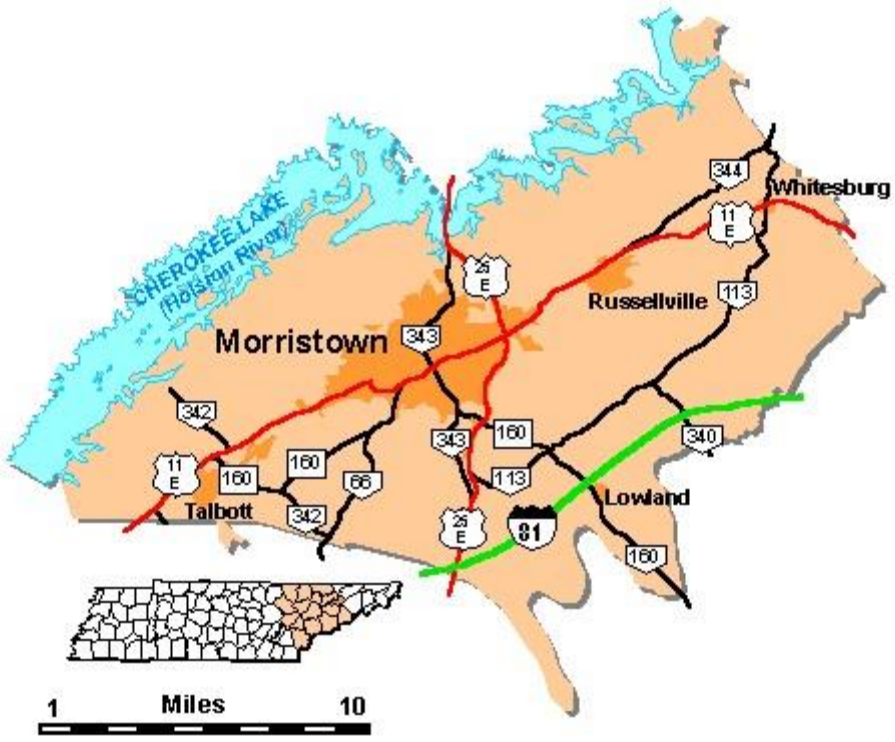
Hamblen County
Hazard Mitigation Plan



October 30, 2017

<u>Prepared By</u>:

Hamblen County Hazard Mitigation Committee

Hamblen County Emergency Management

<u>Assistance Provided By</u>:

Tennessee Emergency Management Agency
as part of the Tennessee Mitigation Initiative

October 30, 2017

Executive Summary

Over the past three 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 successful 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 2016 update of the Hamblen County Hazard Mitigation Plan was created to act as a well thought-out guide to be used by, and for, the people of Hamblen County. For this plan to be successful, each jurisdiction within the county participated in the drafting and preparation of the plan. These participating jurisdictions include:

- Hamblen County (unincorporated)
- City of Morristown
- Hamblen County School Board

In reference to federal code title *44 CFR 201*, the plan is required to be submitted to both TEMA (State) and FEMA (Federal) for review to be approved. 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.

Every 5 years the plan is required to be updated and revised in regards to maps, vulnerability assessments, tables, information, and projects. This is the updated plan that the committee met in August of 2016 and submitted to TEMA in October 2016. After recommendations from TEMA Planning, additional revisions and updates were made to the plan and resubmitted to TEMA in April 2017.

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Appendices

Section 1: Planning Process

Planning Process

The previous Hamblen County Hazard Mitigation Plan was approved by FEMA on March 20, 2012. 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 October 8th, 2013 *(See **Appendix 1** for the meeting's attendance sheet)*. At this meeting Hamblen County Emergency Management Agency stated that they would continue the role of leading staff and interested persons in updating their mitigation plan. The tasks to be undertaken by Hamblen County Emergency Management Agency 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. On October 9, 2014 the Hamblen County Hazard Mitigation Committee met again (see ***Appendix 2*** for meeting attendance sheet and minutes). On August 11, 2016 the committee met again to approve all plan updates, revisions and the new project list (see ***Appendix 3*** for attendance sheet and meeting minutes).

At each of these meetings, Hamblen County continued to have a 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 committee were sent by email with link attached to view the document on our website 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. This was done after the final draft was received back from TEMA.

Within this committee all three jurisdictions are participants, as well as a cross-section of other representatives. The Hamblen County Hazard Mitigation Committee consists of the following members:

Member	Title	Representation
Chris Bell ***(Current Chair)***	Director	Hamblen County EMA
Clark Taylor	Deputy Chief	Morristown Fire Department
Paul Brown	Director	Morristown Public Works
Keith Ely	Assessor of Property	Property Assessor
Tina Whitaker	Department Manager	Hamblen Planning Department
Danny Houseright	Director	Morristown/Hamblen EMS
Billy Gulley	Lieutenant	Morristown Police Department
Hugh Clement	Assistant Director	Hamblen County Schools
Eric Carpenter	Director	Hamblen 911
Don Ellison	Training Officer	Hamblen County EMA
Tim Greene	Deputy Chief Training Officer	Morristown Fire Department
Charles Southerland	Safety and Planning	Morristown Utility
Dale Griffie	Deputy Director	Hamblen County EMA
Barry Poole	Road Superintendent	Hamblen County Road Department
Daniel Singleton	Operations District Supervisor	TDOT, Morristown
Anthony Cavallucci	Warning Meteorologist	NWS, Morristown

The Hamblen County Hazard Mitigation Committee is 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, Hamblen County Emergency Management Agency reviewed the original county plan and made notes on what sections would require the main updates. Hamblen County Emergency Management Agency suggested that the three core areas for needed updates were in the risk/vulnerability assessment, localized flood prone areas for mitigation actions, and in the restructuring of the county's listed hazard mitigation projects.

Stage 2: From there the committee started making the updates to the plan. A large amount of this effort took place at the second Hamblen County Hazard Mitigation Committee meeting that was held on October 9th 2014. Tasks included re-evaluating the plan's hazards, re-assessing their risks, re-calculating each jurisdiction's vulnerable areas, re-establishing the county's mitigation goals, examine the status of mitigation projects listed in the original plan, update the county's mitigation project chart and to prioritize the projects listed, and set another date to finalize any remaining business needs for the plan. TEMA, East Planning personnel Bart Hose, was present at this meeting to

answer mitigation planning and grant questions. ***Appendix 2*** provides a copy of the meeting's attendance sheet and minutes.

The committee next met on August 11th, 2016, to finalize the county's mitigation project chart, prioritize the projects listed, and conduct a final review of the hazard mitigation plan prior to submission to FEMA. ***Appendix 3*** provides a copy of the meeting's attendance sheet and minutes.

Appendix 4 details a year by year summary of actions involving the Hazard Mitigation Plan.

Stage 3: To encourage public involvement, the Hamblen County Hazard Mitigation Committee held a meeting for public comment with a public notice. ***Appendix 5*** presents a copy of the public notice. There was no public feedback.

Stage 4: Next the committee evaluated the written updates of the plan against FEMA's crosswalk requirements via email correspondence.

Stage 5: Upon receiving the "Approval Pending Adoption" designation from FEMA, the public will be given a chance to comment on the final draft of the plan prior to its adoption by each local jurisdiction. This opportunity will take place at a local board meeting for each jurisdiction before the 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 Hamblen County Hazard Mitigation Plan. The primary purpose of reviewing this information was to identifying 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
- City of Morristown Land Use Plan
- Hamblen County Land Use Plan
- Hamblen County Building/Zoning Codes
- Hamblen County BEOP

- Hamblen County Schools Strategic Plan

All of the listed plans, studies, and data sources were incorporated into the Hamblen 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 reorganized and updated from the original Hamblen County Hazard Mitigation Plan. Hamblen County reviewed and analyzed each section of the original plan and made updates in the following ways:

Section 1: Planning Process
Hamblen County updated the original plan's description of the planning process to include the new or no longer participating committee members, the countywide mitigation meetings that took place for the plan's update, and the latest opportunity for the public to get involved. Hamblen County also compiled a new list of existing documents that they reviewed in updating their sections in the plan.

Section 2: County Profile
Hamblen County created a new development trends section in this plan update.

Section 3: Risk Assessment
Hamblen County kept all of their listed natural hazards from the original hazard mitigation plan.

As part of the plan update, Hamblen County updated their previous occurrence hazard listings to cover the most recent five years (if data was available) and re-evaluated each hazard's extent, probability, and potential impacts. Also, the plan updated the HAZUS-flood model study and simplified countywide floodplain maps for the first time, as seen in the plan's appendices.

Section 4: Mitigation Strategy
Hamblen County has updated their mitigation goals to address a more realistic view based on access to funds both locally and through grants. Hamblen 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

Hamblen County will continue to 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 Hamblen County BEOP has mitigation concepts incorporated into it; and will continue to strive to achieve the goals and projects within the plan by each jurisdiction.

Section 2: County Profile

Development Trends

Hamblen County and its jurisdictions can be found in East Tennessee. It is bordered by the Grainger County to the northwest, Hawkins County to the northeast, Greene County to the East, Cocke County to the southeast, and Jefferson County to the southwest. It has a population of 63,074 (2013). Hamblen County was named in honor of Hezekiah Hamblen (1775–1854), an early settler, landowner, attorney, and member of the Hawkins County Court for many years. Governor Dewitt Clinton Senter, a resident of the county, used his influence to assist in its establishment. The county has a total area of 176 square miles, of which 161 square miles is land and 15 square miles is water.

The incorporated jurisdictions have populations as follows (2010 census):

Jurisdiction	Population
Morristown	29,137

Morristown is the focal point for medical services, dining, and entertainment, with 3 major industrial parks all located within the city boundaries. There is a moderate agricultural base. Hamblen County is centrally located to all major U.S. markets with transportation access via 3 state routes. Historical sites and tourism are also a critical component of the development and expansion of Morristown and Hamblen County.

Due to current land use trends, the Hamblen County Property Assessor predicts future growth in residential, commercial, and industry. There are no immediately anticipated flooding problems from the residential expansion. During the past several years, both retail and commercial growth have been expanding rapidly. Some of this growth is attributed to new transportation projects being completed to add more options for access to Morristown. Most of the commercial development has been focused in the western part of the city/county and also on highway 25E near exit 8 in the southern part of the county. The central part of the city has also seen redevelopment of existing sites. Along with this, storm water plans have continued to be updated and followed for infrastructure build-out.

Commercial growth and development in Morristown has increased and has trended towards the west in the recent years. Residential development has been more evenly distributed and more muted. The City's storm water ordinance requires storm water peak flow control for

new development so that runoff after development does not exceed the runoff prior to development. This growth has not significantly affected the City's storm water plan. This control is typically provided by detention ponds or other storage methods. These facilities must be designed by state-licensed engineers and are reviewed by a licensed engineer on behalf of the City. Since the control is provided at each site as new development occurs, no significant upgrades to the City's infrastructure have been required.

Legal & Regulatory Capability

The following chart indicates the legal and regulatory adherence of each of the jurisdictions within Hamblen County:

Regulatory Tools/Plans	Regulatory Type: Ordinance Resolution Codes Plans, Etc.	Hamblen County	Morristown
Building Codes	Municipal Code	Y	Y
Zoning	Municipal Code	Y	Y
Emergency Response Plan	Basic Emergency Operations Plan (BEOP)	Y	Y
National Flood Insurance Program Participant		Y	Y
Post-Disaster Recovery Plan	BEOP	Y	Y

Section 3: Risk Assessment

Hazard Identification

To begin to assess Hamblen 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 Hamblen County by going through newspaper articles, Hamblen 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 Hamblen County mitigation committee during 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 Hamblen 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** **(b) Saturation**	-Excess overland flow occurs when the rain is falling more rapidly than it infiltrates into the soil. -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. This process is slower than overland flow but faster than baseflow.
Baseflow	-Rainwater which has percolated to the aquifer can seep into the river channel. This is the slowest process.

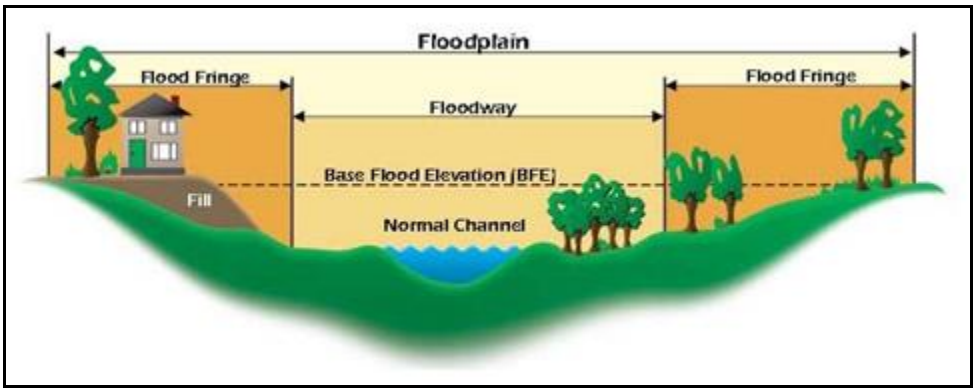
Source: The Field Studies Council

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 Hamblen 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 Hamblen County, all jurisdictions have 100-year floodplains located within their boundaries and all jurisdictions are susceptible to smaller localized flooding outside of the 100-year floodplains. Areas in the county known to flood more often include:

Localized Flood Areas Mitigated			
Location	**Action/Project**	**Project Description**	**Project Completed**
East Morris Blvd	Drainage Project at Flash Flooding Sites	Storm water system reworked for development	July 2016
Intersection of Shinbone Road and Jarrell Road	Road Elevation and Culvert Project	Bridge, culvert rebuilt	November 2015
South Henry at Sunrise	Drainage Project at Flash Flooding Sites	Replaced bridge	July 2016

Localized Flood Areas Carried Over from 2011 and New Areas			
Location	**Action/Project**	**Project Description**	**Project Completed**
South Cumberland at Railroad*	Drainage Project at Flash Flooding Sites		
Dalton Ford & Reeds Chapel Rd	Drainage Project at Flash Flooding Sites		
Old Russellville Pike (Hwy. 344)	Drainage Project at Flash Flooding Sites		
South Cumberland at Parker Rd	Drainage Project at Flash Flooding Sites		
Tara Subdivision	Drainage Project at Flash Flooding Sites		
Old Kentucky Rd at Jaybird	Drainage Project at Flash Flooding Sites		
Russellville Primary School	Drainage Project at Flash Flooding Sites		
Debi Circle (Stubblefield Creek)	Drainage Project at Flash Flooding Sites		
Russellville Intermediate School†	Drainage Project at Flash Flooding Sites		

*****_Public Works has a plan in place for 2017_

† _TDOT has plan to repair when four-lane project commences_

*Detailed Flood Insurance Rate Maps (FIRMs) are also included in **Appendix 4**, which shows where FEMA has placed the 100-year and 500-year floodplains for each jurisdiction.*

Hamblen 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 Hamblen County from January 1994 to May 2016 and a list of floods impacts imposed on the community since 1997.

Flood Events in Hamblen County: January 1994 to May 2016

Location	Date	Type	Deaths	Injuries	Property Damage
Morristown	2/10/1994	Flash Flood	0	0	1K
Countywide	3/27/1994	Flash Flooding	0	0	50K
Countywide	6/14/1997	Flash Flood	0	0	0
Countywide	5/7/1998	Urban/Sml Stream Fld	0	0	0
Countywide	7/11/1999	Flood	0	0	0
Regional	3/17/2002	Flood	0	0	50M (regional)
Countywide	3/18/2002	Flash Flood	0	0	0
Regional	2/14/2003	Flood	0	0	18.1M (regional)
Countywide	2/21/2003	Flood	0	0	0
Countywide	4/10/2003	Flood	0	0	0
Morristown	9/26/2009	Flood	0	0	0
Morristown	2/28/2011	Flood	0	0	10K
Morristown	2/28/2011	Flood	0	0	5K
Russellville	6/20/2011	Flash Flood	0	0	45K

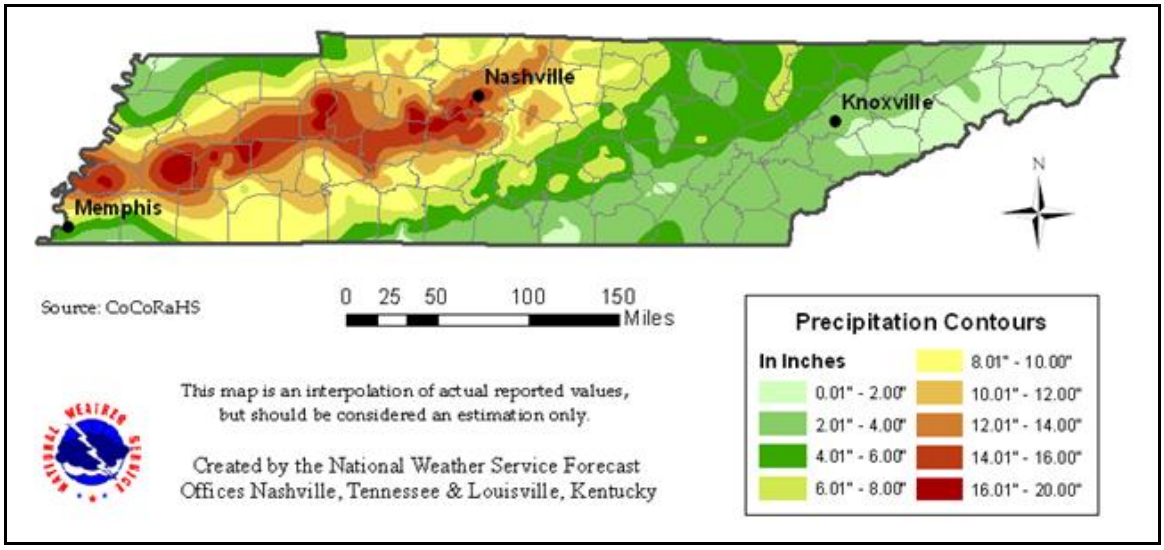
Flood Impacts in Hamblen County: January 1997 to May 2011

Location	Date	Impact Description
Countywide	6/14/1997	Hamblen county EOC reported numerous bridges washed out on backroads in eastern and southern parts of the county.
Countywide	5/7/1998	Thunderstorms with very heavy rain cause extensive urban and small stream flooding throughout the county.
Countywide	7/11/1999	Numerous incidents of minor flooding were reported.
Regional	3/17/2002	Widespread flooding occurred across most of East Tennessee. Rainfall totals between five and eight inches were reported in 36 hours. Total damage estimates were calculated to be over 5 million dollars.
Regional	2/14/2003	Four day rainfall totals of two to eight inches fell across east Tennessee, with the highest amounts occurring across the Cumberland Plateau and adjacent valleys areas. This rainfall combined with a melting snowpack (reports of up to a foot in the higher elevations) to produce widespread flooding of rivers and streams with numerous mudslides.
Countywide	2/21/2003	With the ground already saturated from the previous week's rainfall, three day rainfall totals of one to three inches created some flooding of streams and rivers as well as several mudslides across east Tennessee.
Countywide	4/10/2003	Seven day rainfall totals (4th through the 10th) of three to five inches were reported across central east Tennessee and northeast Tennessee, with one to three inches occurring on the 10th. Several secondary roads across the area were flooded with several rivers experiencing some minor flooding.
Morristown	9/26/2009	Area flooding occurred along highways 11 east and 25 east in and around Morristown, Tennessee. Several inches to nearly a foot of water was over a few of the area roads, with several areas briefly impassable due to the flooding.
Morristown	2/28/2011	A NWS employee reported heavy rain from a thunderstorm caused flooding along Panther Creek Road.
Morristown	2/28/2011	Mesonet reported 2.26 inches of rain in a 3 hour period from a thunderstorm producing minor flooding.

Small localized flood events are likely to occur about every year in Hamblen 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 worse case scenario it is possible for the extent of a flooding event to exceed 9 inches of rainfall and cause over 2 feet of

localized flooding in the span of two days. As seen with the May 2010 Tennessee Flood Event *(DR-1909)*, it is possible for 20 inches or more of rainfall to amass within two days (see following map).

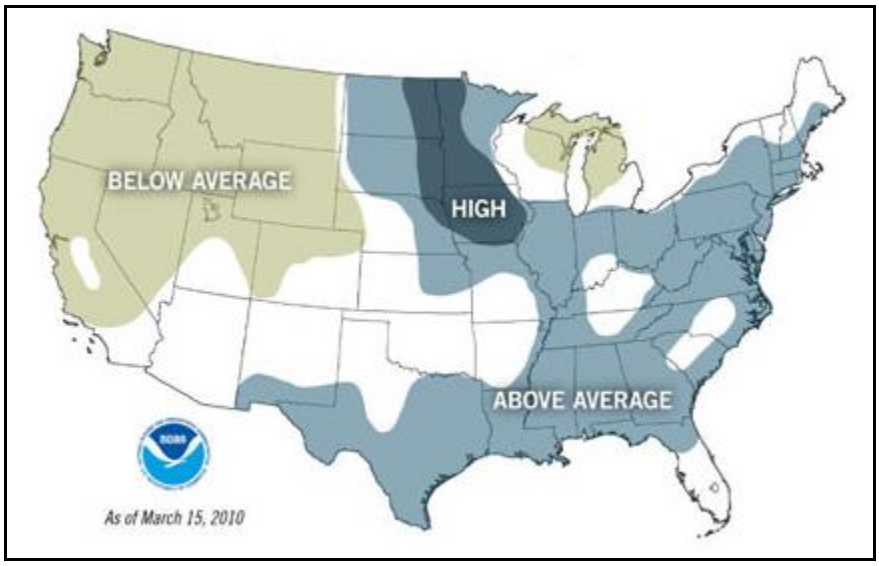
Tennessee May Flood- Precipitation for May 1st & 2nd 2010



Source: National Weather Service

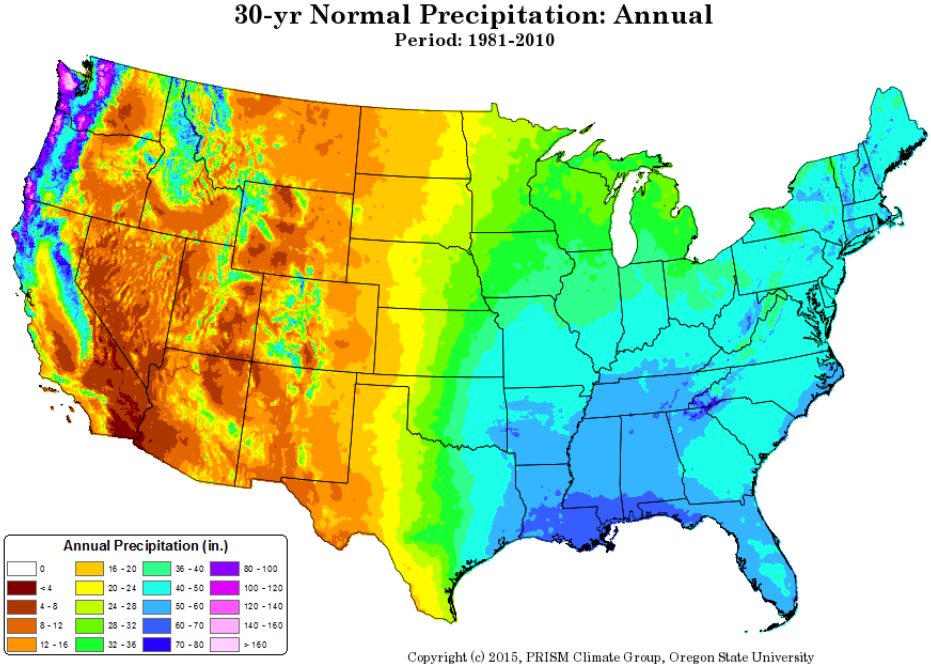
According to a NOAA Flood Risk Map (see map below), the majority of Tennessee was located in an "above average" risk of flooding zone during spring 2010. This proposed vulnerability is coupled with the fact that on average Tennessee usually acquires over 50-60 inches of rainfall a year (see following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

Flood Risk Map



Source: NOAA

Average Annual Precipitation per Year (1981-2014)



Source: PRISM Climate Group, Northwest Alliance for Computational Science and Engineering-Oregon State University

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

Jurisdiction	Impacts			Vulnerability
	Human	*Property*	*Business*	*H+P+B=#; #/3= V*
Hamblen County Unincorporated	**2**	**3**	**1**	**2.00**
City of Morristown	**1**	**3**	**1**	**1.67**
Hamblen County School Board	**1**	**2**	**1**	**1.33**

Jurisdiction	Vulnerability	Probability	Risk *V+P=R*	
Hamblen County Unincorporated	**2.00**	**3**	**5.00**	**Moderate**
City of Morristown	**1.67**	**4**	**5.67**	**Medium**
Hamblen County School Board	**1.33**	**1**	**2.33**	**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	
Risk of injuries and deaths from the hazard	
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	
Amount of residetial property damage associated from the hazard	
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	
Amount of business damage associated from the hazard	
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 indefinitly or relocated
5	A top-10 local employer closed indefinitly

Probability	
Likelihood of the hazard occurring within a given span of years	
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 Hamblen County, see the HAZUS vulnerability study in ***Appendix 5***.

Sinkholes

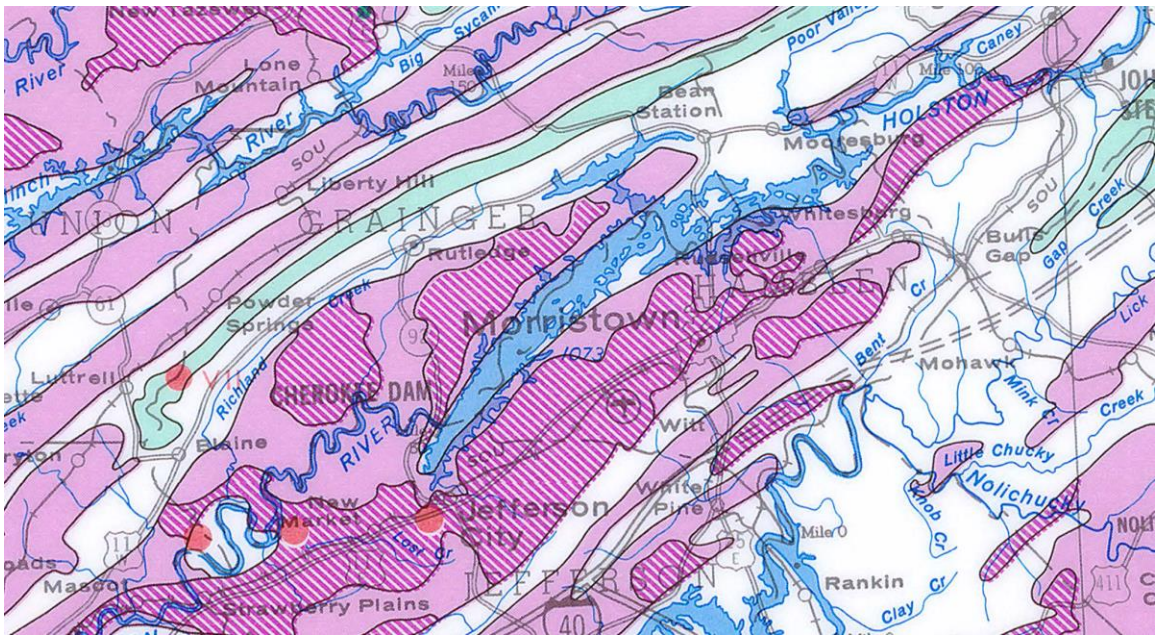
Both the City of Morristown and Hamblen County have begun to see a rise in the occurrence of sink holes in both jurisdictions in recent years. This has affected our infrastructure, transportation, and our own public works and road departments. There is some possible contemplation that our rapid economic growth in certain areas has just revealed these with our karst geological structure in certain parts of our jurisdiction. Because of the costs and time associated with repairing the sink holes, we would like to try and mitigate through study where we are vulnerable to these sinkholes and if certain areas have the risk to more developing.

Data of occurrences from past five years (2012-2017)

Date of Sinkhole	Work Completed to Fix Sinkhole	Location
7/2/12	12/30/16	MORRISTOWN AIRPORT
5/29/13	6/4/13	COMMERCE BLVD.
8/7/13	8/16/13	RESOURCE DRIVE
12/2/13	12/3/13	SOUTH ECONOMY
5/16/14	5/21/14	HUNTER ROAD
8/8/2014	8/13/2014	MORNINGSIDE DRIVE
7/16/15	6/17/16	AMESBURY DRIVE
8/28/15	8/28/15	MORTON STREET
12/18/15	2/20/17	EAST INDUSTRIAL PARK *
12/28/15	12/31/16	VANTAGE VIEW DRIVE
9/16/16	9/16/16	VETERANS PARKWAY
12/8/16	12/9/16	MARTIN LUTHER KING BLVD.
9/26/17	9/27/17	SUPERIOR DRIVE

* The East Industrial Park sinkhole took 2 years to fix at a cost of $360,795.52.

The following map was retrieved by the Geologic Hazards Map of Tennessee.



Karst areas (areas with caves, sinkholes and disappearing streams)

Areas with a high density of karst features

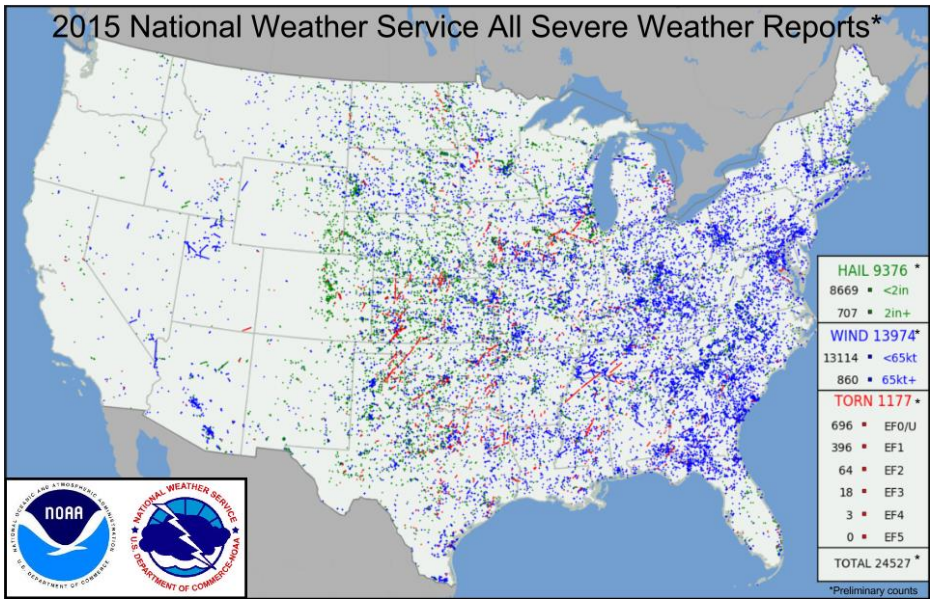
According to the Geologic Hazards Map of Tennessee, because of the potential for property damage if a structure is located over a cavern, it is imperative to study existing karst features and associated hydrologic conditions during the planning and investigative stages of a construction program. It is believed increased sinkhole activity in the Hamblen County area has increased because of new infrastructure construction. Already stated in this plan is Hamblen County's flood risk. When Hamblen County floods, there is risk to the karst's in the area flooding as well. The flooding of a karst causes an imbalance between surface runoff into the sinkhole and discharge into the underlying cavern system. Consideration must be given, therefore, to the flood history of a depression before a structure is located.

The above chart provided details about Hamblen County's sinkhole history which totals 131 work days to fix the area affected. The next page illustrates an example of work completed on a sinkhole.

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 ¾ 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).

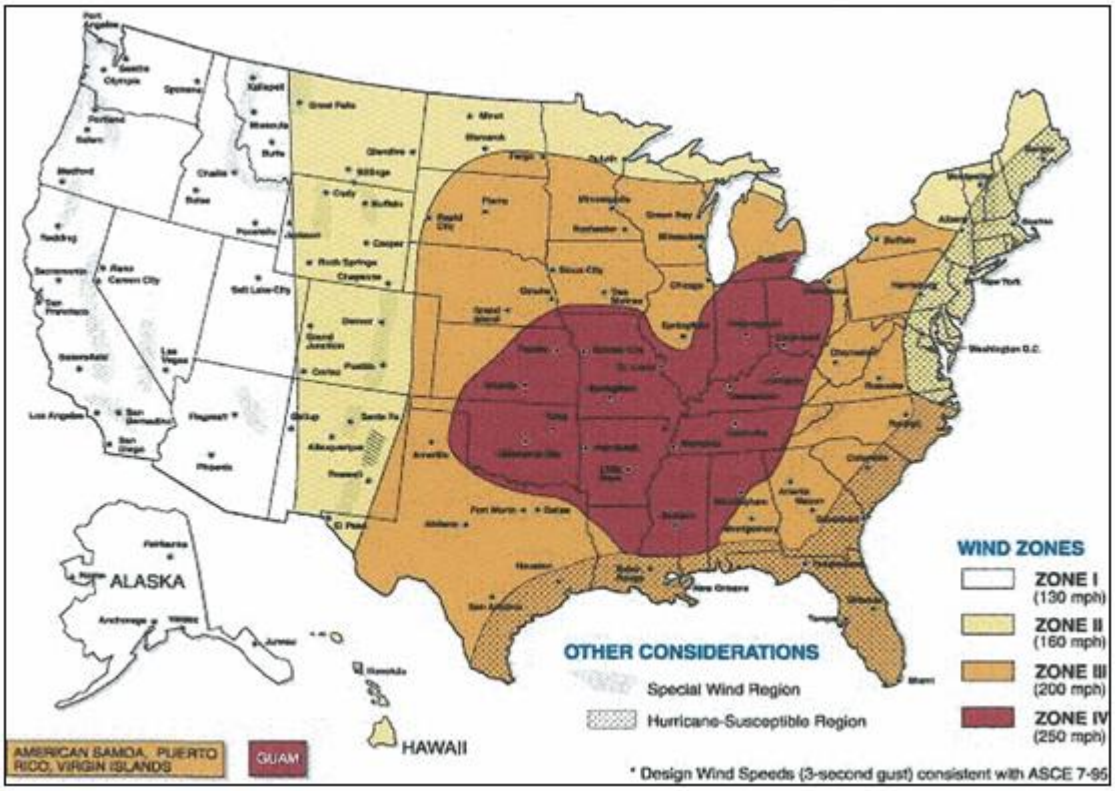
Average Severe Storm Watches Per Year (1999-2015)



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 Hamblen 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



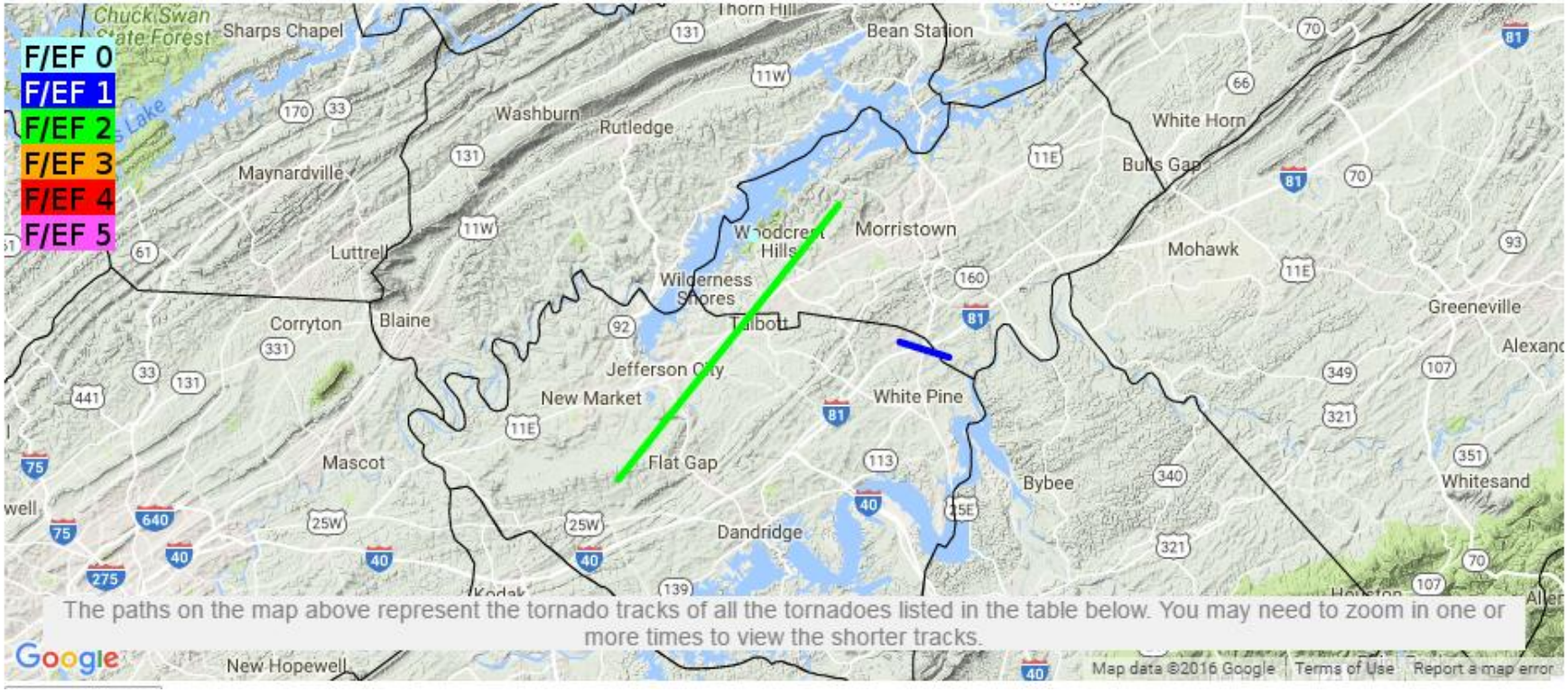
Source: FEMA

Hamblen County historically has had only one tornado in the past. Based on NOAA NCDC data, the following table provides information on this event. No damages have been reported from this EF1 tornado.

Tornado Events in Hamblen County: Nov. 1985 to April 2011

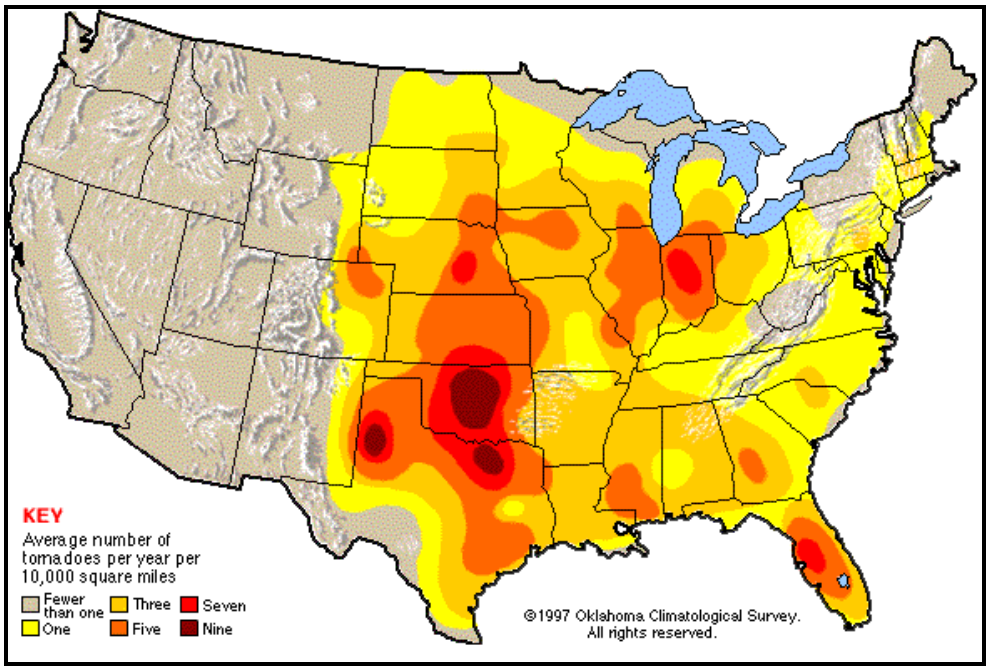
Location	Date	Extent	Deaths	Injuries	Property Damage
Hamblen County	11/27/1985	EF1	0	0	25K
Hamblen County	4/27/2011	EF0	0	0	10K

2011 Tornado Event Map



Even though major tornado events haven't occurred in Hamblen County, tornado risk studies show that it is possible for Hamblen County to receive a tornado every year (see the following map for this 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 worse case scenario it is possible for the extent of a tornado to exceed an EF3 ranking.

Fujita Scale/Enhanced Fujita Scale for Tornadoes

Fujita Scale/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 houses; 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 about once a year in Hamblen County. The severity of hail is measured by the diameter of the hail itself, commonly using the TORRO Hail Index (see following chart). The largest hail event in Hamblen County was recorded in Morristown on May 18, 1995, where tennis ball size hail (H7/2.75 inch) was reported causing window damage to several vehicles.

TORRO Hail Index

TORRO Hail Index			
Scale	Max Diameter	Comparisons	Typical Impacts
H0	5-9mm	Pea	No damage.
H1	10-15mm	Mothball	Slight general damage to plants, crops.
H2	16-20mm	Marble	Significant damage to fruit, crops, vegetation.
H3	21-30mm	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored.
H4	31-40mm	Pigeon's Egg	Widespread glass damage, vehicle bodywork damage.
H5	41-50mm	Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries.
H6	51-60mm	Hen's Egg	Bodywork of grounded aircraft dented, brick walls pitted.
H7	61-75mm	Tennis Ball	Severe roof damage, risk of serious injuries.
H8	76-90mm	Soft Ball	Severe damage to aircraft bodywork.
H9	91-100mm	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 Hamblen County between January 2000 and May 2014.

Hail Events in Hamblen County: January 2000 to May 2016

Location	Date	Extent	Death	Injuries	Property Damage
Morristown	5/21/2000	0.75 in.	0	0	0
Morristown	5/23/2000	1.00 in	0	0	0
Morristown	8/17/2000	0.75 in	0	0	0
Russellville	7/8/2001	0.75 in	0	0	0
Morristown	8/11/2001	1.00 in.	0	0	0
Morristown	4/28/2002	1.00 in.	0	0	5K
Morristown	4/28/2002	1.75 in.	0	0	5K
Morristown	6/2/2004	0.75 in.	0	0	0
Morristown	6/2/2004	0.75 in.	0	0	0
Morristown	6/2/2004	0.88 in.	0	0	0
Morristown	6/2/2004	1.00 in.	0	0	0
Russellville	6/12/2004	0.75 in.	0	0	0
Morristown	7/26/2004	1.75 in.	0	0	0
Morristown	3/13/2005	1.00 in.	0	0	0
Russellville	4/22/2005	0.75 in.	0	0	0
Morristown	12/28/2005	0.75 in.	0	0	0
Morristown	4/7/2006	0.75 in.	0	0	0
Morristown	8/10/2006	1.00 in.	0	0	0
Morristown	5/18/2008	0.75 in.	0	0	0
Morristown	7/21/2008	1.00 in.	0	0	0
Alpha	5/8/2009	0.75 in.	0	0	0
Morristown	6/11/2009	0.75 in.	0	0	0
Morristown	5/26/2011	1.25 in.	0	0	0
Morristown	5/26/2011	1.00 in.	0	0	0
Morristown	7/1/2012	1.00 in.	0	0	0
Alpha	6/5/2013	1.00 in.	0	0	0
Morristown	5/22/2014	1.00 in.	0	0	0
Morristown	6/10/2014	1.00 in.	0	0	0

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 about three times a year in Hamblen County. The severity of severe storm winds is commonly measured by wind speed (knots or mph). The highest severe storm wind event in Hamblen County was recorded August 4, 1997 with wind speeds clocked at 75 knots. Historically, wind impacts have largely been in the form of downed trees and powerlines in Hamblen County.

The following chart provides severe storm wind event information for Hamblen County between January 2005 and May 2016.

Wind Events in Hamblen County: January 2005 to May 2016

Location	Date	Extent	Death	Injuries	Property Damage
Morristown	4/22/2005	70 kts.	0	0	25K
Morristown	4/22/2005	65 kts.	0	0	5K
Morristown	6/6/2005	65 kts.	0	0	15K
Countywide	7/1/2005	60 kts.	0	0	20K
Morristown	4/2/2006	60 kts.	0	0	5K
Countywide	4/8/2006	60 kts.	0	0	12K
Morristown	6/24/2006	40 kts.	0	0	5K
Morristown	7/28/2006	60 kts.	0	0	25K
Morristown	8/8/2006	60 kts.	0	0	10K
Countywide	8/10/2006	60 kts.	0	0	25K
Russellville	9/28/2006	60 kts.	0	0	3K
Russellville	9/28/2006	60 kts.	0	0	3K
Morristown	4/3/2007	50 kts.	0	0	30K
Morristown	6/8/2007	60 kts.	0	0	15K
Morristown	6/24/2007	55 kts.	0	0	12K
Russellville	6/25/2007	55 kts.	0	0	10K
Morristown	6/26/2007	55 kts.	0	0	15K
Pineville	7/18/2007	55 kts.	0	0	0
Alpha	7/18/2007	55 kts.	0	0	0
Morristown	7/19/2007	60 kts.	0	0	0
Morristown Arpt	1/30/2008	55 kts.	0	0	0
Russellville	3/19/2008	50 kts.	0	0	0
Cherokee Lake	4/11/2008	45 kts.	0	0	2K
Morristown	6/28/2008	55 kts.	0	0	8K
Russellville	6/28/2008	52 kts.	0	0	5K
Russellville	2/11/2009	60 kts.	0	0	20K
Morristown	6/11/2009	60 kts.	0	0	0
Morristown	6/16/2009	60 kts.	0	0	20K
Morristown	6/16/2009	60 kts.	0	0	15K
Russellville	8/4/2009	60 kts.	0	0	30K
Alpha	9/7/2009	50 kts.	0	0	5K
Valley Home	7/13/2010	50 kts.	0	0	0
Morristown	8/5/2010	50 kts.	0	0	2K
Morristown	8/5/2010	50 kts.	0	0	1K
Alpha	9/3/2010	50 kts.	0	0	0
Morristown	9/3/2010	50 kts.	0	0	0
Russellville	2/28/2011	55 kts.	0	0	20K
Morristown	4/27/2011	55 kts.	0	0	20K
Morristown	5/26/2011	50 kts.	0	0	0
Russellville	6/20/2011	50 kts.	0	0	2K
Morristown	6/21/2011	55 kts.	0	0	5K
Morristown	6/21/2011	60 kts.	0	0	20K
Morristown	7/1/2012	55 kts.	0	0	0
Morristown	7/5/2012	60 kts.	0	0	0
Witt	7/5/2012	60 kts.	0	0	0
Morristown	7/5/2012	60 kts.	0	0	0
Cherokee Lake	7/31/2012	50 kts.	0	0	0
Morristown	5/21/2013	50 kts.	0	0	0
Morristown	5/22/2013	50 kts.	0	0	0
Morristown	6/27/2013	50 kts.	0	0	2K
Alpha	6/27/2013	50 kts.	0	0	2K
Russellville	8/23/2013	50 kts.	0	0	5K
Morristown	2/21/2014	55 kts.	0	0	10K
Morristown	6/10/2014	50 kts.	0	0	10K
Valley Home	6/18/2015	50 kts.	0	0	0
Morristown	9/30/2015	50 kts.	0	0	0
Hamblen (Zone)	2/24/2016	60 kts.	0	0	0

Hamblen 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 analysis's potential impacts to determine vulnerabilities and then analysis's the probability of a severe storm event occurring to calculate a risk ranking for each jurisdiction.

Jurisdiction	Impacts			Vulnerability
	Human	*Property*	*Business*	*H+P+B=#; #/3= V*
Hamblen County Unincorporated	**3**	**4**	**3**	**3.33**
City of Morristown	**3**	**5**	**3**	**3.67**
Hamblen County School Board	**3**	**3**	**3**	**3.00**

Jurisdiction	Vulnerability	Probability	Risk	
			V+P=R	
Hamblen County Unincorporated	**3.33**	**1**	**4.33**	**Moderate**
City of Morristown	**3.67**	**1**	**4.67**	**Moderate**
Hamblen County School Board	**3.00**	**1**	**4.00**	**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	
Risk of injuries and deaths from the hazard	
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	
Amount of residetial property damage associated from the hazard	
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	
Amount of business damage associated from the hazard	
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 indefinitly or relocated
5	A top-10 local employer closed indefinitly

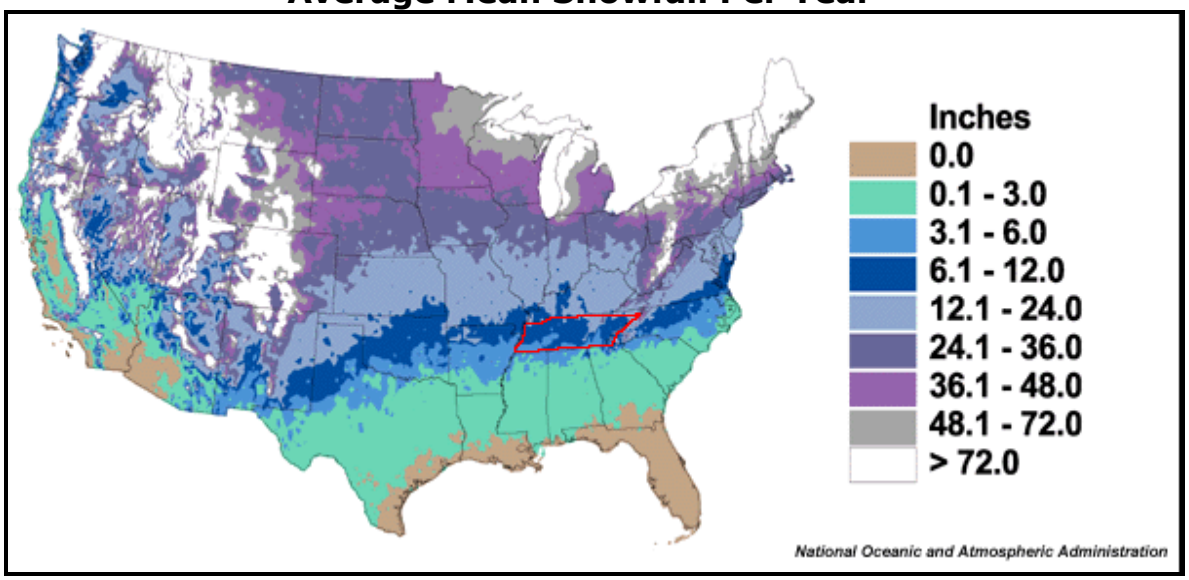
Probability	
Likelihood of the hazard occurring within a given span of years	
1	Less than once every 10 years
2	About once every 5-10 years
3	About once every 2-5 years
4	About once a year
5	More than once a year

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 Hamblen 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, Hamblen County usually experiences one winter storm event every 2 years. The severity of winter storms is commonly measured by inches of snowfall. It is possible for snowfall to accumulate over 6 inches in Hamblen County. The average mean snowfall per year in Hamblen County is between 6 to 12 inches (as seen on the map below).

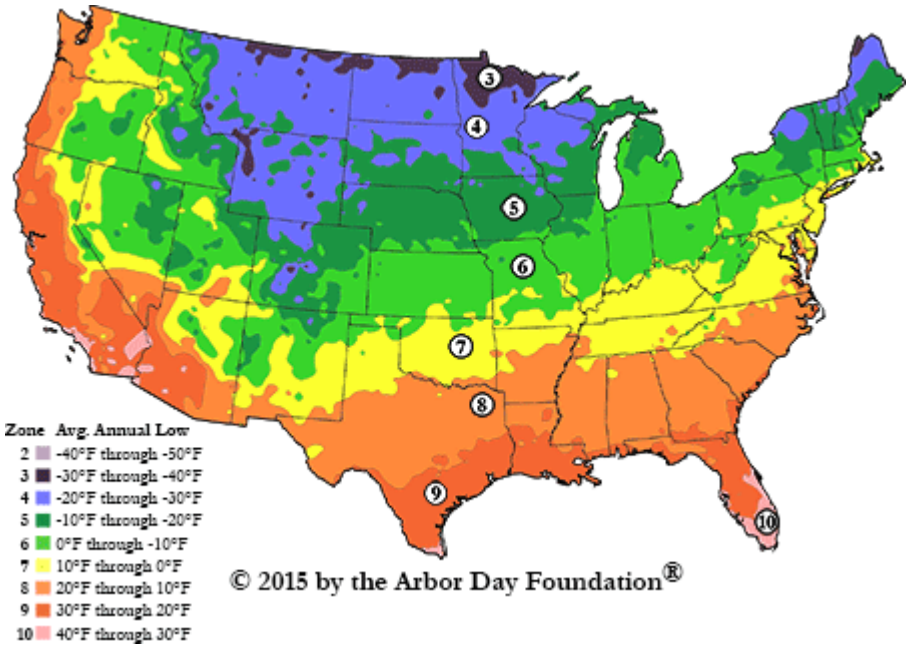
Average Mean Snowfall Per Year



Source: NOAA

Hamblen 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 Hamblen County between January 2000 and January 2017.

Winter Storm Impacts in Hamblen County: Jan. 2000 – Jan. 2017

Location	Date	Type	Deaths	Injuries	Property Damage
Hamblen (zone)	1/22/2000	Winter Storm	0	0	0
Hamblen (zone)	12/2/2000	Winter Storm	0	0	0
Hamblen (zone)	12/18/2000	Winter Storm	0	0	0
Hamblen (zone)	1/1/2001	Winter Storm	0	0	0
Hamblen (zone)	1/20/2001	Winter Storm	0	0	0
Hamblen (zone)	1/5/2003	Heavy Snow	0	0	0
Hamblen (zone)	1/16/2003	Winter Storm	0	0	0
Hamblen (zone)	1/22/2003	Winter Storm	0	0	0
Hamblen (zone)	1/9/2004	Winter Storm	0	0	0
Hamblen (zone)	2/26/2004	Heavy Snow	0	0	0
Hamblen (zone)	1/29/2005	Ice Storm	0	0	0
Hamblen (zone)	1/29/2010	Heavy Snow	0	0	0
Hamblen (zone)	12/12/2010	Heavy Snow	0	0	0
Hamblen (zone)	1/17/2013	Heavy Snow	0	0	0
Hamblen (zone)	2/13/2014	Heavy Snow	0	0	0
Hamblen (zone)	2/16/2015	Ice Storm	0	0	0
Hamblen (zone)	2/16/2015	Winter Storm	0	0	0
Hamblen (zone)	2/21/2015	Heavy Snow	0	0	0
Hamblen (zone)	1/20/2016	Heavy Snow	0	0	0
Hamblen (zone)	1/22/2016	Heavy Snow	0	0	0
Hamblen (zone)	1/6/2017	Heavy Snow	0	0	0

The following chart provides winter storm event information Hamblen County between January 2000 and January 2017.

Winter Events in Hamblen County: Jan. 2000 – Jan. 2017

Type	Date	Impact Description
Winter Storm	1/22/2000	2 to 4 inches reported.
Winter Storm	12/02/2000	1 to 3 inches reported.
Winter Storm	12/18/2000	1 to 2 inches reported.
Winter Storm	1/1/2001	Light snow reported.
Winter Storm	1/20/2001	Around 1 inch reported.
Winter Storm	1/5/2002	2 to 4 inches reported.
Heavy Snow	1/5/2003	4 to 6 inches reported.
Winter Storm	1/16/2003	2 to 8 inches reported.
Winter Storm	1/22/2003	2 to 8 inches reported; highest amount in higher elevations.

Winter Storm	1/9/2004	2 to 3 inches reported.
Ice Storm /Heavy Snow	1/29/2005	¼ to ½ inches of ice accumulation reported along with 4 to 8 inches of snow. Trees and power lines down.
Heavy Snow	1/29/2010	4 to 8 inches reported.
Heavy Snow	12/12/2010	4 inches reported.
Heavy Snow	1/17/2013	4 to 5 inches reported.
Heavy Snow	2/13/2014	7.2 inches reported.
Ice Storm	2/16/2015	Up to an inch of ice accumulation causing trees and power lines to go down.
Heavy Snow	2/21/2015	5 inches reported.
Heavy Snow	1/20/2016	4.3 inches reported.
Heavy Snow	1/22/2016	6 inches reported.
Heavy Snow	1/6/2017	4 inches reported

Due to the incidents that occurred on February 16 and February 21, 2015, Hamblen County had a Presidential Declaration for Public Assistance (DR-4211).

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

Jurisdiction	Impacts			Vulnerability
	Human	*Property*	*Business*	*H+P+B=#; #/3= V*
Hamblen County Unincorporated	2	3	2	2.33
City of Morristown	2	3	2	2.33
Hamblen County School Board	2	2	3	2.33

Jurisdiction	Vulnerability	Probability	Risk *V+P=R*	
Hamblen County Unincorporated	2.33	4	6.33	Medium
City of Morristown	2.33	4	6.33	Medium
Hamblen County School Board	2.33	5	7.33	High

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	
Risk of injuries and deaths from the hazard	
1	Death very unlikely, injuries are unlikely
2	Death unlikely, injuries are minimal
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Property	
Amount of residetial property damage associated from the hazard	
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	
Amount of business damage associated from the hazard	
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 indefinitly or relocated
5	A top-10 local employer closed indefinitly

Probability	
Likelihood of the hazard occurring within a given span of years	
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

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 Hamblen County Hazard Mitigation Committee identified the following goals to be the forefront in the overall development of this plan. 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.

Goal 1: Protect the lives and health of citizens from the effects of natural hazards.

Goal 2: Emphasize mitigation planning to decrease vulnerability of existing and new structures.

Goal 3: Encourage public support and commitment to hazard mitigation, by communicating mitigation benefits.

Identification and Prioritization of Mitigation Projects

Hamblen County has developed a comprehensive range of mitigation projects. These projects were solicited and identified by the different entities who make up the Hamblen 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, Hamblen County was able to determine when and which projects should be implemented based on available funding and time.

The Hamblen 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, Administrative, 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 benefits.	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 environ. impacts, possibly long-term
		2	Some environ. Impacts, some possibly long-term
		3	Few, if any, environ. 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 Hamblen County Hazard Mitigation Project List.

Hamblen County Project List

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

Hamblen County Project List for 2016 Plan

Mitigation Projects								
Priority Rank	**Action/Project**	**Hazard Mitigated**	**Jurisdictions Benefitted & Represented**	**Addresses New or Existing Buildings/Infra**	**Responsible Agency**	**Possible Funding Source(s)**	**Timeframe**	**Project Status**
1	Drainage Projects at Flash Flooding Sites	Flood	All	Existing	Hamblen County Highway Department	HMGP, PDM, FMA,	1-2 years	
2	All Hazards (Including Severe Weather) Educational Program Regarding Mitigation	All	All	New/Existing	Hamblen County EMA	Local	Continuous	
3	Road Elevation and Culvert	Flood	Morristown; All	Existing	Highway Departments	HMGP, PDM, TDOT	3-5 years	
4	Tree Limb Removal on Public Right of Ways	Winter Storms	Hamblen County Unincorporated	n/a	Public Works, TDOT, Hamblen County	Local	Continuous	
5	Engineering Study to address Public Right of Ways and Public Property Sinkholes	Severe Weather	All	New/Existing	Local Government	HMGP	5 years	
~~6~~	~~Public Safe Space Projects for Schools~~					~~HMGP, PDM~~		

Hamblen County Project List from 2011 Plan

Mitigation Projects							
Priority Rank	**Action/Project**	**Hazard Mitigated**	**Jurisdictions Benefitted & Represented**	**Addresses New or Existing Buildings/Infra**	**Responsible Agency**	**Possible Funding Source(s)**	**Timeframe**
1	Drainage Projects at Flash Flooding Sites	Flood	All	Existing	Hamblen County Highway Department	HMGP, PDM, FMA,	1-2 years
2	All Hazards Educational Program regarding Mitigation	All	All	New/Existing	Hamblen County EMA	Local	Continuous
3	Road Elevation and Culvert Projects for Evacuation Routes	Flood	Morristown; All	Existing	Highway Departments	HMGP, PDM, TDOT	1-3 years
4	Public Safe Space Projects for Schools	Tornado/ Severe Storms	All; Hamblen County Schools	New/Existing	Hamblen County Public Schools	HMGP, PDM	2-4 years
5	Severe Weather Awareness Projects	All	All	n/a	Hamblen County EMA	Local	Continuous
6	Tree Limb Removal on Public Right of Ways	Winter Storms	Hamblen County Unincorporated	n/a	Hamblen County EMA	Local	Continuous

Updates to the 2011 Plan Projects:

Priority Rank	Update
1	See "Localized Flood Areas Mitigated" chart (page 14)
2	See meeting dates in appendices. Conducted training during meetings. Bart Hose, TEMA East Regional Planner conducted one of these trainings on October 9, 2014.
3	See "Localized Flood Areas Carried Over from 2011 and New Areas" chart (page 14)
4	Did not receive any HMGP or PDM monies for this project. Not completed/ Eliminated from 2016 plan, but shown for reference.
5	Projects for Severe Weather Awareness Week include: a. 2011 – Tours of National Weather Service in Morristown b. 2012 – spoke at various schools during the week on preparedness for severe weather c. 2013 – Elementary school coloring contest on severe weather d. 2014 – Video contest with high schools on severe weather Every year tornado drills were conducted
6	Morristown Public Works and Hamblen County Road Department continues to pick up limbs after severe weather events.

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 Hamblen County unincorporated and the City of Morristown are NFIP participants. FEMA has listed these two jurisdictions to have a current effective map date as of 7/3/2006, with Hamblen County having its initial FIRM (flood insurance rate map) performed in 1991 and Morristown in 1978. Below are two charts that give an overview of NFIP policy and loss data for Hamblen County.

NFIP Policy Data for Hamblen County (as of 4/30/2011)

Jurisdiction	Policies In-Force	Insurance In-Force Whole $	Written Premium In-Force
Hamblen Co.	15	2,169,600	9,737
Morristown	56	11,000,000	69,318

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 Hamblen County (as of 4/30/2011)

Jurisdiction	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Hamblen Co.	1	1	0	0	961.81
Morristown	18	10	0	8	910,654.71

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 Hamblen County's only repetitive loss property as of May 2011.

Repetitive Loss Properties for Hamblen County						
Jurisdiction	Type of Structure	Flood Zone	Number of Losses	Total Building Payment	Total Contents Payment	Total Paid
Morristown	Non Residnt	C	2	1,643.71	678.68	2,322.39

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

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

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 critical facilities list, 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 HMGP grant funding. For the five year update, Hamblen County Emergency Management will notify the jurisdictional governments and the Hamblen 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 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 Hamblen County Hazard Mitigation Committee's goal is to have meetings within this time span; dates, public notices, and objectives for these meetings will be determined by Hamblen County Emergency Management.

Five months prior to the plan's expiration date, Hamblen 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 Hamblen 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 Hamblen 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 strengthen stance of mitigation implementation and awareness within the county and its jurisdictions.

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

- City of Morristown Land Use Plan
- Hamblen County Land Use Plan
- Hamblen County Building/Zoning Codes
- Hamblen County BEOP
- Hamblen County Schools Strategic Plan

The process of incorporating the hazard mitigation plan into other plans will begin during the other plan's update cycles. Hamblen 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 Hamblen County Hazard Mitigation Plan has been incorporated into the County's BEOP. This method of incorporation attempted to follow the described process stated above.

Continued Public Participation

The Hamblen 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 Hamblen 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

Hazard Mitigation Plan Committee 2013 Update

October 8, 2013 11:00am

West Wing Conference Room

Name	Agency	Signature
1. Danny Young	Hamblen Planning Comm.	
2. Danny Houseright	M-H EMS	
3. Barry Poole	Hamblen Road Dept	
4. Hugh Clement	Hamblen County Schools	
5. Don Ellison	EMA	
6. Charles Southerlan	Morristown Utility	
7. Nathan Antrican	Morristown Police Dept	
8. Clark Taylor	Morristown fire Dept.	
9. Kevin Jarnigan	South Hamblen VFD	
10. Chris Bell	M-H EMA	

Appendix 2

Hazard Mitigation Planning Meeting
October 9, 2014
2:30 PM

Member	Representation	Attendance
Chris Bell	Hamblen County EMA	
Hugh Clement	Hamblen County Schools	
Reece Conway	Morristown Public Works	
Don Ellison	Hamblen County EMA	
Keith Ely	Property Assessor	
Buddy Fielder	City of Morristown	
Tim Greene	Morristown Fire Department	
Dale Griffie	Hamblen County EMA	
Billy Gulley	Morristown Police Department	
Jamie Purkey	Morristown/Hamblen EMS	
Charles Southerland	Morristown Utility	
Danny Young	Hamblen Planning Department	
Terry Ewing	EMA	
Chris Wisecarver	Morristown P.D.	
Gary Ryan	MFD	
~~Billy Gulley~~	MPD	
~~Hugh Clement~~	HCDE	

Agenda

Hazard Mitigation Committee

October 9, 2014

2:30 PM

I. Review basic components of the Hazard Mitigation Plan and why we have a
County Plan – Bart Hose, Representative from TEMA Planners

II. High Risk Flood Areas List Updated (Plan Page 6)

*Add Debbie Circle (Stubblefield Creek)
*South Cumberland at Algonquin

III. Flood Events List Update to 2013 NOAA (Plan Pages 6-7)
Checked with NOAA and no update needed

IV. Project List (Reference page 22-23 for information on how project list is determined.) ----Page 24
Possible revisions and additions include 1) having utility lines run underground in downtown area; 2) add a hazard for "Sinkhole" on the West end of Morristown

V. County and City Planning Departments (Page 25)
No items needed updates

VI. Severe Winter Weather Mitigation – Risk/Vulnerability Analysis and Possible Project – TEMA Planner Bart Hose conducts

Revise projects list to include tree remove and replacements

Additional Items not on agenda brought forth in meeting:

1) Add a TDOT rep for the committee (Jay Rosen as a possible candidate)

2) Look into armoring the EOC

3) Discussion for money for the EOC Facility

4) Use CDBG for the Early Warning System for the Community

Hazard Mitigation Planning Minutes
October 9, 2014 2:30 PM
Fire Station 1 Training Room

The meeting was called to order and opened up by Morristown-Hamblen EMA Director, Chris Bell. Chris stated that the grant has been applied for in order for the projects that are listed on the plan to proceed to completion.

Mr. Bart Hose from TEMA gave a presentational slide on the risks/hazards on different aspects of disasters and the outcome once the clean-up has been completed. Bart confirmed with the committee members that were present on ways to adopt a plan, restructure or update an existing plan that is already in place.

Bart stressed how important it is to make sure that on the plan that is set in place to note the wording on each project and how the project (s) are going to effect the area and how it will be resolved to include the amount of time the project will take to complete in order to ensure that all grant monies are given correctly without any delays.

All grant monies that are issued out of that 15% goes to the state and incidents that are not eligible for grant monies are: Warning Systems, Generators, Repairs and/or Clean-ups, Dredging or Creek Re-routing. Any monies needed for these will come out of the agency that is responsible for these types of uses for either the City or County.

Bart stressed that at any given time we apply for grants FEMA wants point direction which means the purpose for the grant monies and the completion date, they are very strict on the usage of funds. Also before applying for grants find out what areas would be affected and address the strength of the hazard and the possible impact due to the hazard.

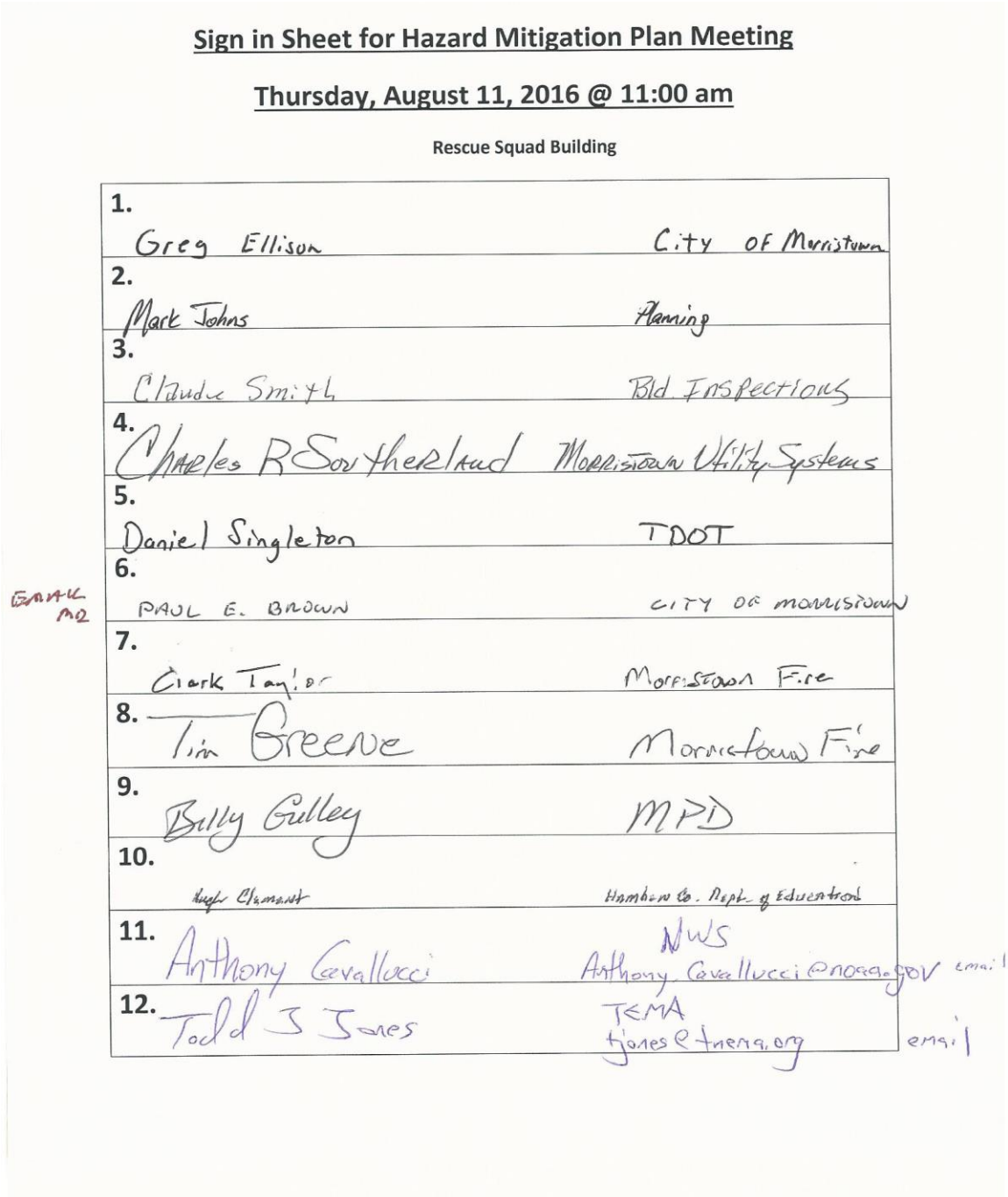
Chris opened the floor for discussions to see if any agency present had any concerns or issue that should be addressed so that they could be looked into. Buddy Fielder with the City of Morristown asked why Debi Circle was not included on the plan for a flood zone and needed to be added on the project list. Chris Wisecarver with MPD stated that there are two large

sinkholes in the Windsor Square development behind K-Mart that also needs to be addressed as well as the flood area on South Cumberland at Algonquin Street.

Gary Ryan with MFD ask about the electrical wires located on the North Side of the alley downtown because if a structural fire happened in that general area none of the fire trucks would be able to get in because of the power lines. Chris discussed this some in detail with Charles Southerland with Morristown Utility and stated that they would look into possibility having the electrical lines put underground.

Meeting was adjourned by Chris.

Appendix 3



Sign in Sheet for Hazard Mitigation Plan Meeting

Thursday, August 11, 2016 @ 11:00 am

Rescue Squad Building

1.	Greg Ellison	City of Morristown
2.	Mark Johns	Planning
3.	Claude Smith	Bld Inspections
4.	Charles R Southerland	Morristown Utility Systems
5.	Daniel Singleton	TDOT
6.	PAUL E. BROWN	CITY OF MORRISTOWN
7.	Clark Taylor	Morristown Fire
8.	Tim Greene	Morristown Fire
9.	Billy Gulley	MPD
10.	Hugh Clamant	Hamblen Co. Dept of Education
11.	Anthony Cavallucci	NWS Anthony.Cavallucci@noaa.gov email
12.	Todd S Jones	TEMA tjones@tnema.org email

Hazard Mitigation Plan Meeting Minutes
August 11, 2016 at 11:00 am
Morristown Rescue Squad Building

In attendance: Greg Ellison, Mark Johns, Claude Smith, Charles Southerland, Daniel Singleton, Paul Brown, Clark Taylor, Tim Greene, Billy Gulley, Hugh Clement, Anthony Cavallucci, Todd Jones, Elise Hagner, Jessica Wuton, Lindsey Horn

EMA Director Chris Bell opened the meeting at 11 am.

In 2010 General Bassum of TEMA saw that TN was lacking in Hazard Mitigation plans.

Hazard mitigation grants are in smaller amounts. Money is limited. There will be a 30-40% increase because we have an active mitigation plan.

Director Bell then read from 44 CFR 201 which explains the purpose of hazard mitigation. The purpose of hazard mitigation planning is to look at the vulnerabilities we have in the area and see what we can mitigate to prevent there from being a greater impact at the time of the incident.

The first Hamblen County Hazard Mitigation Plan was finalized and approved in 2011-has to be updated every five (5) years. Committee is supposed to meet every other year. Last meeting held in 2014.

Committee then reviewed each of the jurisdictions; then reviewed the vulnerabilities and hazards, both with no changes. Then the committee moved to the localized flooding areas to review. (see Hazard Mitigation Plan, page 6):

- East Morris Blvd – Mitigated Lomar July 2016
- Old Russellville Pike – 344
- South Cumberland at Railroad – Plan is in place
- Couth Cumberland at Parker Road
- Intersection of Shinbone Road and Jarrell Rd – bridge and culvert rebuilt
- South Henry at Sunrise – replaced bridge
- Debi Circle spelling needs to be corrected
- Remove both East Andrew Johnson Hwy @ Larry Baker Rd and South Cumberland @ Algonquin
- Add Russellville Intermediary School
- Add Dalton Ford and Reeds Chapel Rd.

Hazards for Hamblen County: winds, hail, flooding, tornadic activity, severe weather, and winter storms – no changes.

The committee then reviewed and made revisions and updatesits to projects list:

- Change timeframe on Prioroty #1 to 3-5 years
- Combine #2 and #5
- Edit #3 – remove “evac routes” and change to 3-5 years
- Remove Public safe space for schools
    - Hugh Clement: We have not utilized safe space build-outs, but we do have a designated space set in our emergency plan for each school.
    - Todd Jones: Can retrofit buildings; expensive
- Tree removal on public right of way – change responsibility to Public Works, TDOT, Hamblen County
- Add “Repair public property and drainage area sinkholes as affected” – Jurisdiction – all; new/existing infra; TDOT, Local government; 5 years

Director Bell asked if there were any more projects to add- none.

Everyone went around the table and introduced themselves

Director Bell said that he would send changes to everyone, asked they reply back with approval of changes to the Hazard Mit Plan and then at first of October they would be submitted to TEMA -> FEMA.

Meeting was adjourned.

Appendix 4

Yearly Reviews

2012:

1. February 2012: Conducted severe weather awareness education during Severe Weather Awareness Week. Projects included: (Project Rank #5)
   - Tornado drills in schools, government, daycares, medical centers, nursing homes, business facilities.
   - Radio, TV interviews.
   - Tested emergency systems.

2013:

1. Vantage view Project
   - Hazard Mitigation Grant Program [HMGP] #4060-0001 City of Morristown Drainage Improvement Project (Project Rank #1)
2. Updated and Revised Hamblen County Hazard Mitigation Committee (page 2)
3. Severe Weather Awareness Week Activities (Projects Rank #5)
   - (Same as above)
   - Presentations in 8 schools during week
   - Coloring contest

2014:

1. Continue "Vantage View" Hazard Mitigation Program Project (Project Rank #1)
2. February 2014: Severe Weather Awareness Week Activities
   - Conduct Public Service Announcement video contest between two local high schools. Winning video shown on local and regional TV stations.
3. Committee meeting on October 9, 2014 with TEMA East planner Bart Hose on updates to hazard Mitigation Plan.

**The Hazard Mitigation Grant for the Vantage View Project was approved for Phase 1 in October 2013. But as of November 2014, the City of Morristown cancelled the contract because of "undue burden of the state and federal levels requiring continued additional forms and information to proceed with Phase II of actual construction. The FEMA approval letter and City of Morristown contact cancellation letter is shown below.

November 24, 2014

Chris Bell
Director
Morristown-Hamblen Emergency Management Agency
511 West Second St.
Morristown, TN 37814

Director Bell,
Do to overwhelming concern for safety the City of Morristown has decided to no longer pursue the Hazard Mitigation Grant for the Vantage View Storm Water Project. The pipe failure beneath Vantage View Drive is critical. We feel should the processes and information required for the grant funding slow the bid and construction portions of the project, potential storm or geologic events will cut off this singular access to the 200 plus residents of the area. We greatly appreciate the efforts your office and those at the State and Federal level. Your assistance in making the proper notifications regarding our decision is appreciated.
We hope that the participating funding agencies will understand our position relative to our safety concerns and will continue to assist Morristown should funding be needed in the future. Thank you for serving our community.

Ralph "Buddy" Fielder ACA
City of Morristown, Tennessee

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

FEMA

October 30, 2013

Mr. James Bassham, Director
Tennessee Emergency Management Agency
3041 Sidco Drive
Nashville, TN 37204-1502

Attention: Mr. Douglas Worden, State Hazard Mitigation Officer

Reference: Hazard Mitigation Grant Program (HMGP) Project *4060-0001: City of Morristown Drainage Improvement Project (Phase One)*

Dear Mr. Bassham:

We are pleased to inform you that the subject project has been approved for $69,000 with a Federal share of $36,087 and a Non-Federal share of $32,913. The following is the approved Scope of Work (SOW) for the above-referenced project:

> *The project's intent is to replace the damaged culvert and embankment. The objective is to size the culvert such that it will safely pass inflows from the watershed without increasing flood levels upstream and without increasing peak flows downstream. This will be accomplished by preparing a study of the watershed and stream to verify and/or establish the drainage area and to determine the hydrologic response (the watershed is karst in nature) as well as the hydraulic response. (Note that FEMA indicated that there is no effective model available for the stream, therefore new models will need to be created.) The City will use HEC-HMS, HEC-RAS, SWMM, and HY8 software to conduct these analyses in accordance with FEMA-accepted protocols. The current Phase I application will only include the engineering and design phase. An engineering study is needed for the benefit cost analysis to reflect correct information. Once the engineering and design phase complete that data will be used to run an accurate benefit cost analysis and then proceed with Phase II.*

The Period of Performance (POP) for Phase I of this project is two (2) years from the date of this correspondence and shall end on October 30, 2015. All the activities specified in the scope of work should be completed and all Phase I deliverables submitted to FEMA no later than this date. In accordance with HMGP rules and policy, we will require the submittal of all closeout documentation, even if the project is deemed unfeasible or not cost effective, within 90 days, no later than January 28, 2016.

The City of Morristown shall deliver to FEMA through the Tennessee Emergency Management Agency for review and comment on the following project conditions:

www.fema.gov

2015:

1. February 2015: Severe Weather Awareness Week Activities
2. Reviewed Plan May 2015 and all items up to date
3. Preparing for 5 year update for 2016
4. No meeting this year

2016:

Hazard Mitigation Plan 5 Year Review and Update Minutes
August 11, 2016 at 11:00 am
Morristown Rescue Squad Building

In attendance: Greg Ellison, Mark Johns, Claude Smith, Charles Southerland, Daniel Singleton, Paul Brown, Clark Taylor, Tim Greene, Billy Gulley, Hugh Clement, Anthony Cavallucci, Todd Jones, Elise Hagner, Jessica Wuton, Lindsey Horn, Chris Bell

EMA Director Chris Bell opened the meeting at 11 am.

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Director Bell asked if there were any more projects to add- none.

Everyone went around the table and introduced themselves

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Meeting was adjourned.

Appendix 5

Public Notice

3/23/2017 Print

The newspapers of **Tennessee** make public notices from their printed pages available electronically in a single database for the benefit of the public. This enhances the legislative intent of public notice - keeping a free and independent public informed about activities of their government and business activities that may affect them. Importantly, Public Notices now are in one place on the web (www.PublicNoticeAds.com), not scattered among thousands of government web pages.

County: Hamblen
Printed In: Citizen Tribune (Morristown)
Printed On: 2017/03/16

PUBLIC NOTICE

Hamblen County Multi-Hazard Mitigation Committee meeting will be held on Wednesday, March 22 at 4:00 pm at the Hamblen County Courthouse, Third Floor, Small Courtroom. The purpose of this meeting is to gather input from the public on the updated Hamblen County Multi-Hazard Mitigation Plan. This meeting is open to the public.

Chris Bell
EMA Director

Published: 3/16/17

Public Notice ID: 2401785?

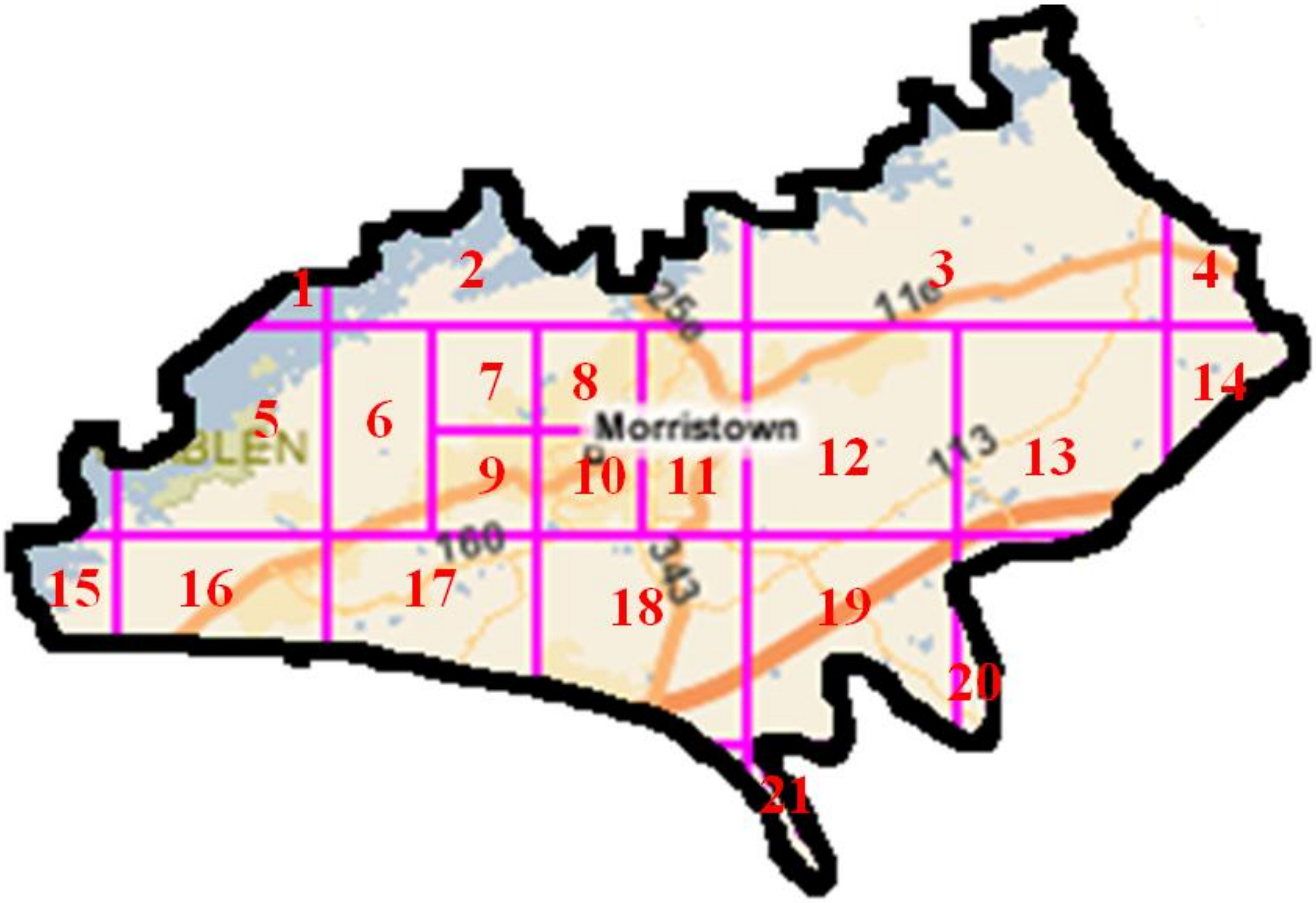
Hamblen Hazard Mitigation Plan Public Meeting

March 22, 2017 Small Courtroom Hamblen County Courthouse 4:00pm

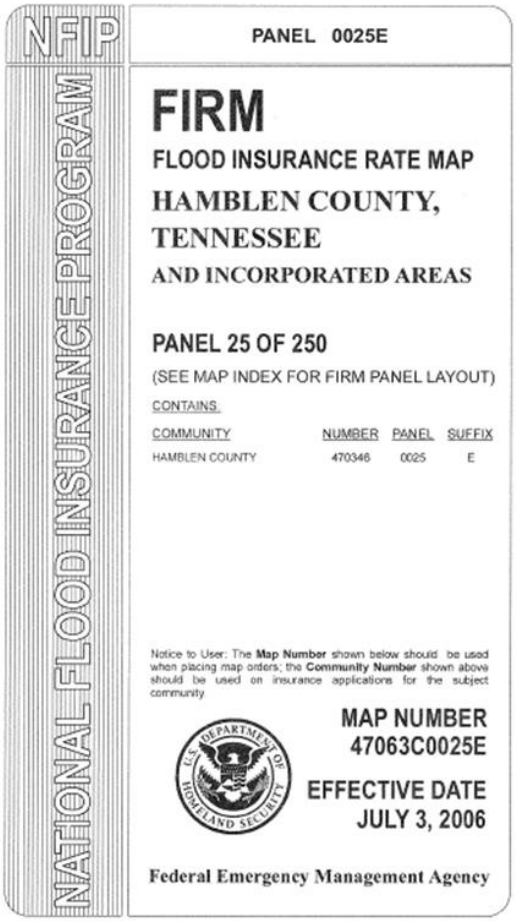
1) Chris Bell — Hamblen EMA
2) Tim Greene — HFD
3) Mark Johns — Planning Hamblen
4) Paul Brown — City of Morristown Public Works
5) Don Ellison — MHEMA
6) Lindsey Horn — MHEMA
7)
8)
9)
10)

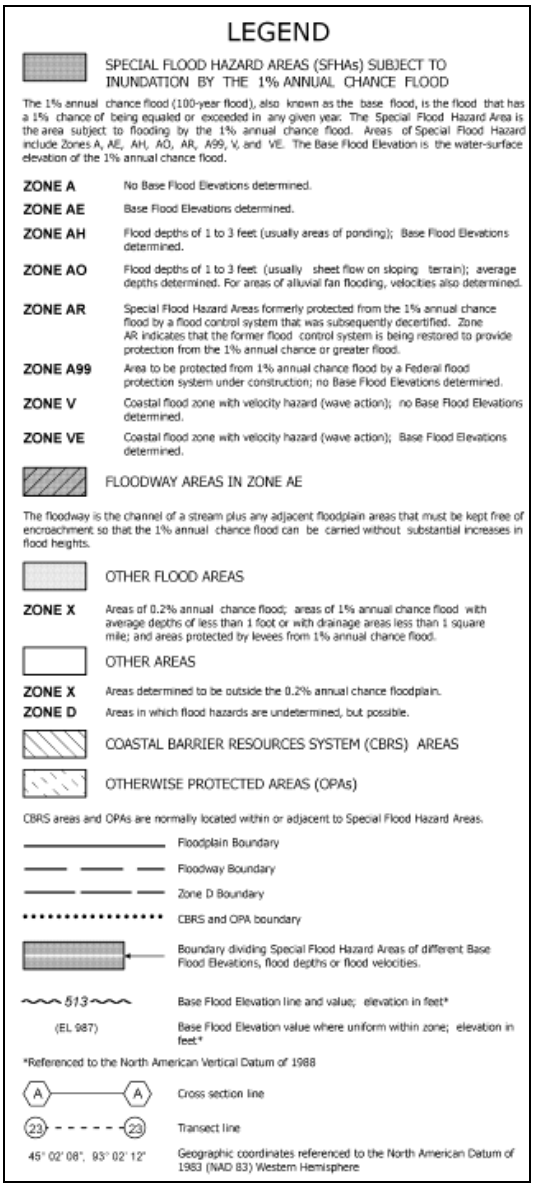
Appendix 6

Flood Insurance Rate Maps for Hamblen County

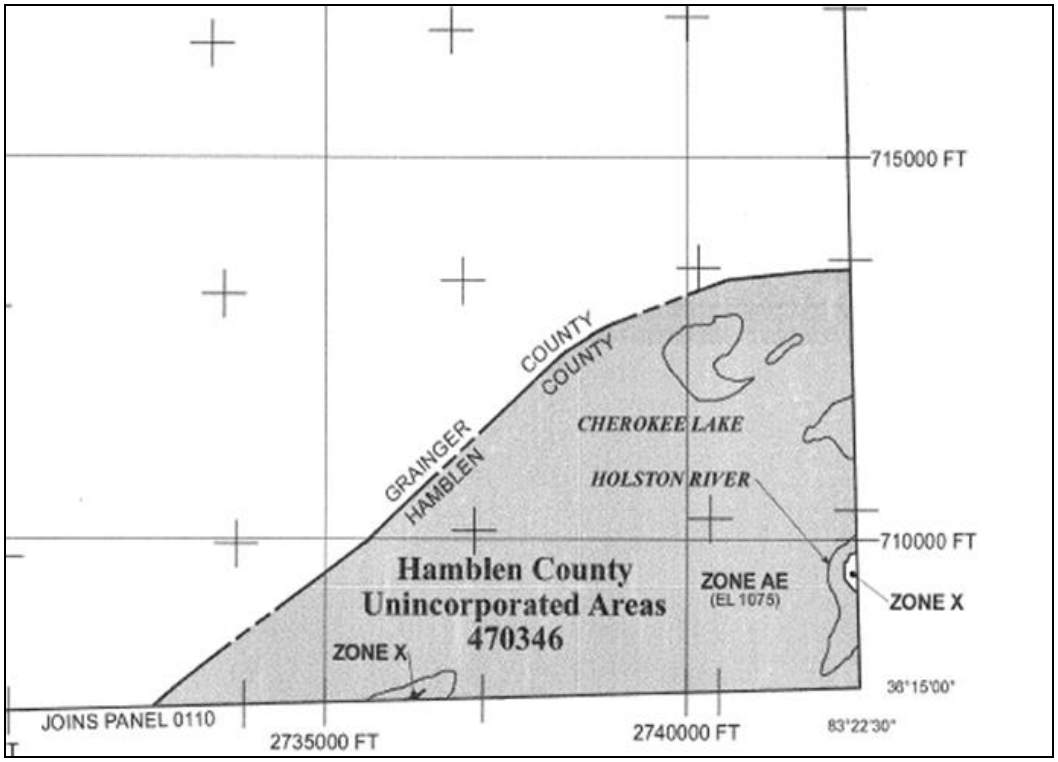


The above map shows Hamblen County broken into FIRM Panels with numeric labeling. The following maps show a close-up of each Panel Label indicating the area's 100 year floodplains through shading. These maps were produced on July 3, 2006 and are available from the FEMA Map Service Center.


NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0025E
FIRM
FLOOD INSURANCE RATE MAP
HAMBLEN COUNTY, TENNESSEE
AND INCORPORATED AREAS
PANEL 25 OF 250
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS
COMMUNITY NUMBER PANEL SUFFIX
HAMBLEN COUNTY 470346 0025 E
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
47063C0025E
EFFECTIVE DATE
JULY 3, 2006
Federal Emergency Management Agency


LEGEND
SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
FLOODWAY AREAS IN ZONE AE
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
OTHER FLOOD AREAS
ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
OTHER AREAS
ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
Floodplain Boundary
Floodway Boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513
Base Flood Elevation line and value; elevation in feet*
(EL 987)
Base Flood Elevation value where uniform within zone; elevation in feet*
*Referenced to the North American Vertical Datum of 1988
A
A
Cross section line
23
23
Transect line
45° 02' 08", 93° 02' 12"
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

Panel 1



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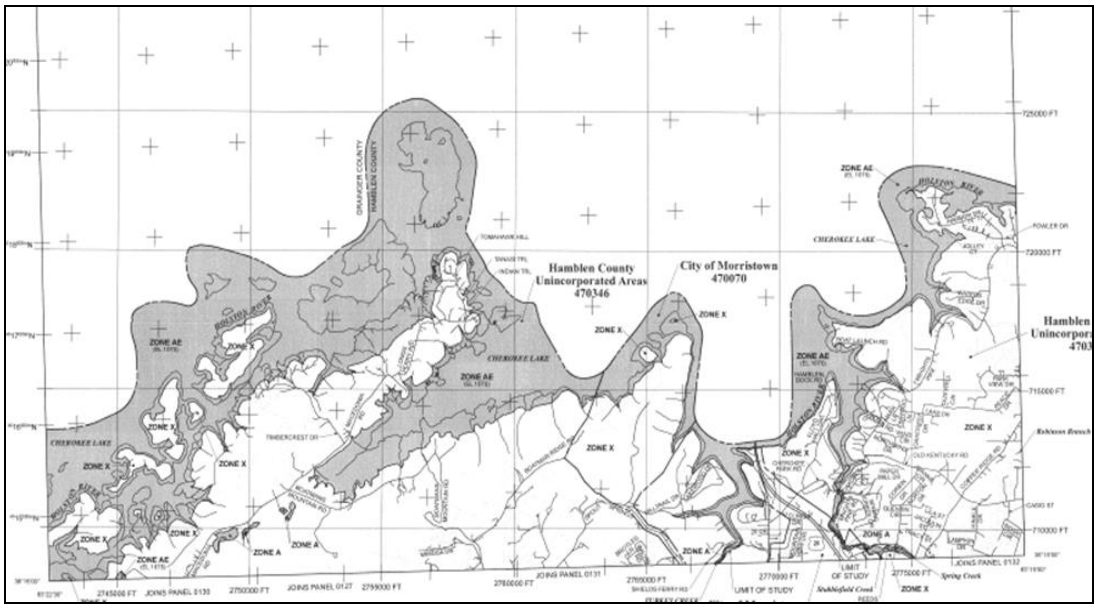

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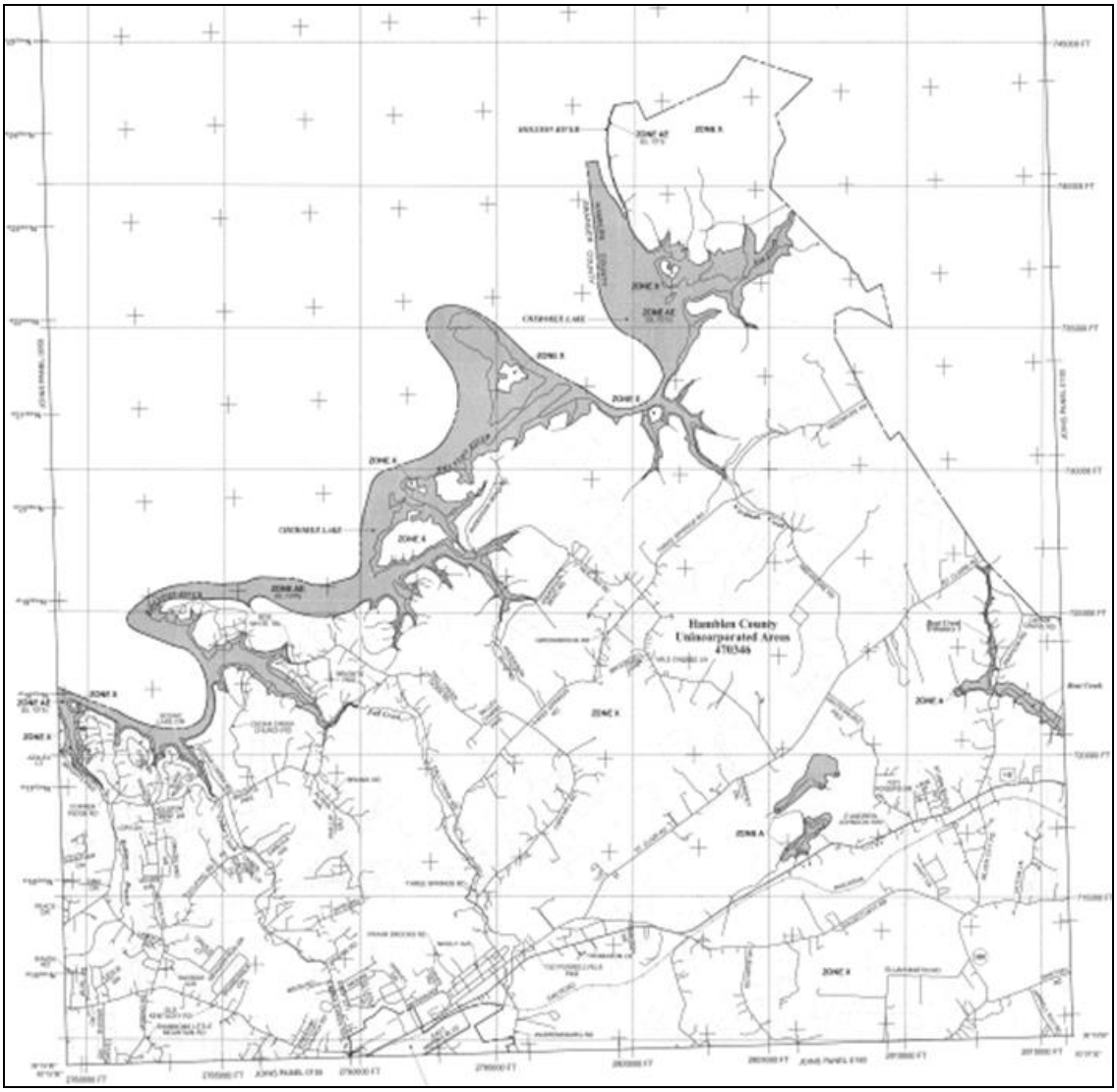

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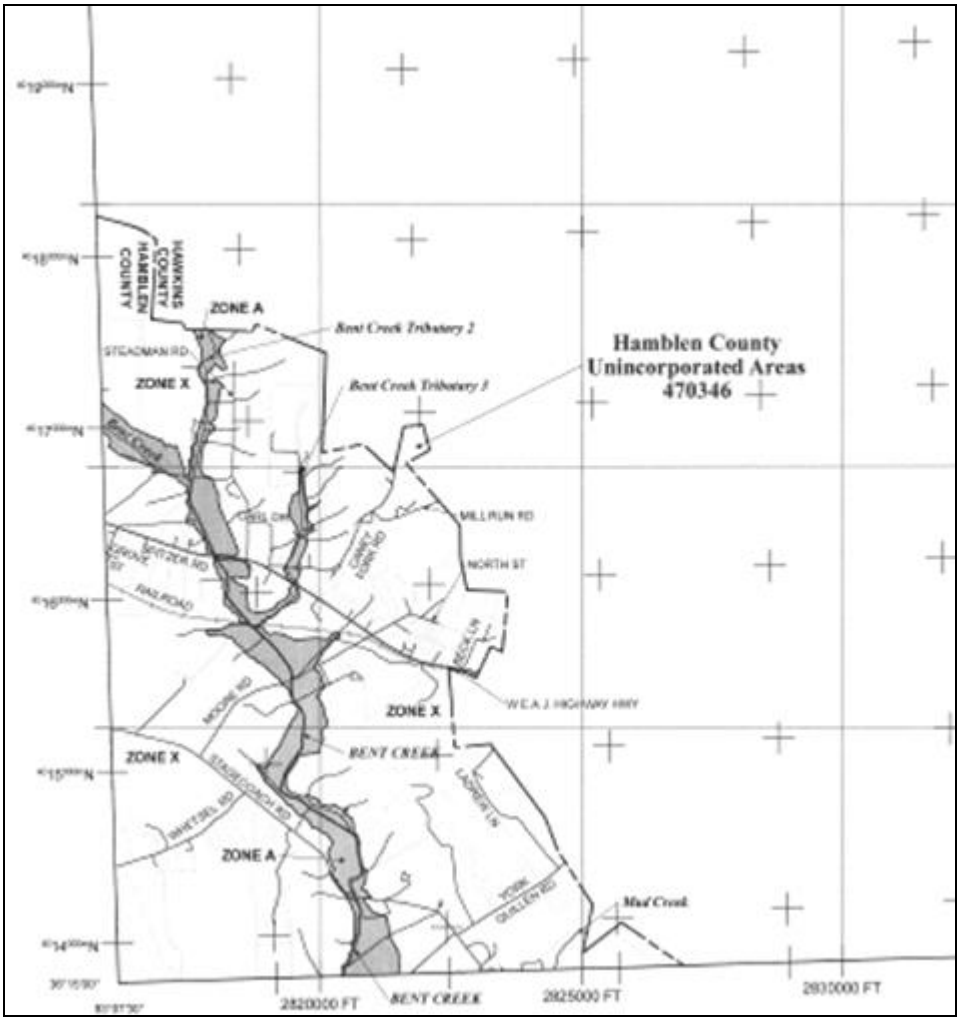
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STEADMAN RD
ZONE X
Bent Creek Tributary 1
Hamblen County
Unincorporated Areas
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Bent Creek
MILL RUN RD
NORTH ST
RAILROAD
ZONE X
MOORE RD
BENT CREEK
ZONE X
STAGECOACH RD
ZONE A
Mud Creek
2820000 FT
BENT CREEK
2825000 FT
2830000 FT

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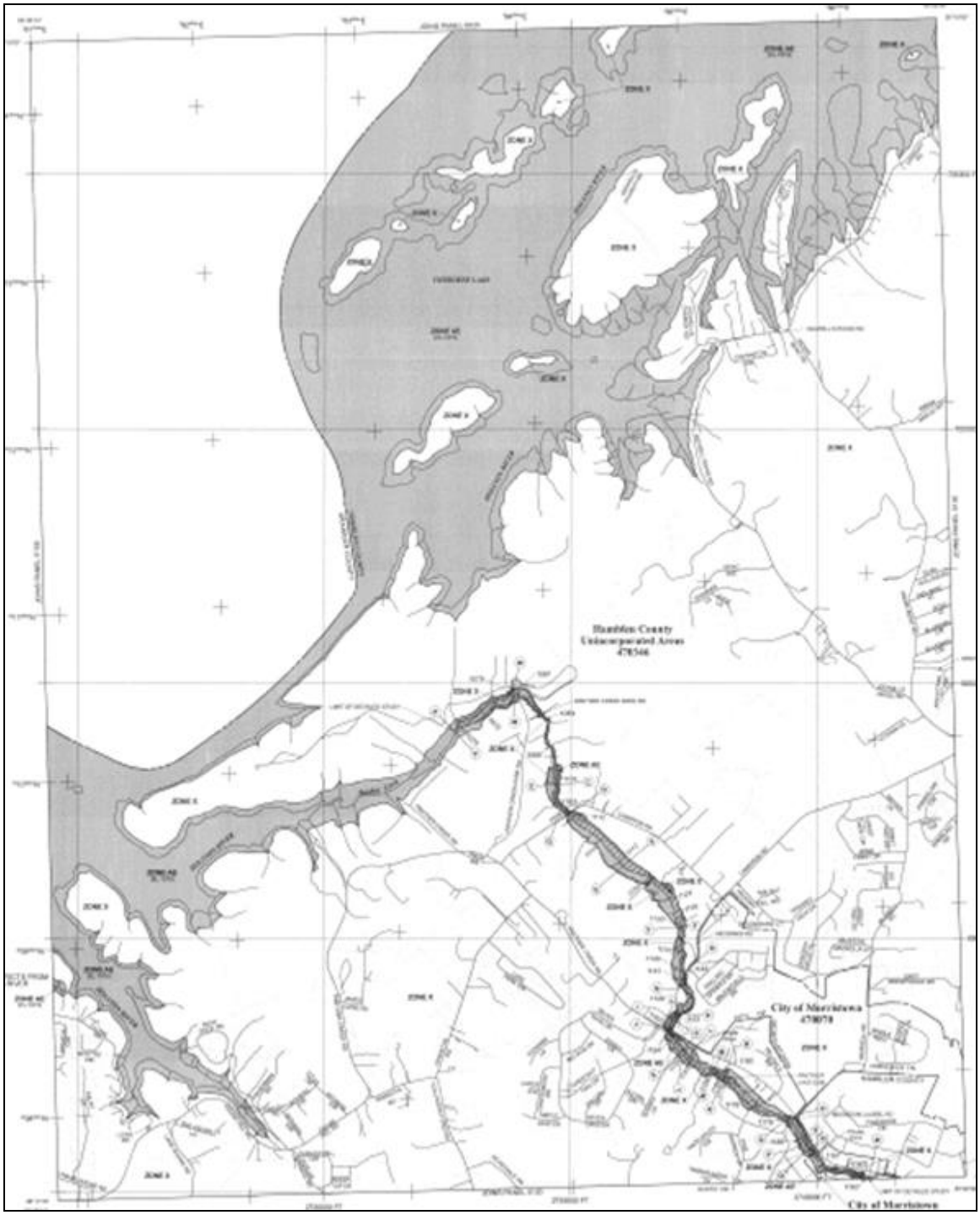

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City of Morristown
470070
Hamblen County
Unincorporated Areas
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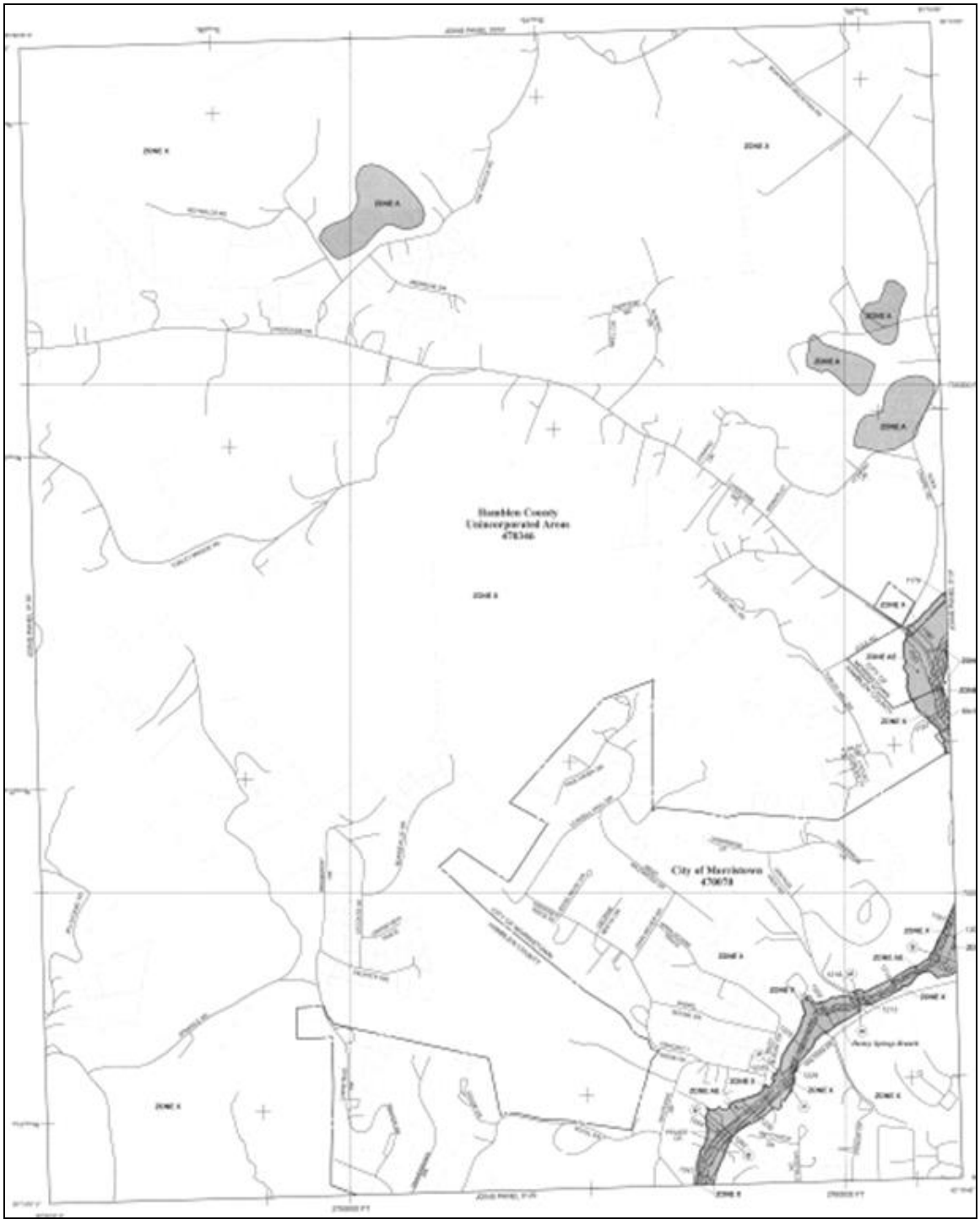
Hamblen County

Panel 7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City of Morristown
470078

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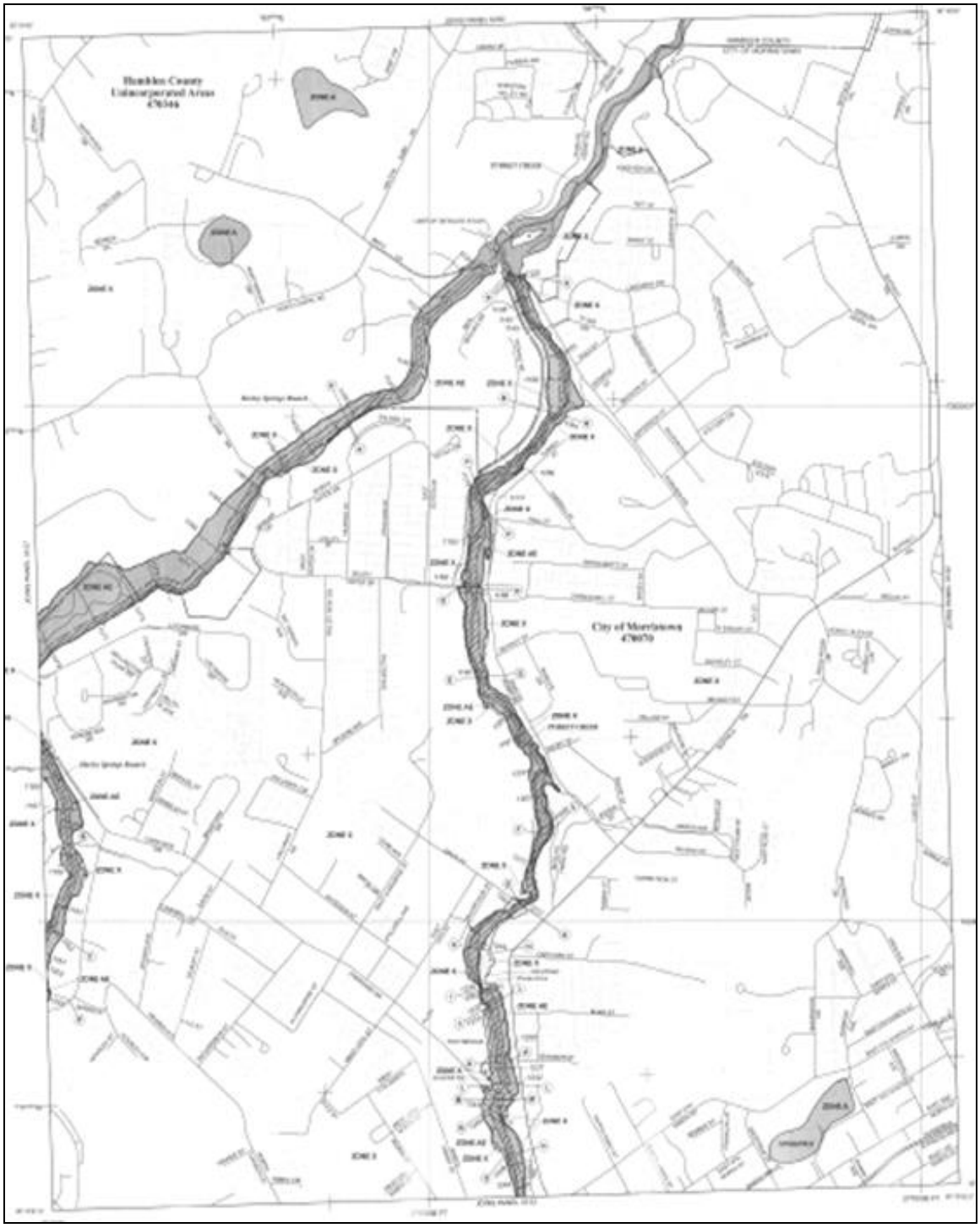
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City of Morristown
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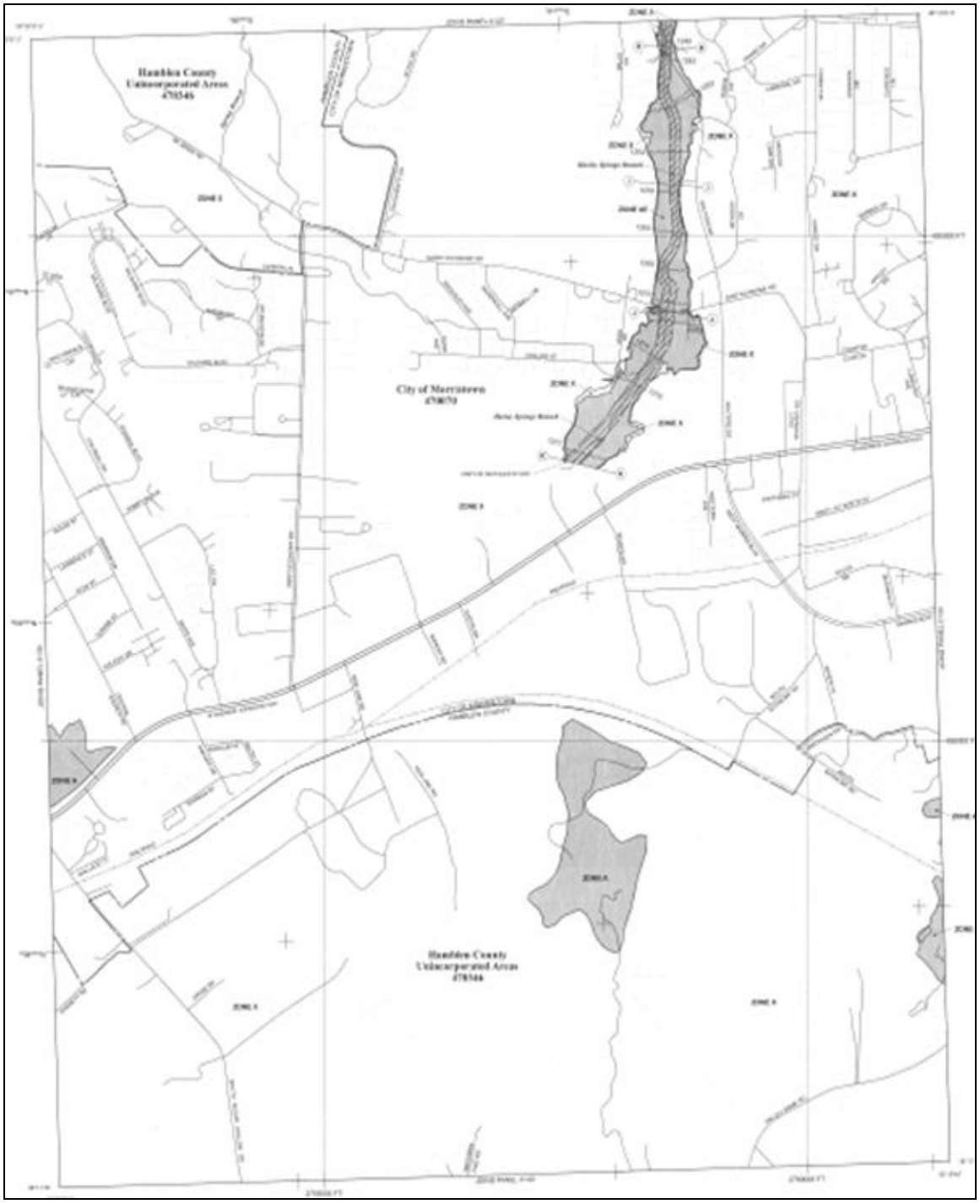
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City of Morristown
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Hamblen County
Unincorporated Areas
470346

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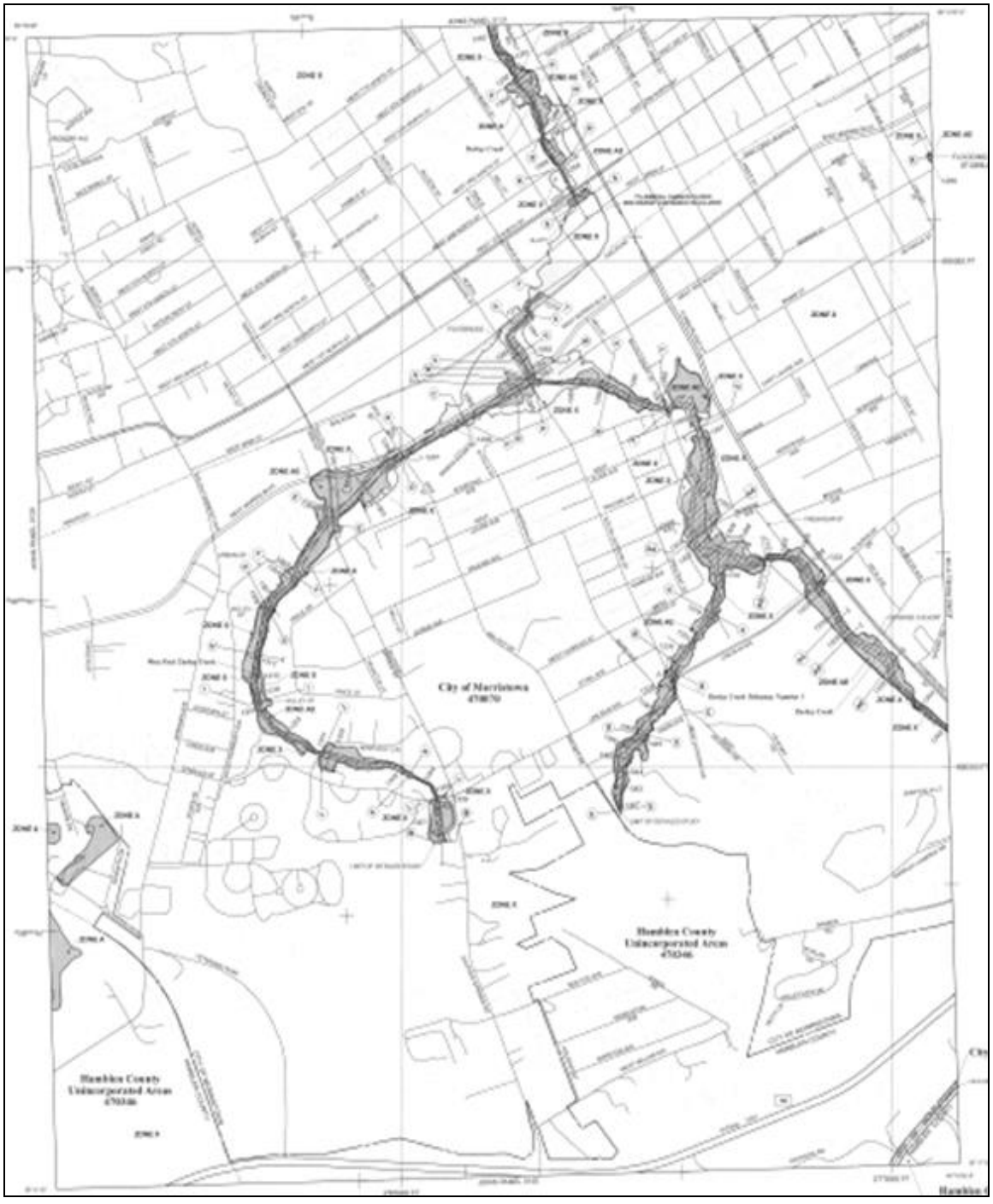
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Hamblen County
Unincorporated Areas
Hamblen County
Unincorporated Areas

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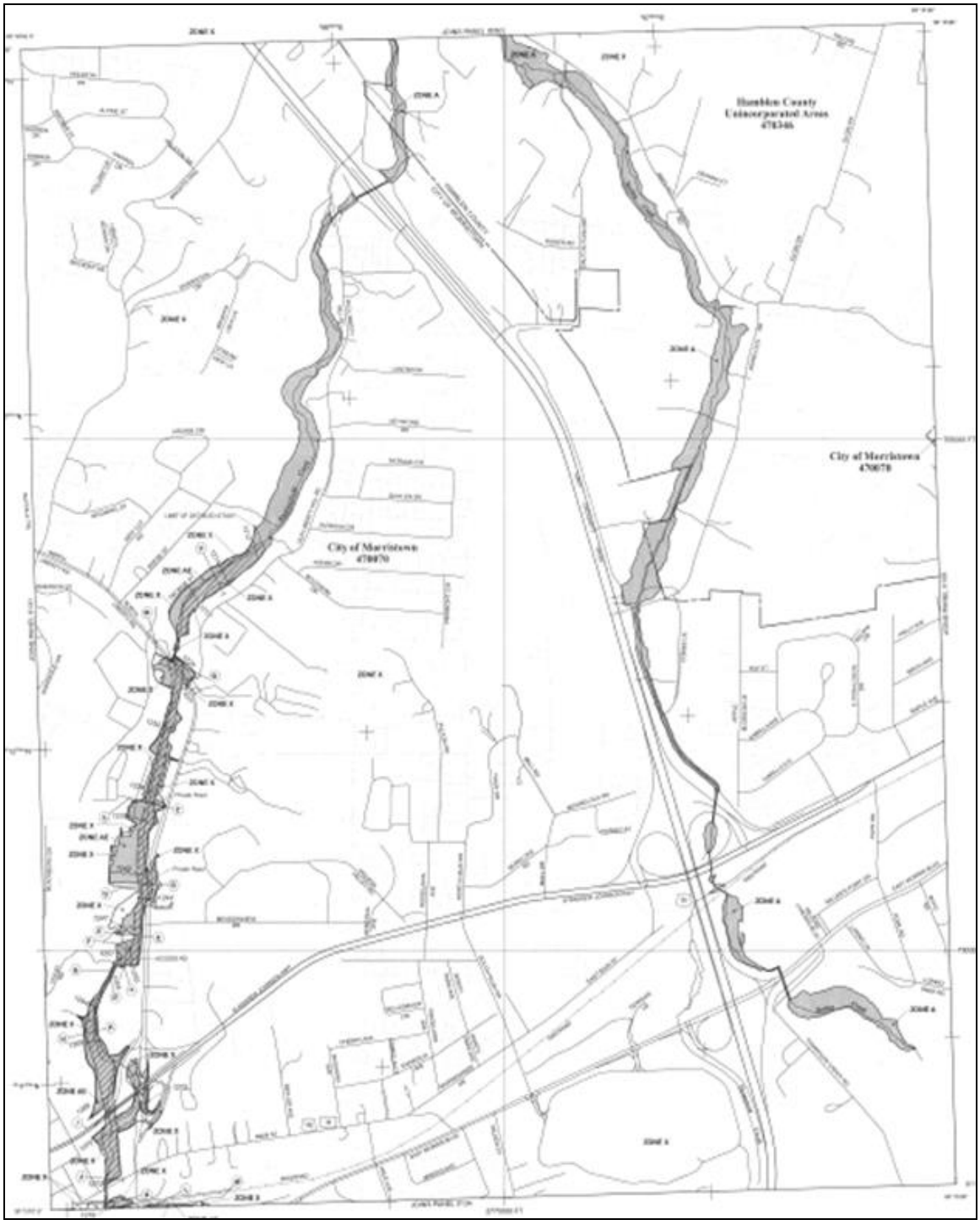
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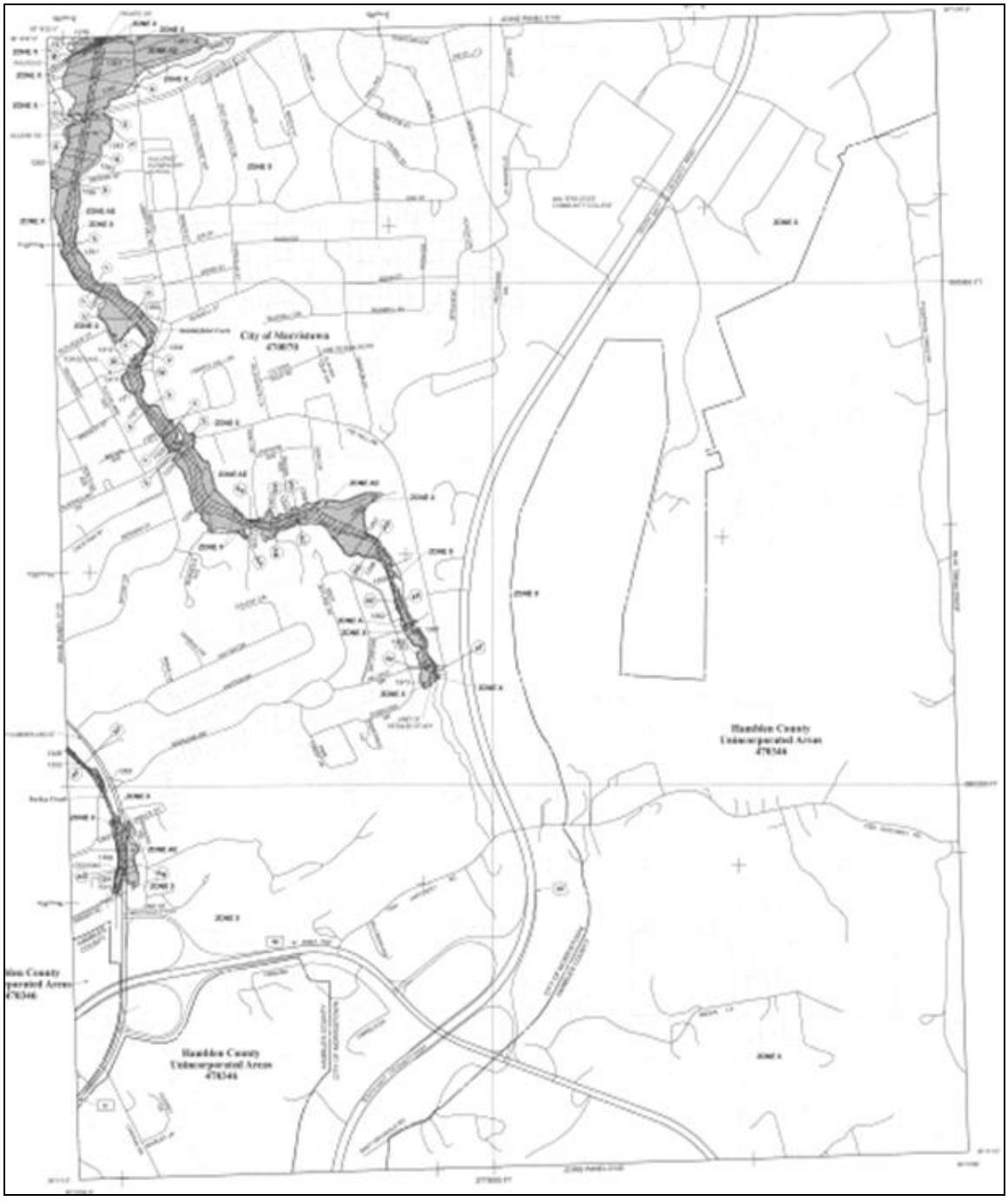
Unincorporated Areas
City of Morristown
City of Morristown

Panel 11B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Unincorporated Areas
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Hamblen County
Unincorporated Areas
470346

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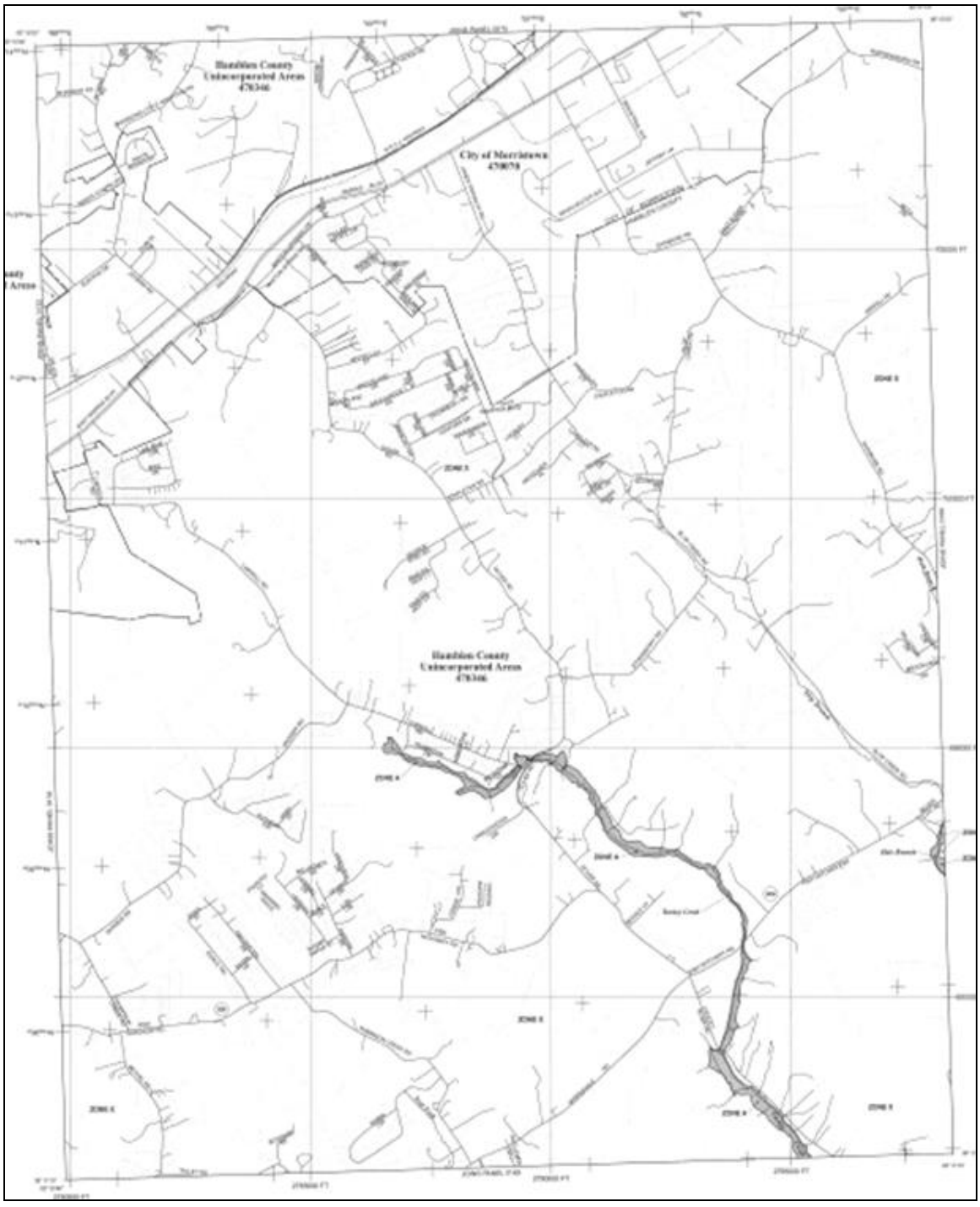
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City of Morristown
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Hamblen County
Unincorporated Areas
470346

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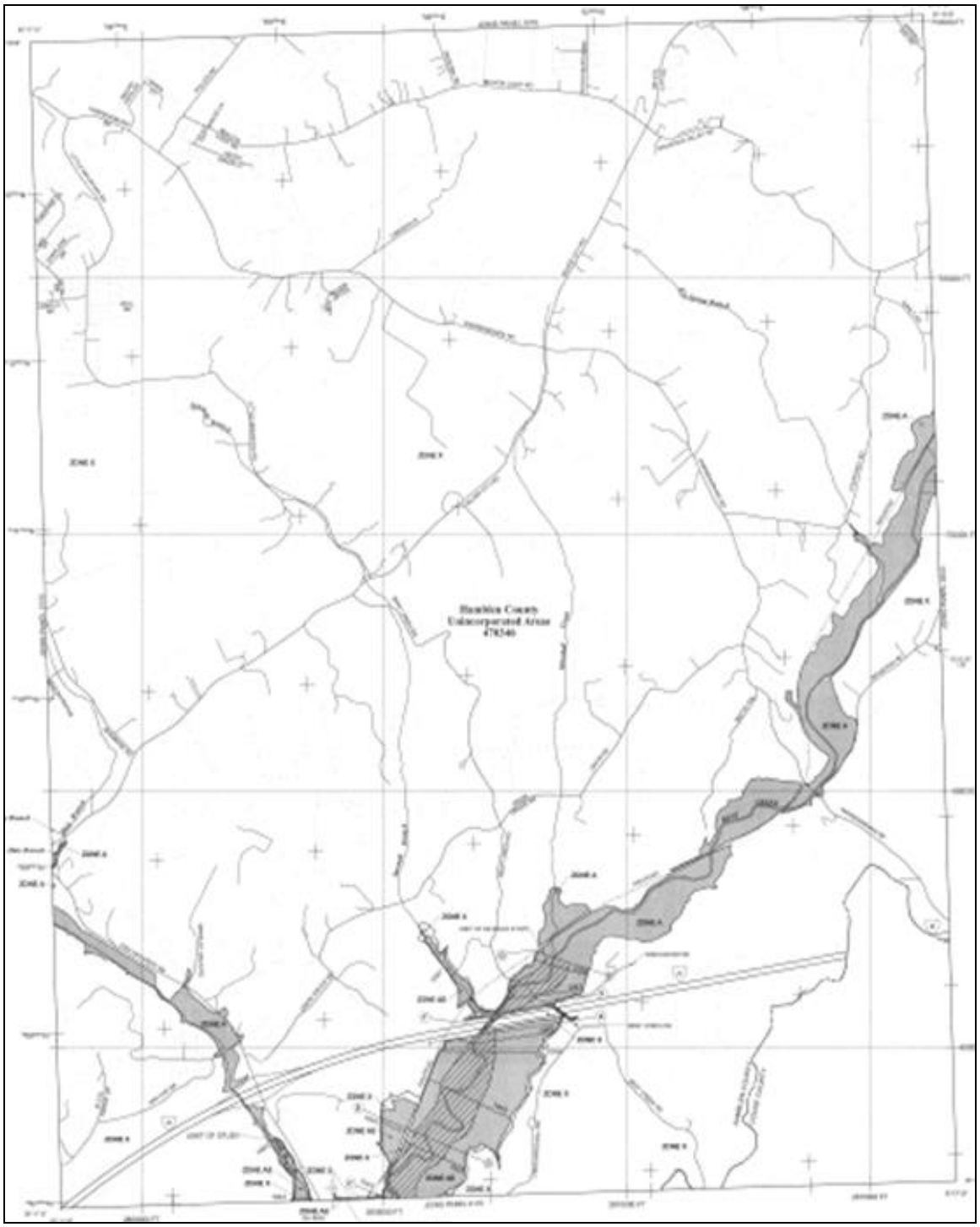

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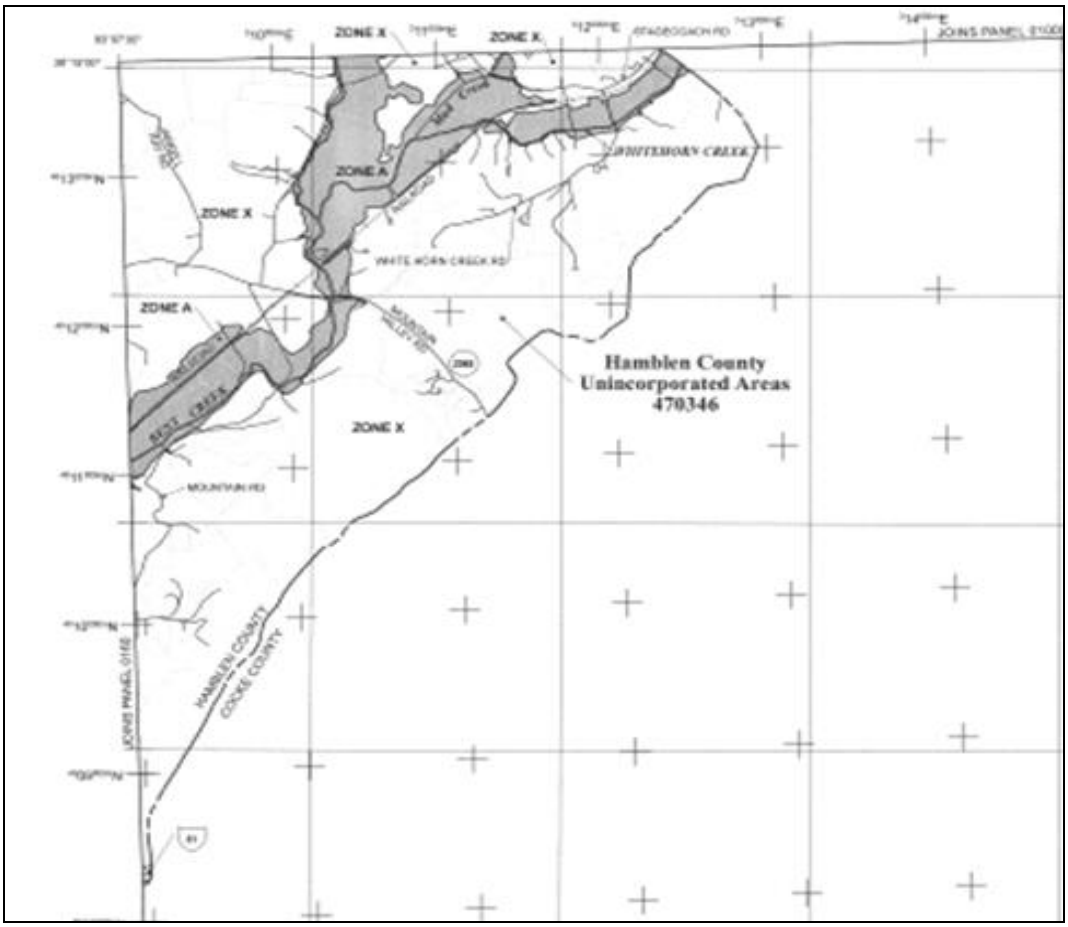
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ZONE X
ZONE A
ZONE X
ZONE A
ZONE X
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Unincorporated Areas
470346
HAMBLEN COUNTY
COOKE COUNTY
JOHNS PANEL 0145

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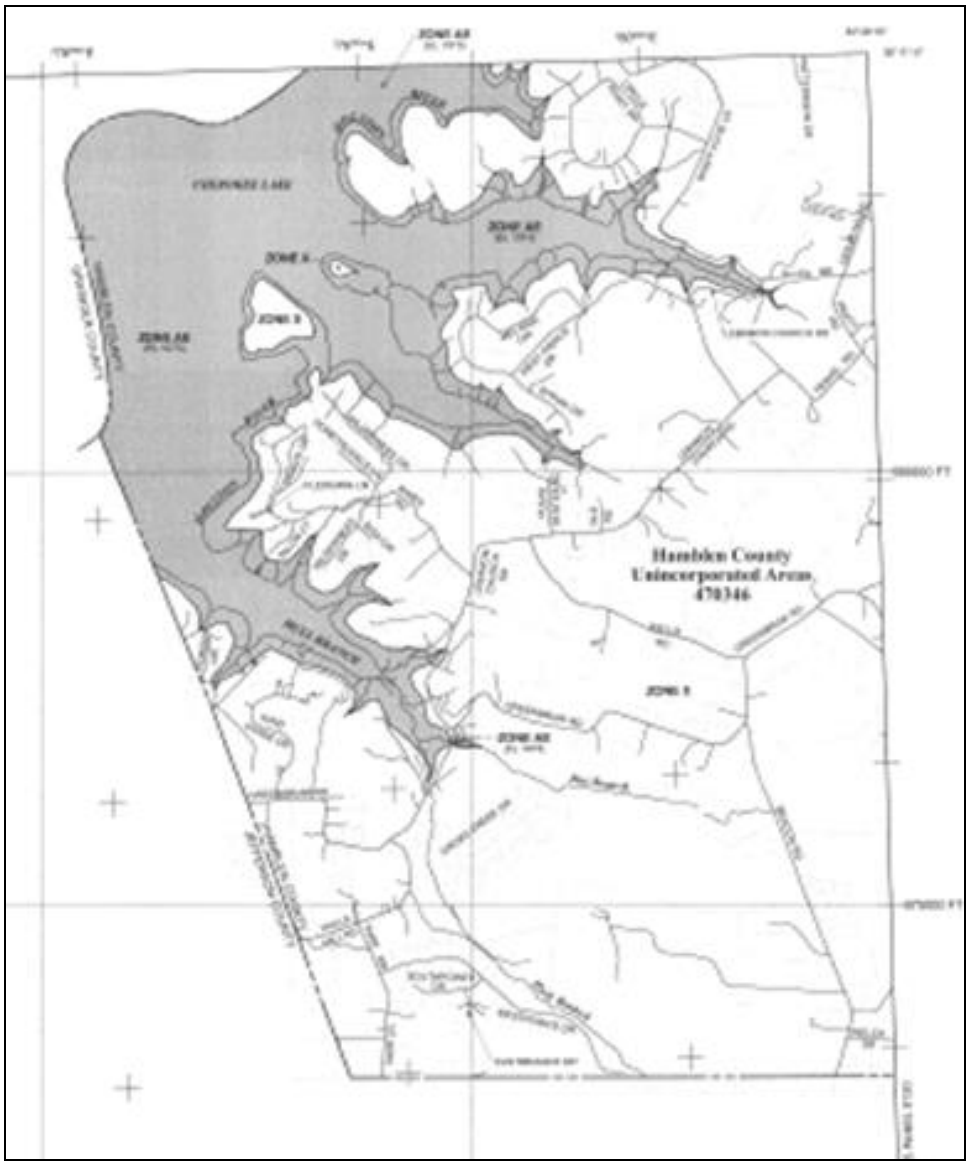

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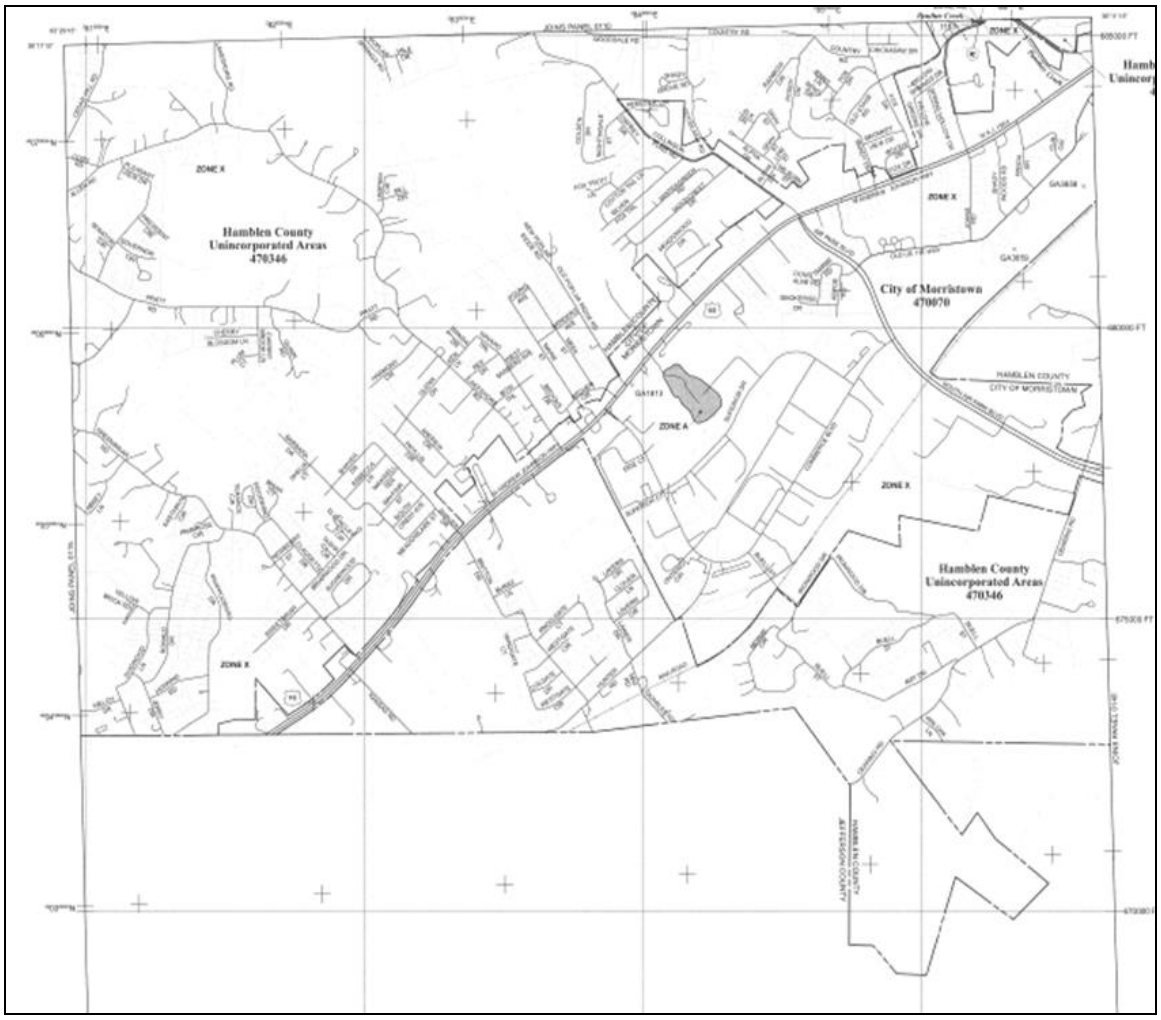
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City of Morristown
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Hamblen County
Unincorporated Areas
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ZONE X
ZONE A

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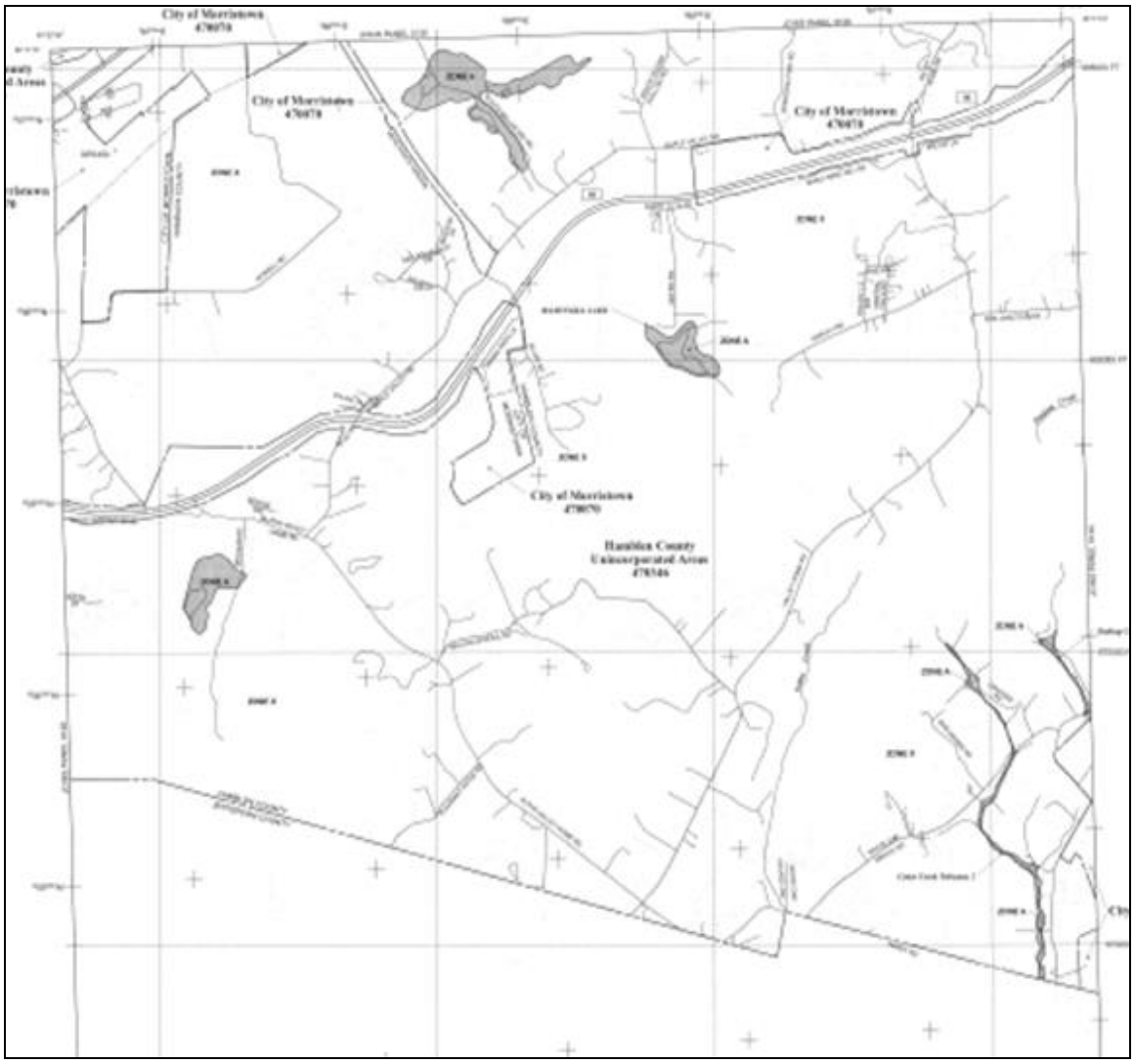
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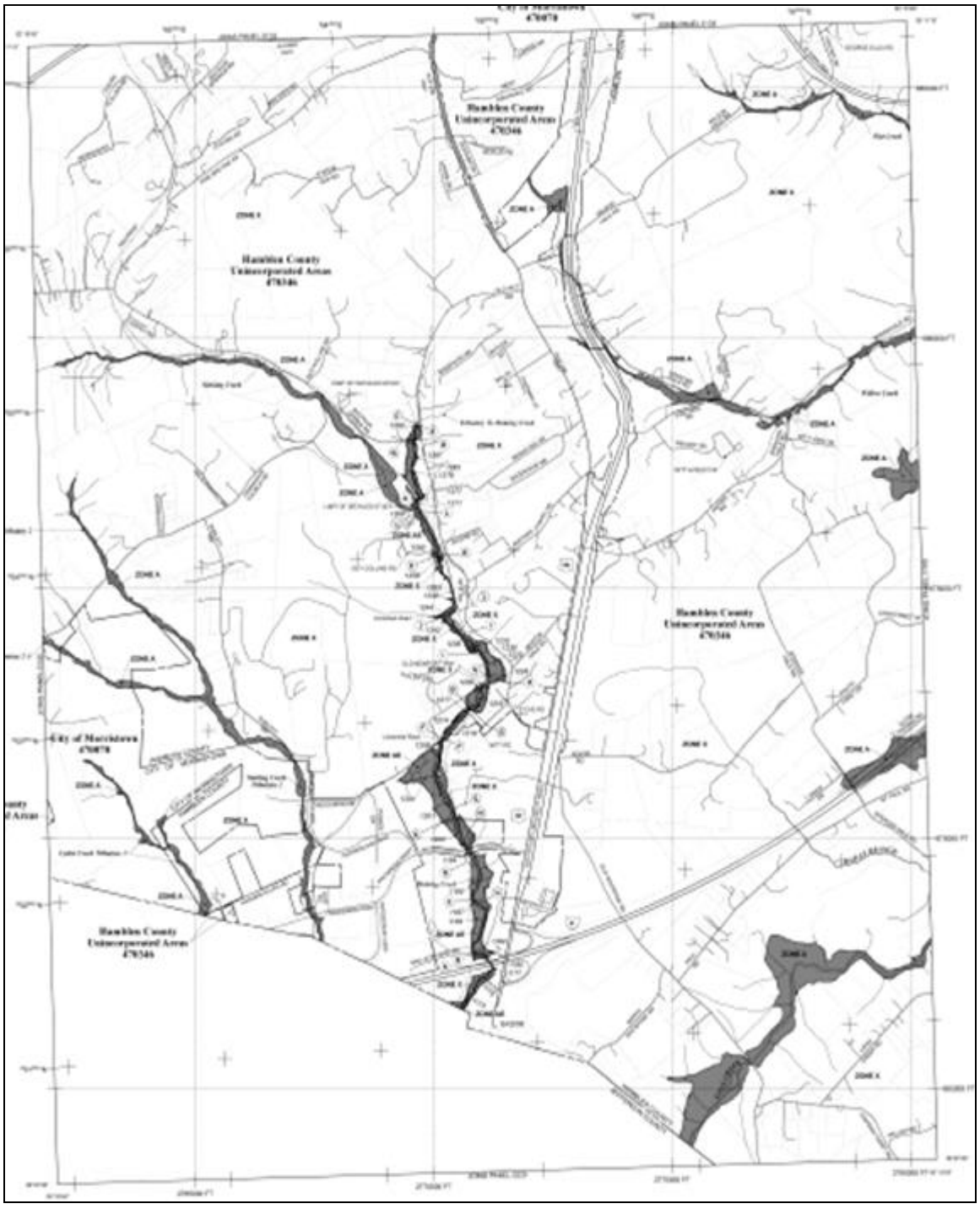
Hamblen County
Unincorporated Areas
470346

Panel 18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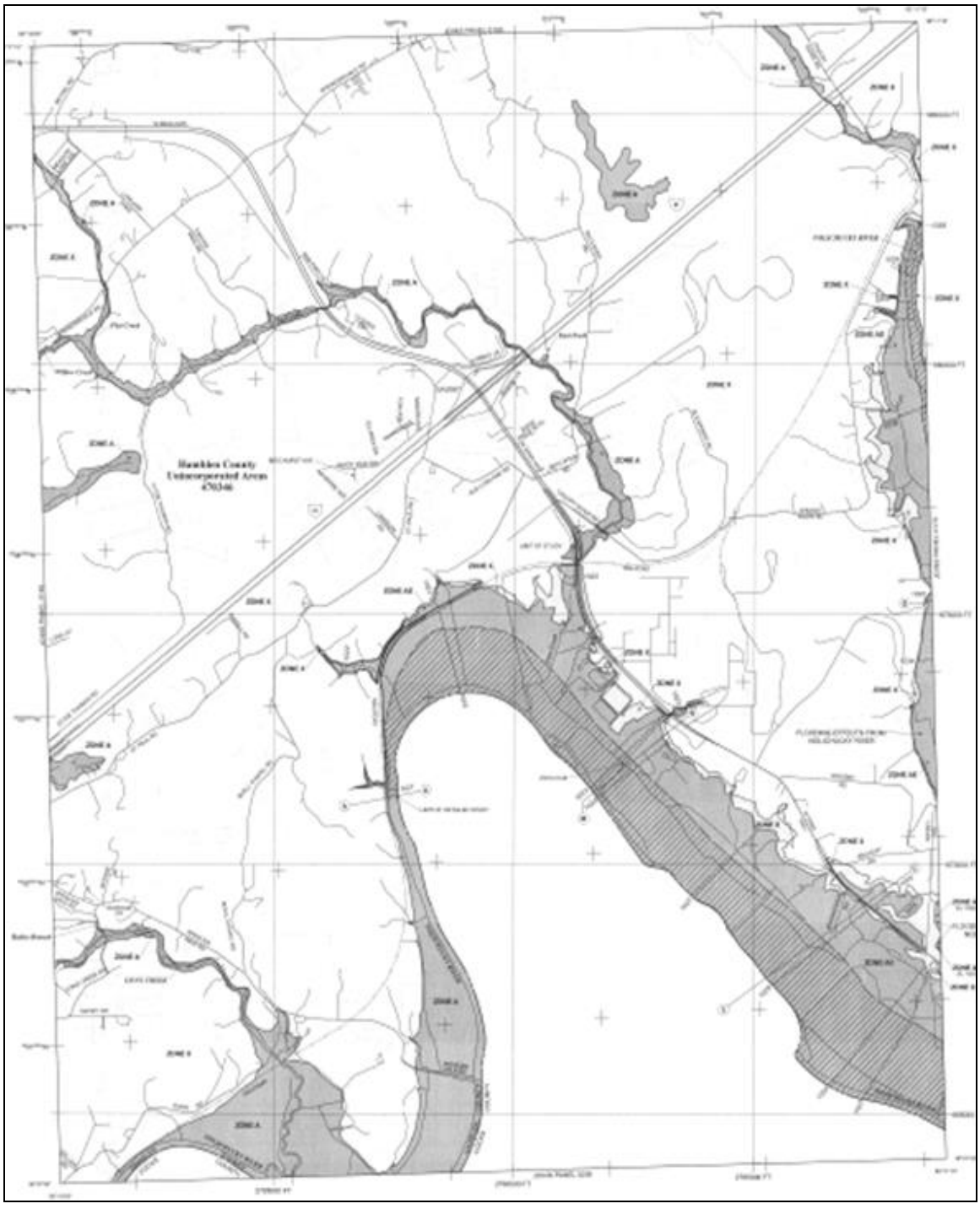
Unincorporated Areas
470346
Hamblen County
Unincorporated Areas
470346
Hamblen County
Unincorporated Areas
470346
City of Morristown
470078
Hamblen County
Unincorporated Areas
470346

Panel 19



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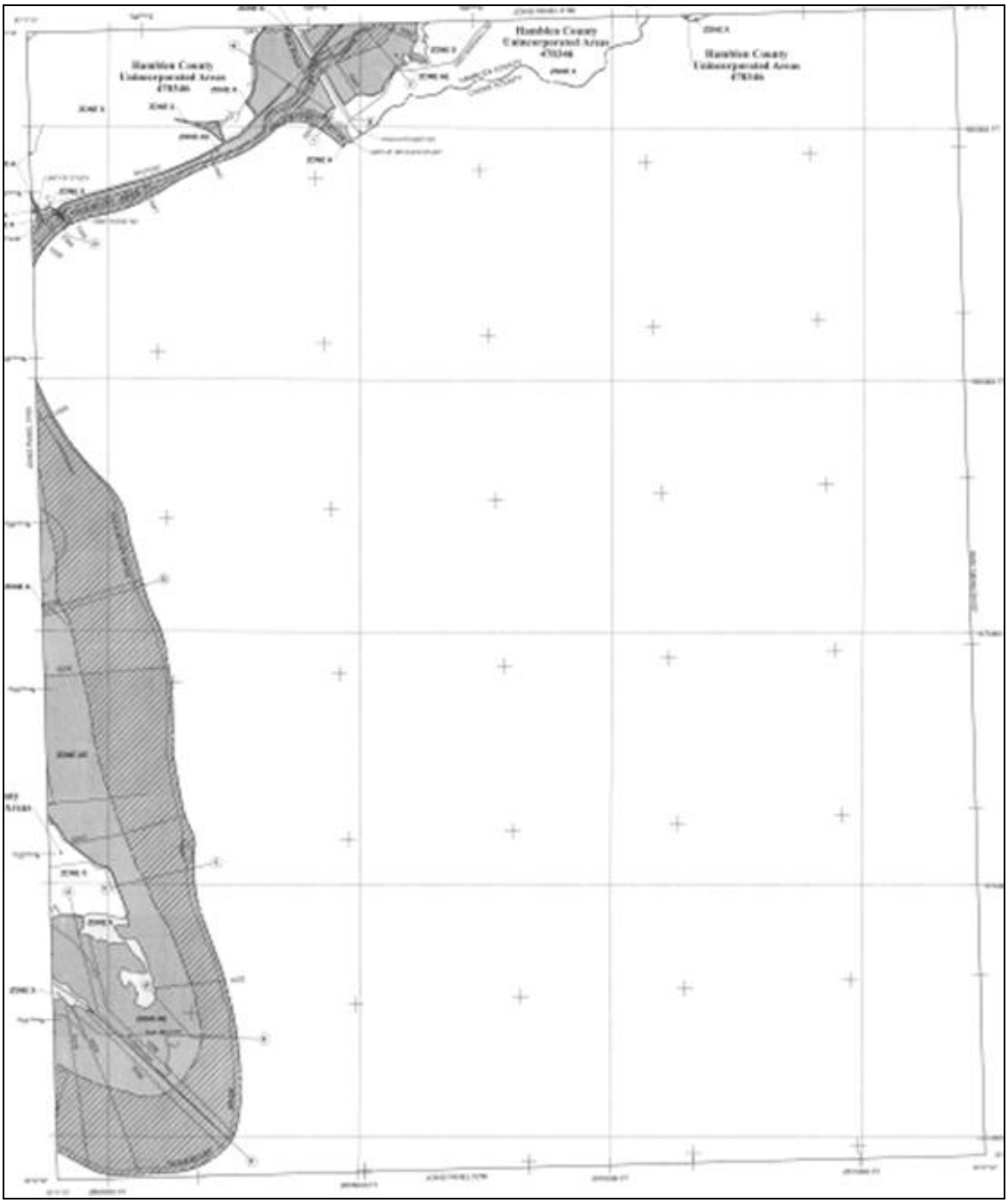

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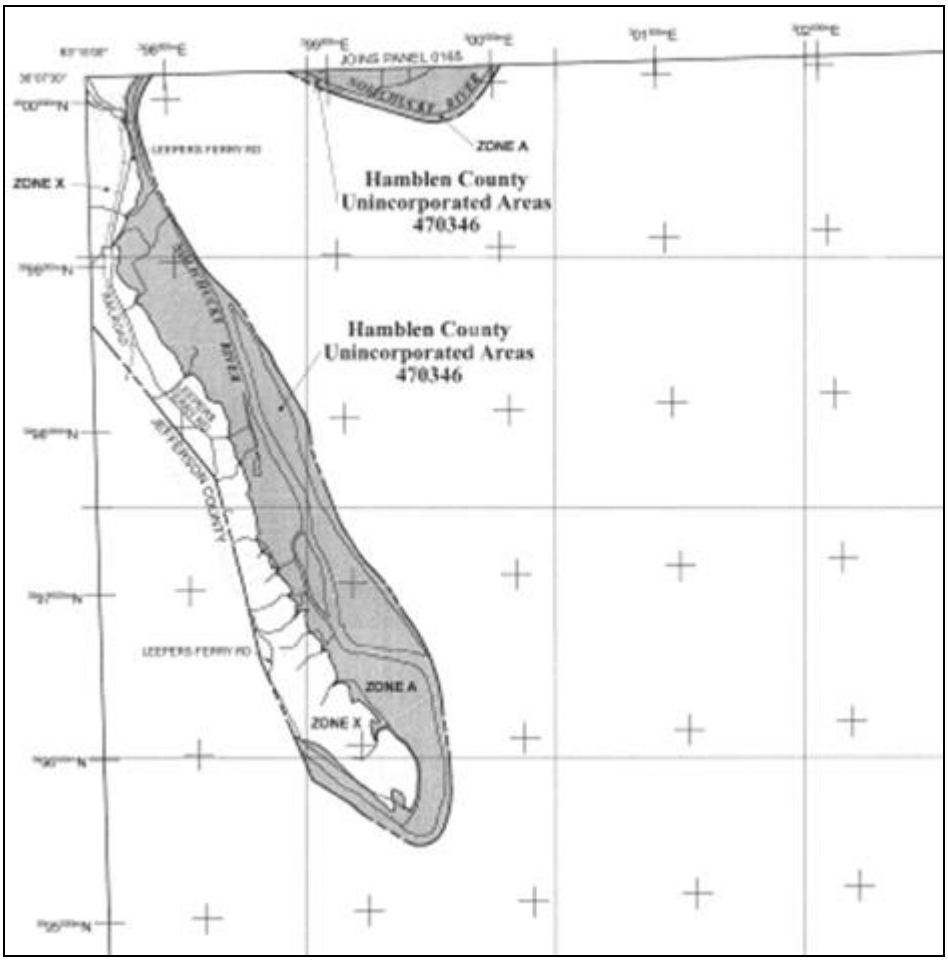
JOINS PANEL 0165
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ZONE X
Hamblen County
Unincorporated Areas
470346
Hamblen County
Unincorporated Areas
470346
ZONE A
ZONE X

Appendix 7

HAZUS: Flood

Hazus-MH: Flood Event Report

Region Name: HamblenCo

Flood Scenario: 100 year flood

Print Date: Friday, February 17, 2017

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.

Table of Contents

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 176 square miles and contains 2,321 census blocks. The region contains over 25 thousand households and has a total population of 62,544 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 26,439 buildings in the region with a total building replacement value (excluding contents) of 6,481 million dollars (2010 dollars). Approximately 91.55% of the buildings (and 71.73% of the building value) are associated with residential housing.

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Building Inventory

General Building Stock

Hazus estimates that there are 26,439 buildings in the region which have an aggregate total replacement value of 6,481 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	4,648,815	71.7%
Commercial	975,462	15.1%
Industrial	609,369	9.4%
Agricultural	15,684	0.2%
Religion	115,858	1.8%
Government	30,518	0.5%
Education	85,370	1.3%
Total	**6,481,076**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	660,855	83.4%
Commercial	65,406	8.3%
Industrial	52,580	6.6%
Agricultural	2,048	0.3%
Religion	8,865	1.1%
Government	417	0.1%
Education	1,972	0.2%
Total	**792,143**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 2 hospitals in the region with a total bed capacity of 278 beds. There are 23 schools, 5 fire stations, 2 police stations and no emergency operation centers.

Building Damage

General Building Stock Damage

Hazus estimates that about 10 buildings will be at least moderately damaged. This is over 67% 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

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	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	5	50.00	3	30.00	1	10.00	1	10.00	0	0.00
Total	**0**		**5**		**3**		**1**		**1**		**0**	

Table 4: Expected Building Damage by Building Type

Building	1-10		11-20		21-30		31-40		41-50		Substantially	
Type	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	5	50.00	3	30.00	1	10.00	1	10.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 278 hospital beds available for use. On the day of the scenario flood event, the model estimates that 278 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	5	0	0	0
Hospitals	2	0	0	0
Police Stations	2	0	0	0
Schools	23	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 955 tons of debris will be generated. Of the total amount, Finishes comprises 56% of the total, Structure comprises 21% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 38 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 126 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 56 people (out of a total population of 62,544) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 15.87 million dollars, which represents 2.00 % 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 15.86 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 76.53% 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
Building Loss						
	Building	8.06	0.50	0.19	0.14	8.89
	Content	4.08	1.65	0.46	0.60	6.79
	Inventory	0.00	0.08	0.10	0.01	0.19
	Subtotal	**12.14**	**2.23**	**0.74**	**0.75**	**15.86**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.01
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
ALL	**Total**	**12.14**	**2.23**	**0.74**	**0.75**	**15.87**

Appendix A: County Listing for the Region

Tennessee

- Hamblen

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Tennessee				
Hamblen	62,544	4,648,815	1,832,261	6,481,076
Total	**62,544**	**4,648,815**	**1,832,261**	**6,481,076**
Total Study Region	**62,544**	**4,648,815**	**1,832,261**	**6,481,076**