7:4 Risk Assessment

All Components of this Risk Assessment were developed using the best available data in the Purchase Region. GIS resources and public input were used to identify which hazards, of those listed below, affect the Purchase Region. The Purchase Area Development District (PADD) staff compiled this information to identify hazards and the Jackson Purchase Hazard Mitigation Council (JPHMC) reviewed the definitions and discussed their occurrence in and impact on the region. This review identified all hazards to the region and consequently all hazards that affect Hickman County.

Of the three jurisdictions in Hickman County—the County proper, the City of Clinton, and the City of Columbus—all three are eligible and will participate in the Jackson Purchase Hazard Mitigation (JPHM) Plan. It should be noted, however, that, while the Cities of Clinton and Columbus are participating, the county currently is not a participant in the National Flood Insurance Program (NFIP), despite having mapped its Special Flood Hazard Areas (SFHAs).

During the 2012 hazard mitigation update planning process Hickman County considered NFIP participation; but it was rejected by the Fiscal Court. NFIP participation was visited again at the beginning of the 2018 update cycle and at that time the Court still did not have an interest in NFIP participation. The Mitigation Planning Team (MPT) for Hickman County will continue to conduct meetings and review current Hazards from the perspective of how they impact their jurisdiction, in the event that the Fiscal Court passes a Floodplain Management Ordnance and joins the NFIP at a later date.

For this revision, the Hickman County MPT reviewed the previous prioritization of Hazards from the perspective of how they impacted their jurisdictions. The resulting prioritization and risk assessments are contained in this county annex.

7:4.1 Identifying Hazards

FEMA recognizes many forms of natural hazards. Major natural hazards that may occur include:

- Geologic hazards
  - Tsunami
  - Volcano
  - Earthquake
  - Land Subsidence/Karst Topography
  - Landslide
- Weather generated hazards
  - Avalanche
  - Hurricane
  - Severe Thunderstorm
  - Hailstorm
  - Windstorm/Microburst
  - Severe Winter storm
  - Tornado
- Wildfire
- Flooding
  - Flashfloods
  - General Flooding
  - Coastal
  - Riverine
- Urban
- Climatological
  - Drought
  - Extreme Heat
- Failure of Man-made structures from the impact of natural forces
  - Dam Failure
  - Levee/flood Wall Failure

Natural Hazards Addressed by the Regional Plan

The regional planning process identified hazards that significantly impact the entire Purchase Region and eliminated from consideration those natural hazards that do not. Natural hazards where a historical record of damage to people and property exists, or the potential for such damage to occur, are addressed in the plan. This determination does not preclude the plan from including more hazards in future updates. The Hickman County MPT agreed that the identification process was sufficiently thorough to serve all the signatory counties of the plan and will not be repeated for the Hickman County Annex. Table 7.1 summarizes why these hazards were identified.

Table 7.1 Hazards Identified and Reasons for Identification

Hazard	How Identified	Why Identified
Tornado	* Review of past disaster damage * Review of FEMA hazard maps * Public Input	* Several past occurrences * Hazard maps show all jurisdictions affected
Flood **Flash Flood** **River Erosion**	* Review of past disaster damage (FEMA & National Climatic Data Center) * Local Emergency Management * Public Input * Review of FIRM maps	* Affects the region frequently * Maps show many flood prone areas * Public identified several regions not mapped affected by flooding * Repetitive flooding has led to the deposit of enormous amounts of silt in Kentucky's Mississippi River ports
Thunderstorm Wind **Hail**	* Review of past disaster damage * Public Input * Review of past occurrences from National Climatic Data Center	* Many events in the past * Widespread: affects all jurisdictions * High wind zone
Earthquake	* Review of Ground Motion Maps * Review of the New Madrid and Wabash Seismic Zone Maps * Public Input	* Proximity to New Madrid/Wabash Seismic Zones * Historic accounts of 1812 disaster. * Potential for destructive impact in some jurisdictions
Winter Storm / Ice Storm	* Review of past disaster damage * Review of past occurrences from National Climatic Data Center * Public Input * Local DES/KYTC	* Several past occurrences * Variety of events including snow/ ice * Can affect all jurisdictions
Excessive Heat / Drought	* Review of past disaster damage * Public Input * Review of Palmer Drought Severity Index	* Losses have occurred in past * Large impact of agriculture on the region
Dam Failure	* Review of High Risk Dams in the region * Corps of Engineers Input	*Potential for flooding *Number of High Risk dams in region
Wildfire	* Review of State Mitigation Plan * Public Input	*Potential for loss at Wildland/urban interface, * Increased fuel supply due to ice storm damage

7:4.2 Hazard Profiles

The Hickman County MPT reviewed the previously profiled hazards based on; historical evidence gathered from the National Centers for Environmental Information (NCEI), Kentucky State Climatology Center, Federal Emergency Management Agency's (FEMA) Hazard Mapping website, the Kentucky State Hazard Mitigation Plan and the Kentucky Geological Survey. The PADD staff gathered GIS information and historical data to provide to the MPT. There are some limitations to the best available GIS and historical data pertaining to hazards. The Hickman MPT identified hazards affecting the county based on past experiences. Information collected throughout the planning process by means of public input was a pertinent resource to the plan. Because the purpose of this plan is to identify hazards that present a threat to the safety of life and property, only moderate and high risk hazards will be fully addressed in this plan.

Summary of Hazard Profiles

Several overall conclusions can be drawn from the information gathered in the Hazard Profiles. Based on historical frequency and past disaster damages, several hazards identified in the Regional Plan, stand out as more significant threats to Hickman County, while several others appear to be less significant.

According to frequency and damage figures, Winter Storms, Thunderstorm Wind, Tornadoes, and Flash Flood / Flood stand out as the most significant threats to Hickman County. Earthquake is a hazard rated by committee members as one of the biggest potential threats. There is no historical data on actual earthquake damages in Hickman County to analyze the threat, and considerable debate as to the severity of the resultant damage even for the "worst case scenario".

Hail, Drought, and Dam Failure were also determined to be threats to the county, yet historic frequency and damage data do not suggest that these are among the most significant. There is no historical occurrence of damage or injury due to a dam failure in Hickman County. Hailstorms are a hazard that threatens the county, having caused some property and crop damage. Drought is a threat to the Agricultural segment of the county economy.

Table 7.2 is a summary of past Declared Disasters as provided by FEMA for Hickman County. This table is limited to providing information only related to declared disasters on the county level and does not list each jurisdiction.

Table 7.2 Presidential Disaster Declarations that Affected PADD Counties

DR#	Declaration Date	Disaster Type	Total Declared Counties	Declared Counties	Counties Declared for Public Assistance and Individual Assistance	Counties Declared for Public Assistance Only	County	DH Approved Funding	IFG Approved
381	5/11/1973	Severe Storms, Flooding	5	Ballard, Carlisle, Fulton, Hickman, McCracken	Ballard, Carlisle, Fulton, Hickman, McCracken	0			
461	3/29/1975	Severe Storms, Flooding	17	Ballard, Calloway, Fulton, Graves, Hickman, Marshall, McCracken	Ballard, Calloway, Fulton, Graves, Hickman, Marshall, McCracken	0			
821	2/24/1989	Severe Storms, Flooding	67	Ballard, Carlisle, Graves, Hickman, Marshall, McCracken	Ballard, Carlisle, Graves, Hickman, Marshall, McCracken	0			
1089	1/13/1996	Blizzard	120	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			
1163	3/4/1997	Flooding	101	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	Ballard, Carlisle, Fulton, Hickman, Marshall, McCracken	Calloway	McCracken	$137,084.85	$78,709.00
1802	10/9/2008	Severe Wind Storm	36	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			
3302	1/28/2009	Severe Wind Storm	114	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			
1818	2/5/2009	Severe Winter Storm, Flooding	117	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken	0	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, Marshall, McCracken,			
1976	5/4/2011	Severe Storms, Tornadoes, Flooding	22	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman,		Calloway			

DR#	Declaration Date	Disaster Type	Total Declared Counties	Declared Counties	Counties Declared for Public Assistance and Individual Assistance	Counties Declared for Public Assistance Only	County	DH Approved Funding	IFG Approved
				Marshall, McCracken					
4057	3/6/2012	Severe Storms, Tornadoes, Straight-line Winds, Flooding	1	Ballard		Ballard			
4216	4/30/2015	Severe Winter Storms, Snowstorms, Flooding, Landslides, Mudslides	3	Ballard, Marshall, McCracken		Ballard, Marshall, McCracken			
4218	5/12/2015	Severe Winter Storms, Snowstorms, Flooding, Landslides, Mudslides	3	Calloway, Fulton, Marshall		Calloway, Fulton, Marshall			
4278	8/26/2016	Severe Storms, Tornadoes, Flooding, Landslides, Mudslides	2	Calloway, Marshall		Calloway, Marshall			

Source:https://www.fema.gov/disasters?field_state_tid_selective=49&field_disaster_type_term_tid=All&field_disaster_declaration_type_value=All&items_per_page=20&=GO

According to State Department of Emergency Management records Hickman County was eligible for Public Assistance as a result of the above declarations.

For this revision, the Hickman County MPT reviewed the prioritization of Hazards from their 2012 Plan keeping the risk order the same for the 2018 Plan. Updated climatic/event data, 2016 revised flood zones, local events occurring since the previous plan, 2010 Census data and 2015 American Community Survey provided a higher resolution for the resulting Hazard risk assessment prioritization. The following discussions of risk and risk assessments are in the order of these reaffirmed priorities.

Table 7.3 Hickman County Hazard Summary Table

PLAN VERSION	2017	2012
HIGH RISK HAZARDS	WINTER STORM THUNDERSTORM WIND TORNADO FLASH FLOOD / FLOOD	WINTER STORM SEVERE STORM TORNADO FLOODING
MODERATE RISK HAZARDS	EARTHQUAKE	EARTHQUAKE
LOW RISK HAZARDS	HAIL DROUGHT DAM FAILURE	HAILSTORM DROUGHT DAM FAILURE

SOURCE: Hickman County MPT 2017
Note: MPT discussion left hazards unchanged from 2012; table updated to reflect NCEI terminology The storm events database for the NCEI, formerly the National Climatic Data Center, will be the source utilized for the best available data for the Purchase Region. Please see the NCEI contact page if you have questions. https://www.ncdc.noaa.gov/customer-support

Table 7.4 represents a summary of the hazard events identified by the MPT that are recorded in the NCEI Storm Events Database for Hickman County for the period 01/01/1950 thru 03/31/2017. Data is available as early as 1950, but depending on reporting for events, the first event on record may come at a much later time. The detailed, disaggregated listing of these events are included in Appendix 1.

Please see NCEI (formerly the National Climatic Data Center) contact page if you have questions at https://www.ncdc.noaa.gov/customer-support

Table 7.4 Summary of Hazard Previous Occurrences and Impacts
January 1, 1950 – March 31, 2017

Event	Events	Death	Injury	Damage($)	Damage($)
Tornado	7	0	0	$387.25K	0
Thunderstorm Wind	66	0	1	$628.00K	$10.00K
Winter Storm	15	0	0	0	0
Ice Storm	4	0	0	$10.20M	0
Flood	27	0	2	$130.00K	$15.00K
Flash Flood	23	0	4	$392.00K	0
Hail	27	0	0	$2.00K	0
Excessive Heat	7	0	0	0	0
Drought	32	0	0	0	$9.200M
Wildfire	1	0	0	0	0
Tornado	7	0	0	$387.25K	0
Dam Failure	No History				
1 class A structure = no loss of life anticipated, only damage to dam owner's property					
2 class B structures = loss of life not probable, some economic loss & environmental damage					

Source: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

For the purpose of the update to the 2017 JPHM Plan, the events from January 1, 2012 through the first quarter of 2017 (1/1/2017 – 3/31/2017) will be reviewed. This provides 5.25 years of recent data covering the current period for this cycle of the JPHM Plan update. For a complete listing of all events, please refer to the Appendix 1.

Winter Storm

Winter Storms can produce an array of hazardous weather conditions that include heavy snow, freezing rain and sleet, high winds and extreme cold. Winter storms are fueled by strong temperature gradients and an active upper-level cold jet stream. Winter storms can paralyze a community by shutting down normal everyday operations. Accumulating snow and ice can result in downed trees and power lines and may block transportation routes or make them hazardous. Heavy snow can also lead to the collapse of weak roofs or unstable structures. Often, the loss of electricity results in the loss of heat in some homes and buildings. This presents a threat to human life, especially the elderly population.

The level of impact Winter Storms have on a community is greatly determined by their ability to manage and control the affect it has on the community, for example the rapid mobilization of snow removal equipment. Because severe winter storms are sporadic in western Kentucky, many communities cannot afford the expensive equipment and maintenance of snow removal equipment. This increases the potential damage a severe winter storm may cause in a community. If more than a half-inch of ice accumulation occurs and damage is widespread, it can take a while to remove trees and repair power lines. This can result in a loss of electricity and heat for several days. During the planning period for this update there have been seven Winter Storms recorded in Hickman County.

Table 7.5 Winter Storm Events and Impacts in Hickman County, January 1, 2012 – March 31, 2017

Location	Date	Time	Time Zone	Deaths	Injuries	Property Damage	Crop Damage
HICKMAN (ZONE)	12/05/2013	22:00	CST-6	0	0	0.00K	0.00K
HICKMAN (ZONE)	02/04/2014	12:00	CST-6	0	0	0.00K	0.00K
HICKMAN (ZONE)	03/02/2014	10:00	CST-6	0	0	0.00K	0.00K
HICKMAN (ZONE)	02/16/2015	00:00	CST-6	0	0	0.00K	0.00K
HICKMAN (ZONE)	02/20/2015	14:00	CST-6	0	0	0.00K	0.00K
HICKMAN (ZONE)	03/04/2015	13:00	CST-6	0	0	0.00K	0.00K
HICKMAN (ZONE)	01/22/2016	01:00	CST-6	0	0	0.00K	0.00K
TOTALS				**0**	**0**	**00.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The following event description is typical of the type of winter events experienced in Hickman County.

- On December 5, 2013 a winter storm produced a variety of precipitation types across western Kentucky. The precipitation changed from rain to freezing rain, then to sleet, and finally to snow in most areas. The wintry precipitation started late in the evening across most areas, but not until early the next morning in the Hopkinsville area. The heaviest accumulations of snow and sleet were in the Ohio River counties from Henderson through Paducah to Ballard County, where 4 to 6 inches fell on top of a quarter inch of ice. Isolated amounts up to 7 inches were measured in Ballard County. Along the Tennessee border from Murray to the Hopkinsville area, about one-quarter to one-half inch of icing occurred, followed by up to an inch of sleet and snow. In between the Tennessee border counties and the aforementioned Ohio River counties, two to four inches of sleet and snow along with up to one-quarter inch of ice was reported. This included Owensboro, Madisonville, Princeton, and Mayfield. The freezing rain caused some sagging of power lines and trees, especially where glazing was the heaviest in the Hopkinsville area. Isolated power outages were reported. Where precipitation changed to snow, it fell heavily for a few hours. Visibility was reduced below one-half mile, and snowfall rates were at least an inch per hour. An off-duty meteorologist near Paducah reported nearly two inches of snow per hour. Roads were very slick and hazardous across all of western Kentucky, with numerous accidents reported. A tractor-trailer rig jackknifed on Interstate 24 between Paducah and Reidland. Another tractor-trailer rig jackknifed on the Natcher Parkway near the Owensboro by-pass. Non-essential travel was discouraged in the hardest hit counties, such as Ballard County. A state of emergency was declared in Henderson County. At a farm on State Route 1377 southeast of Bardwell (in Carlisle County), a section of a chicken house roof about 200 feet long collapsed. The roof structure of an immediately adjacent chicken house was compromised. These same areas of roof structure were likely weakened by a severe thunderstorm wind event on October 31, 2013. An arctic cold front swept east across the region, bringing much colder air. As the depth of the cold air increased behind the front, precipitation changed from freezing rain to sleet and then to snow in most areas. A pair of disturbances in the upper levels of the atmosphere moved northeast across the region, causing wintry precipitation to become heavy at times.

SUMMARY AND CONCLUSIONS OF WINTER STORMS / ICE STORM PROFILE

From January 1, 2012 through March 30, 2017, there have been seven occurrences of Winter Storms in Hickman County reported by the NCEI. There were no recorded monetary damages reported with these occurrences. Likewise, there were no injuries or fatalities recorded. The seven reported Winter Storm Events over the 5.25 year plan update period, divides out to 1.33 reported Winter Storm Events per year, or a more than 100% probability that such an event will occur in any given year. The annual cost of a Winter Storm Event could not be calculated based on recorded events for the planning update period.

Thunderstorm Wind

A thunderstorm is formed when a combination of moisture, rapidly rising, warm air, or a force capable of lifting air, meets warm and cold front, a sea breeze, or a mountain. Thunderstorms can produce tornadoes, large hail, and heavy rain which can cause flash flooding. The National Weather Service considers a thunderstorm as severe if it develops ¾ inch hail or 58 mph winds. Straight line winds during thunderstorms can exceed 100 miles per hour and are responsible for wind damage associated with thunderstorms. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.

Thunderstorms affect relatively small area when compared with winter storms, as the average storm is 15 miles in diameter and lasts an average of 30 minutes. All thunderstorms are dangerous and capable of threatening life and property in localized areas. Every thunderstorm produces lightning, which results from the buildup and discharge of electrical energy between positively and negatively charged areas.

Thunderstorms are quite frequent in Hickman County. They may produce damage, injuries, or fatalities. Numerous thunderstorms have been recorded that produce high winds, lightning, and hail in the county. Many of these thunderstorms have caused property or crop damage. Although relatively short in duration when compared to other weather events, are often long lived enough to track across the entire county before dissipating their energy or exiting the region.

Table 7.6 Thunderstorm Wind Events and Impacts in Hickman County January 1, 2012 – March 31, 2017

Location	Date	Time	Time Zone	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
OAKTON	09/06/2012	17:40	CST-6	61 kts. EG	0	0	30.00K	0.00K
CLINTON	09/06/2012	17:45	CST-6	56 kts. EG	0	0	15.00K	0.00K
CLINTON	01/12/2013	13:40	CST-6	52 kts. EG	0	0	0.00K	10.00K
CLINTON	07/01/2014	17:25	CST-6	56 kts. EG	0	0	5.00K	0.00K
CLINTON	06/26/2015	14:37	CST-6	56 kts. EG	0	0	5.00K	0.00K
CLINTON	05/26/2016	13:35	CST-6	56 kts. EG	0	0	5.00K	0.00K
CROLEY	06/15/2016	13:15	CST-6	61 kts. EG	0	0	65.00K	0.00K
CLINTON	07/06/2016	12:30	CST-6	61 kts. EG	0	0	25.00K	0.00K
CLINTON	03/01/2017	05:07	CST-6	58 kts. MG	0	0	30.00K	0.00K
TOTALS					**0**	**0**	**$108.00k**	**10.00K**

Wind Magnitude Definitions: Measured Gust:'MG', Estimated Gust:'EG', Measured Sustained:'MS', Estimated Sustained:'ES' *Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database* https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The following descriptions are typical of thunderstorm wind experienced in Hickman County:

- Two Events on September 6, 2012 occurring in the Oakton community and the city of Clinton generated $45,000 in damages. Several trees were blown down on U.S. Highway 51. The county road maintenance building lost part of its roof and the roofs were blown off two chicken houses on Highway 123.

- On July 6, 2016 a reported $25,000 in property damages was reported by an event occurring in the city of Clinton. Numerous trees were blown down. A tin roof was blown off an equipment shed and another business in Clinton. Most of the damage was on the north side of Clinton.

- An event on March 1, 2017 in Clinton blew down a tower over 180 feet tall. Portions of a 16-by-20 foot shed were blown into a field. A wind gust to 67 mph was measured by a Davis weather station a couple of miles south of Clinton. This storm generated a reported $30,000 in property damages.

- The single storm producing the largest amount of reported damages ($65,000) during the 5.25 year planning period occurred on June 15, 2017. Numerous trees were down, corn stalks were laid over, one tree fell across a home. A porch and garage of another residence was damaged. A large chicken barn collapsed, and another damaged. The damage occurred near U.S. Highway 51 south of Clinton near the intersection of Highway 2209.

SUMMARY AND CONCLUSIONS OF THUNDERSTORM WIND PROFILE

During the period covered by the update (01/01/2012 – 03/31/2017) there have been nine occurrences of Thunderstorm Wind Events in Hickman County reported by the NCEI. There are no reported fatalities or injuries as a result of these events. These occurrences produced $180,000 of reported damages in personal property. Hickman County experienced nine reported Events over the 5.25 year update period, which divides out to 1.71 reported events per year, a more than 100% probability that such an event will occur in any given year. Based on recorded events and reported damages in Hickman County, the cost of a Thunderstorm Wind Event could be calculated as:

- $180,000 in damages / 9 events = $20,111 per event on average.
- $20,111 damage per event x 1.71 events per year = $11,760 damage per year.

Of critical concern to the Hickman County MPT and the main contributing factor in their consideration of risks and vulnerability, is the potential of property damage and human cost of any occurring Thunderstorm Wind Event.

Tornado

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. It is most often generated by a thunderstorm when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly and upper level winds, especially the jet stream runs at an angle relative to the prevailing surface winds. These conditions occur with regularity over the Purchase Region, and can occur at any time of the year. Tornadoes are often accompanied by large hail and damage is most often the result of the high wind velocity and wind-blown debris. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction. They have the power to uproot trees, structures, and turn harmless objects into deadly flying debris.

Most tornadoes aren't very wide and touch down only briefly. However, a highly destructive tornado may carve a path over a mile wide and several miles long. Tornadoes typically cause the most damage to lightly or poorly built structures, such as residential homes. An average of 800-1000 tornadoes are reported nationwide and they are more likely to occur during the spring and early summer months. Tornadoes can occur at any time of the day, but are more likely to form in the late afternoon or early evening.

In 2007 the Enhanced Fujita (EF) Scale was introduced to better reflect wind speed and the amount of damage produced by tornadoes. It replaced the Fujita-Pearson Scale that defined every tornado on record in the United States since 1950. EF rankings are assigned after a tornado event has occurred and the National Weather Service has inspected the damage.

Table 7.7 The Enhanced Fujita Tornado Measurement Scale

Scale	Estimated Wind Speed	Typical Damage
EF0	65-85 mph	Light Damage - Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; signboards damaged.
EF1	86 – 110 mph	Moderate Damage - Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
EF2	111 – 135 mph	Considerable Damage - Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light object missiles generated; cars lifted off ground and thrown.
EF3	136 – 165 mph	Severe Damage - Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
EF4	166 – 200 mph	Devastating Damage - Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
EF5	>200 mph	Incredible Damage - Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Table 7.8 Tornado Events and Impacts in Hickman County
January 1, 2012 – March 31, 2017

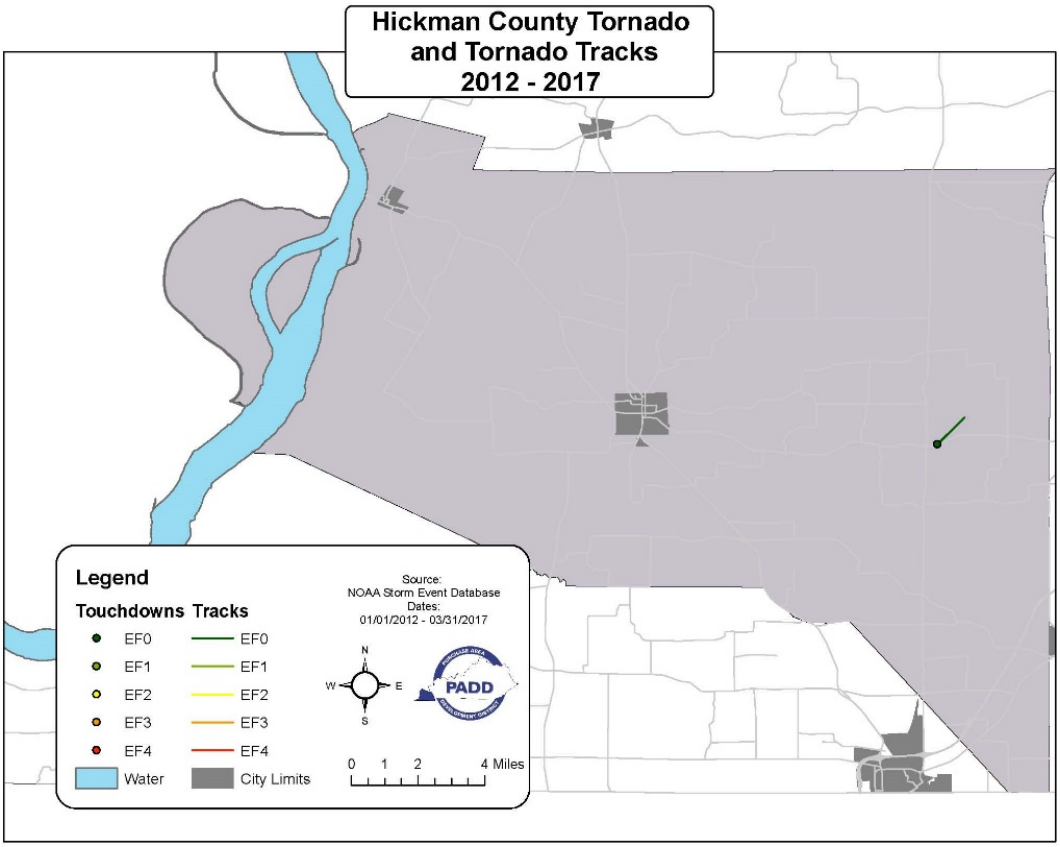
Location	Date	Time	Time Zone	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
FULHAM	4/28/2014	16:46	CST-6	EF0	0	5	2.00K	0.00K

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information, Storm Events Database:
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The following recorded Tornado Event from April 28, 2014 is the lone tornado in Hickman County occurring since the 2012 Plan update. There were no fatalities or injuries recorded from this occurrence. It resulted in a reported $2,000 in property damages.

- Large tree limbs were blown down by this brief tornado. The tornado crossed Highway 58 on the east side of Fulgham and dissipated about a minute later. Peak winds were estimated near 85 mph. This tornado was produced by the same mini-supercell that spawned the EF-2 tornado near Union City, Tennessee and Fulton, Kentucky.

Figure 7.1 Vulnerability to Tornados through Identification of Tornado Tracks
January 1, 2012 – March 31, 2017



SUMMARY AND CONCLUSIONS OF TORNADO PROFILE

During the period covered by the update (01/01/2012 – 03/31/2017) there has been a single occurrence of a Tornado Event in Hickman County recorded by the NCEI. There were no injuries or fatalities and it resulted in $2,000 in reported personal property damage.

Information from Table 7.8 and Figure 7.1 related to Tornadoes can be used to define the frequency of tornado events and the impact of these events. Data on tornado event magnitude is provided in the form of the Enhanced Fujita Scale as shown on the map.

Hickman County experienced one event over a 5.25 year period, which divides out to .19 Reported Tornado Events per year, or a 19% probability that such an event will occur in any given year. Based on recorded events and reported damages, the cost of a tornado event could be calculated as:

- $2,000 divided by 1 events = $2,000 per event.
- $2,000 times .19 events/year = $380 per year.

Any area in the county is as vulnerable as another and tornado events are completely random and unpredictable. While the county has been very fortunate to not have multiple occurrences during this cycle, of critical concern to the Hickman County MPT, and the main contributing factor in their consideration of risks and vulnerability, is the potential human cost of Tornado Events and the damage created.

Flash Flood / Flood

Flash Flood is the most common form of flooding in Hickman County. The cause, being too much rain water, delivered in too short of time. However, rather than steep slopes and narrow valleys channeling and volume from heavy rains, the runoff is too great for the county's low lying, meandering streams, to carry away. This slow drainage is often exacerbated by stream blockages of tree limbs and trunks, which form effective check dams and barrages.

River basin flooding is common among Kentucky's major streams and bodies of water during the winter and early spring months. The major bodies of water in Hickman County are: the Mississippi River, Obion Creek and the Bayou DeChein. The Mississippi River delivered catastrophic flooding to the area in the past, most memorably in 1937, but has since been contained, if not controlled by levees and floodwalls. The Mississippi at flood stage backs up the Bayou DeChein and Obion Creek causing flooding along those two streams.

Periodic flooding of land adjacent to rivers, streams and shorelines is natural and can be expected to take place at fairly regular intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. 100 Year Flood: as determined by the FEMA, is a flood event of a magnitude expected to be equaled or exceeded once on the average during any 100-year period. The term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood is also used by the NFIP as the standard for floodplain management and to determine the need for flood insurance.

Table 7.9 Flash Flood / Flood Events and Impacts in Hickman County January 1, 2012 – March 31, 2017

Location	Date	Time	Time Zone	Event Type	Deaths	Injuries	Property Damage	Crop Damage
CLINTON	06/01/2013	08:30	CST-6	Flash Flood	0	0	0.00K	0.00K
CLINTON	12/21/2013	21:00	CST-6	Flood	0	0	0.00K	0.00K
FULHAM	04/28/2014	04:05	CST-6	Flash Flood	0	0	40.00K	0.00K
OAKTON	04/28/2014	08:00	CST-6	Flash Flood	0	0	0.00K	0.00K
CLINTON	06/26/2015	15:05	CST-6	Flood	0	0	0.00K	0.00K
S. COLUMBUS	05/26/2016	14:15	CST-6	Flash Flood	0	0	0.00K	0.00K
BEULAH	06/01/2013	08:30	CST-6	Flash Flood	0	0	0.00K	0.00K
				TOTALS	**0**	**0**	**40.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information Storm Events Database:
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

Major Events and Impacts in Hickman County, 2012-2017

- April 28, 2014: A few severe thunderstorms occurred during the afternoon and evening hours. A powerful mid-level shortwave trough and its associated 70-80 knot jet streak translated from the southern high Plains into the upper Midwest. On the heels of this initial shortwave trough, a channeled vorticity maximum and attendant 70-knot jet streak progressed across the southern Plains into southwest Missouri. In association with these features, a 40 to 50 knot southerly low-level jet became established over the Mississippi Valley. Isolated severe thunderstorms occurred during the afternoon hours near a surface warm front lifting north across the Lower Ohio Valley. During the evening, widespread storms including isolated severe storms occurred ahead of a cold front surging eastward across the Ozark Mountains. The strong supply of warm and moist air fueled heavy rainfall and some local flash flooding southwest of a Paducah to Murray line overnight.

  Major flash flooding of roads was reported in the Clinton area. Cars were washed into ditches. Emergency vehicles were dispatched to assist stranded motorists. There was $40,000 reported in property damages.

  Creeks remained well out of their banks, and some back roads were still underwater. U.S. Highway 51 was underwater but passable over the Bayou Du Chien Creek. State highway crews flagged traffic across the bridge. The flooding was due to thunderstorms the previous night combined with light to moderate rain the next day.

- May 26, 2016: A southerly wind flow of very moist and unstable air fed a slow-moving thunderstorm complex. Surface dew points were in the lower 70's south of the complex. Instability was quite high to the south of the storm complex. An outflow boundary moved southward ahead of the storms, providing the lift necessary for new storms to develop. The result was locally heavy rainfall as storms repeatedly moved over the same areas. Isolated storms produced large hail and tree damage.

  Emergency response officials received many reports of water on roads in Clinton and elsewhere around the county.

Figure 7.2 Hickman County 100 Year Floodplain

Hickman County has very few structures located in the identified flood hazard area. Presently the County does not participate in the NFIP program.

Figure 7.3 City of Clinton Flood Hazard Areas

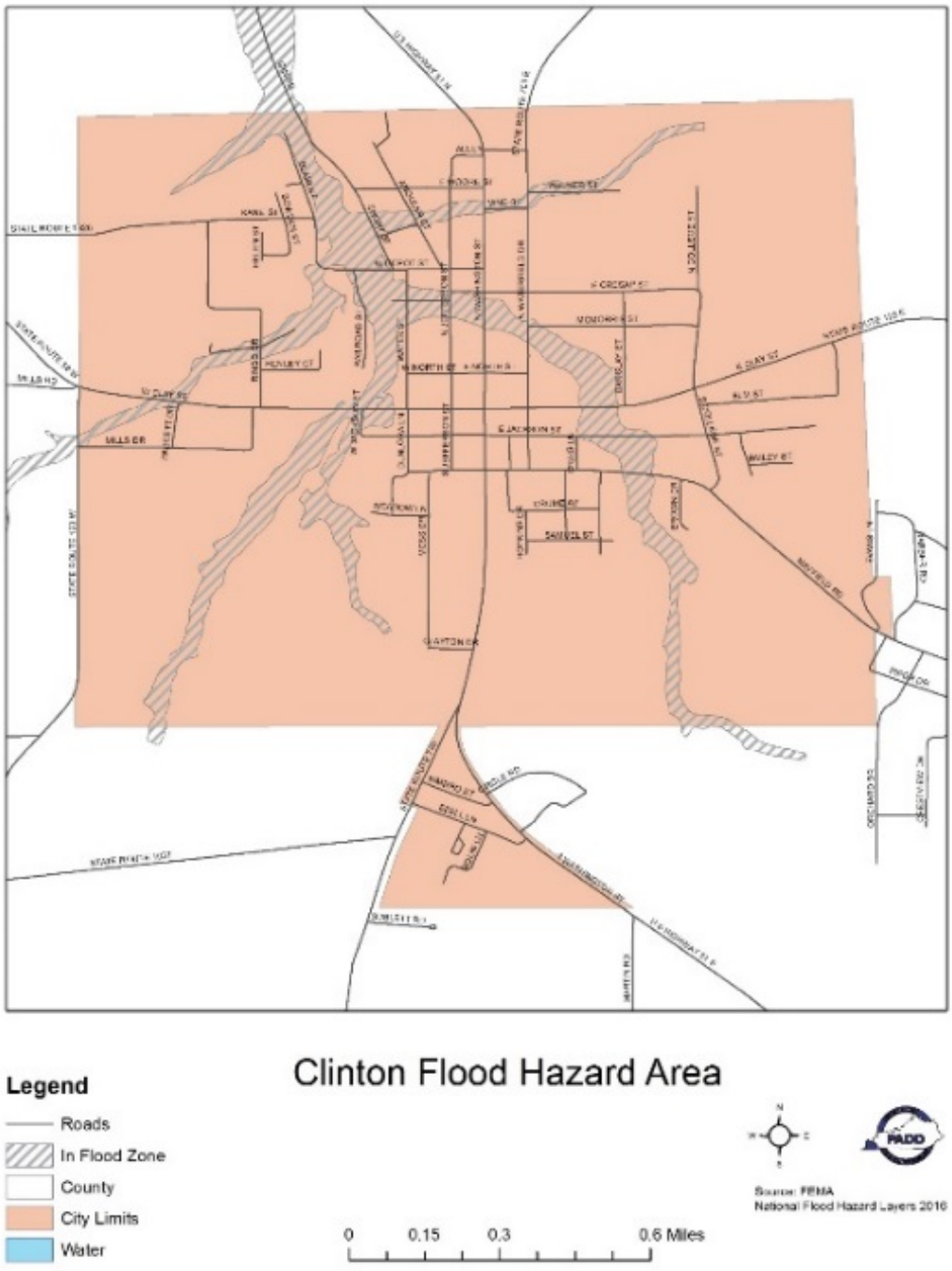
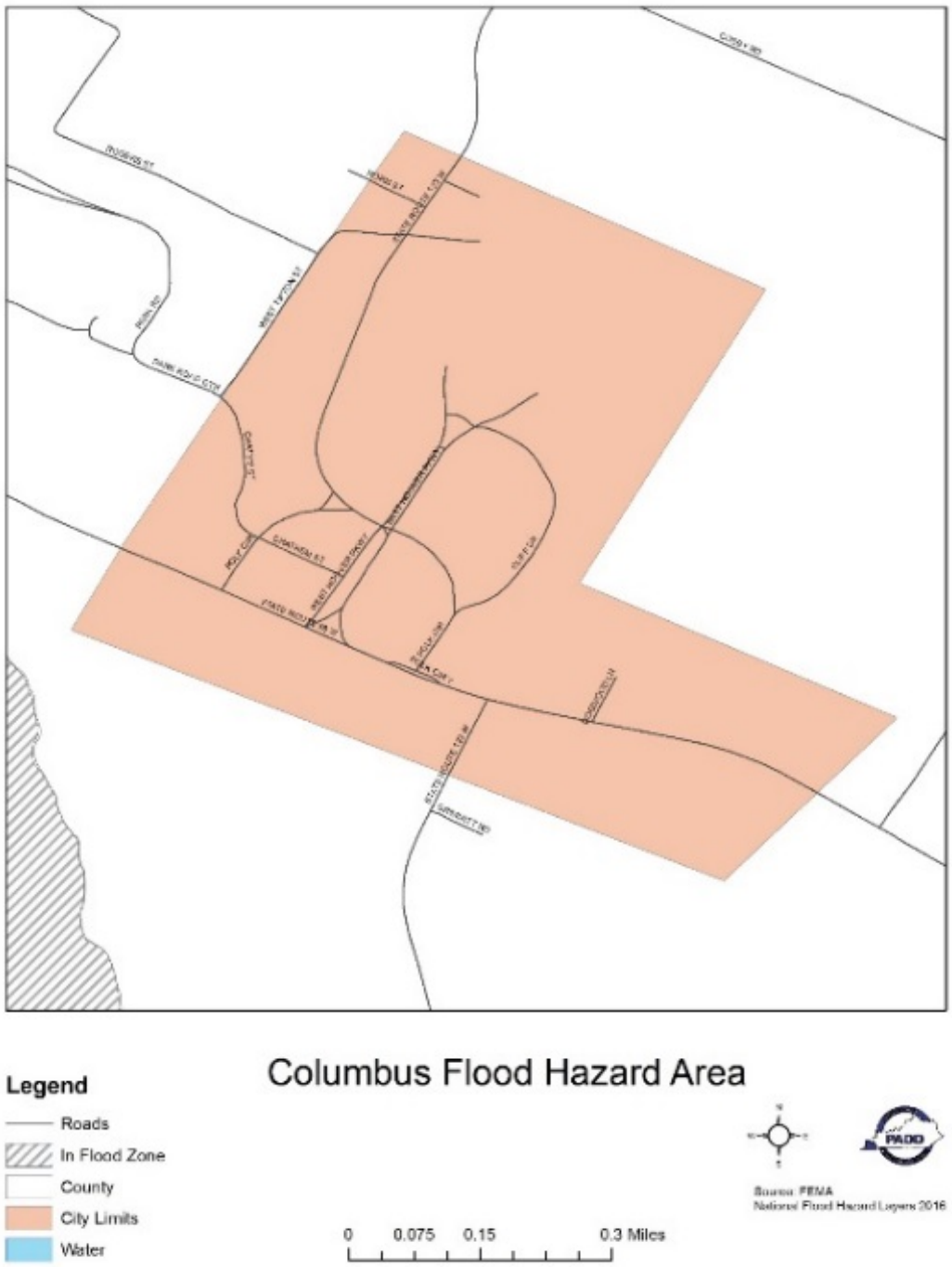


Figure 7.4 City of Columbus Flood Hazard Areas



The City of Columbus has no mapped flood hazard areas therefore it does not participate in the NFIP program.

Table 7.10 National Flood Insurance Program Participation by Jurisdiction

Jurisdiction	Floodplain Management Ordinance	SFHA in Jurisdictional Limits	Comments	City Class
Ballard County	X	X		
City of Barlow			No mapped SFHA	6
City of Kevil			No mapped SFHA	6
City of La Center		X	SFHA mapped in 2009, NFIP under consideration	5
City of Wickliffe	X	X		5
Calloway County	X	X		
City of Murray	X	X		3
City of Hazel			No mapped SFHA	6
Carlisle County	X	X		
City of Bardwell	X	X		5
City of Arlington	X	X		6
Fulton County	X	X		
City of Fulton	X	X		4
City of Hickman	X	X		4
Graves County	X	X		
City of Mayfield	X	X		3
City of Wingo		X		6
Hickman County		**X**	**Mapped SFHA, non-participant**	
City of Clinton	**X**	**X**		**5**
City of Columbus			**No mapped SFHA**	**5**
Marshall County	X	X		
City of Benton	X	X		4
City of Calvert City	X	X		4
City of Hardin	X	X		5
McCracken County	X	X		
City of Paducah	X	X		2

Information from the FEMA Community Status Book as of 6-13-17

SUMMARY AND CONCLUSIONS OF FLOODING PROFILE

Information from the above tables and maps related to flooding can be used to define the frequency of Flood Events and the impact of these events. Data on flood event magnitude was not available.

The frequency of occurrence that can be derived from this data is seven Flood Events in 5.25 years, which divides out to 1.33 reported Flooding Events per year, or a probability greater than 100% for the occurrence of a Flood Event in any given year. Based on recorded events and reported damages in Hickman County, the cost of a Flood Event could be calculated as:

- $40,000 divided by 7 events = $5,714 per event.
- $5,714 times 1.33 events/year = $7,599 per year.

Earthquake

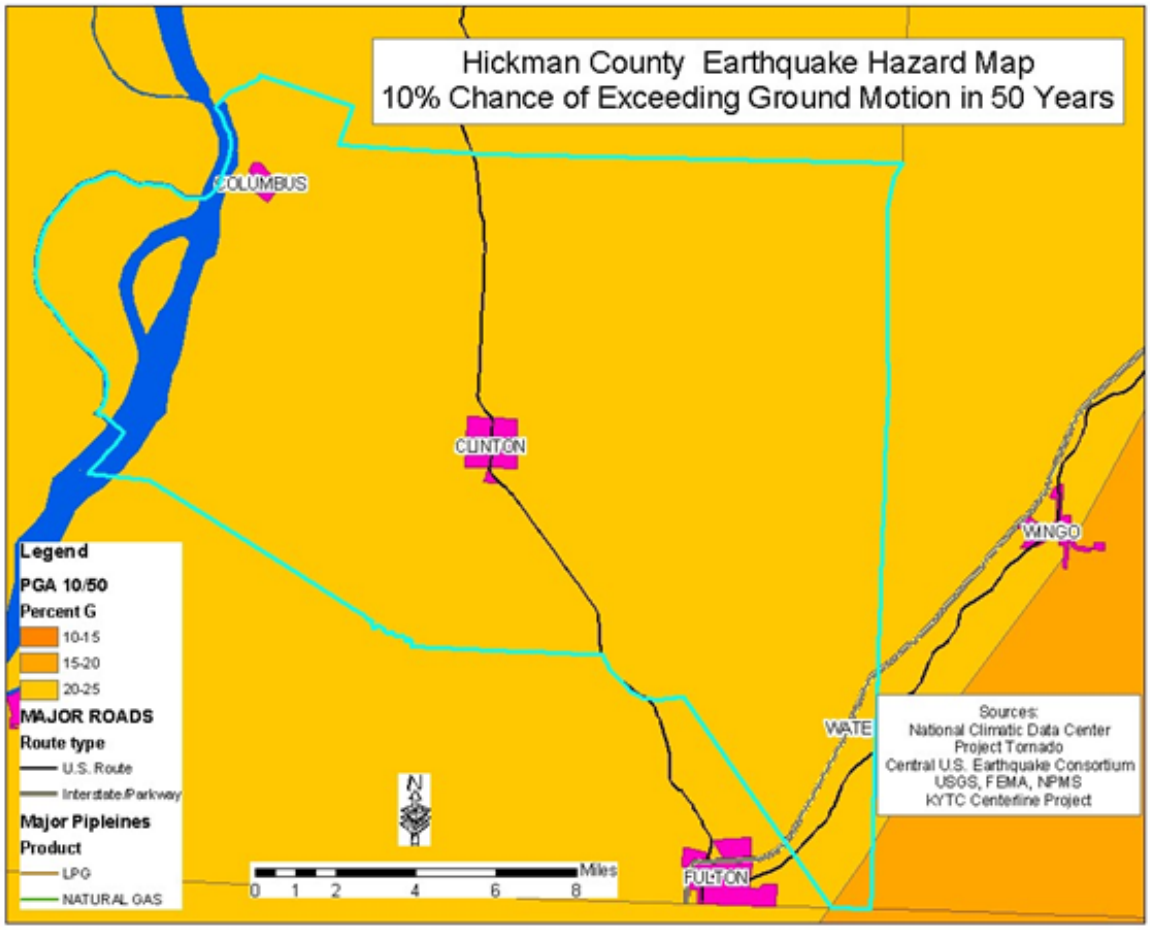
An earthquake is a geologic event that involves movement or shaking of the earth's crust. Earthquakes are usually caused by the release of stresses accumulated as a result of the rupture of rocks along borders of the earth's ten tectonic plates. Earthquakes can affect hundreds of thousands of square miles, causing damage to property, resulting in loss of life and injury, and disrupting the social and economic functioning of the affected area.

An assessment to the earthquake threat to the entire Purchase Region is provided in the regional plan. More than 90% of Hickman County lies in an area that has a 10 per cent probability of an earthquake in the new Madrid Seismic Zone producing ground motions that exceed 20 % to 25% of "G" during the next 50 years (See Figure 7.5). That would equate to a VI on the Modified Mecalli Scale, or a 5.4 on the Richter. (Trees sway, suspended objects swing, and objects fall off shelves). The remainder of the county would experience ground motions 15-20% of G under the same conditions.

That does not mean it will happen in fifty years, as one could look at the data and just as correctly assume that there is a 90% probability that the region will not experience this level of ground motion during a given 50 year period. It should be noted that 20% of G is an acceleration of 73 inches/second/second.

Even the precise location of faults within the New Madrid Seismic Zone are subject to debate. No one knows what causes New Madrid earthquakes. However, there are ideas that are being researched. Although there is great uncertainty regarding the cause of earthquakes, scientists generally do agree on what happens when they do occur – that is, the likely levels of ground shaking associated with the waves earthquakes emit. These levels are reflected in the National Seismic Hazard Maps, which represent the products of a long consensus building process. These maps also account for the uncertainties in our understanding.

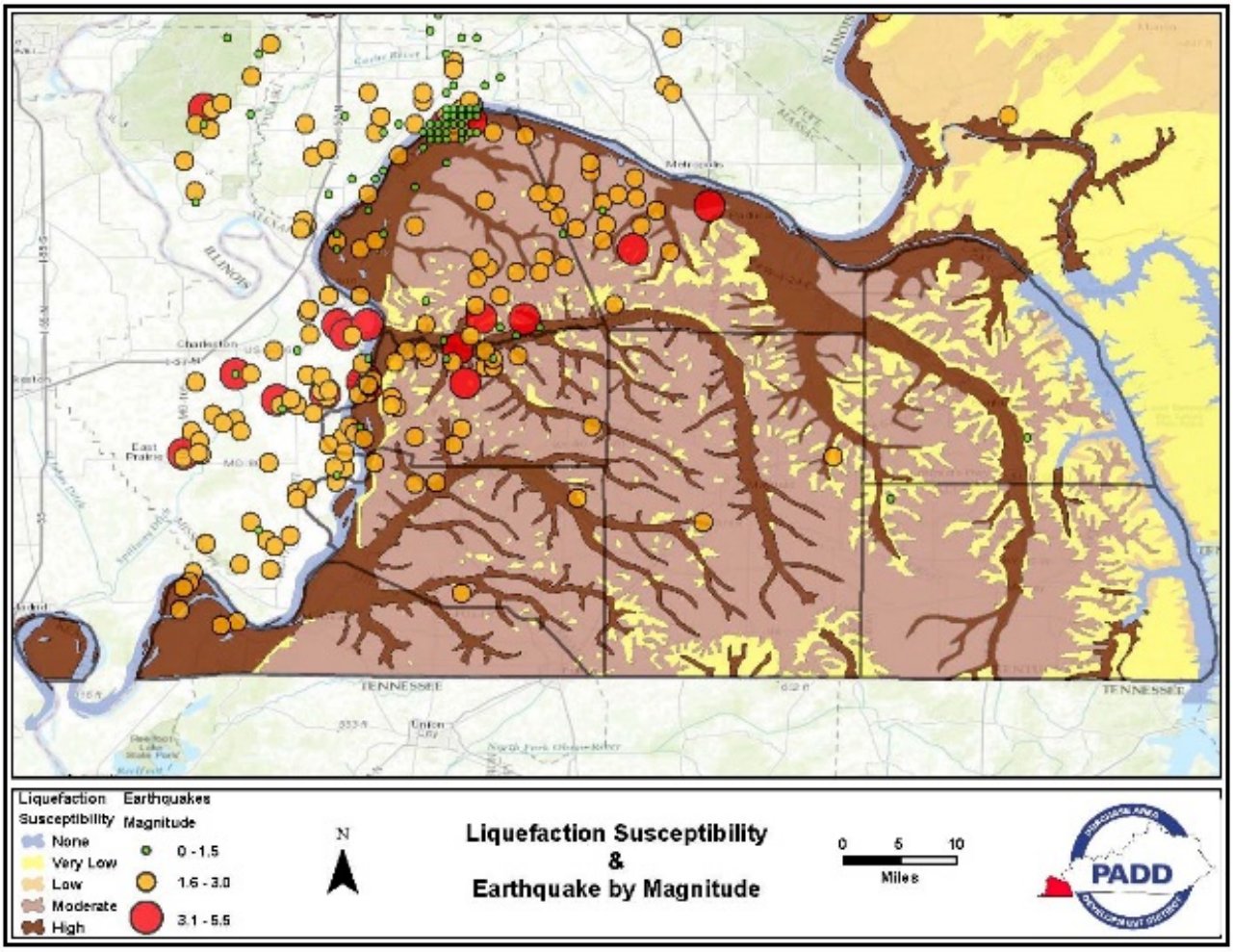
Figure 7.5 Earthquake Ground Motion Map



At issue for all the Purchase Region and virtually all of Hickman County would be the effect of a large magnitude quake on the soils underlying the region. The ground shaking estimate accounts for both the likely ranges of recurrence intervals and locations. Due to the relatively low rate of seismicity, ground cover, deep soil, etc., most faults within the region aren't even mapped.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends on the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site and regional geology. Earthquakes may also cause Liquefaction. Liquefaction occurs when the ground soil loses the ability to resist shear and flows much like quick sand. When liquefaction occurs, anything relying on the substrata for support can shift, tilt, rupture, or collapse

Figure 7.6 Generalized Liquefaction Susceptibility & Earthquake Magnitude of the Purchase Region



Source: USGS Map was derived from the USGS Earthquake Catalog, Available at: https://earthquake.usgs.gov/earthquakes/search/

Included as Appendix 2 to the regional plan and the Hickman County Chapter are excerpts from Mid-America Earthquake Center Report 08-02 *Impact of Earthquakes on the Central USA*. This report is the result of a FEMA funded Project completed under the management of the U.S. Army Corps of Engineers.

> The NMSZ scenario for the State of Kentucky consists of a magnitude 7.7 (Mw7.7) earthquake along the northeast extension of the presumed eastern fault line in the New Madrid fault system. The ground motions used to represent this seismic event were developed by the U.S. Geological Survey (USGS) for the middle fault in the proposed New Madrid Seismic Zone (NMSZ). Each fault line is presumed to consist of three fault segments; northeastern, central, and southwestern. This scenario, the worst case event for Kentucky, employs an event in the northeast segment of the eastern fault. The location of

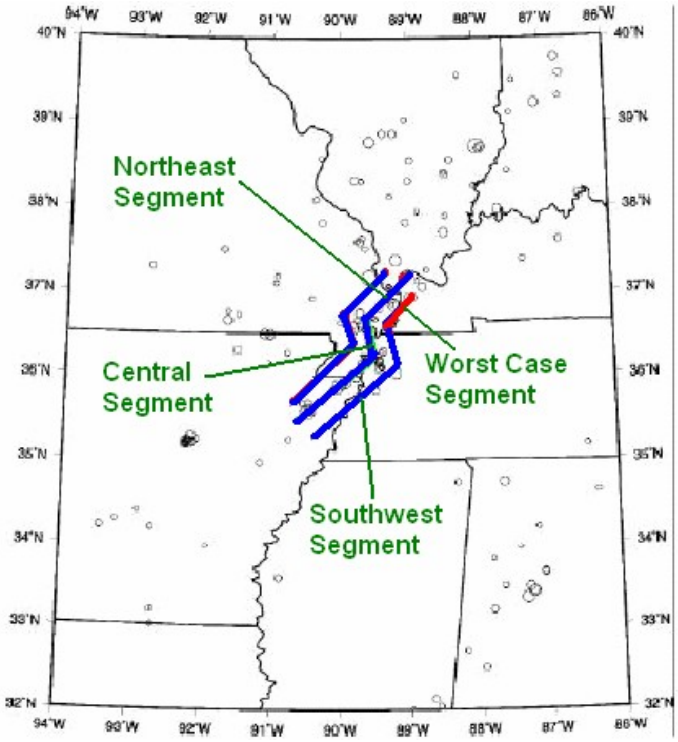
this scenario event is illustrated in Figure 7.7. For more information on the ground motion used in this scenario please reference Appendix 2.

This earthquake impact assessment includes all 120 counties in the State of Kentucky. Kentucky is approximately 40,400 square miles and is bordered by Indiana and Ohio to the north, Tennessee to the south, West Virginia and Virginia to the east and Illinois and Missouri to the west. For the purposes of this analysis, 25 critical counties have been identified in the western portion of the state where shaking is anticipated to be most intense. These 25 counties are the focus of much of the damage assessment included within this document". Purchase counties included as critical counties are Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, McCracken, and Marshall.

Within the State of Kentucky, nearly 29,000 buildings experience complete damage, which are included in the nearly 53,000 at least moderately damaged buildings. While this is roughly 2% of all Kentucky buildings, many of these collapsed structures are concentrated in the western counties. As with previous state scenarios, residential buildings experience the greatest amount of damage. Nearly 98% of all building collapses occur to residential structures. In addition, about 94% of all at least moderate damage occurs in the 25 critical counties for Kentucky.

More detailed data from the scenario's results are included in the Appendix 2.

Figure 7.7 **Scenario Fault Location for the State of Kentucky**



SUMMARY AND CONCLUSIONS OF EARTHQUAKE HAZARD PROFILE

Low magnitude earthquakes occur constantly in the New Madrid Seismic Zone. Depending on the depth and magnitude, some of the stronger tremblers, 3 and above, are felt throughout the entire region. Damages amount to the rare instance of a picture being knocked off a wall or items shaken from shelves.

The potential for an earthquake of catastrophic proportions is not open to debate. Historic and geologic evidence are proof. However, the probability of such an event in any given time frame is open to interpretation and the effects are still a matter of discussion. The excerpts from Report 08-02 include the results generated by the team at the Mid-America Earthquake Center, of a HAZUS simulation for a New Madrid magnitude 7.7. The results clearly support at least the Moderate Risk ranking of this hazard, and provide detailed potential damage and casualty estimates.

Hail

Hail is one of four types of precipitation that falls from the sky. It's also the most dangerous, damaging type, occurring during severe storms. If hail measuring larger than ¾ inches in diameter falls during a thunderstorm, it is classified as severe weather. Sometimes damaging winds accompany this type of storm as well. According to the National Oceanic and Atmospheric Administration, hail causes over one billion dollars of damage in the United States each year.

Generally, hail must be 1 ¼ inches in diameter (Half-Dollar size) before it causes damage to heavy composite shingles or wood shake shingles. Lightweight composite shingles may show damage after being struck by 1-inch diameter (Quarter size) hail. Only deteriorated composite shingles will show hail damage due to hail less than 1 inch in diameter, and the hail generally must be more than ¾ inch in diameter (Dime size).

TORRO Hailstorm Intensity Scale

The Torro Hailstorm Intensity Scale was introduced by Jonathan Webb of Oxford, England, in 1986 as a means of categorizing hailstorms. The scale extends from H0 to H10 (See Table 7.11) with its increments of intensity or damage potential related to hail size, texture, numbers, fall speed, speed of storm translation, and strength of the accompanying wind.

An indication of equivalent hail kinetic energy ranges (in joules per square meter) has now been added to the first six increments on the scale, and this may be derived from radar reflectivity or from hail pads. The International Hailstorm Intensity Scale recognizes that hail size alone is insufficient to accurately categorize the intensity and damage potential of a hailstorm, especially towards the lower end of the scale. For example, without additional information, an event in which hail of up to walnut size is reported (hail size code 3: hail diameter of 21-30 mm) would be graded as a hailstorm with a minimum intensity of H2-3. Additional information, such as the ground wind speed or the nature of the damage the hail caused, would help to clarify the intensity of the event. For example, a fall of walnut-sized hail with little or no wind may scar fruit and sever the stems of crops but would not break vertical glass and so would be ranked H2-3. However, if accompanied by strong winds, the same hail may smash many windows in a house and dent the bodywork of a car, and so be graded an intensity as high as H5.

However, evidence indicates that maximum hailstone size is the most important parameter relating to structural damage, especially towards the more severe end of the scale. It must be noted that hailstone shapes are also an important feature, especially as the "effective" diameter of non-spheroidal specimens should ideally be an average of the co-ordinates. Spiked or jagged hail can also increase some aspects of damage.

Table 7.11

?	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m²	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Size codes are presented in TABLE 7.12 The Size Code is the maximum reported size code accepted as consistent with other reports and evidence.

Table 7.12

Size code	Maximum Diameter mm	Description
0	5-9	Pea
1	10-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > Soft ball
9	91-100	Grapefruit
10	>100	Melon

From January 1, 2012 through March 31, 2017, there have only been three occurrences of Hail Events reported in Hickman County by the NCEI. There were no reported injuries and no reported property or crop damages associated with any of the events.

Table 7.13 Hail Events and Impacts in Hickman County January 1, 2012 – March 31, 2017

Location	Date	Time	Time Zone	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
FULHAM	09/05/2012	15:00	CST-6	0.75 in.	0	0	0.00K	0.00K
FULHAM	04/25/2015	19:39	CST-6	0.75 in.	0	0	0.00K	0.00K
CROLEY	05/26/2016	13:40	CST-6	1.00 in.	0	0	0.00K	0.00K
TOTALS					**0**	**0**	**0.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The event occurring on May 26, 2016 is typical of the type of Hail Event in recent years for Hickman County. A southerly wind flow of very moist and unstable air fed a slow-moving thunderstorm complex. Surface dew points were in the lower 70's south of the complex. Instability was quite high to the south of the storm complex. An outflow boundary moved southward ahead of the storms, providing the lift necessary for new storms to develop. The result was locally heavy rainfall as storms repeatedly moved over the same areas. Isolated storms produced large hail and tree damage.

SUMMARY AND CONCLUSIONS FOR HAIL PROFILE

Hickman County has experienced three reported Hail Events during the 5.25 year plan update period, which divides out to 0.57 events per year or a probability of 57% chance for an event with Hail occurrence in any given year.

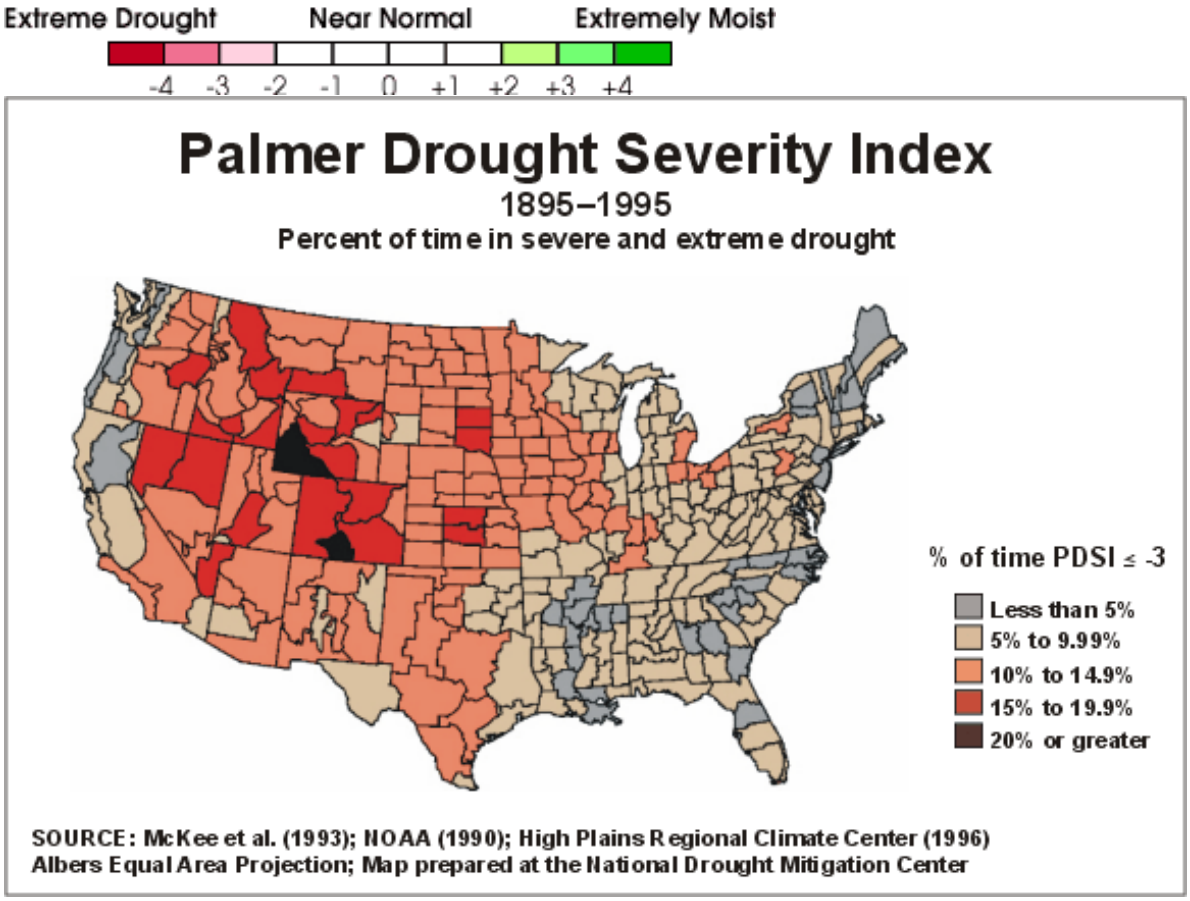
Based on the few recorded events and no reported damages in Hickman County, the cost of a Hail Event could be not be calculated for this update cycle. A historical account of Hail Events recorded in Hickman County by NCEI can be found in Appendix.

Drought

Droughts occur when a long period passes without substantial rainfall. Drought conditions can cause significant crop damage, but there is little property damage from excessive heat. Due to the historical occurrences of drought and excessive heat in the Purchase Region, these hazards present a threat not only to the agriculture of the region, but to the aged, and chronically ill population.

The Palmer Drought Severity Index (PDSI) is used to show the relative dryness or wetness in an area and indicates prolonged and abnormal moisture deficiency or excess. The PDSI is used for evaluating the scope, severity and frequency of prolonged periods of abnormally wet or dry weather (see Figure 7.8). The PDSI scale follows below.

Figure 7.8 Palmer Drought Severity Index



During the planning period for this update there have been 11 occurrences of Drought conditions recorded in Hickman County. There were no injuries / fatalities or damages (property or crop) recorded during these events

Table 7.14 Drought Events and Impacts in Hickman County January 1, 2012 – March 31, 2017

Location	Date	Time	Time Zone	Deaths	Injuries	Property Damage	Crop Damage
Hickman (zone)	05/12/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	06/01/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	07/01/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	08/01/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	09/01/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	10/01/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	11/01/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	12/01/2012	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	01/01/2013	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	01/10/2015	00:00	CST-6	0	0	0.00K	0.00K
Hickman (zone)	11/01/2016	00:00	CST-6	0	0	0.00K	0.00K
TOTALS				**0**	**0**	**0.00K**	**0.00K**

Source: National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Storm Events Database
https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=21%2CKENTUCKY

The excessive heat and drought events from July 1, 2012 are recorded below as an example of the heat type event that occurs in Hickman County and throughout the Purchase.

(July 1, 2012 Drought Event)
The drought which began in May worsened considerably across western Kentucky as summer progressed. By the end of July, all of western Kentucky was upgraded to extreme to exceptional drought. The exceptional drought conditions were along and west of a line from Henderson to Princeton to Benton to Murray. The remainder of western Kentucky was classified as having extreme drought conditions. At Paducah, only 1.78 inches of rain fell in July, which was 2.66 inches below normal. Soil moisture deficits continued to increase. By the end of July, 90 to 100 percent of the region's topsoil and subsoil moisture was reported as short or very short. Many crops were showing stress, and the situation became dire for many farmers. A majority of the corn and soybeans were listed in poor to very poor condition. Increasing amounts of livestock and pasture were showing stress. The percentage of pastures rated as poor or very poor continued to grow. Ponds across the region were dry or drying quickly. Even with the isolated rainfall from thunderstorms, fire danger remained high. Bans on outdoor burning were in place for most of western Kentucky, including Ballard, Caldwell, Carlisle, Christian, Crittenden, Daviess, Fulton, Henderson, Hickman, Lyon, Marshall, McCracken, Mclean, Muhlenberg, Union, and Webster Counties. Fourth of July fireworks shows were cancelled or banned in many places. The State of Kentucky issued a Water Shortage Watch for Mclean and Crittenden Counties. The goal of the watch is to implement water conservation measures to ensure ample water supplies. Stream flows were running below normal. The drought began in May and continued into August.

SUMMARY AND CONCLUSIONS OF EXCESSIVE HEAT / DROUGHT PROFILE

There have been 11 Drought events in the county during the 5.25 year planning period. This divides out to 2.10 events per year, a better than 100% probability that a drought could occur in any given year. Common sense would dictate that the conditions that generated a heat type event in one county could have generated a heat type event in another. Information from the above table can be used to define the frequency of Drought Events and the impact of these events throughout the region. Drought is mainly a threat to the agricultural segment of the county economy, but it is also has a significant impact on water and wastewater systems, especially those with cast iron piping, as soil shrinkage causes pipes to snap was brought to the JPHMC and MPTs' attention by the West McCracken Water District during the 2012 plan update cycle.

As there are no reported damages or injuries for the planning update period, the annualized cost of a heat related event could not be calculated. The complete history of drought events in Hickman County can be reviewed in Appendix 1.

Dam Failure

There are around 80,000 dams in the United States. The Kentucky Division of Water has surveyed the 81 dams in the Purchase Region. Dams are classified based on the evaluation of damage possible downstream. The FEMA guide to dam classifications is as follows:

Table 7.15 FEMA Dam Classification

Classification	Description
Class A (Low)	No loss of human life is expected and damage will only occur to the dam owner's property.
Class B (Moderate/Significant)	Loss of human life is not probable, but economic loss, environmental damage, and/or disruption of lifeline facilities can be expected.
Class C (High)	Loss on one or more human life is expected.

Source: FEMA 333; Federal Guidelines for Dam Safety

Table 7.16 Dam Classification by County

The existing dams in the area by classification. Seven of the eight counties have dams that have been classified by the state. Hickman County has six structures, five evaluated as Class A and one evaluated as Class B.

County	Class A (low)	Class B (moderate)	Class C (high)
Ballard	3	1	0
Calloway	7	1	0
Carlisle	22	0	1
Graves	23	2	6
Hickman	**5**	**1**	**0**
Marshall	3	1	2
McCracken	3	0	0
Total	**66**	**6**	**9**

Figure 7.9 Hickman County Dams by Downstream Hazard Potential

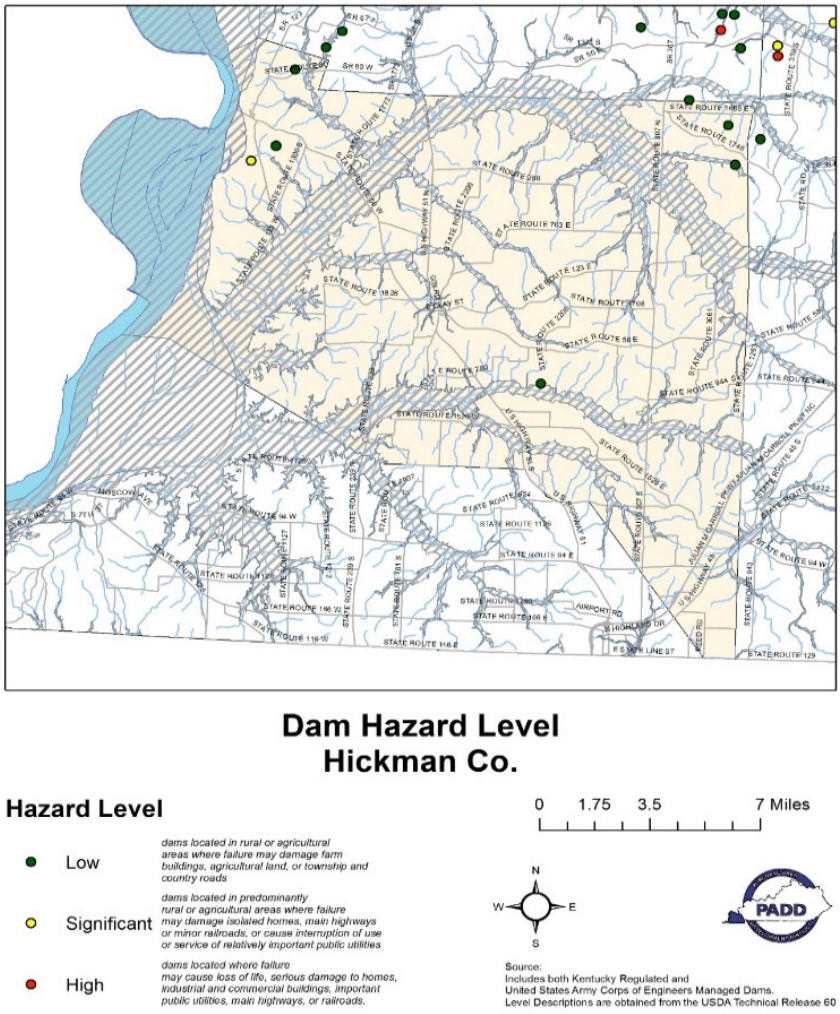


Figure 7.9 shows the approximate location of the State rated dams in Hickman County. Please note that due to scaling, multiple dams may appear as a single structure.

SUMMARY AND CONCLUSIONS FOR DAM FAILURE HAZARD PROFILE

There is no historical occurrence of damage or injury due to a dam failure in Hickman County. However, dam failure is considered a hazard.

7:4.3 Assessing Vulnerability: Identifying Assets Overall Summary Vulnerability

The vulnerability of structures to Severe Weather and Earthquake Hazards in Hickman County is equal to the total structure value of the county. These hazards are not limited to a particular geographic region. All critical facilities in the County were determined to be vulnerable to Severe Weather and Earthquake Hazards.

Hickman County's vulnerability to flooding was determined by GIS analysis. A GPS derived data base of Critical Facilities, and the Kentucky Infrastructure Authority database for Water and Waste Water facilities were brought into the GIS. FEMA revised Flood Hazard Areas were added as an overlay and where the data intersected those structures/facilities were deemed vulnerable to a 100 year flood. The value of Critical Facilities and structures exposed to the other identified hazards, which are limited in area extent, varied by hazard type.

Impact & Frequency

The impact and frequency of each hazard is identified in each hazard profile in the previous section through maps and frequency tables. Impact is addressed further in the tables and narrative discussions found in the following asset identification and vulnerability sections of this plan.

Identification of Assets

This section of the plan identifies what can be affected in each jurisdiction by the different hazard events that affect the Purchase Region. The information to complete this section was collected from a variety of sources using the HAZUS 4.0 Kentucky Data, the NOAA NCEI, the 2010 Census, U.S. Census Bureau 2011-2015 American Community Survey 5 Year Estimates and the Kentucky Revenue Cabinet. These resources help in identifying the number of buildings, infrastructure and critical facilities and associated costs. Local structure point data was available to identify the types and numbers of structures in each hazard area. The information was collected, mapped and summarized by the PADD staff and reviewed and analyzed by the Purchase Regional Hazard Mitigation Council for inclusion in the plan.

Hickman County MPT members reviewed the following information to determine the vulnerability in each community. Tables were created by the PADD staff to estimate the numbers of existing buildings located in mapped Flood Hazard areas. For the other identified hazards, tornado, thunderstorm wind, earthquakes, and winter storms MPT members were not able to identify specific hazard areas for those hazards which were determined to potentially affect anything within Hickman County. These hazards and their occurrence are not limited to any particular area based on past historical events and documentation as provided in the hazard profiles for the hazards.

Critical Facilities and Infrastructure

For the purpose of this plan, the JPHMC adopted the definitions of the FEMA HAZUS Loss Estimation Model according to FEMA publication 386-1, version 4.0, pages 3-9 that state the following definitions of critical facilities and infrastructure. HAZUS separates critical facilities into five categories based on their loss potential.

For the purpose of this plan, all of the following elements are considered critical facilities except Hazardous Materials Facilities. It was determined by the regional council that Hazardous Materials Facilities would not be addressed as critical facilities. Rationale: Hazardous Materials facilities are addressed in existing Emergency Operations Plans at the Facility and jurisdictional level, which are deemed by the committee as being both sufficient and beyond the expertise of the committee.

FEMA Critical Facilities Definitions

- Transportation Facilities include airways – airports, heliports; highways – bridges, tunnels, roadbeds, overpasses, transfer centers; railways – track segments, tunnels, bridges, rail yards, depots; waterways – canals, locks, seaports, ferries, harbors, docks, and piers.

- Lifeline Utility Systems such as potable water, wastewater, oil, natural gas, electric power and communication systems.

- Essential Facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Consider not only their structural integrity and content value, but also the effects on the interruption of their functions because the vulnerability is based on the service they provide rather than simply their physical aspects. Essential Facilities include hospitals and other medical facilities, police and fire stations, emergency operations systems, evacuation shelters, schools, and health and human services to the PADD.

- High Potential Loss Facilities are facilities that would have a high loss associated with them, both physical and economical, such as nuclear power plants, dams, and military installations.
- Hazardous Materials Facilities include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins. (Note: Not considered in this Plan)

Critical Facilities Estimated Replacement Value Methodology

Due to a software compatibility problem between FEMA's HAZUS Program, ESRI's Arc and MS Windows, PADD staff was unable to generate complete critical facilities values for the region. FEMA and KYEM have acknowledged this issue and have committed to resolving this problem however this process will not be complete before the region plan expires.

As a result, staff has supplemented updated HAZUS information when available with local data to establish the estimated value of critical facilities. As a last result, data generated during the 2012 update cycle has been utilized to complete tables. For purposes of the update to the 2018 JPHM Plan, this combination of data sources constitutes the best data available.

PADD staff used a combination of GIS data sources and local GIS data layers to build a map of the critical facilities and infrastructure for each jurisdiction found in the hazard area. Estimates were done on a county basis.

Types and Numbers of Buildings for Severe Weather and Earthquake Hazards

Severe Weather Hazards and Earthquakes have been determined to potentially affect anything within each jurisdiction depending on the path of the hazard event. Severe Weather Events and the potential of Earthquake Events are the top five priorities identified and ranked by the Hickman County MPT. These hazards and their occurrences are not limited to any particular area based on past historical events and documentation is provided in the hazard profiles.

Table 7.17 identifies the total number of structures vulnerable to these hazards. This table represents residential structures only and was derived from U.S Census Bureau 2011-2015 American Community Survey 5 Year Estimates. Due to data limitations, the numbers of other types of structures was not available at the time of this plan. Future updates of the plan will include numbers of other types of structures as data becomes available.

Table 7.17 Hickman County Severe Weather/Earthquake Hazard Vulnerable Assets

County	Number of Residential Structures		
	Structures in County	Structures in Hazard Area	% in Hazard Area
Ballard	3,889	3,889	100%
Calloway	18,065	18,065	100%
Carlisle	2,426	2,426	100%
Fulton	3,360	3,360	100%
Graves	16,753	16,753	100%
Hickman	**2,335**	**2,335**	**100%**
Marshall	15,898	15,898	100%
McCracken	31,342	31,342	100%
Total	**94,240**	**94,240**	**100%**

Sources: U.S Census Bureau 2011-2015 American Community Survey 5 Year Estimates

Critical Facilities and Infrastructure at Risk to Severe Weather and Earthquake Hazards
Using the HAZUS MH definition for critical facilities and infrastructure, the County and Cities helped the PADD staff identify types and numbers of critical facilities (see Table 7.18) and infrastructure that are vulnerable to tornado, thunderstorm wind, winter storms, and earthquakes in Hickman County. These hazards have been determined to potentially affect anything within each jurisdiction, depending on the path of the hazard event. These hazards are not limited any particular area based on past events and documentation as provided in the hazard profiles.

Table 7.18 Hickman County Critical Facilities & Infrastructure Severe Weather and Earthquake

Type of Facility	# of Existing Buildings	Current Replacement Value	# in Hazard Area
County EOC			
Communication-Radio			
Fire Stations	4	$6,400,000	4
Public Safety Buildings			
Railways			
Government Buildings	4	$500,000	4
Hospitals			
Electric Power Plants			
Sewage Plants	1	$45,000,000	1
Package Treatment Plants	1	$125,000	1
Water Plants	2	$90,000,000	2
Flood Control Pump Station	2	$150,000	2
Lift Stations			
Wells	4	$500,000	4
Storage Tanks	4	$780,000	4
Schools	2	$30,000,000	2
Airport			
Natural Gas Facilities			
Dams	7		7
Bridges	22	$13,200,000	22
TOTAL	**53**	**$186,655,000**	**53**

Sources: When available local data was used and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System data and the costs were calculated based on standard planning costs.

Critical Facilities and Infrastructure at Risk to Flooding

The PADD GIS staff reviewed the best available information to provide an estimated number of residential structures and Critical Facilities that are vulnerable to flooding. GPS structure points, overlain with the Flood Hazard Areas were the primary source of at risk data, and Water Information System data base were used to determine at risk Critical Facilities.

Table 7.19 summarizes the numbers of residential structures in the flood hazard area for each County. The highlighted areas indicate the data for Hickman County.

Table 7.19 Hickman County Flood Hazard Vulnerable Assets

County	Estimated Number of Residential Structures In Flood Hazard Areas		
	Number of Structures in County	Percentage of Structures in Flood Hazard Area	Number of Structures in Flood Hazard Area
Ballard	3,889	3.7%	147
Calloway	18,237	0.5%	101
Carlisle	2,426	3.2%	80
Fulton	3,360	7.8%	268
Graves	16,753	2.2%	361
Hickman	**2,335**	**7.3%**	**147**
Marshall	15,898	2.8%	444
McCracken	31,342	2.5%	768
Total	**94,240**	**2.5%**	**2,316**

Sources: U.S Census Bureau 2011-2015 American Community Survey 5 Year Estimates
PADD GIS Database

The following maps indicate the location of critical facilities in each jurisdiction relative to the flood hazard areas. These maps were presented to the regional council and for public comment for review during the identification of vulnerable assets for each jurisdiction.

Figure 7.10 and 7.11 depicts the location of Hickman County's critical and transportation facilities in relation to the mapped 100 year flood zones.

Figure 7.10 Hickman County Flood Zones and Structures

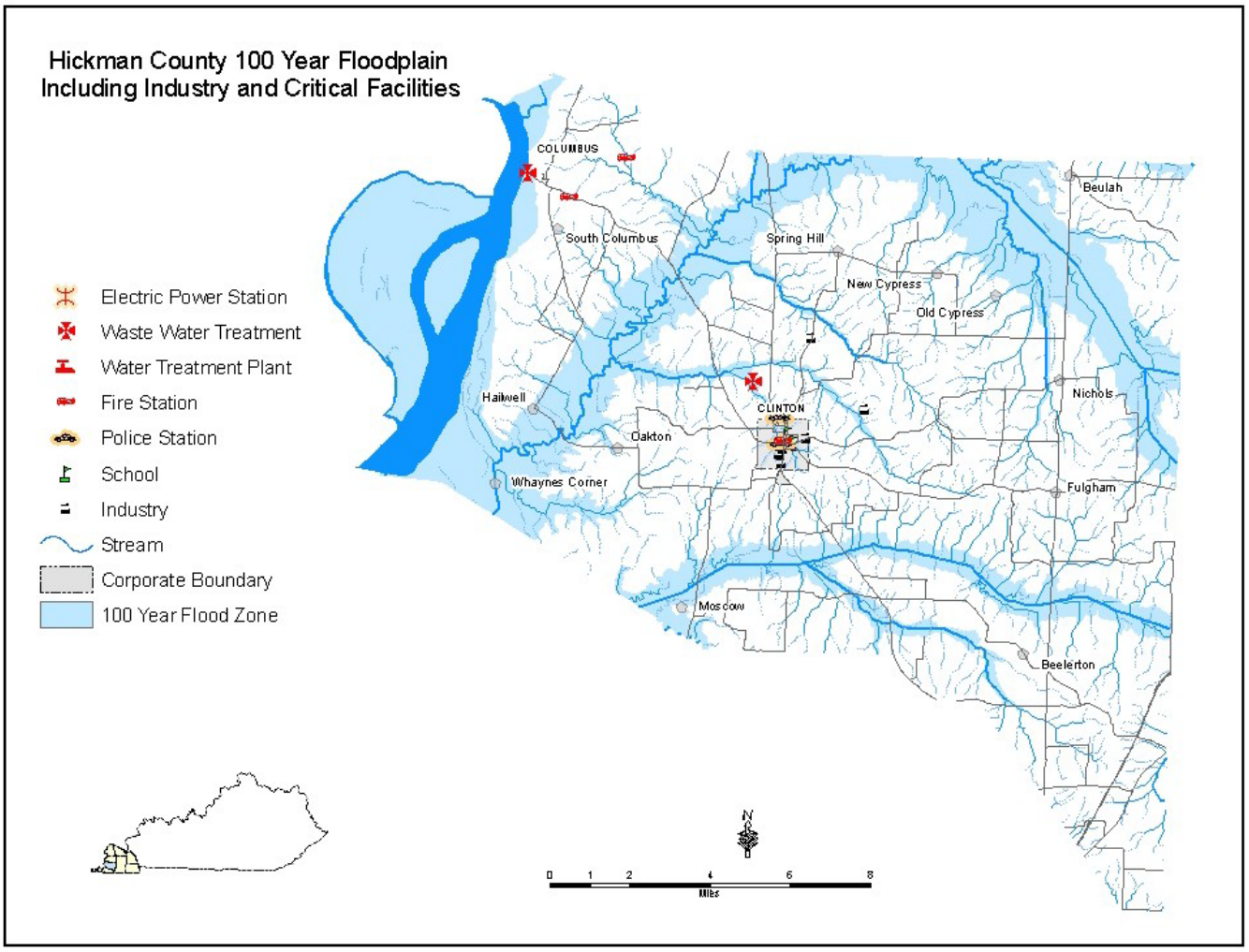


Figure 7.11 Hickman County Flood Zone Including Industry and Critical Facilities

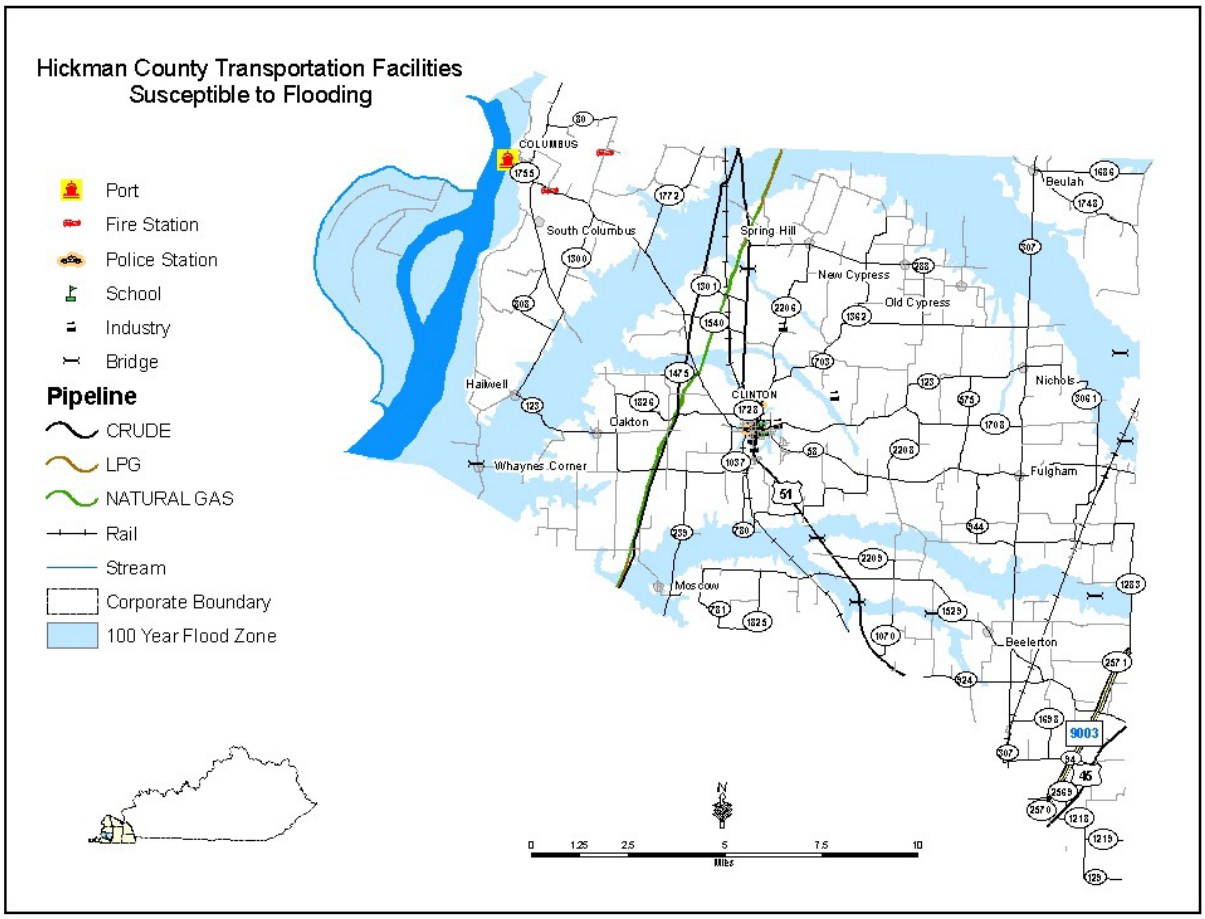
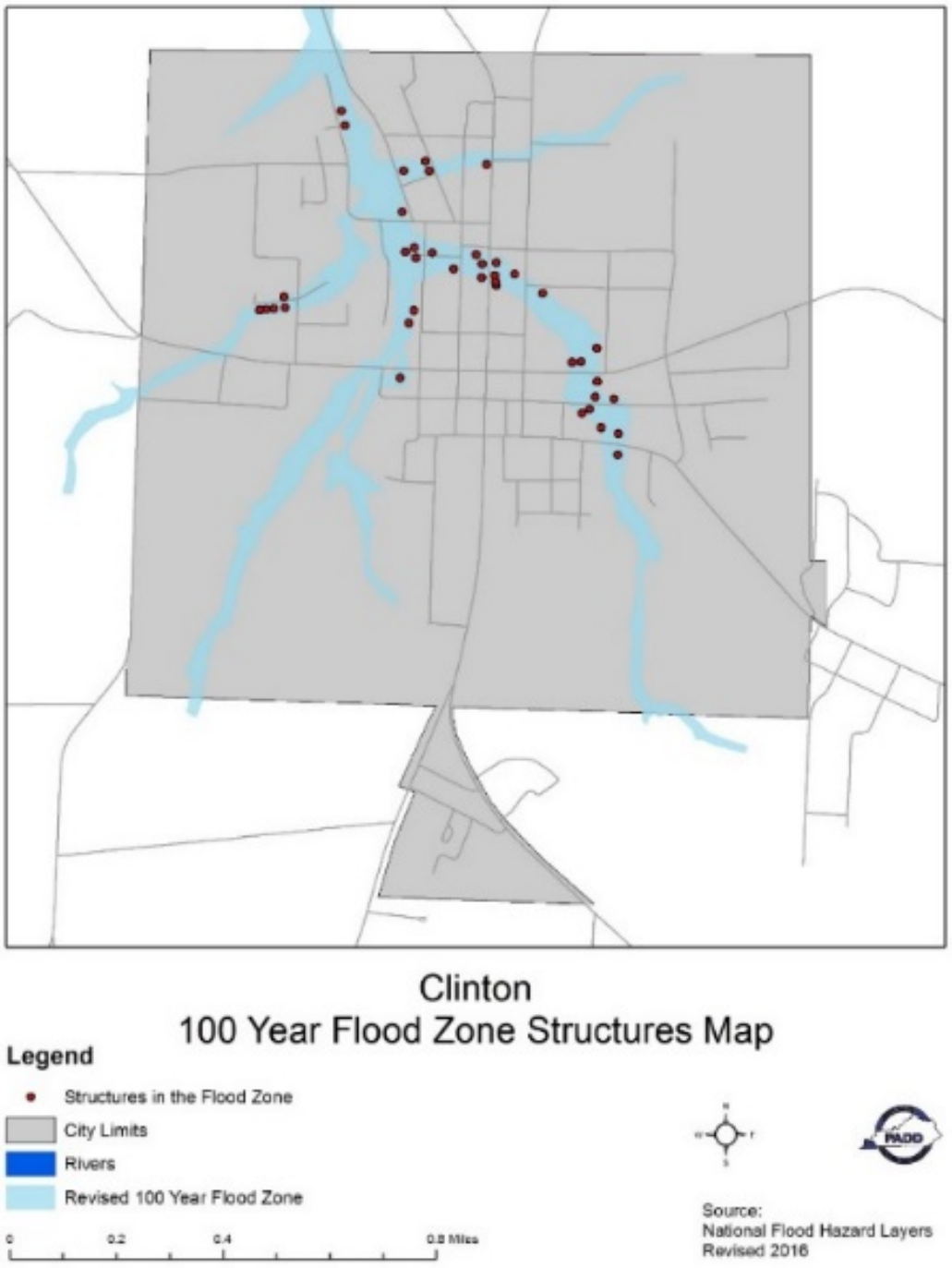


Figure 7.12 indicates the location of critical facilities in the City of Clinton relative to the Flood Hazard areas. These maps were presented to the JPHMC and for public comment for review during the identification of vulnerable assets for each jurisdiction.

Figure 7.12 City of Clinton Flood Hazard Area



Further review of the city jurisdictions for the City of Columbus reveal that there are no critical facilities located in flood hazard areas for Columbus.

Table 7.20 summarizes the types and number of critical facilities and infrastructure in the identified Flood Hazard areas. These figures, by default are also applicable to the vulnerability of structures to Dam Failure. These charts were created using the mapped information above. Ownership issues provided some limitation in distinguishing what critical facilities belonged to a particular jurisdiction; therefore, asset vulnerability was determined on a county level.

Table 7.20 Hickman County Flood Vulnerability: Critical Facilities and Infrastructure

Type of Facility	# of Existing Buildings	Current Replacement Value	# in Hazard Area
County EOC			
Communication-Radio			
Fire Stations	4	$6,400,000	
Public Safety Buildings			
Railways			
Government Buildings	4	$500,000	
Hospitals			
Electric Power Plants			
Sewage Plants	1	$45,000,000	1
Package Treatment Plant	1	$125,000	
Water Plants	2	$90,000,000	
Pump Stations	2	150,000	1
Lift Stations			
Flood Control Pump Station			
Wells	4	$500,000	
Storage Tanks	4	$780,000	
Schools	2	$30,000,000	
Airport			
Natural Gas Facilities			
Dams	7		
Bridges	22	$13,200,000	17
TOTAL	**53**	**$186,655,000**	**19**

Sources: When available local data was used and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System data and the costs were calculated based on standard planning costs.

For the other identified hazards in this plan, council members were not able to identify specific hazard areas for the following hazards: drought/excessive heat, and dam failure. There are no potential inundation maps for the event of the failure of the agricultural dams in the county, and therefore no way to judge the impact. PADD GIS analysis has determined that no Critical Facilities are in close proximity to any of the known dams.

Drought poses a considerable hazard to the agricultural sector of the economy and while its effects cannot be mitigated except by irrigation the impact is mitigated by crop insurance programs. Extreme heat poses a health risk, but not a structural risk to residences or Critical Facilities. Infrastructure at risk to Excessive Heat/Drought consists of in ground water and wastewater systems that relay on cast iron pipe. This type of pipe is prone to radial fracture caused by soil shrinkage.

Future Development: Types and Numbers of Future Buildings, Critical Facilities, and Infrastructure

Hickman County is not expected to grow in population over the next ten years. There will likely be little, if any, increase in the number of residential structures or critical facilities and infrastructure.

Table 7.21 Population Projections for the Purchase Region of Kentucky

County	Census 2000	Census 2010	Census 2015	Census Projection				
				2020	2025	2030	2035	2040
Kentucky	4,041,769	4,339,367	4,425,092	4,533,464	4,634,415	4,726,382	4,808,682	4,886,381
Ballard	8,286	8,249	8,212	8,164	8,097	8,005	7,906	7,780
Calloway	34,177	37,191	38,343	39,328	40,487	41,687	42,604	43,503
Carlisle	5,351	4,874	5,036	4,737	4,604	4,450	4,298	4,139
Fulton	7,752	6,238	6,528	5,726	5,252	4,789	4,349	3,939
Graves	37,028	37,421	37,433	37,883	38,243	38,483	38,657	38,788
Hickman	**5,262**	**4,612**	**4,767**	**4,349**	**4,077**	**3,803**	**3,563**	**3,306**
Marshall	30,125	31,101	32,301	31,149	31,060	30,830	30,347	29,980
McCracken	65,514	65,018	66,188	65,317	65,487	65,376	64,918	64,273
Purchase	**193,495**	**195,819**	**195,313**	**196,653**	**197,307**	**197,423**	**196,732**	**195,708**

Source: U.S. Census Bureau, http://www.ksdc.louisville.edu/data-downloads/projections/ 2017

There are no significant changes in land use anticipated for Hickman County. Should land use changes occur, they will be included in future updates of the plan where applicable.

New Residential Structures – Tornado, Earthquake, Severe Thunderstorm, Severe Winter Storm

The PADD staff calculated the estimated future residential structure growth by multiplying the existing number of residential structures by the expected growth rate for each county. Results of these calculations are represented in Table 7.22. These numbers would represent the approximate number of new future residential structures vulnerable to tornadoes, earthquakes, thunderstorm wind, and winter storms. With the forecast lack of growth, there is unlikely to be an increase in the housing stock in Hickman County.

Table 7.22 Estimated Future Structure Growth for the Purchase Region

County	Estimated Housing Units (2015)	Estimated % Household Growth Rate (2025)	Estimated Future Growth	Median Structure Value	Estimated Value of Future Growth
Ballard	3883	0.79%	31	$101,800	$3,155,800
Calloway	18,537	7.20%	1335	$119,900	$160,066,500
Carlisle	2437	-7.53%	-159	$77,200	*
Fulton	3,359	-15.81%	-531	$61,000	*
Graves	16,741	2.79%	467	$92,900	$43,384,300
Hickman	**2,338**	**-8.68%**	**-203**	**$68,400**	*
McCracken	31,544	2.04%	643	$111,600	$71,758,800
Marshall	15,982	1.45%	232	$124,400	$28,860,800
Purchase	94,821	2.01%	1906		

* Projected Negative Growth Rate

Source: EHHGR - Kentucky State Data Center (Vintage 2016)

EHU - US Census Bureau, Population Division (June 2017)

MSU - American Community Survey 5- Year Estimates (2011-2015)

Flood

Hickman County is a not member of the NFIP. The City of Columbus does not have a mapped Flood Hazard Area. The City of Clinton is a member of the NFIP. It has a Flood Plain Management Ordinance IAW the appropriate State Revised Statutes. As a consequence, development is not likely to occur in flood regions identified on the FIRMS covering the City of Clinton and by the Q3 Flood data used in this plan. It is a mitigation goal that Hickman County will eventually enter the NFIP. Industrial expansion that takes place in the City of Clinton will be in areas which are not located in floodplains.

The PADD staff and Hickman County MPT members discussed potential increase in numbers of vulnerable critical facilities, industry and infrastructure; however, there was no consensus for making a reliable calculation reached. In future updates, involvement from the local planning process may assist in estimating the increase of critical facilities and infrastructure based on projected population growth.

In summary, MPT members have estimated the numbers of existing residential structures that are located in hazard areas. Future updates of this plan may include actual point data for building locations which will revise the vulnerability figures downward. Better data may result in a better estimate of growth and future buildings for each Hickman County that will allow a more accurate assessment of vulnerable assets. This information was used to determine mitigation strategies and actions to help reduce potential losses from hazard events.

7:4.4 Assessing Vulnerability: Estimating Potential Losses

Winter Storm, Thunderstorm Wind, Tornado, Earthquake

Table 7.23 summarizes the total value of adjusted property as provided by the Kentucky Department of Revenue, and the population for each county as provided by 2011-2015 American Community Survey 5 Year Estimate. These values were used to determine potential dollar losses and the number of people at risk in a county and all its jurisdictions, for those hazards that have no defined area: tornado, thunderstorm wind, winter storm, and earthquake. The figures for Hickman County are highlighted. Table 7.23 is specifically focused on residential structures.

Table 7.23 Total Value of Adjusted Property for the Purchase Region

County	County Square Miles	Population 2011-2015 ACS	Total Property Value 2016($)
Ballard	273.70	8,256	545,949,576
Calloway	412.50	38,106	2,355,178,011
Carlisle	199.10	4,984	234,857,047
Fulton	230.70	6,422	277,810,192
Graves	557.00	37,502	1,886,576,304
Hickman	**253.20**	**4,720**	**265,028,387**
Marshall	340.00	31,181	2,457,186,169
McCracken	268.30	65,408	5,111,587,459
Region	**2,433.5**	**196,579**	**13,134,173,145**

Source: Kentucky State Hazard Mitigation Plan. 2011-2015 American Community Survey 5 Year Estimate, Kentucky Revenue Cabinet, Year Estimate, Kentucky Revenue Cabinet, https://revenue.ky.gov/Property/Pages/default.aspx

Table 7.24 Severe Weather/Earthquake Hazard Vulnerable Asset

County	Structures in County	Structures in Hazard Area	% in Hazard Area
Ballard	3,889	3,889	**100%**
Calloway	18,237	18,237	**100%**
Carlisle	2,426	2,426	**100%**
Fulton	3,360	3,360	**100%**
Graves	16,753	16,753	**100%**
Hickman	**2,335**	**2,335**	**100%**
Marshall	15,898	15,898	**100%**
McCracken	31,342	31,342	**100%**
Region	**94,240**	**94,240**	**100%**

Sources: U.S. Census Bureau 2011- 2015 American Community Survey 5-Year Estimates

PADD staff and the Hickman County MPT determined that all 2,335 residential structures in the county are vulnerable to the "area" threats of weather and earthquake. According to the 2011-2015 American Community Survey 5-Year Estimates, the median house value for Hickman County is $68,400. An estimate of the maximum potential residential loss for Hickman County is $159,714,000.

Critical Facilities and Infrastructure for Severe Weather and Earthquakes

It was the determination of the PADD staff that the best way to estimate the potential dollar loss associated with critical facilities and infrastructure was to use the insurance replacement values when available for those structures provided by the jurisdictions, or default to HAZUS planning values. Table 7.25 provides a summary of the potential dollar loss of vulnerable critical facilities and infrastructure to the non-geospecific hazards of Severe Weather and Earthquakes for Hickman County. Additional information on potential earthquake losses, especially for in-ground infrastructure can be found in Appendix 2.

Table 7.25 Hickman County Critical Facilities & Infrastructure Severe Weather and Earthquake

Type of Facility	# of Existing Buildings	Current Replacement Value	# in Hazard Area	Replacement Cost
County EOC				
Communication-Radio				
Fire Stations	4	$6,400,000	4	$6,400,000
Public Safety Buildings				
Railways				
Government Buildings	4	$500,000	4	$500,000
Hospitals				
Electric Power Plants				
Sewage Plants	1	$45,000,000	1	$45,000,000
Package Treatment Plant	1	$125,000	1	$125,000
Water Plants	2	$90,000,000	2	$90,000,000
Flood Control Pump Station	2	$150,000	2	$150,000
Lift Stations				
Wells	4	$500,000	4	$500,000
Storage Tanks	4	$780,000	2	$780,000
Schools	2	$30,000,000	2	$30,000,000
Airport				
Natural Gas Facilities				
Dams	7		7	
Bridges	22	$13,200,000	22	$13,200,000
TOTAL	**53**	**$186,655,000**	**53**	**$186,655,000**

Sources: When available local data was used and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority, Water Resource Information System data and the costs were calculated based on standard planning costs.

Flood

Residential Structures: After the vulnerability maps were created for the flood hazard areas, the cost associated with replacing those structures was evaluated. It was the determination of the PADD staff that the best way to estimate the potential dollar loss associated with the flood hazard areas was to use the median structure value as identified by the 2011- 2015 American Community Survey 5-Year Estimates for residential structures. Table 7.26 summarizes the median residential structure value used to determine the value of structures located in flood hazard areas. The data for Hickman County is highlighted.

Table 7.26 2011 – 2015 Selected Housing Characteristics

Subject	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	Marshall	McCracken	Purchase Region
Total Housing Units	3,889	18,237	2426	3360	16,753	**2335**	15,898	31,342	94,240
Occupied Housing Units	3288	14,834	2059	2568	14,390	**1973**	12,062	27,514	79,228
Vacant Housing Units	601	3403	367	792	2363	**362**	3296	3828	15,012
Mobile Homes	657	2306	500	205	2220	**360**	2966	2988	12,202
Owner-occupied	2678	9355	2059	2568	14,390	**1470**	9813	18,511	60,844
Renter-occupied	610	5479	367	792	2363	**503**	2789	9003	21,906
Household Size – Owner	2.42	2.49	2.34	2.51	2.63	**2.26**	2.50	2.46	2.45
Household Size– Renter	2.73	2.09	2.58	2.07	2.37	**2.39**	2.18	2.06	2.31
Median House Value –	$101,800	$119,900	$77,200	$61,000	$92,900	**$68,400**	$111,600	$124,400	$94,650

Source: U.S. Census Bureau 2011- 2015 American Community Survey 5-Year Estimates

According to the ACS 5-Year Estimates the median house value for Hickman County is $68,400. An estimate of the potential residential flood damage for Hickman County is $10,054,800. It was determined that the use of median values provided a fair assessment of potential dollar loss and the number people in hazard area when no other data was available. This table also shows the average number of people per household for Hickman County according to 2011-2015 ACS 5-Year Estimates. This value was used to determine the number of people in a flood hazard area. Using imagery PADD staff determined that 147 residential structures are located in areas with a map flood hazard.

Table 7.27 represents a comparison of estimated of potential dollar loss of vulnerable residential structures in flood hazard areas by county. The data for Hickman County is highlighted.

Table 7.27 Flood Hazard Vulnerable Residential Structures by County

County	Number of Residential Structures			Total Property Value		Number of People		
	Structures in County*	Structures in Hazard Area**	% in Hazard Area**	Total Value in County***	Value in Hazard Area**	Residents*	Residents in Hazard Area**	% in Hazard Area**
Ballard	3,889	147	3.7%	$545,949,576	$18,016,336	8,256	305	3.7%
Calloway	18,237	101	0.5%	$2,355,178,011	$9,420,712	38,106	229	0.6%
Carlisle	2,426	80	3.2%	$234,857,047	$751,543	4,984	199	4%
Fulton	3,360	268	7.8%	$277,810,192	$21,669,195	6,422	450	7%
Graves	16,753	361	2.2%	$1,886,576,304	$41,504,679	37,502	1,013	2.7
Hickman	**2,335**	**147**	**7.3%**	**$265,028,387**	**$16,696,788**	**4,720**	**189**	**4.0%**
Marshall	15,898	444	2.8%	$2,457,186,169	$68,801,213	31,181	1,871	7.0%
McCracken	31,342	768	2.5%	$5,111,587,459	$127,789,686	65,408	2,158	3.3%
Total	**94,240**	**2,818**	**2.9%**	**$13,134,173,145**	**$304,650,152**	**196,579**	**6,733**	**3.2%**

Sources: * U.S Census Bureau 2011-2015 American Community Survey 5 Year Estimates,
** PADD GIS Database, HAZUS & PVA information,
***Kentucky Revenue Cabinet and PVA data.

Critical Facilities and Infrastructure for Flood Hazards

It was the determination of the PADD staff that the best way to estimate the potential dollar loss associated with critical facilities and infrastructure was to use the insurance replacement values for those structures when available, or values from the HAZUS data tables.

Table 7.28 Hickman County Critical Facilities & Infrastructure Flood Vulnerability

Type of Facility	# of Existing Buildings	Current Replacement Value	# in Hazard Area	Replacement Cost
County EOC				
Communication-Radio				
Fire Stations	4	$6,400,000		
Public Safety Buildings				
Railways				
Government Buildings	4	$500,000		
Hospitals				
Electric Power Plants				
Sewage Plants	1	$45,000,000	1	$45,000,000
Package Treatment Plant	1	$125,000		
Water Plants	2	$90,000,000		
Flood Control Pump Station	2	$150,000	1	$75,000
Lift Stations				
Wells	4	$500,000		
Storage Tanks	4	$780,000		
Schools	2	$30,000,000		
Airport				
Natural Gas Facilities				
Dams	7			
Bridges	22	$13,200,000	17	$10,200,000
TOTAL	**53**	**$186,655,000**	**19**	**$55,275,000**

Sources: When available local data was used and all other values were determined using HAZUS MH. The numbers of water treatment facilities are derived from Kentucky Infrastructure Authority (KIA), Water Resource Information System (WRIS) data and the costs were calculated based on standard planning costs.

7:4.5 Assessing Vulnerability: Analyzing Development Trends

The PADD grew 1.2% in population between 2000 and 2010 compared to a growth of 7.4% for the state of Kentucky. Hickman County is projected to decrease in population by 5.7% by 2020. This projected population decline is expected to continue through 2040.

Hickman County is primarily rural in nature. Most residential development occurs on property that fronts primary and secondary roads. However with the projected population decline and an estimated negative growth rate (-7.53% by 2025) in future residential structure growth, the county can expect very little if any in residential development over the next several years. It could be expected that any new residential structures built would be to replace older or deteriorated homes by existing population. Essential facilities and services may show little to no increase as the population decreases.

Table 7.29 represent growth trends in the PADD as report by the Kentucky State Data Center using Census information. Hickman County is highlighted.

Table 7.29 2017 Population Projects for the Purchase Region

County	Census 2000	Census 2010	Census 2015	Census Projections				
				2020	2025	2030	2035	2040
Kentucky	4,041,769	4,339,367	4,425,092	4,533,464	4,634,415	4,726,382	5,808,682	4,886,381
Ballard	8,286	8,249	8,212	8,164	8,097	8,005	7,906	7,780
Calloway	34,177	37,191	38,343	39,328	40,487	41,687	42,604	43,503
Carlisle	5,351	4,874	5,036	4,737	4,604	4,450	4,298	4,139
Fulton	7,752	6,238	6,528	5,726	5,252	4,789	4,349	3,939
Graves	37,028	37,421	37,433	37,883	38,243	38,483	38,657	38,788
Hickman	**5,262**	**4,612**	**4,767**	**4,349**	**4,077**	**3,803**	**3,563**	**3,306**
Marshall	30,125	31,101	32,301	31,149	31,060	30,830	33,886	29,980
McCracken	65,514	65,018	66,188	65,317	65,487	65,376	64,918	64,273
Purchase	**193,495**	**195,819**	**195,313**	**196,653**	**197,307**	**197,423**	**196,732**	**195,708**

Source: U.S. Census Bureau, http://www.ksdc.louisville.edu/data-downloads/projections/ 2017

Land Use

Farmland is the principal land use in Hickman County. Land use for commercial purposes is primarily concentrated in or near the incorporated cities. Industrial development takes place primarily in the industrial parks. Hickman County also makes use of land for recreation and greenspace. Hickman County has both city and county parks for recreational purposes and is also home to the Columbus-Belmont State Park.

Economic and Social Growth Trends

The economy in the PADD is experiencing trends similar to those of the state averages, both in growth and decline. There have been few new businesses and industries opened in the region, and in turn there have been layoffs and closures within the market. The fastest growing sectors of the local economy in the Purchase Region were services and manufacturing. The following table represents the expansion and location of plants in the Hickman County from 2014 to present. This information was retrieved from the Kentucky Cabinet for Economic Development website www.thinkkentucky.com.

Table 7.30 Summary of Recent Locations and Expansions, 2014-Present

	Reported		
	Companies	Jobs	Investment
Manufacturing Location	0	0	$0
Manufacturing Expansion	0	0	$0
Service & Technology Location	0	0	$0
Service & Technology Expansion	0	0	$0

Note: Totals include announced locations and expansions.
Source: Kentucky Cabinet for Economic Development (8/8/2017)

Table 7.31 Employment by Major Industry by Place of Work, 2015

	Hickman County		Labor Market Area	
	Employment	Percent	Employment	Percent
Total All Industries	1,062	100.0	79,866	100.0
Total Private Industries	809	77.2	66,197	82.9
Natural Resources and Mining	95	8.9	807	1.0
Construction	N/A	N/A	2,869	3.6
Manufacturing	N/A	N/A	8,010	10.0
Trade, Transportation and Utilities	83	7.8	17,807	22.3
Information	N/A	N/A	1,132	1.4
Financial Activities	88	8.3	3,226	4.0
Professional and Business Services	0	0.0	5,692	7.1
Education and Health Services	N/A	N/A	10,052	12.6
Leisure and Hospitality	12	1.1	8,078	10.1
Other Services and Unclassified	29	2.7	1,651	2.1

Source: U.S. Department of Labor, Bureau of Labor Statistics

** Not included in the above Business and Industry summary is the loss of approximately 70 jobs when one of the county's biggest employers, Harper Country Hams, was destroyed by fire in February 2017. This was a major blow to the county economically not only due to the loss of these jobs but the loss of tax revenue generated from these jobs. There is uncertainty over whether or not the company will rebuild.

As previously stated, farming is the most prevalent land use in the Hickman County. Table7.32 is a summary of the farmland located in the Purchase Region and the land use for those acres. This data was retrieved from the United States Department of Agriculture.

Table 7.32 Total Farmland Located in Purchase Region

County	Number of Farms	Land in Farms(acres)	Avg. Farm Size(acres)
Ballard	408	107,186	263
Calloway	821	176,076	214
Carlisle	325	98,620	303
Fulton	178	83,382	468
Graves	1,442	291,813	202
Hickman	**298**	**141,131**	**474**
Marshall	719	94,879	132
McCracken	447	67,192	150
Total	**4,638**	**1,060,279**	**276**

Source: U.S. Department of Agriculture, National Agricultural Statistics Service 2012 Census of Agriculture
http://www.nass.usda.gov:8080/census/Pull_Data_Census

While manufacturing and service sectors are important to the region's economy, agriculture proves to be a vital part of the overall economy. The changes, both hazard related and non-hazard related, that affect farming greatly impact the Purchase Region. Hazards such as hail, flooding, tornadoes, and high wind damage crops and thus influence the economy of the region.

Social growth trends also play a key role in the economy of the Purchase Region. Median income and housing characteristics of the region are valuable tools in analyzing these growth trends. The following tables describe the median income and housing characteristics retrieved from the Kentucky State Data Center Census 2010 information.

Table 7.33 2010 Census and ACS 2011-2015 Median Household Income

Area	Median Household Income		
	2010 Census*	ACS 2011-2015**	Percent Change
Kentucky	$42,302	$43,740	3.3%
Ballard	$39,995	$42,240	5.3
Calloway	$34,947	$37,034	5.6
Carlisle	$35,853	$38,829	7.7
Fulton	$27,524	$28,359	2.9
Graves	$34,550	$39,530	12.6
Hickman	**$37,045**	**$41,218**	**10.1**
Marshall	$41,891	$45,212	7.3
McCracken	$40,976	$44,067	7.0

*Source: Kentucky State Data Center; **U.S. Census Bureau, 2011-2015 American Community Survey 5 Year Estimate*

Table 7.34 2010 Census: Selected Housing Characteristics for the Purchase Region

Subject	Ballard	Calloway	Carlisle	Fulton	Graves	Hickman	Marshall	McCracken
Total Housing Units*	3,889	18,237	2,426	3,360	16,753	**2,335**	15,898	31,342
Occupied Housing Units*	3,288	14,834	2,059	2,568	14,390	**1,973**	12,602	27,514
Vacant Housing Units*	601	3,403	367	792	2,363	**362**	3,296	3,828
Seasonal Use Units**	547	5,654	353	144	1442	**290**	1,426	1,678
Mobile Homes*	657	2,306	500	205	2,220	**360**	2,966	2,988
Owner- occupied*	2,678	9,355	2,059	2,568	14,390	**1,470**	9,813	18,511
Renter- occupied*	610	5,479	367	792	2,363	**503**	2,789	9,003
Household Size – Owner*	2.42	2.49	2.34	2.51	2.63	**2.26**	2.50	2.46
Household Size – Renter*	2.73	2.09	2.58	2.07	2.37	**2.39**	2.18	2.06
Median House Value – Owner Occupied*	$101,800	$119,900	$77,200	$61,000	$92,900	**$68,400**	$111,600	$124,400

*Source * U.S. Census Bureau, 2011-2015 American Community Survey 5 Year Estimate*
***2010 Census Updates; http://ksdc.louisville.edu/1census.htm*

Little to no population growth (0.4%) is expected to occur in the Purchase Region between 2010 and 2020. Hickman County is expected to decline by 5.7% during that same time period. Development is not likely to occur in flood regions identified in each jurisdiction, because the threat of flooding is known and occurs on an annual basis. Industrial expansion that takes place will be in existing industrial parks. The City of Clinton is a member of the NFIP and has implemented a Flood Plain Ordinance IAW the applicable paragraphs of the Kentucky Revised Statues.

7:5 Mitigation Strategy

7:5.1 Capability Assessment

Mitigation strategies were developed in response to the hazard profiles and vulnerability of the assets in each jurisdiction. These strategies provide each jurisdiction with a blueprint for reducing potential losses identified in the risk assessment. These strategies are based on existing authorities, policies, programs, resources, and the ability to expand on and improve the existing tools.

The capability assessment has been divided into three sections:

(A) Existing Authorities, Policies, Programs, and Resources
(B) Existing Governmental Structure
(C) Existing Professional Staff Departments

The purpose of the capability assessment is to identify potential hazard mitigation opportunities available to each jurisdiction through daily operations as a local unit of government. This assessment will highlight the positive measures already in place in the jurisdiction as well as identify weaknesses that could increase vulnerability in a jurisdiction. The capability assessment serves as the foundation for an effective hazard mitigation strategy by establishing goals and objectives for jurisdictions.

(A) Existing Authorities, Policies, Programs, and Resources

The PADD, along with MPT members, evaluated existing authorities, policies, programs, and resources in each jurisdiction. The following chart is a summary of each jurisdiction and the current status of these authorities. Local committee members evaluated this information to determine what goals, objectives, and actions would be necessary to effectively mitigate the vulnerability of a jurisdiction and what resources they currently have that can be used to implement the mitigation strategies identified in this plan.

Table 7.35 Existing Authorities, Policies, Programs, and Resources in the Purchase Region

Jurisdiction	Floodplain Management Ordinance	CRS & FMA Plans	Zoning Regulations	Subdivision Regulations	Land Development Plans	Fire Prevention Code	Comprehensive Plan	Capital Improvement Plan	Stormwater Management Plan	CERT Team	NWS StormReady Program	Local Economic Development	Regional Economic Development	City Class
Ballard County	X							X		X		X	X	
City of Barlow								X				X	X	6
City of Kevil								X				X	X	6
City of La Center					X		X	X				X	X	5
City of Wickliffe	X							X				X	X	5
Calloway County	X		X	X						X	X	X	X	
City of Murray	X		X	X	X		X		X			X	X	3
City of Hazel												X	X	6
Carlisle County	X									X	X	X	X	
City of Bardwell	X											X	X	5
City of Arlington	X											X	X	6
Fulton County	X									X	X	X	X	
City of Fulton	X		X	X	X		X	X				X	X	4
City of Hickman	X		X		X		X					X	X	4
Graves County	X									X		X	X	
City of Mayfield	X		X	X	X		X		X			X	X	3
City Wingo												X	X	6
Hickman County										**X**	**X**	**X**	**X**	
City of Clinton	**X**											**X**	**X**	**5**
City of Columbus													**X**	**5**
Marshall County	X				X	X				X	X	X	X	
City of Benton	X		X				X					X	X	4
City of Calvert City	X		X	X	X		X	X	X			X	X	4
City of Hardin	X											X	X	5
McCracken County	X		X	X	X	X	X			X	X	X	X	
City of Paducah	X		X	X	X		X	X	X			X	X	2

All jurisdictions are members of the PADD. Services are provided by the district in GIS/GPS, Economic Development, Community Development, Aging Services, Workforce Development, and Fiscal Management.

The existing authorities, policies, and programs are further explained in relation to the existing governmental structure and powers of the local jurisdiction. It is the responsibility of each local jurisdiction to develop, enact, and enforce the above referenced authorities and programs.

(B) Existing Governmental Structure

Tables 7.36 (county government) and 7.37 (city government) summarize the governmental structure for each jurisdiction in the PADD. Each jurisdiction is responsible for the implementation of mitigation strategies in their community. These governmental structures were reviewed by the JPHMC to determine the capability of implementing and enforcing existing and future authorities, policies, programs, and resources.

Table 7.36 County Government Structure in the Purchase Region

County	Type of Government
Ballard County	Judge/Executive and 5 magistrates
Calloway County	Judge/Executive and 4 magistrates
Carlisle County	Judge/Executive and 3 magistrates
Fulton County	Judge/Executive and 4 magistrates
Graves County	Judge/Executive and 3 commissioners
Hickman County	**Judge/Executive and 3 magistrates**
Marshall County	Judge/Executive and 3 commissioners
McCracken County	Judge/Executive and 3 commissioners

Table 7.37 Governmental Structure and Class of Incorporated Cities

City	Class	County	Type of Government
City of Barlow	6	Ballard	Mayor and 4 commissioners
City of Kevil	6	Ballard	Mayor and 6 council members
City of La Center	5	Ballard	Mayor and 4 commissioners
City of Wickliffe	5	Ballard	Mayor and 6 council members
City of Murray	3	Calloway	Mayor and 12 council members
City Hazel	6	Calloway	Mayor and 6 council members
City of Bardwell	5	Carlisle	Mayor and 6 council members
City of Arlington	6	Carlisle	Mayor and 4 commissioners
City of Hickman	4	Fulton	Mayor and 4 commissioners
City of Fulton	4	Fulton	Mayor and 4 commissioners
City of Mayfield	3	Graves	Mayor and 10 council members
City of Wingo	6	Graves	Mayor and 4 commissioners
City of Clinton	**5**	**Hickman**	**Mayor and 6 council members**
City of Columbus	**5**	**Hickman**	**Mayor and 6 council members**
City of Benton	4	Marshall	Mayor and 6 council members
City of Calvert City	4	Marshall	Mayor and 6 council members
City of Hardin	5	Marshall	Mayor and 6 council members
City of Paducah	2	McCracken	Mayor and 4 commissioners

Legal Authority of Local Jurisdictions

There are many tools available to local governments in Kentucky that may help them implement mitigation programs, policies and actions. Any hazard mitigation program can utilize any or all of the five types of government powers granted by the State of Kentucky: Regulation; Acquisition; Taxation; Spending, and Education.

Regulation

- Police Power: Local governments have been granted broad regulatory powers in their jurisdictions. Kentucky Revised Statutes grant the general police power to local governments, allowing them to enact and enforce ordinances and laws that define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety and welfare of the citizens of their jurisdiction. The general police power also has the ability to define and abate nuisance ordinances, including those related to public health.

- Jurisdictions can include hazard mitigation requirements in their ordinances as protection of public health, safety and welfare. They may also use this power to enforce nuisance ordinances identifying nuisances that threaten the general health and safety of the public.

- Building Codes and Inspection: The construction and rehabilitation of homes, business and other structures according to standards that will make the structures more resistant to the impact of natural hazards is a big part of mitigation activity in a jurisdiction. These standards can be enforced in a jurisdiction through building codes. Through the adoption and enforcement of building codes in each jurisdiction, it can be assured that mitigation strategies are in place for the planning area.

- Land Use: Local governments can control the use of land in the jurisdiction through regulatory powers granted to them by the State of Kentucky. Jurisdictions can control certain aspects of development under these powers. The amount and type of growth in a jurisdiction can greatly affect the vulnerability of the community in the event of a natural hazard. Land use powers include the power to enact and enforce zoning ordinances, floodplain ordinances, and subdivision controls, as well as the power to engage in planning.

    - Acquisition**:** The State of Kentucky Revised Statutes allows for jurisdictions to acquire property for public purpose. Acquisition can be a useful tool for mitigation goals in that property in hazard prone areas may be acquired so that future development is prohibited in a hazardous area.

    - Taxation**:** Local governments have been given the power to levy taxes and special assignments by the State of Kentucky. Taxation extends beyond the collection of revenue and can provide the means by which the community develops in the future.

    - Spending**:** Local governments have also been given the power to make expenditures on behalf of the public in their interest. Hazard mitigation principles should be incorporated in the spending decisions made by the local government in a jurisdiction.

- Education**:** Although most residents in a jurisdiction have some knowledge of the natural hazards that potentially threaten their community, most of them have had little formal education about what they as individuals can do to reduce their vulnerability to a natural hazard event. Education involving mitigation strategies and potential vulnerability will be essential for all jurisdictions in the planning area.

(C) Existing Professional Staff Departments

Members of Hickman County MPT reviewed their existing capabilities based on their current professional staff departments. During the public input meetings, participants determined that the implementation of Mitigation Strategies and Projects would depend on the capability of that department in each jurisdiction.

Table 7.38 Capabilities Assessment: Existing Professional Staff Departments

Jurisdiction	Board of Education	Building Inspectors	Court Clerk	Emergency Management	County/City Treasurer	Mayor /County Judge/Executive	Health Department	Road Department	Sheriff Department	City Police Department	PVA (Tax Assessment)	Social Services	Utilities Department
Ballard County	X		X	X	X	X	X	X	X		X	X	X
Wickliffe				X	X	X							X
Barlow				X	X	X							X
Kevil				X	X	X							X
LaCenter				X	X	X							X
Calloway County	X		X	X	X	X	X	X	X		X	X	X
Murray	X	X		X	X	X		X		X			X
Hazel				X	X	X							X
Carlisle County	X	X	X	X	X	X	X	X	X		X	X	X
Bardwell		X		X	X	X		X		X			X
Arlington		X		X	X	X		X					X
Fulton County	X		X	X	X	X	X	X	X		X	X	X
HIckman				X	X	X		X		X			X
Fulton	X			X	X	X		X		X			X
Graves County	X		X	X	X	X	X	X	X		X	X	X
Mayfield	X	X		X	X	X		X		X			X
Wingo				X	X	X							X
Hickman County	**X**		**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**
Clinton				**X**	**X**	**X**				**X**			**X**
Columbus				**X**	**X**	**X**							**X**
Marshall County	X	X	X	X	X	X	X	X	X		X	X	X
Benton		X		X	X	X		X		X			X
Calvert City		X		X	X	X		X		X			X
Hardin				X	X	X							X
McCracken County	X	X	X	X	X	X	X	X	X		X	X	X
Paducah	X	X		X	X	X		X		X			X

The following definitions summarize the duties and responsibilities of the professional staff departments listed in Table 7.38.

The **Board of Education** maintains the operations of the county school system. This board is elected at large by the people of the community. County funds usually maintain the buildings and provide for other capital projects. State funds usually pay for salaries and the purchase of textbooks and supplies.

The **Building Inspectors** are responsible for enforcing the State Building Code, the NFIP, the Community Rating System, and other applicable local codes. These items are enforced through an inspection and permitting program.

The **PVA, Court Clerk,** and **Sheriff** are elected every four years by the citizens in the county. The PVA is responsible for the valuation of property for tax purposes. The Court Clerk is the custodian of the court system in each county. This office is financed through the State of Kentucky. The Sheriff operates on a budget approved annually by the magistrates (fiscal court) of each county and is responsible for the enforcement of state and local laws.

The **City Police Departments** are responsible for enforcing local and state laws in their designated jurisdiction.

The **Road Departments** are responsible for the care and maintenance of the public roadways in their designated jurisdiction.

The **Utility Departments** are responsible for providing water, gas, electric and sewer services to the public.

The **Emergency Management Service** is responsible for the mitigation, preparedness, response and recovery operations for both natural and man-made disasters. The formation of an emergency management office in each county is mandated under the Kentucky Revised Statutes.

The **County/City Treasurers** are responsible for the management of the budget and fiscal programs for their jurisdiction. This also includes the administration of state and federal grants.

The **Mayor or County Judge/Executive** is responsible for overseeing the daily operations of county or city government in their respective jurisdictions. They are also responsible for the enforcement of county/city policies and regulations.

The **Health Departments** and **Social Services** have separate boards appointed by commissioners. Employment in these departments is approved by the commissioners with state personnel policies applying. These agencies protect and promote public health and provide social services for medical care and governmental social programs for displaced families.

The **Emergency Management, Road Department, Building Inspectors, and Utilities Department** have been identified as the specific departments that will be responsible for carrying out mitigation activities. Each of these departments has been involved in the hazard mitigation planning process by participating in the JPHMC meetings.

It has been determined by the committee that each of these departments have limited available staff that are responsible for multiple duties within their departments. All jurisdictions have limited funding resources available to hire additional staff. Each staff member is adequately trained to accomplish their current work load. Increase in work activities, including hazard mitigation activities, will increase the need for additional staff to effectively perform tasks.

The PADD, as a regional planning agency, has become a primary resource for technical assistance for all jurisdictions in the region. The PADD staff are trained in planning, GIS/GPS, financial management and project development.

SUMMARY: Capability Assessment

The available staff and financial resources of the departments in each jurisdiction determine the ability for expansion and improvement of existing authorities, policies, programs, and resources to reduce potential losses. Each county in the PADD has equal ability to enforce and implement mitigation strategies.

The capability of cities in the Purchase Region varies so communities often work cooperatively with county government to perform projects that improve the quality of life for residents, including mitigation projects and activities.

Because counties have more resources available to implement mitigation activities, it has been suggested that the goals and objectives be prioritized at a county level. City jurisdictions will have the opportunity at any given time to implement mitigation activities if their capabilities expand and the opportunity exists. In addition to local participation, the PADD staff has provided professional assistance in GIS and plan development to help enhance the ability of the local jurisdictions to implement mitigation activities.

Based on the above information, the Local Hazard Mitigation Goals, Objectives and Actions were compiled at a county level, taking city jurisdiction public input into consideration.

7:5.2 Hazard Mitigation Goals

The Hickman County MPT along with PADD staff, analyzed the loss estimates in the risk assessment to establish goals and objectives for loss reduction. The goals were established with the input from local city participants. The goals and objectives will serve as a guide to develop specific actions to reduce potential losses caused by hazard events. These goals and objectives concur with existing community goals and the goals set forth by the Kentucky State Hazard Mitigation Plan.

Mitigation Goals – The mitigation goals were set to be general, long-term guidelines for hazard mitigation in the jurisdictions.

Mitigation Objectives – The mitigation objectives define the strategies and process of implementation to achieve the identified goals. The objectives are specific, measurable, and have a defined completion.

The following goals and objectives were determined to have the greatest influence on hazard loss reduction in Hickman County.

Goal 1: Improve the survivability of critical facilities and infrastructure in order to preserve their capabilities to provide essential services during a hazard event, by reducing the vulnerability of these facilities.

Purpose of Goal in Relation to the Risk Analysis: It is understood that there will be a certain level of vulnerability to critical facilities and infrastructure depending on the nature of a hazard event. Loss of these capabilities directly affect public health and public safety in part or all of Hickman County. During a natural hazard event, roadways can be damaged and utility services knocked out. These types of damages hinder emergency first responders from being able to effectively get help to those in need. The following objectives were formulated as a result of this goal:

The following objectives have been developed as a result of this goal:

1.1: Enhance the rapid restoration of transportation systems.
1.2: Enhance the rapid restoration of utility systems.
1.3: Where possible, move the critical facilities out of flood prone areas.
1.4: Enhance the resistance of/harden critical facility structures to the effects of natural hazards.
1.5: Enhance the capability to maintain essential public health and public safety services by providing back-up sources of power and redundant communications to critical facilities.

Goal 2: Reduce the potential damaging effects of natural hazards through development policies without limiting the goals for growth of the community.

Purpose of Goal in Relation to the Risk Analysis: It has been determined that potential losses associated with development in Hickman County may be greatly reduced by enforcing or developing county and city policies that regulate development in hazard prone areas. Policies that regulate and guide the development of future infrastructure, residential, and industrial projects will reduce the vulnerability of these facilities.

The following objectives have been developed as a result of this goal:

2.1 Enforce existing policies and authorities.
2.2 Develop new policies such as ordinances and building codes that require new structures to meet standards that will resist natural hazards.
2.3 Develop land use planning policies that restrict development in hazard prone areas such as flood zones.
2.4 Develop subdivision requirements to protect utilities, such as buried power and phone lines.

Goal 3: Protect public health and safety by increasing public awareness of natural hazards that affect Hickman County and by fostering a sense of responsibility within the public for mitigating risks associated with those natural hazards.

Purpose of Goal in Relation to the Risk Analysis: It has been determined that the general public in Hickman County needs to be aware of the high-risk areas, and potential harm associated with the natural hazards that affect their area. While policies can be developed to reduce the development in hazard prone areas, public education will ensure that those policies are utilized to their fullest to reduce the number of existing and future structures in those areas. Through public education, individuals may realize the seriousness of potential hazards and act upon this realization by taking steps to secure their property and protect their families against the risks of natural hazards. The following objectives have been developed as a result of this goal:

The following objectives have been developed as a result of this goal:

3.1 Educate the public on potential natural hazards that affect their Hickman County.
3.2 Increase public understanding and support of the hazard mitigation process.
3.3 Educate the public on how they can take personal responsibility for their own health, safety and property protection.
3.4 Develop and maintain emergency evacuation routes. Educate the public to the location and use of evacuation routes.
3.5 Storm Ready: Maintain Hickman County's status as a Storm Ready Community.
3.6 Pursue Firewise Community status for Hickman County, City of Clinton, and City of Columbus.

Goal 4: Efficiently make use of public and private funds to increase the capabilities of local jurisdictions to reduce potential losses associated with flood hazard events.

Purpose of Goal in Relation to the Risk Area: It has been determined that potential losses can be reduced in Hickman County by their ability to effectively communicate, plan, and implement mitigation projects. Efficiently using public or private money to improve communication, planning, and implementation capabilities for the general public as well as key critical facilities can reduce the impact a hazard has on Hickman County. The following objectives have been developed as a result of this goal:

The following objectives have been developed as a result of this goal:

4.1 Promote inter-agency and inter-local cooperation for the use of mitigation funds and activities.
4.2 Take advantage of State Hazard Mitigation grants associated with Disaster Declarations, Pre-Hazard Mitigation Grant announcements, and other grants to fund Mitigation Projects.
4.3 Leverage State and local funding, local match sources and in-kind match resources to get the maximum utility from available Mitigation Funds.

Goal 5: Protect Hickman County's most vulnerable populations, buildings and critical facilities and infrastructure through the implementation of cost-effective and technically feasible mitigation projects.

Purpose of Goal in Relation to the Risk Area: During the review of the risk analysis, council members determined several structures and critical facilities and infrastructure that will need to have specific mitigation actions taken in order to be effective in reducing the vulnerability. Some identified structures and critical facilities and infrastructure need to be removed from the flood hazard area completely or built to appropriate standards to reduce the potential losses.
The following objectives have been developed as a result of this goal:

5.1 Increase the availability of adequate shelters and community shelters for protection from the direct and indirect effects of severe weather events.
5.2 Continue to improve early warning of impending severe weather events.
5.3 Reduce the number critical facilities and infrastructure in identified flood hazard areas.
5.4 Utilize available mitigation measures to reduce the number of vulnerable structures in the flood hazard areas.
5.5 Utilize available mitigation measures such as structure elevation to reduce the vulnerability of structures in the flood hazard areas.
5.6 Identify and remove stream blockages of tree limbs and trunks, form effective check dams and barrages, and result in the pooling of water during flood events.

Goal 6: Support and participate in regional Hazard Mitigation Planning.

Purpose of the Goal in Relation to the Risk Area: Hickman County, the City of Clinton, the City of Columbus, and representatives of various groups and organizations represented the County and participated in the JPHMC and the development of the regional portion of the plan. Because a regional "Authority" does not exist, the realization of the goals and objectives of the JPHMC Multi-Jurisdictional Plan depends on the support and cooperation of Hickman County and the City of Clinton and the City of Columbus. This is especially true in that; the Regional Goals and Objectives affect all jurisdictions in the Purchase Region, damage to or destruction of the Regional Critical Facilities identified in the plan affect all jurisdictions in the Region, the strategies and mitigation projects that will evolve from these goals require the participation of all the jurisdictions in the region and the results will benefit all the participants. In the same vein, Hickman County, and the City of Clinton and the City of Columbus will require the cooperation and assistance of other jurisdictions, both neighboring and region wide, and the assistance of Regional organizations such as the PADD, the Kentucky State Police, KYTC District One, Purchase District Health Department to help plan, fund and implement Hazard Mitigation projects.

The following objectives have been developed as a result of this goal:

6.1 Request Kentucky Geological Survey and the University of Kentucky to conduct/expand further studies into seismicity, soils and ground shaking potential within the region.
6.2 Develop a regional high resolution, spatially accurate imagery database to extract precise point locations and structure footprints for buildings and other critical facilities.
6.3 Adopt an All-Hazard Week public awareness campaign to include earthquake, flood, tornados and severe storms.

Goal 7: Obtain the best data and analysis available to assess the downstream hazard posed by existing dams in the event of the failure.

Purpose of Goal in Relation to the Risk Area: Potential losses can be reduced in a jurisdiction by their ability to effectively plan and implement mitigation projects. In order to do so, an accurate assessment of the threat posed by Dam Failure must be made to determine the geographic extent of the hazard and the potential impact of the Hazard in terms of threat to the populace and property.

The following objectives have been developed as a result of this goal.

7.1 Identify and map vulnerable structures, critical facilities, and risk prone areas.
7.2 Update County EOP as required
7.3 Support and participate in simulations and preparedness exercises relating to dam failure.
7.4 Monitor other existing dams in cooperation with the State Department of Water.

7:5.3 Identification and Analysis of Mitigation Measures

The intention of this section is to identify, evaluate, and analyze a range of mitigation actions that will help reduce the potential effects of hazard events identified in the risk assessment of the plan. These actions were derived based on the analysis of the risk assessment and support the goals and objectives identified in the plan.

The following list describes potential loss reduction mitigation actions and techniques identified for mitigation of hazard events. These actions and objectives were determined to have the greatest influence on hazard loss reduction in Hickman County. Hazard specific mitigation actions are listed in order of priority in accordance with the High Risk Hazards for the county as identified and prioritized by the Hickman County MPT.

- Prevention activities are designed to keep current problems from getting worse and to eliminate the possibility of future problems. Prevention activities reduce a jurisdiction's vulnerability to hazard events. This type of activity is especially effective in hazard prone areas where development has not occurred. Prevention activities include the following:
  - Planning
  - Floodplain regulations
  - Stormwater management
  - Building codes
  - Capital improvement programs
  - Open space preservation
  - Dam inspection and monitoring

- Property protection activities are designed to adapt existing structures to withstand natural hazards or to remove structures away from hazard prone areas. Property protection activities include the following:
  - Acquisition
  - Relocation
  - Foundation elevation
  - Insurance – flood and homeowner's
  - Retrofitting (includes activities such as wind-proofing, flood-proofing, and seismic design standards)

- Structural projects lessen the impact of a natural hazard by changing the natural progression of the hazard. These types of projects are usually designed by engineers. Structural projects include the following:
  - Storm sewers
  - Floodwalls
  - Highway Projects
  - Retention Basins
  - Reservoirs
  - Dams
  - Levees
  - Dredging
  - Minor flood control projects
  - Culvert resizing
  - Retaining walls
  - Safe rooms

- Emergency services minimize the impact that a natural hazard has on the residents of a jurisdiction. Usually, actions are taken by emergency response services immediately before, during, or in response to a hazard event. Emergency service activities include the following:
  - Warning systems: sirens / automated calling system
  - Evacuation planning and management
  - Sandbagging for flood protection
  - Emergency response services
  - Protection of critical facilities
  - Emergency generators
  -

- Public information and awareness activities are used to educate the residents of a jurisdiction about the potential hazards that affect their area, hazard prone areas, and mitigation strategies they can take part in to protect themselves and their property. Public information and awareness activities include the following:
  - Public speaking events
  - Outreach projects
  - Availability of hazard maps
  - School programs
  - Library materials
  - Hazard Awareness Weeks
  - Real estate disclosure
  - Storm Ready Community Program
  - Firewise Community Program
  - CERT Teams and CERT Training
  - Citizens Corps Organizations

- Natural resource protection activities include those that minimize hazard losses and preserve or restore the functions of natural systems. Natural resource protection actions include the following:
  - Sediment and erosion control
  - Stream corridor restoration
  - Watershed management
  - Forest and vegetation management
  - Wetlands preservation and management

The goals and objectives for hazard mitigation in Hickman County were developed on a multi-jurisdictional basis. The mitigation activities defined for each goal and objective were largely based on the capability of the county to complete the activities given their geographical location and financial capability. Specific projects included in this plan or evolved out of participation in this planning process.

Table 7.39 Hickman County Hazard Summary Table

HIGH RISK HAZARDS	WINTER STORM THUNDERSTORM WIND TORNADO FLASH FLOOD / FLOOD
MODERATE RISK HAZARDS	EARTHQUAKE
LOW RISK HAZARDS	HAIL DROUGHT DAM FAILURE

SOURCE: Hickman County MPT 2017

Winter Storm Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Make sure critical facilities have a backup source of heat
- Provide public education as to the safe use of back up heat sources
- Promote trimming of tree limbs and debris, particularly in areas close to critical facilities and infrastructure such as power lines.
- Evaluate subdivision regulations for inclusion of underground utilities for new development
- Promote public education to individuals and families, business, and schools for winter Storm Events and include the following:
    - Insulate the walls and attic of structures
    - Caulk and weather-strip doors and windows
    - Allow water to slowly drip from faucets to prevent pipes from freezing
    - Check the antifreeze and battery in vehicles
    - Stay off snow or ice covered roads if possible
    - Keep a supply of non-perishable food and water
- Ensure all critical facilities have a backup source of power – generators
- Develop/maintain residential addressed structure point data base for house to house recon during widespread power failures.

Thunderstorm Wind /Hail Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Listen to the latest forecasts, especially when planning outdoor activities
- Keep a NOAA weather radio with extra batteries nearby to listen for weather updates.
- Listen especially for severe thunderstorm watches and warnings.
- Practice lightning safety.
    - Outdoor activities should not take place when lightning is present.
    - Fully enclosed vehicles and large permanent buildings provide safe havens from lightning.
- Pursue programs to provide or subsidize the provision of weather radios to low income populations.
- Promote trimming of tree limbs and debris, particularly in areas close to critical facilities and infrastructure such as power lines.
- Ensure all critical facilities have a backup source of power - generators

Tornado Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Immediate repair or replacement of the emergency siren system for the City of Columbus, which also covers Columbus-Belmont State Park's Campground / RV Park
- Construct community shelter at the City of Columbus
- Develop a plan of action for a tornado event – include home, work, school, and outdoor situations.
- Have tornado drills on a regular basis
- Encourage all households to maintain a disaster supply kit:
  - A 3-day supply of water (1 gallon per person per day)
  - Non-perishable food items
  - One change of clothing and shoes per person
  - One blanket or sleeping bag per person
  - A first-aid kit, including all prescription medicines
  - A battery-powered NOAA weather radio with warning alarm and extra batteries
  - A flashlight and extra batteries
  - Special items for infants, elderly or disabled individuals
- Listen to the latest forecasts, especially when planning outdoor activities.
- Publicize multi-media access to tornado watches and warnings.
- Inspect designated tornado shelters for compliance with building codes to ensure their ability to withstand high winds.
- Install warning systems that are not completely dependent upon electricity.
- Pursue programs to provide or subsidize the provision of weather radios to low income populations.
- Analyze the shelter requirements for temporary residents/visitors to the elder care facilities.
- Evaluate the need for tornado safe rooms, particularly for mobile home parks.
- Initiate mobile home anchoring program
- Build tornado safe room where deemed necessary.
- Ensure all critical facilities have a backup source of power – generators
- Train, equip and maintain Storm Spotter cadre
- Build community shelters in critical locations specifically in close proximity to the County EOC.

Flash Flood / Flood Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Protection from inundation for the City of Clinton's waste water treatment facility.
- Examine and pursue measures to protect from inundation the houses in the City of Clinton's mapped flood hazard areas.
- Hickman County participation in the NFIP
- Enforce City of Clinton Flood Plain Management Plan
- Promote the purchase of flood insurance.
- Elevate the lowest floor level of existing structures above the floodplain
- Elevate flood prone roads
- When feasible, relocate structures out of the floodplain
- Provide openings in foundation walls to allow water to flow in and out
- Install backflow valves to drains, toilets, and other sewer connections
- Maintain ditches and storm water drainage systems
- Ensure all critical facilities have a backup source of power – generators
- Wetland restoration. 4 Rivers Basin Team/Nature Conservancy
- Stream re-alignment
- Increase culvert cross section
- Identification and removal of stream blockages of tree limbs and trunks forming effective check dams and barrages, and resulting in the pooling of water during flood events.

Earthquake Mitigation Activities: Promote public education to individuals, businesses, and schools for hazard events that may include the following.

- Support, encourage, and lobby for the continuing study of the threat of ground shaking from the Wabash and New Madrid Seismic Zones.
- Evaluate public critical facilities and infrastructure to determine their resistance to ground movement.
- Replacement of brittle water and waste water infrastructure specifically cast iron pipe, asbestos cement pipe, and vitreous clay pipe.
- Ensure that all homes and other structures are secured to their foundations.
- Enforce existing seismic building standards (current building code)
- Identify "safe places" in structures that are vulnerable during an earthquake. A safe place might include space under a sturdy table or desk against an interior wall. Stay away from windows.
- Practice the "drop and cover" technique in each identified safe place. Drop under your identified safe place, duck your head between your knees, and cover the back of your neck with your hands. Practice makes this process an automatic response in the event of an earthquake.
- Develop an action plan for an earthquake event – include home, work, school, and outdoor situations.
- Secure heavy furniture to walls. Brace or anchor high or top-heavy objects.
- Purchase earthquake insurance if available.
- Install strong latches on all cabinet doors. This will prevent them from spilling their contents in the event of an earthquake.
- Secure items on shelves or bookcases that might fall and cause injury during an earthquake. Move large or heavy items to lower or bottom shelves.
- Store breakable or glass items in cabinets with latches.
- Brace overhead light fixtures.
- Secure water heater to wall studs.
- Install flexible pipe fittings. These fittings are less likely to break.
- Ensure that all homes and other structures are secured to the foundations.
- Participate in any/all earthquake planning and exercises at the State and National level.

Drought Mitigation Activities: Promote public education to individuals and families, business, and schools for hazard events that may include the following.

- Programs focused on at risk populations, senior citizens, very young children
- Air conditioner/fan loan or subsidized purchase program
- Identification of cooling shelters.
- Replacement of brittle water and waste water infrastructure specifically cast iron pipe.

7:5.4 Implementation of Mitigation Measures

The purpose of this section is to provide a road map on how the mitigation actions identified in section 7:5.3 will be prioritized, implemented and administered in Hickman County. It should be noted that Hickman County does not participate in the NFIP program therefore this section applies solely to the Cities of Clinton and Columbus. However, this section has been prepared in such a manner as to allow the County to participate in the future.

All jurisdictions will adopt the JPHM Plan upon approval in 2018. Each county in the PADD has equal ability to enforce and implement mitigation strategies. The smaller cities in the Purchase Region, depend greatly upon the county government, and the PADD for support and combine resources to perform projects that improve the quality of life for residents, including mitigation projects and activities.

Given the (small) size of most of the Purchase region's cities, the planning process from which the following mitigation actions derived and were prioritized occurred at the county level. However, each city was represented at county-level meetings. Further, within each county-level planning meeting, individual city mitigation actions were discussed and prioritized. In practice, a city would derive one or two structural or property protection projects that it intended to pursue during the next five years and, first, discussed these projects' feasibility to implement in terms of local financing. Predictably, local financing was a significant constraint for both the county and its cities.

Preventative, natural resource protection, emergency service measures, and public information mitigation actions certainly were discussed at each planning meeting. However, the actions are not highly specific actions, by nature. Building code enforcement and enhancement, floodplain mapping and data, floodplain regulation, storm-water management, and planning activities, as examples, do not typically appear distinctive amidst a county and its cities. It is generally universally important, uncontroversial, and prescient to enforce codes, map and regulate floodplains, manage storm-water activity, and plan and zone. Similar that emergency service activities and public information activities are uncontroversial and generally sought (and not mutually exclusively) by both counties and its cities. So while such activities were discussed individually for counties and for cities, their inclusion within the following mitigation action list will appear similar within each jurisdiction's list. In other words: Hickman County and its incorporated cities, Wickliffe, Clinton and Columbus all agreed that preventative activities, emergency service measures, and public information activities primarily should be implemented using local and federal-cum-state financing (e.g., EMPG) and are a high priority for pursuance during the next five years.

The jurisdictions that have participated in the mitigation planning process are listed in this plan. In addition to local participation, the PADD staff has provided professional assistance in GIS and plan development to help enhance the ability of the local jurisdictions to implement mitigation activities.

Funding: Outside of local financing and state financing options, the jurisdictions of the PADD will attempt to utilize the following funding sources in implementing goals, objectives and actions when possible: the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), the Pre-Disaster Mitigation Program (PDM), Hazard Mitigation Technical Assistance Programs (HMTAP), the National Earthquake Technical Assistance Program, the Wind and Water Technical Assistance Program, and federal-state matching programs. It should be noted that the above list represents known funding sources at the time of this writing. It is not exhaustive.

Project Prioritization: Hickman County will maintain the list of set goals, objectives, and actions that have been identified in this plan. These items were prioritized based on a set of criteria located in the FEMA Multi-Hazard Mitigation Planning Guidance that includes social, technical, administrative, political, legal, economic, and environmental factors (STAPLE+E) within the county jurisdictions.

As mentioned above, this mitigation strategy will divide mitigation actions into Community-Rating System (CRS) categories *preventative activities*, *property protection activities*, *natural resource protection activities*, *emergency services measures*, *structural projects*, and *public information activities*.

Mitigation actions falling under *preventative activities*, *emergency services measures*, and *public information activities* generally (i.e., unless otherwise specified) are process-driven by nature and driven by uncontroversial and laudable goals. It is thus muddying and complicated to subject such measures to a formal, qualitative, and subjective prioritization mechanism like STAPLE+E. How does a community distinguish "technical assistance" or "hazard response operations" or "enforcement of building codes" as of equally or of higher priority than the construction of a community safe room? Consequently, such process-oriented actions are treated as default "High" in priority and are considered pursued by Hickman County and its incorporated cities of Clinton and Columbus e.g., Hickman County will "enforce building codes" while its cities may not.

The categories *structural projects*, *property protection activities*, and *natural resource protection activities* primarily will include actions that involve construction activity toward new and existing building structures. It is these intended projects and project categories that were prioritized using STAPLE+E.

Each structural/construction action for each community was given a High, Medium, or Low priority using the STAPLE+E framework. Because STAPLE+E relies upon qualitative and subjective assessment, Table 7.43 defines how each component of the STAPLE+E framework was interpreted. Generally, the mitigation actions with the highest priority were the most cost-effective and most compatible with the jurisdiction's social and cultural values. The below list of structural/construction actions includes a column specifying which components of the STAPLE+E framework as defined below were relevant in the designation of the projects' priority status. "E1" in the project lists refers to the "Economic" consideration. "E2" refers to the "Environmental" consideration.

The PADD staff reviewed each jurisdiction's priorities annually to ensure that they were properly prioritized. The designated council representative from each jurisdiction will be responsible for maintaining this list.

The STAPLE+E criteria guidelines for action prioritization that were given to the council members in order to analyze their actions were as follows:

Table 7.40 STAPLE+E Criteria Explanation

S - Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T – Technical	Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	Mitigation actions can truly be successful if all stakeholders have been offered and opportunity to participate in the planning process and if there is public support for the action.
L – Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E – Economic	Budget constraints can significantly deter the implementation of mitigation actions. It is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.
E - Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Tables 7.41-7.43 represent non-process actions requiring construction or acquisition related to the goals and objectives set forth in this plan, prioritized by each jurisdiction. The table identifies the hazard the action addresses, the action, the action priority, the entity responsible for the action, the potential sources of funding for the action, and to which Community Rating System (CRS) action category each project belongs.

Table 7.44 represents process actions that, thusly, are of High priority to Hickman County *and* to its incorporated jurisdictions equally: For example, it is expected that "adopting and enforcing building codes" applies with equally "High" priority to Ballard County and to its incorporated cities Clinton and Columbus.

Construction/Non-Process Projects to Be Pursued by Each Jurisdiction:

Table 7.41: Hickman County, Unincorporated

Hazard	Action	Priority	STAPLE+E	Responsible Entities	Potential Funding Sources	CRS Action Category	Completion Timeframe
Flooding	Encourage the Fiscal Court to participate in the NFIP program	High	S, T, A, P, L, E1, E2	Fiscal Court	Local, State, Federal Grant Programs	Structural	Immediate
Flooding	Relocate Critical Facilities out of flood-prone areas or Elevate them	High	S, T, P, L, E2	Fiscal Court; Owners of Facilities	Local, State, Federal Grants Programs	Property Protection	On Going
Tornadoes	Purchase and Install Emergency Warning Sirens for areas of Hickman County that lack adequate coverage	High	S, T, A, P, E1	Fiscal Court	Local, FEMA HMA	Emergency Services Measures	Immediate
Tornadoes	Construct Community Safe Room for rural segments of the County	High	S, T, A, P, L, E1	Fiscal Court	FEMA HMA, Local	Structural; Emergency Services Measures	Immediate
All Identified Hazards	Purchase Generators for Critical Facilities	High	S, T, A, P, E1	Fiscal Court	Local, FEMA HMA	Emergency Services Measures	On Going
All Identified Hazards	Purchase Emergency Power Sources for rural areas' designated shelters	High	S, T, P, L, E1	Fiscal Court	Local, FEMA HMA	Emergency Services Measures	On Going
Flooding	Develop a Debris Removal Plan for Streams and Ditches	Medium	S, P, L, E1, E2	Fiscal Court; Public Works	Local, Federal Grants	Public Information; Natural Resource Protection	On Going
Tornadoes; Severe Storms; Ice Storms	Trim Trees and Debris from Overhead Powerlines	Medium	S, P, L, E1	Utilities Providers	Private, Local	Preventative Activities	On Going
Wildfires	Purchase Equipment to suppress brush fires	Medium	S, P, E1	Fire Departments; Fiscal Court	Non-Profit, Private, Local, Federal Grants	Natural Resource Protection	Long Term
All Identified Hazards	Upgrade Emergency Services Communication Equipment (for Critical Facilities)	Medium	S, T, P, E1	Emergency Management Agency	FEMA/DHS, Other Federal Grants, Local	Emergency Services Measures	On Going

Table 7.42: Clinton, City of

Hazard	Action	Priority	STAPLE+E	Responsible Entities	Potential Funding Sources	CRS Action Category	Completion Timeline
Flooding	Identify measures to alleviate flooding of the City's wastewater treatment system	High	S, T, A, P, L, E1, E2	City	Local, State, Federal Grant Programs	Structural	Immediate
Flooding	Identify & implement measures to protect homes in the mapped flood hazard area from inundation	High	S, T, A, P, L, E1, E2	City	Local, State, Federal Grant Programs	Structural	Immediate
Tornadoes	Purchase and Install Emergency Warning Sirens for portions of Clinton that don't have adequate coverage	High	S, T, A, P, E1	City; Fiscal Court	Local, FEMA HMA	Emergency Services Measures	Immediate
Tornadoes	Construct Community Safe Room for the City of Clinton	High	S, T, A, P, L, E1	City	FEMA HMA, Local	Structural; Emergency Services Measures	Immediate
All Identified Hazards	Purchase Generators for Critical Facilities	High	S, T, A, P, E1	City	Local, FEMA HMA	Emergency Services Measures	On Gong
Tornadoes; Severe Storms; Ice Storms	Trim Trees and Debris from Overhead Powerlines	Medium	S, P, L, E1	Utilities Providers	Private, Local	Preventative Activities	On Going
All Identified Hazards	Upgrade Emergency Services Communication Equipment (for Critical Facilities)	Medium	S, T, P, E1	Ballard County Emergency Management Agency	FEMA/DHS, Other Federal Grants, Local	Emergency Services Measures	On Going

Table 7.43: Columbus City of

Hazard	Action	Priority	STAPLE+E	Responsible Entities	Potential Funding Sources	CRS Action Category	Completion Timeframe
Tornadoes	Repair or replace emergency warning siren system that serves the City of Columbus and Columbus Belmont State Park	High	S, T, A, P, E1	City	Local, FEMA HMA	Emergency Services Measures	Immediate
Tornadoes	Construct Community Safe Room for the City of Columbus and the State Park	High	S, T, A, P, L, E1	City	FEMA HMA, Local	Structural; Emergency Services Measures	Immediate
All Identified Hazards	Purchase Generators for Critical Facilities such as Columbus Water Works	High	S, T, A, P, E1	City	Local, FEMA HMA	Emergency Services Measures	Immediate
Tornadoes; Severe Storms; Ice Storms	Trim Trees and Debris from Overhead Powerlines	Medium	S, P, L, E1	Utilities Providers	Private, Local	Preventative Activities	On Going
All Identified Hazards	Upgrade Emergency Services Communication Equipment (for Critical Facilities)	Medium	S, T, P, E1	Hickman County Emergency Management Agency	FEMA/DHS, Other Federal Grants, Local	Emergency Services Measures	On Going

Table 7.44: Process Mitigation Actions That Apply to Hickman County and Each of Its Incorporated Cities (Clinton and Columbus) with Equally (i.e., "High") Priority

Hazard	Action	Priority	Responsible Entities	Potential Funding Sources	CRS Action Category	Implementation Timeline
Flooding	Establish & Enforce NFIP Flood Ordinances	High	County and City Executives; Floodplain Managers	Fiscal Court; City Councils	Preventative Activities	Immediate
Flooding	Monitor, Evaluate, Collect Damages Data to determine additional and on existing Repetitive-Loss Properties	High	County EMAs; City-Appointed Designees; Floodplain Managers	Fiscal Court; City Councils	Preventative Activities; Property Protection	On Going
All Identified Hazards	Promote the Usage of NOAA Weather Radios	High	County and City EMA and EM agents	Fiscal Court; City Councils	Preventative Activities; Public Information	On Going
Flooding	Provide Updated Floodplain Mapping and other information regarding flood-prone areas to Public	High	County and City EMA and EM agents; Floodplain Managers	Fiscal Court; KYEM; KDOW	Public Information; Preventative Activities	On Going
Earthquakes; Flooding	Public Outreach regarding Importance of and Availability of Earthquake and Flood Insurance	High	County; City; County EMA and EM agents; Floodplain Managers; Insurance	Fiscal Court; City Councils; KYEM; KDOW; UK-KGS	Public Information; Preventative Activities	On Going
All Identified Hazards	Adopt and Enforce Building Codes	High	County; City; Building Inspection agents	Fiscal Court; City Councils; KYEM; FEMA (through HMGP Initiative)	Preventative Activities	Long Term
All Identified Hazards	Public Outreach for the Development of Evacuation Plans and Procedures relevant to All Identified Hazards	High	County; City	Fiscal Court; City Councils; KYEM	Public Information; Emergency Services Measures; Preventative Activities	Lone Term
All Identified Hazards	Develop and Implement a Protection Program for Critical Information Systems	High	County; City	Fiscal Court; City Councils	Emergency Services Measures; Preventative Activities	On Going