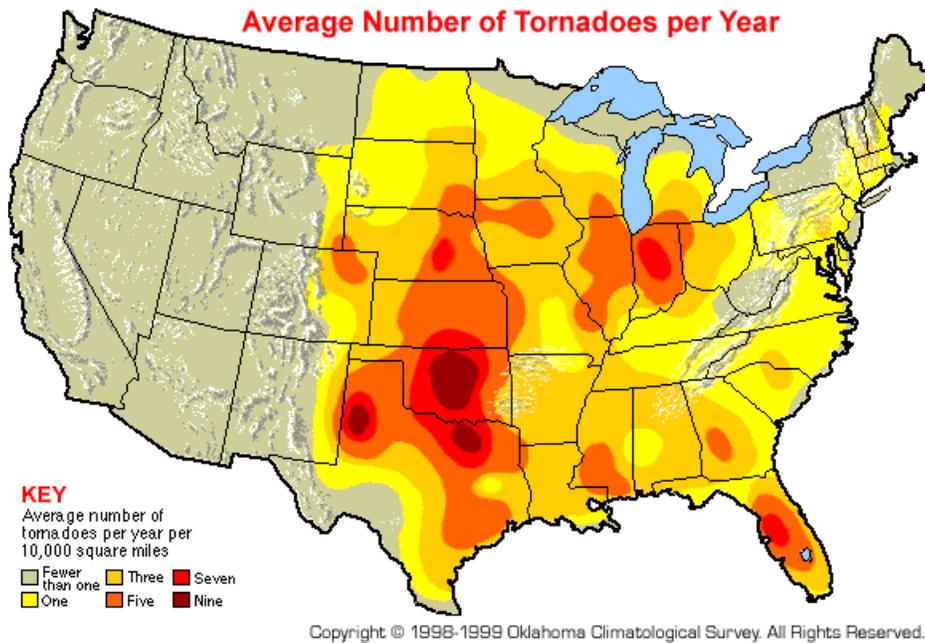
Location	Date	Extent	Impact Description
TIPTON CO.	3/4/1964	F2	Tornado moved northeastward from near the north central Shelby County line through Clopton and Mr. Carmel communities to about 3 miles southeast of Covington, Tipton County. Two persons receive minor cuts and bruises and one a broken arm. Several houses and barns were completely demolished, others severely damaged. Other damage was to trees, utilities, roofs, automobiles, and TV antennas some not in the direct path of the tornado.
TIPTON CO.	5/31/1967	F1	Covington Police Department reported a small tornado struck the Elm Grove community destroying a house under construction, killing a carpenter and injuring a workman.
TIPTON CO.	4/3/1968	F3	Data not available.
TIPTON CO.	9/3/1970	F0	Data not available.
TIPTON CO.	6/7/1974	F1	Tornado demolished a cotton gin in the Mt. Carmel community. Most of the path was in open country where trees were uprooted and twisted.
TIPTON CO.	2/22/1975	F1	The tornado touched down briefly four miles south of Covington destroying two mobile homes and damaged two houses and two automobiles. The two injuries sustained were not serious.
TIPTON CO.	4/25/1975	F1	The tornado first touched down 1 ½ miles southwest of Gilt Edge in farm country, and then again in Gilt Edge destroying a mobile home and killing a five-month old infant. Damage to other buildings also occurred.
TIPTON CO.	3/29/1976	F1	No data available.
TIPTON CO.	1/7/1978	F1	Nine houses were heavily damaged and three mobile homes destroyed. The tornado first touched down on the Brighton-Holly Grove Road about one mile west of Brighton where a barn was destroyed. It then skipped along for about 3 miles. Trees were twisted like tooth picks.
TIPTON CO.	12/7/1978	F0	The tornado (small) that struck the Covington area caused damage to several barns, light sheds, and twisted trees in the area just south of Covington city limits. Two eyewitnesses saw the funnel.
TIPTON CO.	5/9/1981	F0	A small tornado came from a thunderstorm and touched down briefly twisting the tops out of trees, tipping over a small shed, and scattering loose objects around. The funnel was observed by a man and his grandson.

TIPTON CO.	6/4/1989	F0	A tornado touched down briefly in the southwest part of Tipton County, just northeast of Shelby Forest. Witnesses said that it first touched down just west of Ray Bluff Road, about 9.5 miles southwest of Munford. It traveled northeast, crossing Ray Bluff Road, then lifted up about 8.5 miles southwest of Munford. The tornado uprooted trees along its path.
Detroit	11/27/1994	F1	A house was destroyed by a small tornado which briefly touched down. Several vehicles and two 12-row planters were damaged.
COVINGTON	9/16/1996	F0	A tornado touched down several times over northern Tipton and southern Lauderdale counties. A 20'x 60' metal roof was blown off a building in southern Lauderdale county. Some trees and power lines were knocked down as well.
RANDOLPH	11/9/2002	F2	The tornado moved into Tipton county from Mississippi county in Arkansas and moved northeast. The tornado produced significant damage across the county. One man was injured was injured by bricks blown down from the facade of a building in downtown Covington. Across the county, twenty-eight mobile homes, five houses and one business were destroyed. Approximately 275 homes and business were damaged. Numerous trees and power lines were blown down.
GAINESVILLE	2/5/2008	EF0	This tornado began in Northeast Shelby County and crossed into Tipton County along Hughes Road. The tornado tracked northeast and lifted near Beaver Creek Road. One home had minor damage on Beaver Creek Road. Tornado damage was estimated to be EF-0.
CANAAN GROVE	2/5/2008	EF0	A weak tornado touched down briefly in a large farm field just west of Highway 59 in Southeast Tipton County. The tornado lifted as it crossed Highway 59. The tornado knocked down a power pole and some power lines along Highway 59.
CHARLESTON	2/5/2008	EF1	A tornado touched down near Smith Road in the community of Charleston in Eastern Tipton County destroying one trailer home and damaging another. The tornado tracked northeast and severely damaged a home on Highway 179 and then flipped over a trailer to an 18-wheeler on McIntyre Road. The tornado then lifted.
ANTIOCH	2/5/2008	EF1	A tornado touched down near the Antioch-Cotton Road in the Hatchie River Bottom east of Covington destroying a trailer home. An

			adjacent home was also damaged. The tornado then lifted as it moved into the Hatchie River Bottoms.
AVRETT	5/31/2013	EF1	The tornado touched down on Mount Lebanon Road and tracked east destroying two homes. The wind moved cars and trucks a significant amount. There was also damage to grain bins and trees were knocked down. A shop was destroyed.

Based on previous occurrences in adjoining communities, tornado events are likely to occur about every three years in Tipton County, (see the following map for other probability information).

Average Number of Tornadoes Per Year



Source: Oklahoma Climatological Survey

The severity of tornadoes that may occur in the county is measured using the Enhanced Fujita Scale for tornadoes (see chart below). Based on historical events, in a worst case scenario it is possible for the extent of a tornado to exceed an EF3 ranking. Based on NOAA NCEP data, on April 2, 2006 an EF3 tornado touched down in the neighboring Gibson, Dyer, and Weakley counties causing several deaths and extensive damage.

Fujita Scale/Enhanced Fujita Scale for Tornadoes

Fujita / Enhanced Fujita Scale for Tornadoes				
F-Scale	Fastest Quarter Mile Wind Speed	Typical Impacts	Enhanced Scale: 3 Sec Wind Gust Speed	Enhanced F-Scale
F0	40-72 MPH	Some damage to chimney; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.	65-85 MPH	EF0
F1	73-112 MPH	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.	86-110 MPH	EF1
F2	113-157 MPH	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.	111-135 MPH	EF2
F3	158-206 MPH	Roof and some walls torn off well-constructed homes; trains overturned; most trees in forest uprooted.	136-165 MPH	EF3
F4	207-260 MPH	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	166-200 MPH	EF4
F5	261-318 MPH	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.	Over 200 MPH	EF5

Source: NOAA National Weather Service; The Tornado Project

Hail is the frozen form of precipitation, falling as small spheres of solid ice. Even though the risk from hail is relatively low, all jurisdictions have the possibility of hail causing some window and roof damage. Historically, hail events occur three to four times a year in Tipton County. The severity of hail is measured by the diameter of the hail itself, commonly using the TORRO Hail Index (see following chart). Tipton County's largest hail extent is reported at 2.75 inches (H7). Most of the county's hail events were reported causing minor roof damage to several homes and vehicles.

TORRO Hail Index

TORRO Hail Index			
Scale	Max Diameter	Comparisons	Typical Impacts
H0	5-9 MM	Pea	No damage.
H1	10-15 MM	Mothball	Slight general damage to plants, crops.
H2	16-20 MM	Marble	Significant damage to fruit, crops, vegetation.
H3	21-30 MM	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored.
H4	31-40 MM	Pigeon's Egg	Widespread glass damage, vehicle bodywork damage.
H5	41-50 MM	Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries.
H6	51-60 MM	Hen's Egg	Bodywork of grounded aircraft dented, brick walls pitted.
H7	61-75 MM	Tennis Ball	Severe roof damage, risk of serious injuries.
H8	76-90 MM	Soft Ball	Severe damage to aircraft bodywork.
H9	91-100 MM	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.

Source: The Tornado & Storm Research Organization

The following chart provides hail event information for Tipton County between January 2000 and August 2014.

Hail Events in Tipton County: January 2000–August 2014

Location	Date	Extent	Deaths	Injuries	Property Damage
COVINGTON	4/27/2000	0.75 in.	0	0	0.01K
BRIGHTON	3/29/2002	1.00 in.	0	0	0.12K
COVINGTON	11/10/2002	1.00 in.	0	0	0.10K
COVINGTON	11/10/2002	1.00 in.	0	0	0.20K
COVINGTON	12/18/2002	0.75 in.	0	0	0.01K
BRIGHTON	4/6/2003	1.00 in.	0	0	0.10K
COVINGTON	4/6/2003	0.75 in.	0	0	0.01K
BURLISON	4/20/2003	0.75 in.	0	0	0.02K
COVINGTON	5/5/2003	0.88 in.	0	0	0.05K
COVINGTON	5/5/2003	0.88 in.	0	0	0.05K
ATOKA	5/5/2003	1.25 in.	0	0	0.25K
BRIGHTON	5/6/2003	2.75 in.	0	0	7.50K
COVINGTON	5/6/2003	0.75 in.	0	0	0.01K
COVINGTON	5/10/2004	0.75 in.	0	0	0.01K
BRIGHTON	9/12/2004	0.75 in.	0	0	0.01K
BRIGHTON	9/12/2004	0.75 in.	0	0	0.01K
COVINGTON	2/21/2005	1.00 in.	0	0	2.00K
COVINGTON	2/21/2005	2.00 in.	0	0	1.00K
COVINGTON	2/21/2005	0.88 in.	0	0	0.06K
COVINGTON	3/30/2005	0.75 in.	0	0	0.02K
GILT EDGE	4/29/2005	2.75 in.	0	0	8.50K
MUNFORD	11/15/2005	1.00 in.	0	0	0.10K
MUNFORD	11/15/2005	1.00 in.	0	0	0.10K
MUNFORD	4/2/2006	0.88 in.	0	0	2.50K
DIXONVILLE	4/2/2006	1.25 in.	0	0	6.00K
COVINGTON	5/3/2006	0.75 in.	0	0	1.00K
COVINGTON	4/3/2007	0.75 in.	0	0	1.00K
DRUMMONDS	4/3/2007	1.00 in.	0	0	1.00K
DRUMMONDS	8/2/2007	0.75 in.	0	0	1.00K
ATOKA	8/18/2007	0.75 in.	0	0	1.00K
ATOKA	3/15/2008	0.75 in.	0	0	1.00K
MASON	5/10/2008	0.75 in.	0	0	1.00K
ATOKA	3/25/2010	0.75 in.	0	0	0.00K
MASON	4/24/2010	1.50 in.	0	0	0.00K
BURLISON	4/19/2011	1.00 in.	0	0	0.00K
DRUMMONDS	4/19/2011	0.75 in.	0	0	0.00K
TIPTON	4/26/2011	1.50 in.	0	0	0.00K
DRUMMONDS	4/26/2011	1.50 in.	0	0	0.00K
ATOKA	4/26/2011	1.00 in.	0	0	0.00K

ATOKA	5/1/2011	1.00 in.	0	0	0.00K
MUNFORD	5/13/2011	0.75 in.	0	0	0.00K
ATOKA	5/25/2011	1.00 in.	0	0	0.00K
CANAAN GROVE	5/25/2011	1.25 in.	0	0	0.00K
GILT EDGE	9/14/2011	1.00 in.	0	0	0.00K
ATOKA	1/22/2012	0.88 in.	0	0	0.00K
ATOKA	3/31/2012	0.75 in.	0	0	0.00K
CROSSTOWN	3/31/2012	0.75 in.	0	0	0.00K
ATOKA	3/31/2012	1.00 in.	0	0	0.00K
IDAVILLE	10/17/2012	1.00 in.	0	0	0.00K
SALEM	7/10/2013	0.75 in.	0	0	0.00K
MUNFORD	9/1/2013	1.00 in.	0	0	0.00K
BURLISON	9/1/2013	1.00 in.	0	0	0.00K

Severe storm winds most commonly occur as straight-line winds; a downburst of wind created by an area of significantly rain-cooled air that spreads out in all directions after hitting the ground. All jurisdictions are vulnerable to receiving damage from these severe storm winds.

Historically severe storm wind events occur three to four times a year in Tipton County. The severity of severe storm winds is commonly measured by wind speed (knots or mph). The largest severe storm wind events within Tipton County in recent years were recorded on May 31st, 2001, April 19th, 2011. The damage in this event was a result of an intense microburst with wind speeds at 70 mph. During these storms several trees were snapped or uprooted and many homes/barns saw roof damages.

The following chart provides severe storm wind event information for Tipton County between January 2000 and October 2014.

Wind Events in Tipton County: January 2000–October 2014

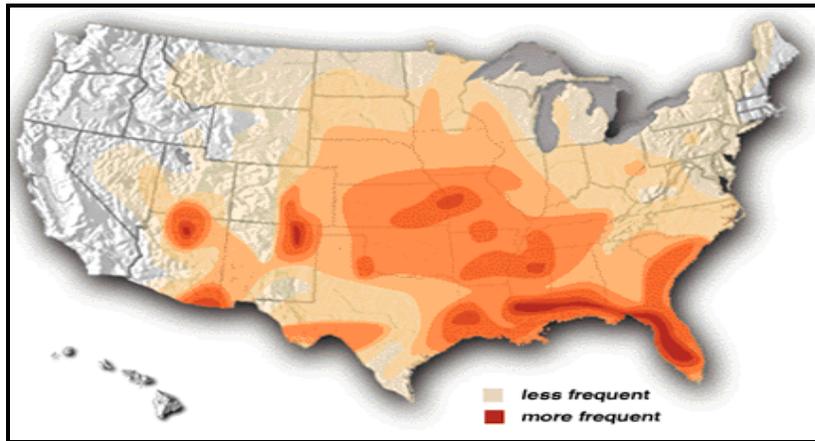
Location	Date	Extent	Deaths	Injuries	Property Damage
COUNTYWIDE	5/25/2000		0	0	60.00K
COUNTYWIDE	7/20/2000		0	0	10.00K
TiptonVILLE	11/8/2000		0	0	1.00K
COUNTYWIDE	2/24/2001		0	0	20.00K
BEACON	5/31/2001	65 kts. E	0	1	100.00K
SUGAR TREE	7/5/2001		0	0	10.00K
PARSONS	10/24/2001		0	0	5.00K
BATH SPGS	4/24/2002		0	0	10.00K
PARSONS	11/10/2002		0	0	1.00K
PARSONS	5/1/2003	50 kts. EG	0	0	5.00K
COUNTYWIDE	5/11/2003	55 kts. EG	0	0	10.00K
BUSSELLTOWN	7/21/2003	50 kts. EG	0	0	5.00K

PARSONS	8/4/2003	50 kts. EG	0	0	5.00K
TiptonVILLE	5/30/2004	50 kts. EG	0	0	5.00K
PARSONS	6/6/2005	50 kts. EG	0	0	5.00K
SUGAR TREE	8/6/2005	50 kts. EG	0	0	5.00K
PARSONS	11/15/2005	50 kts. EG	0	0	5.00K
Tipton (ZONE)	1/4/2007	40 kts. EG	0	0	2.00K
SUGAR TREE	4/3/2007	50 kts. EG	0	0	3.00K
BATH SPGS	4/3/2007	50 kts. EG	0	0	3.00K
BATH SPGS	4/25/2007	50 kts. EG	0	0	6.00K
YELLOW SPGS	1/8/2008	50 kts. EG	0	0	2.50K
DUNBAR	1/8/2008	50 kts. EG	0	0	2.50K
Tipton (ZONE)	1/29/2008	50 kts. EG	0	0	10.00K
SHILOH	2/5/2008	50 kts. EG	0	0	5.00K
SUGAR TREE	5/26/2008	50 kts. EG	0	0	20.00K
LICK SKILLET	6/15/2009	50 kts. EG	0	0	0.00K
BIBLE HILL	7/5/2009	50 kts. EG	0	0	0.00K
JEANETTE	7/15/2009	50 kts. EG	0	0	0.00K
PARSONS	7/15/2009	50 kts. EG	0	0	0.00K
SUGAR TREE	8/4/2009	52 kts. EG	0	0	0.50K
BEACON	4/7/2010	50 kts. MG	0	0	0.00K
GARRETT	5/1/2010	50 kts. EG	0	0	10.00K
TiptonVILLE	5/14/2010	50 kts. EG	0	0	0.00K
PARSONS	4/4/2011	61 kts. EG	0	0	0.00K
ATOKA	4/4/2011	52 kts. EG	0	0	0.00K
ATOKA	4/19/2011	65 kts. EG	0	0	1.660M
ATOKA	5/23/2011	54 kts. MG	0	0	0.00K
ATOKA	6/16/2011	55 kts. MG	0	0	0.00K
BURLISON	6/16/2011	50 kts. EG	0	0	0.00K
BURLISON	6/28/2011	50 kts. EG	0	0	0.00K
MASON	1/22/2012	55 kts. EG	0	0	5.00K
ATOKA	5/31/2012	50 kts. EG	0	0	1.00K
MASON	6/3/2012	50 kts. EG	0	0	0.00K
BRIDE	6/11/2012	56 kts. EG	0	0	0.00K
ATOKA	9/7/2012	59 kts. MG	0	0	0.00K
BURLISON	5/21/2013	50 kts. EG	0	0	0.00K
WALNUT GROVE	5/31/2013	50 kts. EG	0	0	28.00K
COVINGTON	7/18/2013	50 kts. EG	0	0	0.00K
COVINGTON	12/21/2013	50 kts. EG	0	0	0.00K
CROSSTOWN	12/21/2013	50 kts. EG	0	0	0.00K
JAMESTOWN	6/5/2014	61 kts. EG	0	0	0.00K
BRIGHTON	6/7/2014	50 kts. EG	0	0	0.00K
COVINGTON	6/12/2014	52 kts. MG	0	0	0.00K
COVINGTON	6/12/2014	62 kts. MG	0	0	0.00K
BURLISON	10/2/2014	50 kts. EG	0	0	0.00K

Lightning is an enormous electrical discharge is caused by an imbalance between positive and negative charges. During a storm, colliding particles of rain, ice, or snow increase this imbalance and often negatively charge the lower reaches of storm clouds. Objects on the ground, like steeples,

trees, and the Earth itself, become positively charged—creating an imbalance that nature seeks to remedy by passing current between the two charges. Lightning events may affect the entire area of Tipton County any time of the year, though they are more numerous in spring and summer. Historically, lightning events occur one or more times a year in Tipton County. The severity of damages depends on what the lightning strikes.

**Lightning Probability Incidence Map:
Annual Frequency of Cloud-to-Ground Lightning**



The following chart provides lightning event information for Tipton County between January 2000 and August 2014.

**Recorded Lightning Impacts in Tipton County:
January 2000 – August 2014**

Location	Date	Deaths	Injuries	Property Damage
COVINGTON	5/3/2007	0	0	5.00K

Throughout the county all buildings and infrastructure are vulnerable to tornadoes and severe storm impacts. Tipton County’s building stock can be broken down into the following percentage categories: 83% residential, 8% commercial, 4% industrial, 1% agricultural, 1% governmental, 2% religious, and 1% educational. Impacts could range from slight roof damages caused by hail to total structure flattening caused by strong tornadoes. In the county, manufactured homes, electrical lines, and older barns are some of the most vulnerable features.

Tipton County uses a ranking system to determine each jurisdiction’s vulnerability to severe storm events (with a focus on tornadoes). This

system is based off simple arithmetic which analyzes potential impacts to determine vulnerabilities and then analyzes the probability of a severe storm event occurring to calculate a risk ranking for each jurisdiction.

Severe Storms/Tornado

Jurisdiction	Impacts			Vulnerability <i>H+P+B=#; #/3= V</i>
	Human	Property	Business	
Tipton County	4	4	4	4.00
Covington	4	3	3	3.33
Munford	5	5	5	5.00
Atoka	4	4	4	4.00
Brighton	4	4	4	4.00
Burlison	4	4	2	3.33
Garland	1	2	1	1.33
Gilt Edge	3	3	3	3.00
Mason	3	2	3	2.67

Jurisdiction	Vulnerability	Probability	Risk <i>V+P=R</i>	
Tipton County	4.00	5	9.00	Severe
Covington	3.33	1	4.33	Moderate
Munford	5.00	1	6.00	Medium
Atoka	4.00	3	7.00	High
Brighton	4.00	3	7.00	High
Burlison	3.33	2	4.67	Moderate
Garland	1.33	2	6.67	Medium
Gilt Edge	3.00	3	5.00	Moderate
Mason	2.67	3	6.00	Medium

Scale	
Low	2-3.6
Moderate	3.7-5.2
Medium	5.3-6.8
High	6.9-8.4
Severe	8.5-10

Human	
<i>Risk of Injuries and Death from the Hazard</i>	
1	Death very unlikely, injuries are unlikely
2	Death unlikely, injuries are minimal
3	Death unlikely, injuries may be substantial
4	Death possible, injuries may be substantial
5	Deaths probable, injuries will likely be substantial

Property	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
<i>Amount of Business Damage Associated from the Hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

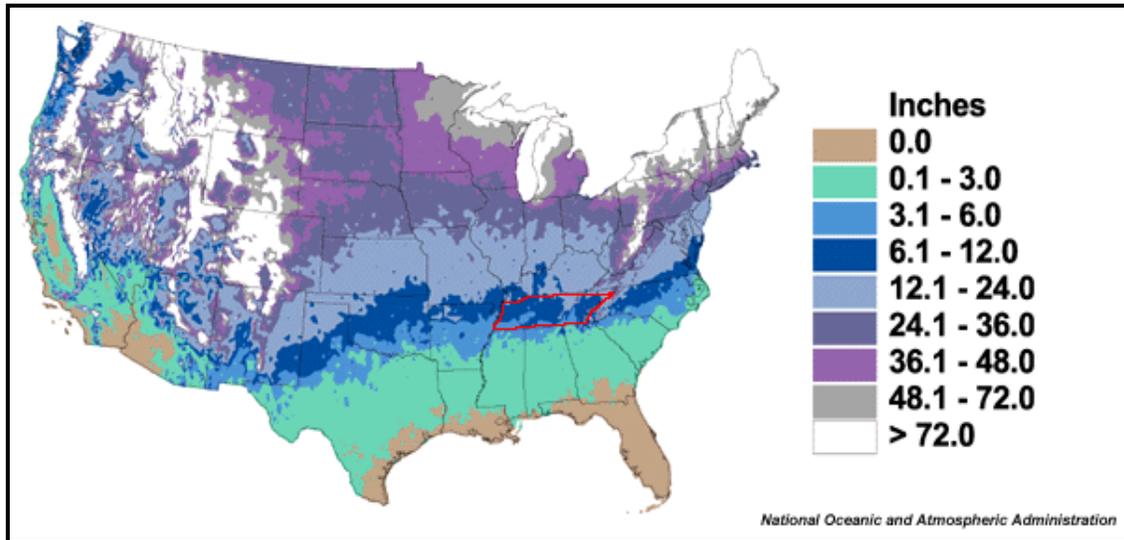
Probability	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

Freezes/Winter Storms

A freeze occurs when temperatures are below 32 degrees Fahrenheit for a period of time. These temperatures can damage agricultural crops, burst water pipes, and create layers of "black ice." Winter storms are events that can range from a few hours of moderate snow to blizzard-like circumstances that can affect driving conditions and impact communications, electricity, and other services. In Tipton County, all jurisdictions are vulnerable to freezes and moderate winter storms, but not to the severity level seen in much of the northern U.S.

Based on previous occurrences, Tipton County usually experiences between two and three instances of winter weather per year. The severity of winter storms is commonly measured by inches of ice or snowfall.

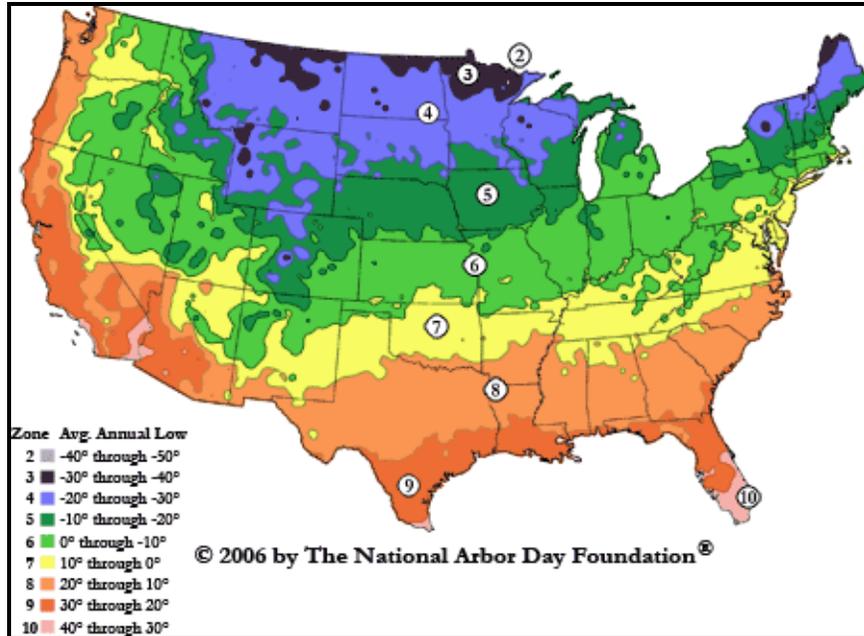
Average Mean Snowfall Per Year



Source: NOAA

Tipton County can experience temperatures between 15 to 5 degrees Fahrenheit, thus causing multiple freeze conditions during the winter months (see the following map for other average lows).

Average Annual Low Temperatures



Source: NOAA

The following chart provides winter storm event information for Tipton County between January 2000 and August 2014.

Winter Events in Tipton County: January 2000 – August 2014

Jurisdiction	Date	Type	Deaths	Injuries	Property Damage
TIPTON (ZONE)	1/27/2000	Heavy Snow	0	0	0.00K
TIPTON (ZONE)	2/6/2003	Heavy Snow	0	0	1.00K
TIPTON (ZONE)	2/25/2003	Heavy Snow	0	0	1.00K
TIPTON (ZONE)	1/5/2009	Ice Storm	0	0	0.00K
TIPTON (ZONE)	1/26/2009	Ice Storm	0	0	0.00K
TIPTON (ZONE)	12/13/2000	Winter Storm	0	0	20.00K
TIPTON (ZONE)	2/5/2002	Winter Storm	0	0	0.00K
TIPTON (ZONE)	12/22/2004	Winter Storm	0	0	1.00K
TIPTON (ZONE)	2/10/2006	Winter Storm	0	0	1.00K
TIPTON (ZONE)	2/18/2006	Winter Storm	0	0	1.00K
TIPTON (ZONE)	3/7/2008	Winter Storm	0	0	0.00K
TIPTON (ZONE)	2/28/2009	Winter Storm	0	0	0.00K
TIPTON (ZONE)	3/1/2009	Winter Storm	0	0	0.00K
TIPTON (ZONE)	1/29/2010	Winter Storm	0	0	0.00K
TIPTON (ZONE)	2/8/2010	Winter Storm	0	0	0.00K
TIPTON (ZONE)	1/9/2011	Winter Storm	0	0	0.00K
TIPTON (ZONE)	2/9/2011	Winter Storm	0	0	0.00K
TIPTON (ZONE)	12/5/2013	Winter Storm	0	0	0.00K
TIPTON (ZONE)	2/2/2014	Winter Storm	0	0	0.00K
TIPTON (ZONE)	2/4/2014	Winter Storm	0	0	0.00K
TIPTON (ZONE)	3/2/2014	Winter Storm	0	0	0.00K
TIPTON (ZONE)	2/1/2007	Winter Weather	0	0	0.00K
TIPTON (ZONE)	1/20/2011	Winter Weather	0	0	0.00K
TIPTON (ZONE)	1/25/2011	Winter Weather	0	0	0.00K
TIPTON (ZONE)	2/7/2011	Winter Weather	0	0	0.00K
TIPTON (ZONE)	11/28/2011	Winter Weather	0	0	0.00K
TIPTON (ZONE)	12/7/2011	Winter Weather	0	0	0.00K
TIPTON (ZONE)	12/25/2012	Winter Weather	0	0	0.00K
TIPTON (ZONE)	1/15/2013	Winter Weather	0	0	0.00K
TIPTON (ZONE)	12/7/2013	Winter Weather	0	0	0.00K
TIPTON (ZONE)	2/8/2014	Winter Weather	0	0	0.00K

Throughout the county many buildings and the majority of infrastructure networks can be vulnerable to winter storm impacts. Tipton County's building stock can be broken down into the following percentage categories: 83% residential, 8% commercial, 4% industrial, 1% agricultural, 1% governmental, 2% religious, and 1% educational. Many of these structures wouldn't receive direct impacts from winter storms but they could receive indirect impacts such as downed electrical lines that cut off electricity to the structures, frozen pipelines that crack, destroyed agriculture crops, and customers not being able to access travels to the

structures due to ice covered roads. In the county, road traveling conditions, electrical lines, and agricultural functions are some of the most vulnerable features.

Tipton County uses a ranking system to determine each jurisdiction’s vulnerability to freezes/winter storm events. This system is based off simple arithmetic which analyzes potential impacts to determine vulnerabilities and then analyzes the probability of a freeze/winter storm event occurring to calculate a risk ranking for each jurisdiction.

Winter Storms

Jurisdiction	Impacts			Vulnerability <i>H+P+B=#; #/3= V</i>
	Human	Property	Business	
Tipton County	2	3	2	2.33
Covington	1	3	2	2.00
Munford	1	3	3	2.33
Atoka	2	3	1	2.00
Brighton	1	2	2	1.67
Burlison	1	3	2	2.00
Garland	1	2	1	1.33
Gilt Edge	1	2	2	1.67
Mason	1	2	2	1.67

Jurisdiction	Vulnerability	Probability	Risk <i>V+P=R</i>	
Tipton County	2.33	4	6.33	Medium
Covington	2.00	4	6.00	Medium
Munford	2.33	4	6.33	Medium
Atoka	2.00	4	6.00	Medium
Brighton	1.67	2	3.67	Low
Burlison	2.00	2	4.00	Moderate
Garland	1.33	2	3.33	Low
Gilt Edge	1.67	2	3.67	Low
Mason	1.67	2	3.67	Low

Scale	
Low	2-3.6
Moderate	3.7-5.2
Medium	5.3-6.8
High	6.9-8.4
Severe	8.5-10

Human	
<i>Risk of Injuries and Death from the Hazard</i>	
1	Death very unlikely, injuries are unlikely
2	Death unlikely, injuries are minimal
3	Death unlikely, injuries may be substantial
4	Death possible, injuries may be substantial
5	Deaths probable, injuries will likely be substantial

Property	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

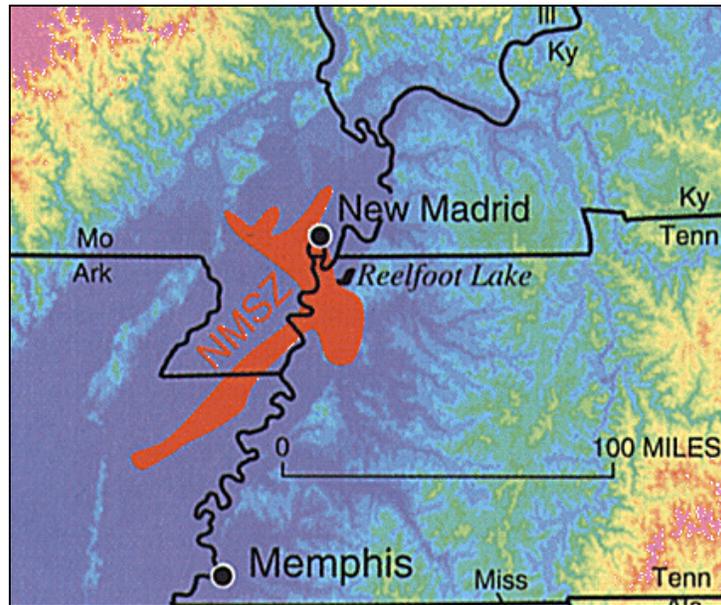
Business	
<i>Amount of Business Damage Associated from the Hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

Probability	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

Earthquakes

Tipton County is in close proximity to the major intraplate (within a tectonic plate) seismic zone known as the New Madrid Seismic Zone. The New Madrid Seismic Zone (NMSZ) is an approximately 120-mile long fault system that stretches across five states including Western Tennessee.

New Madrid Seismic Zone



Historically, the zone is known for producing four of the largest North American earthquakes in recorded history, all in which would have had been felt in Tipton County. This includes the noted three-month period between December 1811 and February 1812 that had quakes reaching Richter Scale magnitudes into the 7.0 through 8.6 ranges.

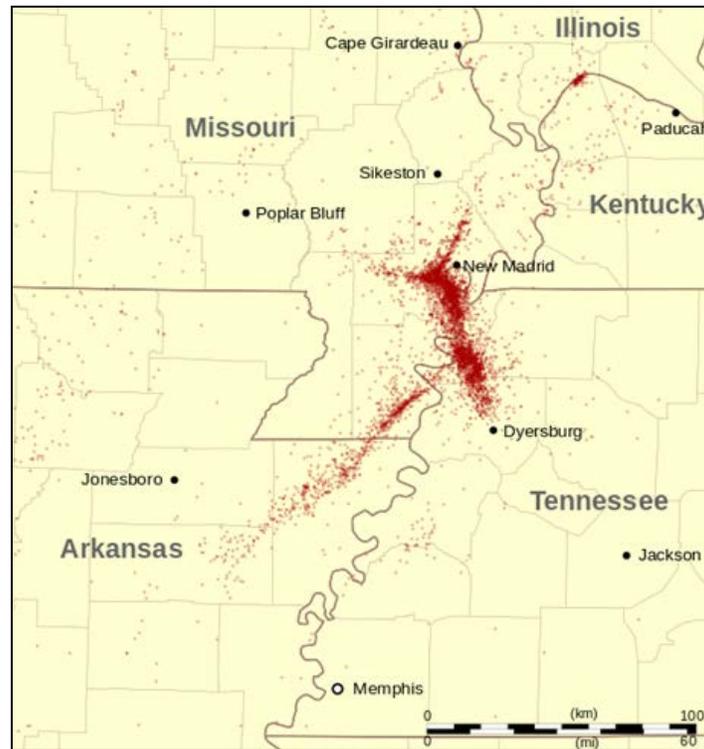
Earthquake Magnitude Scale (Richter Scale)

Richter Scale for Earthquakes		
Magnitudes	Description	Typical Impacts
< 2.0	Micro	Not felt.
2.0-2.9	Slight	Generally not felt, but recorded.
3.0-3.9	Minor	Often felt, but rarely causes damage.
4.0-4.9	Light	Noticeable shaking of indoor items, rattling noises. Significant damage likely.
5.0-5.9	Moderate	Can cause major damage to poorly constructed building over small regions. At most slight damage to well-designed buildings.
6.0-6.9	Strong	Can be destructive in areas up to about 100 miles across populated areas.
7.0-7.9	Major	Can cause serious damage over larger areas.
8.0-8.9	Great	Can cause serious damage in areas several hundred miles across.
9.0-9.9	Epic	Devastating in areas several thousand miles across.

Source: USGS

Since the 1812 earthquakes, the largest recorded quakes from this zone were the October 1895, 6.6 magnitude quake (epicenter Charleston, MO) and the November 1968, 5.5 magnitude quake (epicenter in Dale, IL). From the time when seismic measurement instruments were installed in and around the zone in the 1970's, more than 4,000 small earthquakes have been recorded, with the vast majority being too small to be felt.

NMSZ Earthquakes Recorded Since 1974



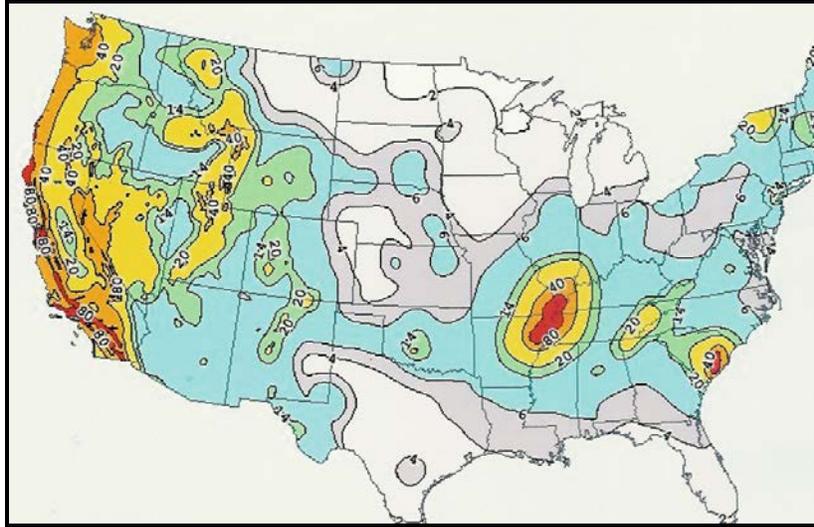
According to a FEMA report filed in 2008, a serious earthquake in the NMSZ could result in the highest economic loss due to a natural disaster in U.S. history, causing widespread and catastrophic damage across a seven-state radius with most of the worst impacts taking place in Western Tennessee (includes Tipton County). Based on this report, a 7.7 magnitude quake in the NMSZ would result in thousands of fatalities, tens of thousands of damages to structures, and total disruption of vital infrastructure in Western Tennessee.

Tipton County sits in what FEMA/TEMA considers the 20-county New Madrid Impact Zone. Statistical earthquake vulnerability studies from FEMA show that out of these 20 counties that Tipton County will probably receive moderate to severe impacts because of its close proximity to the fault line.

Throughout the county many buildings and the majority of infrastructure networks could be vulnerable to earthquake impacts. Tipton County's building stock can be broken down into the following percentage categories: 83% residential, 8% commercial, 4% industrial, 1% agricultural, 1% governmental, 2% religious, and 1% educational. Studies conducted by FEMA for a large magnitude earthquake, (*greater than 7.7*), along the New Madrid Fault Line estimate that 2,000

households could be without water & power in Tipton County and that roughly 1,000 persons may need to seek temporary shelter.

**National Seismic Hazard Map
Ground Motions with a 2% Chance of Occurring in 50 Years**



Source: USGS

The current lack of apparent land movement along the NMSZ has long puzzled scientists. Currently, GPS measurements show that the NMSZ faults are moving no more than 0.0079 inches a year. In contrast the San Andreas Fault in California moves up to 1.5 inches a year. This has led some researchers to believe that the fault may be “shutting down” while others say it is a “sleeping giant.” These differing views have made it difficult for public policy makers to decide on if, how, and how much to prepare for and spend on mitigating a potential large scale earthquake.

Tipton County uses a ranking system to determine each jurisdiction’s vulnerability a large NMSZ earthquake. This system is based off simple arithmetic which analyzes potential impacts to determine vulnerabilities and then analyzes the probability of a severe storm event occurring to calculate a risk ranking for each jurisdiction.

Earthquake

Jurisdiction	Impacts			Vulnerability <i>H+P+B=#; #/3= V</i>
	Human	Property	Business	
Tipton County	5	5	4	4.67
Covington	4	4	3	3.67
Munford	1	4	4	3.00
Atoka	4	4	4	4.00
Brighton	4	4	4	4.00
Burlison	4	4	2	3.33
Garland	4	4	1	3.00
Gilt Edge	4	4	4	4.00
Mason	4	4	4	4.00

Jurisdiction	Vulnerability	Probability	Risk <i>V+P=R</i>	
Tipton County	4.67	1	5.67	Medium
Covington	3.67	1	4.67	Moderate
Munford	3.00	1	4.00	Moderate
Atoka	4.00	1	5.00	Moderate
Brighton	4.00	1	5.00	Moderate
Burlison	3.33	1	4.33	Moderate
Garland	3.00	1	4.00	Moderate
Gilt Edge	4.00	1	5.00	Moderate
Mason	4.00	1	5.00	Moderate

Scale	
Low	2-3.6
Moderate	3.7-5.2
Medium	5.3-6.8
High	6.9-8.4
Severe	8.5-10

Human	
<i>Risk of Injuries and Death from the Hazard</i>	
1	Death very unlikely, injuries are unlikely
2	Death unlikely, injuries are minimal
3	Death unlikely, injuries may be substantial
4	Death possible, injuries may be substantial
5	Deaths probable, injuries will likely be substantial

Property	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than \$500 in damages
2	\$500-\$10,000 in damages
3	\$10,000-\$500,000 in damages
4	\$500,000-\$2,000,000 in damages
5	More than \$2,000,000 in damages

Business	
<i>Amount of Business Damage Associated from the Hazard</i>	
1	Less than 3 businesses closed for only a day
2	More than 3 businesses closed for a week
3	More than 3 businesses closed for a few months
4	More than 3 businesses closed indefinitely or relocated
5	A top-10 local employer closed indefinitely

Probability	
<i>Amount of Residential Property Damage Associated from Hazard</i>	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

Tipton County Declared Disasters 2003-2015

County	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Tipton		2			1	1		1		

Section 4: Mitigation Strategy

Mitigation Goals

The purpose for developing a set of goals is to clearly state the community's overall vision for hazard mitigation and to provide a path towards building a safer, more resilient community. The Tipton County Hazard Mitigation Committee identified the following goals to be the forefront in the overall development of this plan update. All actions/projects recommended as mitigation efforts for the Hazard Mitigation Plan must first meet or further at least one of these goals. The goals are provided in a ranked order where the first goal is paramount.

Goals: To provide the residents of Tipton County

1. Protect public health, safety and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.
2. Reduce loss of life and property from future flooding events in Tipton County.
3. Reduce the repeated flooding of the transportation infrastructures in the County.
4. Improve the County's Technical Capability by using the existing Geographic Information System (GIS) in conjunction with HAZUS-MH to generate natural hazards information for the County and Municipalities.
5. Minimize losses to existing and future structures within hazard areas.
6. To reduce loss of life and property from future tornado events in Tipton County.
7. To reduce loss of life and property from future earthquake events in Tipton County.
8. Reduce the risk of failure and/or structural damage to the transportation infrastructure in the event of an earthquake occurring in Tipton County

Identification and Prioritization of Mitigation Projects

Tipton County has developed a comprehensive range of mitigation projects. These projects were solicited and identified by the different entities that make up the Tipton County Hazard Mitigation Committee. Once the proposed projects attained a sponsoring agency and the details of the projects were discussed by the committee, the committee then proceeded to prioritize the mitigation projects.

The prioritization process was important since most mitigation projects represent a large investment of financial and personal resources. By evaluating each project's degree of feasibility and the level of costs versus benefits, Tipton County was able to determine when and which projects should be implemented based on available funding and time.

For the plan update, the Tipton County Hazard Mitigation Committee used the SAFE-T method to prioritize these projects. This approach was adopted from the successful methodology used by other counties in FEMA Region 4. This rating system uses five variables to evaluate the overall feasibility and appropriateness: Societal, Admistrative, Financial, Environmental, and Technical. A focus on this methodology emphasizes the use of a cost-benefit review to maximize benefits.

Project Prioritization Method: SAFE-T			
Variable		Value	Description
S	Societal: The public must support the overall implementation strategy and specified mitigation actions. The projects will be evaluated in terms of community acceptance and societal	1	Low community priority, few societal benefits
		2	Moderate community acceptance / priority
		3	High community acceptance / priority
A	Administrative: The projects will be evaluated for anticipated staffing and maintenance requirements to determine if the jurisdiction has the personnel and administrative capabilities necessary to implement the project or whether outside help will be needed.	1	High staffing, outside needed
		2	Some staffing, help may be needed
		3	Low staffing, no outside help needed
F	Financial: The projects will be evaluated on their general cost-effectiveness and whether additional outside funding will be required	1	Somewhat cost-effective
		2	Moderately cost-effective
		3	Very cost-effective
E	Environmental: The projects will be evaluated for any immediate or long-term environmental impacts caused by their construction or operation	1	Many environmental impacts, possibly long term
		2	Some environmental impacts, some possibly long term
		3	Few, if any, environmental impacts
T	Technical: the projects will be evaluated on their ability to reduce losses in the long-term, whether there are secondary impacts, and whether the proposed project solves the associated problem or if additional components are necessary.	1	Other actions are needed or short-term fix
		2	Other actions may be needed for long-term fix
		3	Other actions not needed, long-term fix

Committee members ranked the projects as a group by determining the value for each variable and then by adding the variables rates up for a project sum value. All the project rankings can be seen on the Tipton County Hazard Mitigation Project List.

Tipton County Project List

The following Project List provides an overview of all projects decided on by the Tipton County Hazard Mitigation Committee. This includes potential funding sources, implementation timeframes, the project's responsible agency, and other information. This list is to remain active and updated.

Tipton County Project List

Mitigation Projects										
Numerical Priority	Priority Rank (High, Moderate, Low)	Action/Project	Hazard Mitigated	Jurisdictions Benefitted & Represented	Addresses New or Existing Buildings/ Infrastructure	Estimated Cost	Responsible Agency	Possible Funding Source(s)	Population Affected	Timeframe
1	High	Upgrade early warning system to electronic based for use with cell phone/social media	All	All	Both	\$20,000.00	EMA	Local	61,122	2 Years
2	High	Adopt 2012 building codes	All	All	Both	\$2,000.00	County Planning	Local	61,122	1 Year
3	Moderate	Continue to place address numbers on all houses	All	Burlison	Existing	\$25,000.00	EMA	Local	200	2 Years
4	High	Issue weather radios to residents	All	Burlison	Both	\$30,000.00	EMA, County Fire	Local	200	2 Years
5	High	Continue to educate the public and decision makers about hazards and the need for hazard risk reduction	All	All	Both	\$10,000.00	Tipton County GIS	Local	61,122	Semi Annually

6	Moderate	Monitor and develop GIS maps that assist in disaster event response	All	All	Both	\$10,000.00	Tipton County GIS	Local	61,122	Semi Annually
7	Moderate	Use GIS to identify county vulnerabilities and create maps that outline abilities and resources to limit risks	All	All	Both	\$10,000.00	Tipton County GIS	Local	61,122	Semi Annually
8	Moderate	Use GIS to map core utilities such as water, gas, electric and sewer	All	All	Both	\$10,000.00	Tipton County GIS	Local	61,122	Semi Annually
9	Moderate	Continue sharing GIS data throughout the GIS board and other agencies	All	All	Both	\$10,000.00	Tipton County GIS	Local	61,122	Semi Annually
10	Moderate	Enlarge culverts at Betty Boyd Drive	Flood	Atoka	Existing	\$50,000.00	Public Works	HMGP, PDM	8,523	2-3 Years
11	Moderate	Create safe space with generator at existing location of Gilt Edge City Hall/Community Center with shower and restroom facilities	Tornado, Winter Storm	Gilt Edge	New	\$500,000.00	EMA, Gilt Edge	HMGP, PDM	500	2-3 Years
12	Moderate	Enlarge culvert at Quinton Road and Big Creek	Flood	Munford	Existing	\$80,000.00	Public Works	HMGP, PDM, Local	5,951	2-3 Years
13	Moderate	Enlarge culvert at Reeder and Park	Flood	Munford	Existing	\$80,000.00	Public Works	HMGP, PDM, Local	5,951	2-3 Years

Section 4: Mitigation Strategy

14	Moderate	Enlarge culvert at Shannon and West Drive	Flood	Munford	Existing	\$80,000.00	Public Works	HMGP, PDM, Local	5,951	2-3 Years
15	High	Clear utility right of ways	All	Munford	Existing	\$100,000.00	Public Works	HMGP, PDM, Local	5,951	2-3 Years
16	High	Safeguarding/training of population, vulnerable structures/facilities/utilities	Terrorism, Severe Storms	Munford	Existing	\$50,000.00	Munford Police/Fire, Public Works, Parks and Recreation	Local	5,951	2 Years
17	Moderate	Reroute and raise Curry Jones Road	Flood	Tipton County	Existing	\$150,000.00	Public Works	HMGP, PDM	61,122	2-3 Years
18	Moderate	Replace bridge on Cooper Road	Flood	Tipton County	Existing	\$500,000.00	Public Works	HMGP, PDM	61,122	2-3 Years
19	High	Add additional cameras and DVR's at all schools	Security	All	Existing	\$70,000.00	Board of Education	DHSG	12,000	2-3 Years
20	Moderate	Reinforce major storm water ditches/channels	Flood	Atoka	Existing	\$150,000 Each	Public Works	HMGP, PDM	8,523	2-3 Years
21	Moderate	Expand universal shelter to include generator, showers/bedding, laundry facilities and toiletries	Tornado, Winter Storm	Munford	Existing	\$1,500,000.00	EMA	HMGP, PDM	5,951	2-3 Years

22	Moderate	Seismic retrofit of water infrastructure	Earthquake	Munford	Existing	\$500,000.00	Public Works	HMGP, PDM	5,951	2-3 Years
23	High	Create public safe space with generator	Tornado, Winter Storm	Covington	New	\$1,000,000.00	EMA	HMGP, PDM	9,022	2-3 Years
24	Moderate	Hazen Branch Creek improve drain system	Flood	Covington	Existing	\$300,000.00	Highway Department	HMGP, PDM, Local	9,022	2-3 Years
25	Moderate	Improve drainage at South College - railroad underpass	Flood	Covington	Existing	\$200,000.00	Highway Department	HMGP, PDM, Local	9,022	2-3 Years
26	Moderate	Update NFIP flood maps	Flood	All	Both	\$10,000.00	County Planning	HMGP, PDM, Local	61,122	2-3 Years
27	Moderate	Create retention pond to prevent flooding of Lucado Road	Flood	Tipton County	New	\$150,000.00	Public Works	HMGP, PDM	61,122	2-3 Years
28	Low	Vegetation control - county roads	All	Tipton County	Existing	\$75,000.00	Public Works	HMGP, PDM	61,122	2-3 Years

29	Moderate	Install debris racks on bridge on Crane Road	Flood	Tipton County	Existing	\$200,000.00	Public Works	HMGP, PDM	61,122	2-3 Years
30	High	Create safe rooms with generators at remaining 13 schools	Tornado, Winter Storm	All	Existing	\$2,000,000.00 each	Board of Education	HMGP, PDM	12,000	2-3 Years
31	High	Create safe space with generator	Tornado, Winter Storm	Burlison	New	\$500,000.00	Burlison	HMGP, PDM	200	2-3 Years
32	Moderate	Stormwater detention expansion - Walker Park	Flood	Atoka	Existing	\$150,000.00	Atoka	HMGP, PDM	8,523	2-3 Years
33	Moderate	Stormwater detention Blaydes S/D	Flood	Atoka	New	\$200,000.00	Atoka	HMGP, PDM	8,523	2-3 Years
34	High	Retrofit waste water treatment plant to earthquake codes	Earthquake	Covington	Existing	\$500,000.00	Public Works	HMGP, PDM, Local	9,022	2-3 Years
35	Moderate	Retrofit water plant to earthquake codes	Earthquake	Covington	Existing	\$450,000.00	Public Works	HMGP, PDM, Local	9,022	2-3 Years

36	Moderate	Improve drainage at Maintenance Department building	Flood	Covington	Existing	\$500,000.00	Public Works	HMGP, PDM, Local	9,022	2-3 Years
37	Moderate	Safe space with generator at board of education building	Tornado, Winter Storm	All	Existing	\$10,000,000.00	Board of Education	HMGP, PDM	5,000	2-3 Years
38	Moderate	Bridge replacement Meade Lake Road	Earthquake, Flood	Atoka	Existing	\$350,000.00	Public Works	HMGP, PDM	8,523	2-3 Years
39	High	Retrofit Fire Station #3	Earthquake	Atoka	Existing	\$250,000.00	Atoka	HMGP, PDM	8,523	2-3 Years
40	Moderate	Raise road at 9000 area of Munford-Gilt Edge Road (SR 178)	Flood	Tipton County, Gilt Edge	Existing	\$150,000.00	Road Department	HMGP, PDM, FMA	2,000	2-3 Years
41	Moderate	Raise road at 10229 TN Highway 59 West just east of Canal bridge	Flood	Tipton County, Gilt Edge, Burlison	Existing	\$150,000.00	Road Department	HMGP, PDM, FMA	1,000	2-3 Years
42	Moderate	Bury critical power lines	Tornado, Winter Storm	Atoka	Existing	\$500,000.00	Public Works	HMGP, PDM	8,523	2-3 Years

Project List Update

After reviewing the original list of mitigation projects seen in the 2010 Tipton County Hazard Mitigation Plan, the mitigation committee has determined that most all of the strategies listed then were items that are a part of a local government's "general duties" and not actual specific "projects." Tipton County has therefore decided to remove these items off the project list.

In addition to the completed project(s), Tipton County has also added a number of new projects to the list as part of the 2015 hazard mitigation plan update.

National Flood Insurance Program Compliance

The National Flood Insurance Program (NFIP) is a pre-disaster flood hazard mitigation and insurance protection program which has reduced the increasing cost of disasters. The intent of the program is to: require new and substantially improved structures be designed and constructed to minimize or eliminate future flood damage; provide floodplain residents and business owners with financial insurance assistance in the form of insurance after floods; and it transfers most of the cost of private property flood losses from the taxpayers to floodplain property owners through flood insurance premiums. Participation in the NFIP is based on an agreement between communities and FEMA.

Currently all jurisdictions are NFIP participants. FEMA has listed these nine jurisdictions to have a current effective map date as of 6/16/2006, with Tipton County having its FIRM (flood insurance rate map) performed in 2008. Below are two charts that give an overview of NFIP policy and loss data for Tipton County.

NFIP Policy Data for Tipton County			
Jurisdiction	Policies In-Force	Insurance In-Force Whole \$	Written Premium In-Force
Tipton County	74	\$15,377,600	\$47,277
Brighton	18	\$3,064,900	\$11,312
Covington	34	\$9,735,000	\$47,217
Gilt Edge	1	\$28,000	\$129
Mason	3	\$1,015,000	\$2,805
Munford	18	\$3,964,700	\$22,828

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 Tipton County					
Jurisdiction	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Tipton County	47	41	0	6	\$2,113,470.16
Brighton	6	5	0	1	\$335,455.25
Covington	14	11	0	3	\$277,522.46
Mason	2	2	0	0	\$142,723.46
Munford	11	11	0	0	\$544,524.49

Total Losses: number of flood insurance claims filled by policyholders
Closed Losses: number of flood insurance claims paid to policyholders
Open Losses: claims that are still being processed
CWOP Losses: claims that were "closed without payment"
Total Payments: 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 Tipton County.

Repetitive Loss Properties for Tipton County						
Jurisdiction	Type of Structure	Flood Zone	Number of Losses	Total Building Payment	Total Contents Payment	Total Paid
Munford	Non Resident	X	3	\$88,042.36	\$0.00	\$88,042.36
Drummonds	Single Family	X	2	\$24,002.13	\$3,541.96	\$27,544.09
Drummonds	Single Family	X	2	\$112,586.04	\$48,709.37	\$161,295.41
Munford	Non Resident	X	3	\$109,573.99	\$52,500.00	\$162,073.99
Munford	Non Resident	X	2	\$82,468.04	\$0.00	\$82,468.04
Aroka	Single Family	X	2	\$149,205.81	\$0.00	\$149,205.81
Covington	Non Resident	AE	6	\$120,609.79	\$0.00	\$120,609.79

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.

Section 5: Plan Maintenance

Monitoring, Evaluating, and Updating

The Tipton County Hazard Mitigation Committee is designated to monitor and evaluate the mitigation plan. This committee is chaired by Tipton County Emergency Management who leads the monitoring, evaluating, and updating process.

Monitoring of the previous mitigation plan, progress and projects occurred informally over the life-cycle of the previous plan.

Monitoring activities will involve Tipton County Emergency Management setting up a committee meeting to be held on an annual basis. Tipton County Emergency Management will prepare a brief annual report of the meeting's findings by addressing mitigation progress and shortfalls within the county.

The plan is to be evaluated annually and after any significant disaster causing human, infrastructure, and property losses. Following each annual informal evaluation of the plan by emergency management staff, any proposed revisions or recommendations will be brought before the Mitigation Committee to be incorporated into the plan. Potential updates to the plan will address changes to the hazard assessment, the repetitive loss list, the committee membership list, and the project priority list.

The plan will be formally updated every five years in accordance to 44 CFR 201.6(d)3, which states that the plan shall be reviewed, revised, and resubmitted for approval within five years to continue eligibility for hazard mitigation grant funding. For the five year update, Tipton County Emergency Management will notify the jurisdictional governments and the Tipton County Hazard Mitigation Committee approximately one year prior to the plan's expiration date. The review of the plan will include updating the planning process, the County profile, the hazard profiles, the risk assessment, the vulnerability assessment, the mitigation strategies, and the plan maintenance descriptions.

The five year plan update will also include soliciting other interested persons/agencies to join the Mitigation Committee and a review of what has been accomplished in the past 5 years. The Tipton County Hazard Mitigation Committee's goal is to have at least 5 meetings within this time span; dates, public notices, and objectives for these meetings will be determined by Tipton County Emergency Management.

Five months prior to the plan's expiration date, Tipton County Emergency Management will submit the revised plan to the Tennessee Emergency Management Agency for preliminary review. Upon approval by the state, TEMA will submit the updated plan to FEMA for review.

Once Tipton County has attained the designation of the plan's approval pending adoption, each jurisdiction will adopt the plan through a resolution within a year.

Incorporation into Planning Mechanisms

By incorporating the Tipton County Hazard Mitigation Plan into other planning documents and mechanisms, information contained in the mitigation plan can help fill-in missing gaps in existing documents, can contribute to already existing mitigation-based projects, and can create a strengthened stance of mitigation implementation and awareness within the county and its jurisdictions.

Some of the mechanisms that the Tipton County Hazard Mitigation Plan could be incorporated into include:

- Tipton County BEOP
- Tipton County School District Plan
- Tipton County Highway Department Plan
- Tennessee Three Star Economic Development Plan

The process of incorporating the hazard mitigation plan into other plans will begin during the other plan's update cycles. Tipton County Emergency Management will first review the plans side-by-side, and where deemed necessary, Emergency Management will make notes on how mitigation concepts and actions can be incorporated into the other plans. These recommendations will be submitted to the lead agencies of the other planning mechanisms for them to place relevant information within the documents.

Additionally, in the past few years information from the original Tipton County Hazard Mitigation Plan has been incorporated into the County's BEOP. This method of incorporation roughly followed the described process stated above.

Continued Public Participation

The Tipton County Mitigation Committee will strive to involve the public in future mitigation activities. This will be accomplished by continuing to post Mitigation Committee Meeting dates in the local newspaper, by attempting to have a public mitigation meeting once a year, by providing public access to copies of the Tipton County Hazard Mitigation Plan in the local emergency management office, and by soliciting other interested persons to participate in the mitigation planning process. By implementing these methods, the public will have an opportunity to comment on the plan during the update drafting stage and prior to plan approval.

Appendix 1

Attendance Sheet- Committee Meeting #1

Sign-In Sheet
Tipton County Hazard Mitigation Meeting #1
4/15/2015

Name	Title	Department	Email Address	Phone Number
Tommy Dunavant	Director	Covington-Tipton Co. EMA	tdunavad@tptnco.com	901-490-7855
Robert M. Simpson	Director	Covington Public Works	rsimpson@covington-ti.com	901-233-9847
Ben Little	Asst. Dir.	Garrett, TN	benlittle@garrett.gov	901-476-7485
Burt Phillip	Planner	TEMA	bphillips@tncem.org	731-225-2823
Shawn Anderson	Director	TCGIS	sandersson@tptnco.com	901-476-0234
Alan Barkelaw	Fire Chief	Munford	abarkelaw@munford-ti.com	901-837-5766
Douie Wallace	Supv	Tipton Co BOE	dwallace@tipton-county.com	901-508-1796
Brian Koser	Town Admin	Booke	bkoser@townbooke.com	508/638
William Walsh	Mayor	Atoka	dwalsh@tipton-county.com	
W. Dale	Finance Dir	Tipton Co. Finance	wdale@tptnco.com	901-476-0219
Danny Daniel	Asst. Coordinator	TEMA	ddaniel@tncem.org	901-233-0055
Steve Fletcher	Mayor	Gil + Edge	SF6ILTED65@	901.com 901-483 4486
Danny Hernandez	Code Enf.	Brighton		476-8661

Page 1 of 1

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Appendix 3

Attendance Sheet- Committee Meeting #3

Sign-In Sheet
Tipton County Hazard Mitigation Meeting #3
6/10/2015

Name	Title	Department	Email Address	Phone Number
Douie Wallace	Maint Supv	Tipton Co BOE	dwallace@tipton-county.com	901-508-1946
Tommy Dunavant	Director	Tipton Co EMA	tdunavant@tiptonco.com	901-490-1833
Robert M. Simpson	Director	Covington Public Works	rsimpson@covington.tn.com	901-233-9847
Brent Phillips	Planner	TEMA	bphillips@tema.org	731-225-8833
Brian Kural		Rocke	bkural@tiptonrocke.com	
Shawn Anderson	GIS Director	GIS	sanderson@tiptonco.com	901-476-0234
William Vane	Planner	Tipton County	tvane@tiptoncountytnt.com	901-476-0233
Shannon Reed	Public	Tipton Co. Public Works	Shannon@tpw.net	901-476-837-5300
Alan Barkeler	Murfreesboro Fire Chief	City of Murfreesboro	abarkeler@murfreesboro.com	901-837-5960
Benny Denise	DEP/Coordinator	EMA	denise@tiptoncountytnt.com	901-233-0065
Glen Turner	Energy Mgr	Tipton County BOE	gtturner@tipton-county.com	901-378-1943
Jim Kenny	Mayor	Burlison	jkenny2003@gmail.com	901-848-3289
W.C. Galey	Finance Director	Tipton Co.	wfgaley@tiptonco.com	901-476-0217
Brandon Fletcher	Deputy Fire Chief	Gilt Edge	bfletcher135@tjcbse.com	901-233-6415

Appendix 4

Attendance Sheet- Committee Meeting #4

Sign-In Sheet
Tipton County Hazard Mitigation Meeting #4
7/8/2015

Name	Title	Department	Email Address	Phone Number
Alan Barklew	Fire Chief	Munford	abarklew@munford.com	901-837-5960
Denny Daniel	Dist. Coordinator	TEMA	ddaniel@tema.org	248-333-0015
Brent Phillips	Planner	TEMA	b.phillips@tema.org	731-225-2823
William Keane	Planner	Tipton County	Wkeane@tiptoncountyttn.com	901-476-0234
Ben Lettler	Playa	Rowland	ben.lettler@rowland.com	901-476-0234
Shawn Anderson	Director	Tipton County GIS	sanderson@tipton.com	901-476-0234
Brian Kuehl	Town Planner	Rowland	bkuehl@rowland.com	
Daniel Lovett	At-Large Public Works	Public Works	Dlovett@tipton.com	901-837-5927
Tommy Duvavant	Director	TC EMA	tduvavant@tipton.com	901-476-0234
Robert M. Simpson	Director	Public-Works Covington	rsimpson@covingtontn.com	901-233-5847
Shannon Keel	Director	TEPW	Shannon@tepw.net	901-837-5700
Gwendolyn Kilpatrick	Mayor	Mason	Mason mayor.gkilpatrick@comcast.net	901-294-3525
Norma Davis	City Recorder	Mason	masoncitynorma@comcast.net	901-294-3525

Appendix 5

Public Notice/Meeting Minutes/Letters

THURSDAY, APRIL 30, 2015 • A4

Opinion

www.covingtonleader.com

GUEST OPINION

Tipton Co. mitigating hazard risk

By TOMMY DUNAVANT

Covington-Tipton County EMA Director

Hazard mitigation planning has been underway in Tipton County since 2002. Tipton County is in the process of updating and reviewing the plan that was submitted to FEMA in January 2011. The plan will identify hazards, vulnerabilities, mitigation goals and potential mitigation projects.

What is hazard mitigation? The ongoing effort to lessen the impact disasters have on people's lives and property through damage prevention and flood insurance. Examples of hazard mitigation activities include relocating buildings, mapping hazards, developing special hazard overlay areas in the zoning codes, engineering bridges to withstand earthquakes, educating residents and building owners and strengthening building codes. Through these actions and many others, the impact on lives and communities is lessened when disaster strikes.

Why does Tipton County need a Hazard Mitigation Plan? The federal Disaster Mitigation Act (DMA) of 2000 requires every community nationwide to develop and adopt a hazard mitigation plan. To remain eligible for federal hazard mitigation grant programs, Tipton County must have this plan. This reflects FEMA's recent emphasis on hazard mitigation rather than recovery.

Where are we in the planning process? The risk assessment has been completed. It identifies areas in the county which are most susceptible to natural hazards through the identification of all possible natural hazards, including their frequency, probability of happening again, magnitude and distribution. Following the identification of possible hazards, we determined our vulnerability to those events. The vulnerability analysis has been completed, but may be revised when we receive the HAZUS-MH program from FEMA.

The Hazard Mitigation Team is starting to develop the plan's mitigation strategy based on existing hazard mitigation goals, as well as community priorities. Feedback is needed from you to help develop a mitigation strategy. The mitigation strategy and the risk assessment will then be used to develop a draft hazard mitigation plan. The draft plan will be presented to the public at a public meeting sometime this spring. After incorporating the feedback from the citizens, the revised plan will go to the County Commission and city boards for adoption. It will then be sent to TEMA and FEMA for approval.

What are the benefits? If we invest in hazard mitigation planning now we will reduce the amount of damages from a future event. Hazard mitigation planning is designed to help communities recover faster when events occur.

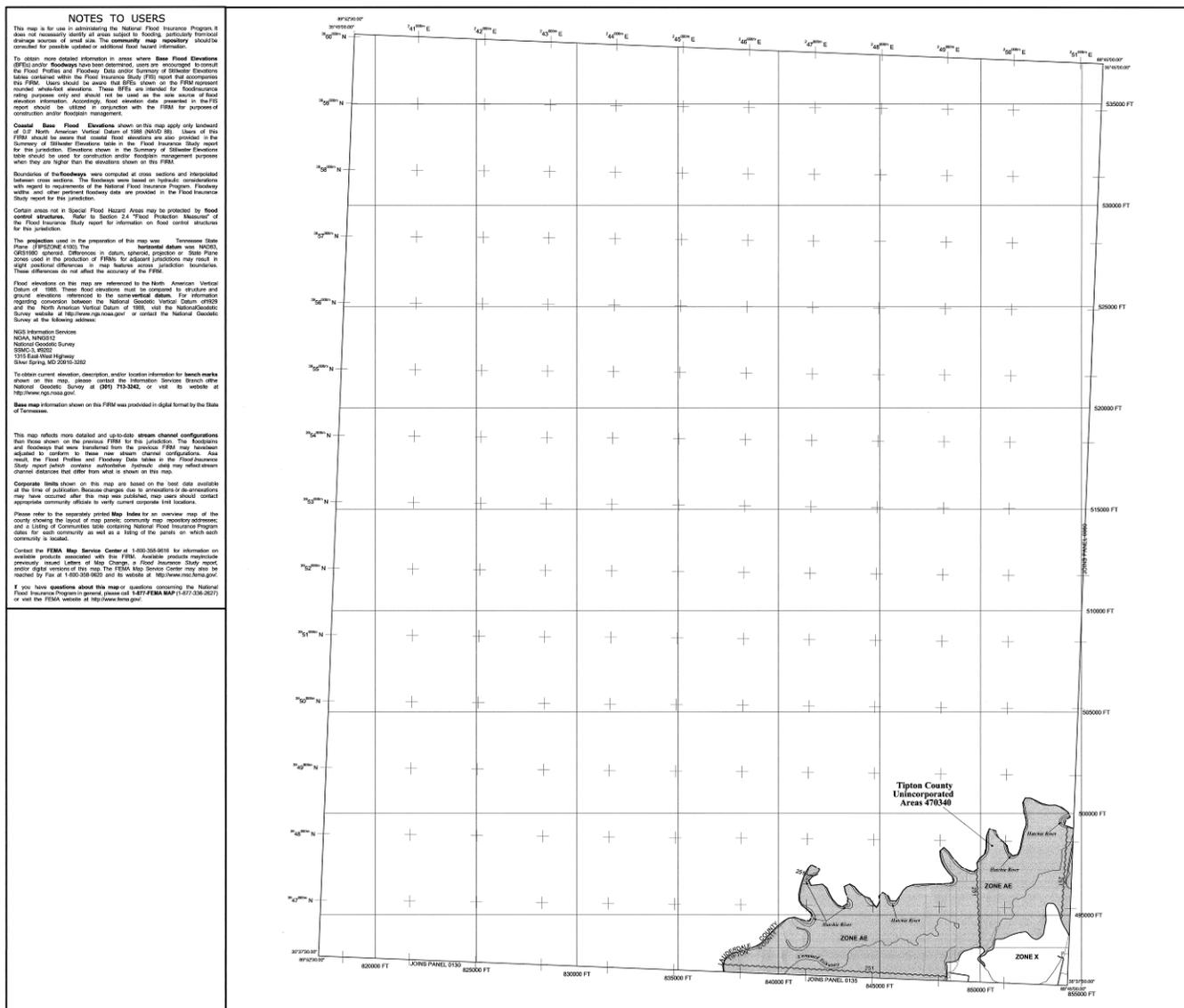
Direct benefits include:

- Reduced loss of life and property
- Reduced short-term and long-term cost associated with recovery and reconstruction
- Increased cooperation and communication within the community through the planning process
- Expedited pre-disaster and post-disaster grant funding

For more information or comments on the plan, you may contact Shannon Reed, chairman, or one of the following committee members: County Executive Jeff Huffman; Covington-Tipton County EMA Director Tommy Dunavant; Donnie Wallace, TCBOE; Covington Mayor Justin Hanson; W.T. Bailey; Robert M. Simpson; William Veazey; Garland Mayor Ben Little; Brighton Mayor Jeff Scott; Munford Mayor Dwayne Cole; Shawn Anderson, Tipton County GIS; Brian Koral, Town of Atoka; or Gilt Edge Mayor Steve Fletcher. The committee will welcome your comments and/or suggestions.

There are also mitigation actions that individuals can take now to lessen the impact of a disaster on their lives and property. Some of these actions include:

- Buying flood and earthquake insurance to protect your belongings
 - Acquiring a weather radio and fire alarms
 - Relocating or elevating structures out of the floodplains
 - If in a floodplain, raising electrical outlets, elevating units such as air/heat and water heaters
 - Securing shelves and water heaters to nearby walls
 - Using fire-retardant materials in new construction
 - Applying shatterproof film to windows
 - Insulating water pipes
 - Retrofitting a closet as a storm shelter
- Citizens are ultimately responsible for their own safety and for the protection of their assets.



NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly horizontal drainage areas. The National Flood Insurance Program should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and Floodway Boundaries have been determined, users are encouraged to consult the Flood Profiles and Floodway Data sheets (available at different elevations) tables contained within the Flood Insurance Study (FIS) report that accompanies this FIS. Users should be aware that BFEs shown on the FIS report represent unrounded, unadjusted elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in this FIS report should be utilized in conjunction with the FEMA for preparation of construction and/or floodplain management.

Coastal State Flood Elevations shown on this map apply only to landward of 0.57 North American Vertical Datum of 1988 (NAVD 88). Users of this FIS should be aware that coastal flood elevations are also provided in the Summary of Selected Elevations table in the Flood Insurance Study report for the jurisdiction. Elevations shown in the Summary of Selected Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIS.

Boundaries of floodways were compiled at cross sections and interpolated between cross sections. The floodways were based on hydraulic computations with regard to requirements of the National Flood Insurance Program. Floodway width and other pertinent floodway data are provided in the Flood Insurance Study report for the jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for the jurisdiction.

The projection used in the preparation of this map was Tennessee State Plane (SPROJCRS 4100). The horizontal datum was NAD83. Orthometric heights, differences in datum, and vertical projection in this map were used in the production of FISs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIS.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to a different vertical datum. For information regarding conversion between the National Geospatial Vertical Datum of 1988 and the North American Vertical Datum of 1988, visit the National Geospatial Survey website at <http://www.ngs.noaa.gov> or contact the National Geospatial Survey at the following address:

NGS Information Services
NGA, WASHINGTON
National Geospatial Survey
SPROJCRS 4100
1315 East West Highway
Silver Spring, MD 20910-3222

To obtain current elevation, description, and/or location information for bench marks shown on this map, contact the Information Services Branch of the National Geospatial Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIS was provided in digital format by the State of Tennessee.

This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIS for this jurisdiction. The floodways and floodways that were delineated from the previous FIS may have been adjusted to reflect these stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report might contain information specific only to stream channel configurations that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexation or dis-annexations may have occurred since this map was published, map users should contact appropriate community officials to verify current corporate limit boundaries.

Please refer to the regulatory printed Map Index for an overview map of the county showing the layout of map sheets, community map, regulatory information, and a listing of communities within National Flood Insurance Program zones for each community as well as a listing of the sheets on which each community is located.

Contact the FEMA Map Service Center at 1-800-368-6618 for information on available products associated with the FIS. Available products may include: printed Letters of Map Change, Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-368-6622 and its website at <http://www.fema.gov>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-368-2677) or visit the FEMA website at <http://www.fema.gov>.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHA) SUBJECT TO INUNDATION BY THE ANNUAL CHANCE FLOOD

Zone AE: 1% annual chance flood elevation
Zone AR: 1% annual chance flood elevation
Zone AO: 1% annual chance flood elevation
Zone X: 1% annual chance flood elevation

FLOODWAY AREAS IN ZONE AE

Zone AE: 1% annual chance flood elevation
Zone AR: 1% annual chance flood elevation
Zone AO: 1% annual chance flood elevation
Zone X: 1% annual chance flood elevation

OTHER FLOOD AREAS

Zone X: 1% annual chance flood elevation
Zone AE: 1% annual chance flood elevation
Zone AR: 1% annual chance flood elevation
Zone AO: 1% annual chance flood elevation

OTHER AREAS

Zone X: 1% annual chance flood elevation
Zone AE: 1% annual chance flood elevation
Zone AR: 1% annual chance flood elevation
Zone AO: 1% annual chance flood elevation

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

Zone X: 1% annual chance flood elevation
Zone AE: 1% annual chance flood elevation
Zone AR: 1% annual chance flood elevation
Zone AO: 1% annual chance flood elevation

OTHERWISE PROTECTED AREAS (OPA)

Zone X: 1% annual chance flood elevation
Zone AE: 1% annual chance flood elevation
Zone AR: 1% annual chance flood elevation
Zone AO: 1% annual chance flood elevation

MAP INFORMATION

Scale: 1" = 2000'
Date: December 19, 2006
Map Number: 4716C022F

NATIONAL FLOOD INSURANCE PROGRAM

FIRM FLOOD INSURANCE RATE MAP

TIPTON COUNTY, TENNESSEE AND INCORPORATED AREAS

PANEL 022F

PANEL 25 OF 475

SEE MAP INDEX FOR FIRM PANEL LAYOUT

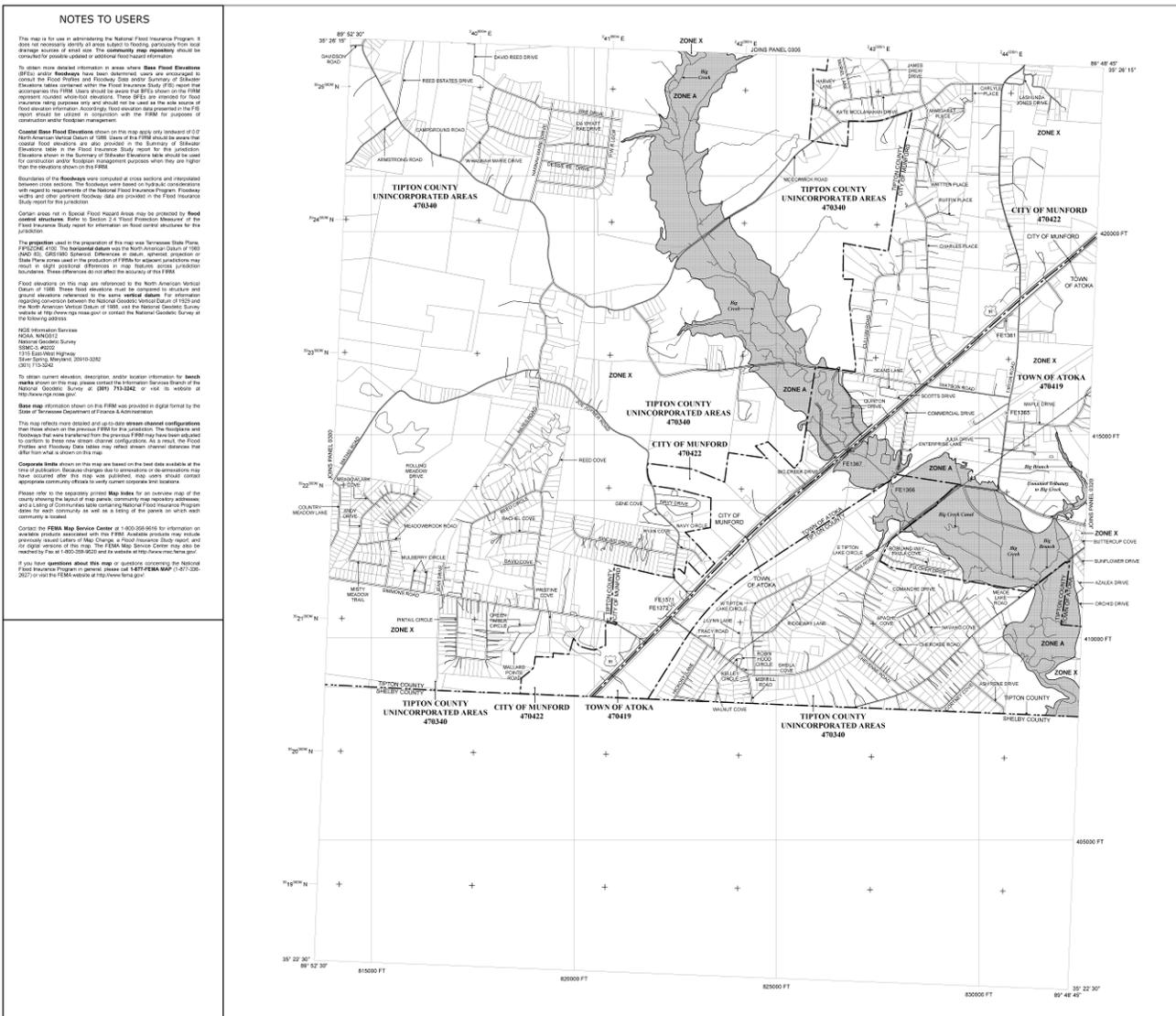
COMMUNITY NUMBER PANEL SHEET

UNINCORPORATED AREAS AREA SHEET #

MAP NUMBER 4716C022F

MAP REVISED DECEMBER 19, 2006

Federal Emergency Management Agency



NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not constitute a contract for insurance. Flood insurance coverage is available for purchase subject to the terms, coverages, conditions, exclusions, and limitations of the policy. Flood insurance coverage is not available for certain types of structures or areas.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or Floodway Elevations have been determined, users are encouraged to contact the local community or the National Flood Insurance Program. BFEs and Floodway Elevations are provided in the Flood Insurance Study (FIS) report for the community. BFEs and Floodway Elevations are provided in the FIS report for the community. BFEs and Floodway Elevations are provided in the FIS report for the community. BFEs and Floodway Elevations are provided in the FIS report for the community.

Coastal Barrier Resources System (CBRS) Areas

Locations of the CBRS are shown on this map as areas where the coastal flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study. The CBRS areas are shown on this map as areas where the coastal flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study. The CBRS areas are shown on this map as areas where the coastal flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

Other Flood Hazard Areas

Locations of the Other Flood Hazard Areas are shown on this map as areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study. The Other Flood Hazard Areas are shown on this map as areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

Other Protected Areas (OPA)

Locations of the Other Protected Areas are shown on this map as areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study. The Other Protected Areas are shown on this map as areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SPECIAL FLOOD HAZARD AREAS SUBJECT TO INSURANCE BY THE NATIONAL FLOOD INSURANCE PROGRAM)

ZONE A Special Flood Hazard Areas (SFHA) - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

ZONE X Other Flood Hazard Areas - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

ZONE D Coastal Barrier Resources System (CBRS) Areas - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

ZONE O Other Protected Areas (OPA) - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

OTHER FLOOD HAZARD AREAS

ZONE X Other Flood Hazard Areas - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

ZONE D Coastal Barrier Resources System (CBRS) Areas - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

ZONE O Other Protected Areas (OPA) - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

OTHER FLOOD HAZARD AREAS

ZONE X Other Flood Hazard Areas - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

ZONE D Coastal Barrier Resources System (CBRS) Areas - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

ZONE O Other Protected Areas (OPA) - Areas where the flood elevations are also provided in the Summary of Special Flood Hazard Areas in the Flood Insurance Study.

NATIONAL FLOOD INSURANCE PROGRAM

PANEL D315G

FIRM FLOOD INSURANCE RATE MAP

TIPTON COUNTY, TENNESSEE AND INCORPORATED AREAS

PANEL 315 OF 475 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

COMMUNITY	NUMBER	ENGL	DATE
ATOKA TOWNSHIP	47415	018	0
MURFREESBORO CITY	47422	018	0
TIPTON COUNTY	47536	018	0

MAP NUMBER 47162C0315G

MAP REVISED MAY 4, 2009

Federal Emergency Management Agency

NOTES TO USERS

This map is for informational purposes only. It does not constitute a contract. The Flood Insurance Program is subject to change without notice. The user should consult the Flood Insurance Study for the most current information.

To obtain more detailed information in areas where Base Flood Elevations (BFE) and Floodway Data were determined, users are encouraged to consult the Flood Insurance Study (FIS) report that accompanies the Flood Insurance Study (FIS) report. Users should be aware that BFEs shown on the FIS report may not be the same as those shown on the FIS report. Floodway Data shown on the FIS report may not be the same as those shown on the FIS report. Floodway Data shown on the FIS report may not be the same as those shown on the FIS report.

General: Base Flood Elevations shown on this map apply only to structures of 10 North American Vertical Datum of 1988 (NAVD 88) feet. Users of this FIS should be aware that certain flood elevations are also provided in the Summary of Elevation Tables in the Flood Insurance Study report for this jurisdiction. Elevation shown in the Summary of Elevation Tables should be used for construction and/or floodway management purposes when they are higher than the elevations shown on this FIS.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with respect to requirements of the National Flood Insurance Program. Floodway width and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Tennessee State Plane (SPROJCS 4100). The horizontal datum was NAD83. Orthographic projection. Differences in datum, whether vertical or horizontal, may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIS.

Flood elevations on this map are determined by the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NES Information Services
NCEA 52051E
National Geodetic Survey
2525 L Street
Silver Spring, MD 20910-3202

To obtain current elevation, elevation, and/or location information for bench marks shown on this map, please contact the Information Division Branch office of the National Geodetic Survey at (817) 713-3842, or visit its website at <http://www.ngs.noaa.gov/>.

Base map information shown on this FIS was produced in digital format by the State of Tennessee.

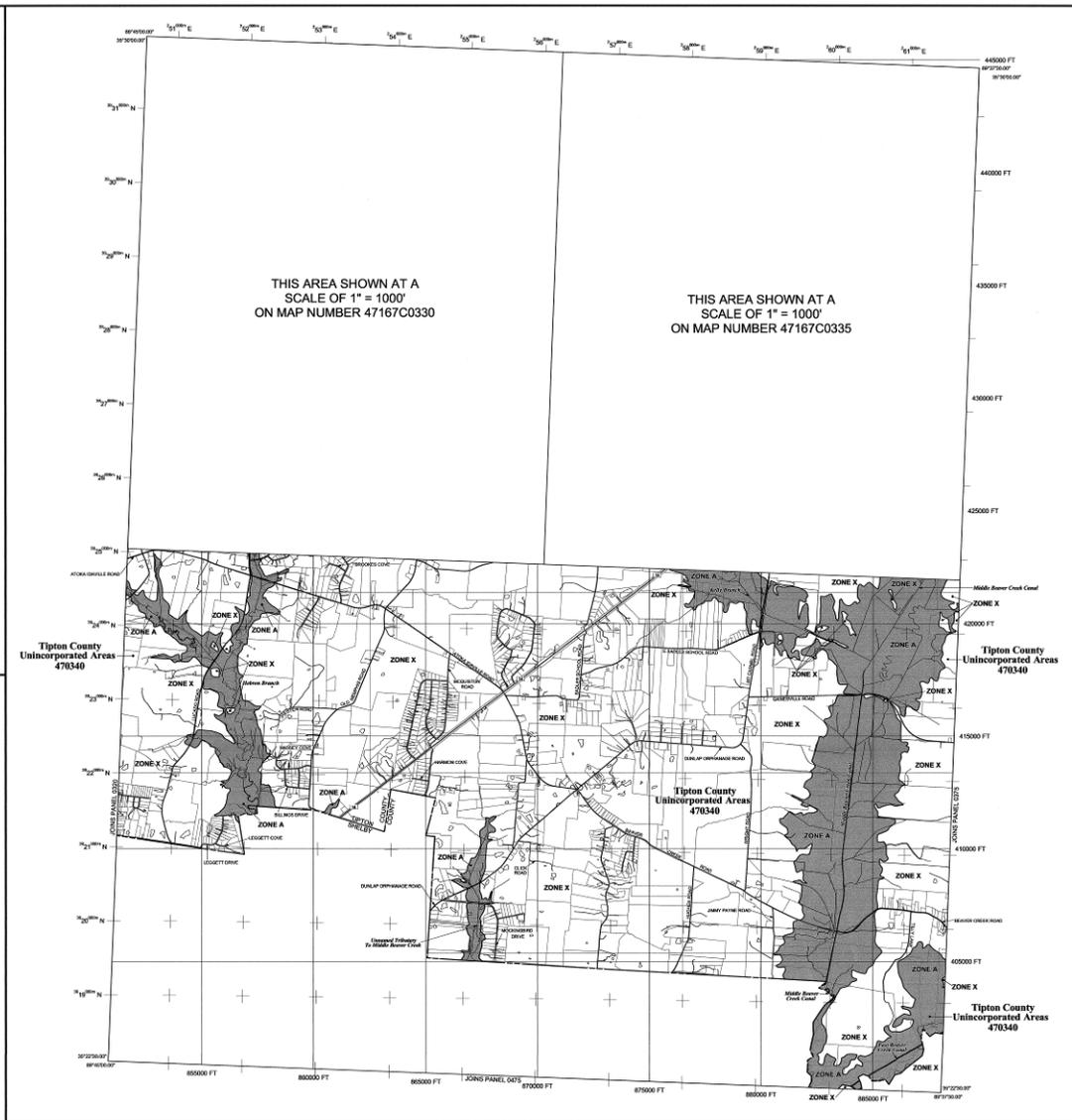
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIS for this jurisdiction. The floodways and floodway data were transferred from the previous FIS map description and adjusted to reflect the more detailed channel configurations. As a result, the Flood Profile and Floodway Data tables in the Flood Insurance Study report reflect necessary adjustments. Hydraulic data may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Boundary changes due to annexation or de-annexation may have occurred since this map was published. Map users should contact appropriate community officials to verify current corporate limit locations.

Users refer to the separately printed Map Index for an overview map of the county showing the extent of map sheets, community map, municipality addresses, and a listing of community table containing National Flood Insurance Program data. For each community, as well as a listing of the points on which such community is based.

Contact the FEMA Map Service Center at 1-800-368-5858 for information on available products associated with the FIS. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by fax at 1-800-368-5852 and is website at <http://www.fema.gov/>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-5888 (1-877-368-5888) or visit the FEMA website at <http://www.fema.gov/>.



LEGEND

OFFICIAL FLOOD HAZARD AREAS (FIRM) SUBJECT TO SUBSIDIZATION BY THE NATIONAL FLOOD INSURANCE PROGRAM

ZONE A: No Base Flood Elevation Determination.

ZONE B: Flood Elevation Determination.

ZONE C: Flood Elevation of 1 to 3 feet (usually areas of parking); Base Flood Elevation Determination.

ZONE D: Flood Elevation of 1 to 3 feet (usually areas of parking); Base Flood Elevation Determination.

ZONE E: Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood elevation that was subsequently determined to be inadequate to protect structures from the 1% annual chance or greater flood.

ZONE F: Area to be protected from the 1% annual chance flood by a flood elevation that was subsequently determined to be inadequate to protect structures from the 1% annual chance or greater flood.

ZONE G: Coastal flood area with velocity based (wave action); Base Flood Elevation Determination.

ZONE H: Coastal flood area with velocity based (wave action); Base Flood Elevation Determination.

FLOODWAY AREAS IN ZONE AE:

The floodway is the portion of a stream that any adjacent floodway area that must be kept free of encroachments so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X: Area of 1.2% annual chance flood; area of 1% annual chance flood with average depth of less than 1 foot, or with average wave height of 1 to 3 feet; and area protected by levees from the 1% annual chance flood.

OTHER AREAS

ZONE B: Area determined to be within the 1.2% annual chance floodway.

ZONE D: Area in which flood insurance is not available; not available.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHER PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard areas.

Phonetic boundary

Phonetic boundary

Zone 3 boundary

CBRS and OPAs boundary

Boundary defining Special Flood Hazard Area of different Base Flood Elevations, Flood depths or flood velocities.

Base Flood Elevation value when within water; otherwise 0 feet.

Referenced to the North American Vertical Datum of 1988 (NAVD 88)

Cross section line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

USGS National Hydrographic Survey Hydrographic data, zone 14

500-foot grid values Tennessee State Plane coordinate system, EPSG:4100

Larson Contour Code

Map users should refer to the National Flood Insurance Program for information on the FIS panel.

Map Index

Refer to Map Index for more information

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

December 19, 2006

For delivery, also include history and/or community map to the Community Map history table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-368-5888.

MAP SCALE: 1" = 200'

1000' 500' 0' 500' 1000'

1000 METERS 500 METERS

NATIONAL FLOOD INSURANCE PROGRAM

FIRM FLOOD INSURANCE RATE MAP

TIPTON COUNTY, TENNESSEE AND INCORPORATED AREAS

PANEL 350 OF 475

CBRS MAP INDEX FOR FIRM PANEL LAYOUT

CONTAINING:

COMMUNITY	NUMBER	PANEL SUFFIX
TIPTON COUNTY UNINCORPORATED AREAS	470340	350

MAP NUMBER 47167C0350F

MAP REVISED DECEMBER 19, 2006

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in determining the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly horizontal drainage variations. Flood elevations are based on the information submitted and are not intended for possible update or additional flood hazard information.

To obtain more detailed information in areas where these Flood Elevation (FE) and/or Floodway (FW) lines have been determined, users are encouraged to contact the Flood Insurance and Floodway Data and/or Summary of Flood Elevation labels contained within the Flood Insurance Study (FIS) report that accompanies this FIS. Users should be aware that FE/FW values are for FEMA-approved inundated whole-tide situations. These FE/FW are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FEMA Flood Insurance Study report for flood insurance rating purposes.

Coastal Flood Elevation values shown on this map apply only to coastal areas of 0.7 North American Vertical Datum of 1988 (NAVD 88). Users of this FIS should be aware that coastal flood elevations are also presented in the Summary of Flood Elevation labels in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Flood Elevation labels should be used for notification and/or floodproofing purposes when they are higher than the elevations shown on this FIS.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway study and other pertinent floodway data are presented in the Flood Insurance Study report for this jurisdiction.

Coastal areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The map is based on the projection of 1983 map use Tennessee State Plane (SPZONE 1150). The horizontal datum was NAD83. Orthorectified elevation in feet, unless otherwise noted, are based on the production of FIS. For additional information, users should refer to the National Flood Insurance Study report for this jurisdiction. These differences do not affect the accuracy of the FIS.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1955 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NADS Information Services
 2024 RONKES
 National Geodetic Survey
 5350 LITTLETON
 1315 East West Highway
 Silver Spring, MD 20910-3302

To obtain current elevation, description, and/or location information for bench marks shown on this map, users should contact the Information Services Branch of the National Geodetic Survey at (301) 733-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIS was produced in digital format by the State of Tennessee.

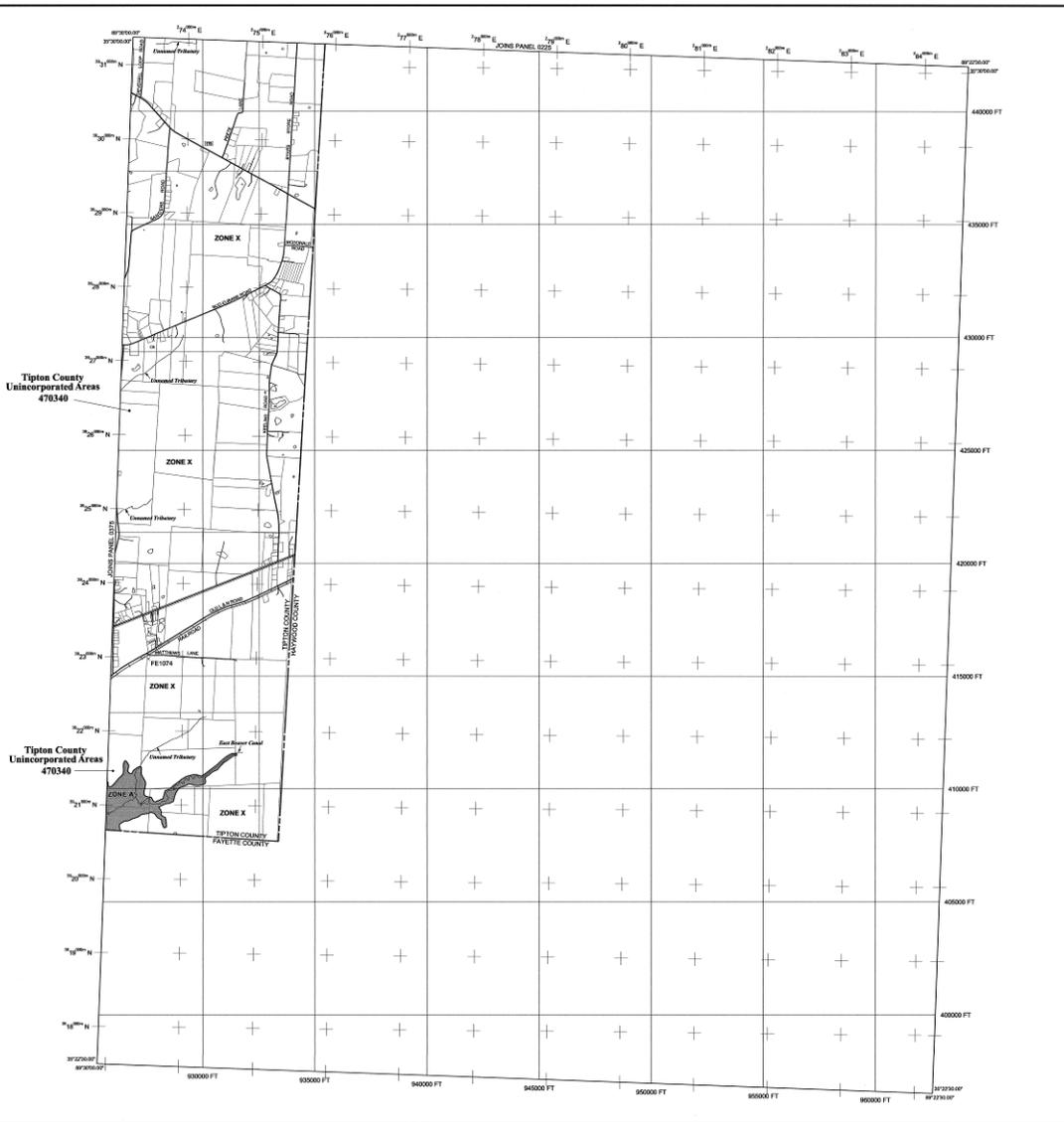
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIS for this jurisdiction. The floodplains and floodways that were delineated from the previous FIS may have been updated to reflect the more current stream configurations. Areas that result in the Flood Profile and Flooding Date labels in the Flood Insurance Study report (panels 1000000 and 1000001) may reflect stream channel configurations that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because they are for informational or illustrative purposes only, they may not reflect the most current information. They should be used as a guide to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the local map corner, community map, spotpoint addresses, and a listing of Community labels containing National Flood Insurance Program data. For more community information, visit the website at <http://www.fema.gov>.

Contact the FEMA Map Service Center at 1-800-368-5848 for information on available products associated with this FIS. Available products include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by fax at 1-800-368-5848 or its website at <http://www.fema.gov>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-5848 (1-877-368-5848) or visit the FEMA website at <http://www.fema.gov>.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SPECIAL SUBJECT TO SUBORDINATION BY THE 1% ANNUAL CHANCE FLOOD)

ZONE A Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone A is shown on the map as a shaded area.

ZONE X Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone X is shown on the map as a shaded area.

ZONE AR Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone AR is shown on the map as a shaded area.

ZONE AV Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone AV is shown on the map as a shaded area.

ZONE V Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone V is shown on the map as a shaded area.

ZONE VE Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone VE is shown on the map as a shaded area.

ZONE VEI Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone VEI is shown on the map as a shaded area.

FLOODWAY AREAS IN ZONE AE

The floodway is the extent of an area over which flooding from the 1% annual chance flood may be expected to occur. The 1% annual chance flood is shown on the map as a shaded area. The floodway is shown on the map as a shaded area.

OTHER FLOOD AREAS

ZONE X Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone X is shown on the map as a shaded area.

OTHER AREAS

ZONE X Areas of 1% annual chance flood, shown on the map for the 1% chance of being equal to or exceeded in any given year. The Flood Insurance Study (FIS) report for this jurisdiction provides the Flood Profile and Flooding Date labels for the 1% annual chance flood. Zone X is shown on the map as a shaded area.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPA)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Map Scale: 1" = 2000'

MAP SCALE 1" = 2000'

0 100 200 300 400 FEET

0 100 200 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0400F

FIRM FLOOD INSURANCE RATE MAP

TIPTON COUNTY, TENNESSEE AND INCORPORATED AREAS

PANEL 400 OF 475

DATE MAP INDEX FOR FIRM PANEL LAYOUTS

CONTRACT NUMBER

COMMUNITY NUMBER PANEL SHEETS

FIRM COUNTY INCORPORATED AREAS

478340 470340

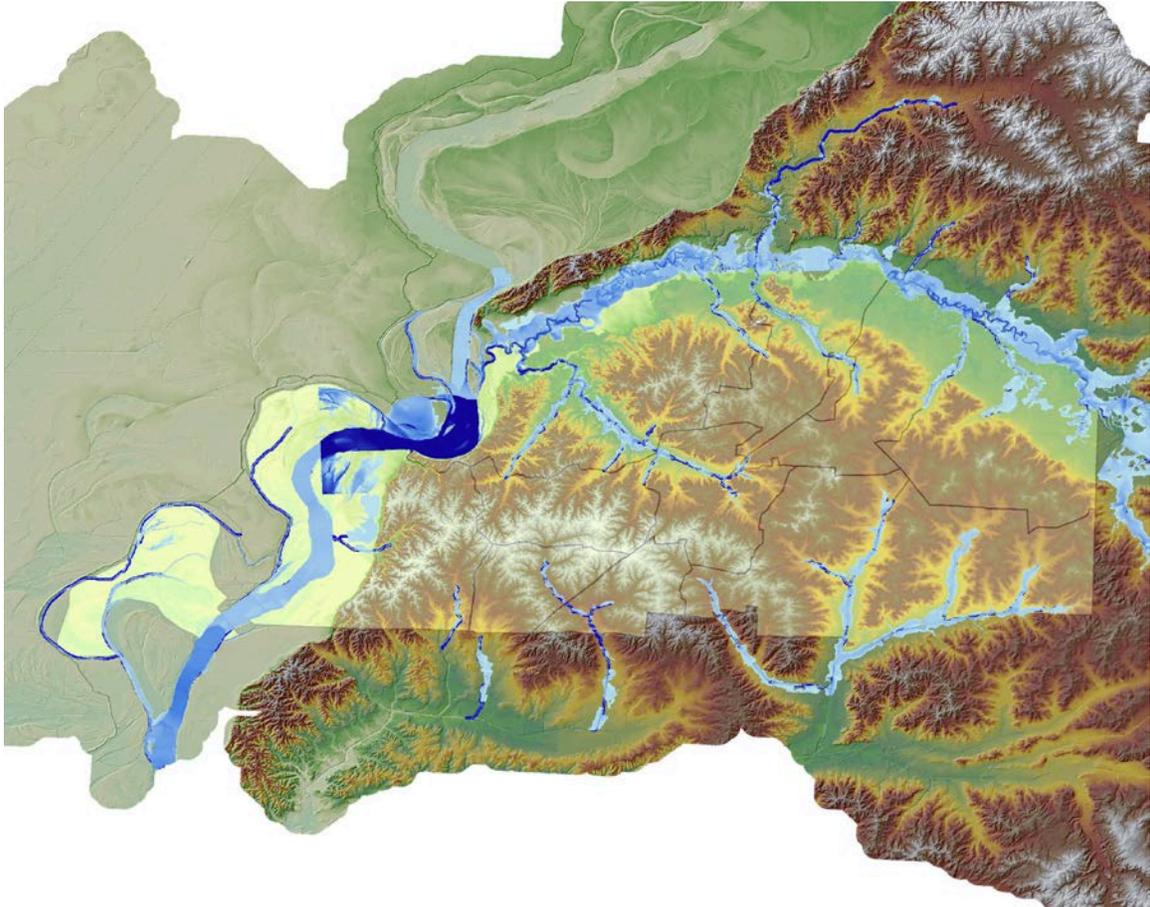
MAP NUMBER 47167C0400F

MAP REVISED DECEMBER 19, 2006

Federal Emergency Management Agency

Appendix 7

HAZUS: 100-year Flood Study



Hazus-MH: Flood Event Report

Region Name: Tipton County
Flood Scenario: 100 year
Print Date: Friday, April 10, 2015

Disclaimer:

*This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.*

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Flood Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Flood Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building-Related Losses	
Appendix A: County Listing for the Region	10
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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 473 square miles and contains 1,430 census blocks. The region contains over 22 thousand households and has a total population of 61,081 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 22,402 buildings in the region with a total building replacement value (excluding contents) of 5,364 million dollars (2010 dollars). Approximately 98.51% of the buildings (and 83.43% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 22,402 buildings in the region which have an aggregate total replacement value of 5,364 million (2010 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	4,474,719	83.4%
Commercial	445,953	8.3%
Industrial	221,409	4.1%
Agricultural	23,751	0.4%
Religion	116,849	2.2%
Government	29,309	0.5%
Education	51,936	1.0%
Total	5,363,726	100.00%

**Table 2
Building Exposure by Occupancy Type for the Scenario**

Occupancy	Exposure (\$1000)	Percent of Total
Residential	818,175	81.4%
Commercial	96,131	9.6%
Industrial	60,977	6.1%
Agricultural	7,180	0.7%
Religion	20,725	2.1%
Government	1,967	0.2%
Education	382	0.0%
Total	1,005,537	100.00%

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 70 beds. There are 14 schools, 9 fire stations, 9 police stations and 1 emergency operation center.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Tipton County
Scenario Name:	100 year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 15 buildings will be at least moderately damaged. This is over 10% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	11	73.33	1	6.67	3	20.00	0	0.00
Total	0		0		11		1		3		0	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	11	73.33	1	6.67	3	20.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 70 hospital beds available for use. On the day of the scenario flood event, the model estimates that 70 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
Fire Stations	9	0	0	0
Hospitals	1	0	0	0
Police Stations	9	0	0	0
Schools	14	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 1,913 tons of debris will be generated. Of the total amount, Finishes comprises 48% of the total, Structure comprises 23% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 77 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 425 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 555 people (out of a total population of 61,081) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 36.87 million dollars, which represents 3.67 % 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 36.82 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 45.89% 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	10.43	1.59	3.15	0.45	15.62
	Content	6.49	5.05	6.41	2.17	20.11
	Inventory	0.00	0.12	0.94	0.03	1.09
	Subtotal	16.91	6.77	10.49	2.65	36.82
<u>Business Interruption</u>						
	Income	0.00	0.01	0.00	0.00	0.01
	Relocation	0.00	0.00	0.00	0.00	0.01
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.01	0.00	0.02	0.03
	Subtotal	0.00	0.02	0.00	0.02	0.05
ALL	Total	16.92	6.79	10.49	2.67	36.87

Appendix A: County Listing for the Region

- Tennessee
 - Tipton

Appendix B: Regional Population and Building Value Data

	Building Value (thousands of dollars)			Total
	Population	Residential	Non-Residential	
Tennessee				
Tipton	61,081	4,474,719	889,007	5,363,726
Total	61,081	4,474,719	889,007	5,363,726
Total Study Region	61,081	4,474,719	889,007	5,363,726

Appendix 8

Ongoing Performance Tasks

1. The EMA will continue to educate the public on preparedness and safety.
2. The EMA will continue to participate in formal campaigns such as CUSEC's earthquake awareness week.
3. The EMA will continue to coordinate activities for severe weather awareness week.
4. The EMA will continue to encourage residents to buy flood and earthquake insurance.
5. The utility companies have adopted a program to maintain right of ways. This on-going program will continue to keep power lines free of ground growth and tree limbs that could cause power outages during severe storms.
6. The school system will include hardening hallways in their new construction plans.
7. EMA will continue to monitor any flooding conditions that may arise within the county.
8. The EMA will continue working with all agencies to review and update the BEOP and other response plans.
9. The EMA will continue working with those agencies that will provide shelter during times of emergencies.
10. The mitigation committee working with the local media will provide periodic releases dealing with personal disaster plans for the general public; such as maintaining emergency supplies, family contacts, evacuation plans, shelter locations, etc.

Appendix 9

Ordinances

RESOLUTION NO. 16-06-01

A RESOLUTION APPROVING AND ADOPTING A HAZARD MITIGATION PLAN FOR TIPTON COUNTY, TENNESSEE.

WHEREAS, the Town of Atoka recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property while saving taxpayer dollars; and

WHEREAS, an adopted hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, the Town of Atoka participated in the planning process with other local governmental units within Tipton County to prepare the Hazard Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF MAYOR AND ALDERMEN OF THE TOWN OF ATOKA, TENNESSEE as follows:

SECTION 1. The Board of Mayor and Aldermen of the Town of Atoka, Tennessee hereby adopts the Tipton County Hazard Mitigation Plan as an official plan.

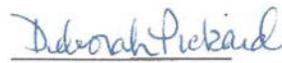
SECTION 2. The Tipton County Emergency Management Agency will submit the adopted Hazard Mitigation Plan to the Federal Emergency Management Agency for final review and approval on behalf of the participating governmental units in substantively the same form and content as the agreement has been proposed.

SECTION 3. This Resolution takes effect immediately upon its passage and approval, the public welfare requiring it.

PASSED by the Board of Mayor and Aldermen of the Town of Atoka, Tennessee this 14th day of June, 2016.


Mayor

ATTEST:


Town Recorder

Resolution # 05-10-2016-02

Adopting the Tipton County Hazard Mitigation Plan

Whereas, the **Town of Brighton** recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

Whereas, the **Town of Brighton** participated jointly in the planning process with the other local units of government within the County to prepare the Hazard Mitigation Plan;

Now, therefore, be it resolved, that the **Brighton Board of Mayor and Aldermen**, hereby adopts the Tipton County Hazard Mitigation Plan as an official plan; and

Be it further resolved, that the Tipton County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Hazard Mitigation Plan to the Federal Emergency Management Agency officials for final review and approval.

Passed: May 10, 2016



Mayor

ATTESTED:



Town Recorder

Resolution # _____

Adopting the Tipton County Hazard Mitigation Plan

Whereas, the City of Covington recognizes the threat that natural hazards pose to people and property;
and

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

Whereas, the City of Covington participated jointly in the planning process with the other local units of government within the County to prepare the Hazard Mitigation Plan;

Now, therefore, be it resolved, that the Covington Board of Mayor and Aldermen, hereby adopts the Tipton County Hazard Mitigation Plan as an official plan; and

Be it further resolved, that the Tipton County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Hazard Mitigation Plan to the Federal Emergency Management Agency officials for final review and approval.

Passed: June 14, 2016



Certifying Official

Resolution # 16-2

Adopting the Tipton County Hazard Mitigation Plan

Whereas, the City of Garland recognizes the threat that natural hazards pose to people and property;
and

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

Whereas, the City of Garland participated jointly in the planning process with the other local units of government within the County to prepare the Hazard Mitigation Plan;

Now, therefore, be it resolved, that the Garland Board of Mayor and Aldermen, hereby adopts the Tipton County Hazard Mitigation Plan as an official plan; and

Be it further resolved, that the Tipton County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Hazard Mitigation Plan to the Federal Emergency Management Agency officials for final review and approval.

Passed: August 9, 2016

Ben Little
Certifying Official

Resolution 07-12-16-02

Adopting the Tipton County Hazard Mitigation Plan

Whereas, the **Town of Gilt Edge** recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

Whereas, the **Town of Gilt Edge** participated jointly in the planning process with the other local units of government within the County to prepare the Hazard Mitigation Plan;

Now, therefore, be it resolved, that the **Town of Gilt Edge**, hereby adopts the Tipton County Hazard Mitigation Plan as an official plan; and

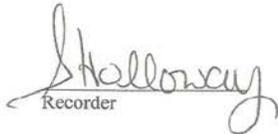
Be it further resolved, that the Tipton County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Hazard Mitigation Plan to the Federal Emergency Management Agency officials for final review and approval.

Resolved this 12th day of July 2016



Mayor

ATTEST:



Recorder

Resolution # 2016-6-2

Adopting the Tipton County Hazard Mitigation Plan

Whereas, the City of Mason recognizes the threat that natural hazards pose to people and property;
and

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for
harm to people and property and save taxpayer dollars; and

Whereas, an adopted hazard mitigation plan is required as a condition of future grant funding for
mitigation projects; and

Whereas, the City of Mason participated jointly in the planning process with the other local units of
government within the County to prepare the Hazard Mitigation Plan;

Now, therefore, be it resolved, that the Mason Board of Mayor and Aldermen, hereby adopts the
Tipton County Hazard Mitigation Plan as an official plan; and

Be it further resolved, that the Tipton County Emergency Management Agency will submit on behalf
of the participating municipalities the adopted Hazard Mitigation Plan to the Federal
Emergency Management Agency officials for final review and approval.

Passed: June 2, 2016


Certifying Official



RESOLUTION 2016-06-01

**CITY OF MUNFORD, TENNESSEE
TO
ADOPT THE TIPTON COUNTY HAZARD MITIGATION PLAN**

WHEREAS, the City of Munford recognized the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people property and save taxpayer dollars; and

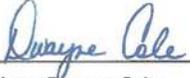
WHEREAS, an adopted hazard mitigation plan is required as a condition of future grant funding for mitigation projects, and

WHEREAS, the City of Munford participated jointly in the planning process with the other local units of government within the County to prepare the Hazard Mitigation Plan;

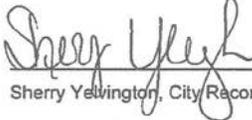
NOW, THEREFORE BE IT RESOLVED that the Board of Mayor and Aldermen of City of Munford hereby adopts the Tipton County Hazard Mitigation Plan as an official plan; and

BE FURTHER RESOLVED that the Tipton County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Hazard Mitigation Plan to the Federal Emergency Management Agency officials for final review and approval and this Resolution shall become effective immediately upon its adoption, the Public Welfare requiring it.

READ and ADOPTED this the 27th day of June, 2016.



Mayor Dwayne Cole



Sherry Yelvington, City Recorder

MINUTES OF MAY TERM, 2016

MONDAY THE 9TH

IN RE: RESOLUTION ADOPTING THE TIPTON COUNTY HAZARD
MITIGATION PLAN

On motion by Commissioner Courtney Fee and seconded by
Commissioner Glenn Turner it was ordered by the Legislative Body of Tipton
County, Tennessee at its May 9, 2016 Term, that the following Resolution
adopting the Tipton County Hazard Mitigation Plan be approved:

RESOLUTION NO. 16/05/337

Adopting the Tipton County Hazard Mitigation Plan

Whereas, Tipton County Government recognizes the threat that natural hazards pose to people and property;

And

Whereas, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted hazard mitigation plan is required as a condition of future grant funding for mitigation projects; and

Whereas, the Tipton County Government participated jointly in the planning process with the other local units of government within the County to prepare the Hazard Mitigation Plan;

Now, therefore, be it resolved, that Tipton County Executive, and County Commissioners, hereby adopts the Tipton County Hazard Mitigation Plan as an official plan; and

Be it further resolved, that the Tipton County Emergency Management Agency will submit on behalf of the participating municipalities the adopted Hazard Mitigation Plan to the Federal Emergency Management Agency officials for final review and approval.

Passed: 5-9-16



County Official

SAID MOTION PASSED ON VOICE VOTE.