

# Shelby County Multi-Hazard Mitigation Plan

2022

"Under the Federal Disaster Mitigation Act of 2000 (DMA 2000 or "the Act"), Shelby County (County) is required to have a Federal Emergency Management Agency ("FEMA") - approved Local Hazard Mitigation Plan ("the Plan") in order to be eligible for certain pre- and post-disaster mitigation funds. Adoption of this Plan by the County and approval by FEMA will serve the dual objectives of providing direction and guidance on implementing hazard mitigation in the County, and qualify the County to obtain federal assistance for hazard mitigation. Solely to help achieve these objectives, the Plan attempts to systematically identify and address hazards that can affect the County. Nothing in this Plan is intended to be an admission, either expressed or implied, by or on behalf of the County, of any County obligation, responsibility, duty, fault or liability for any particular hazard or hazardous condition, and no such County obligation, responsibility, duty, fault or liability should be inferred or implied from the Plan, except where expressly stated."

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## **1. Introduction and Background**

### **1) Participating Jurisdictions**

The 2022 Shelby County Multi-Hazard Mitigation Plan is an update of the County's most recent plan that expired in August 2021. The 2022 Plan update includes six participating jurisdictions: Shelby County, the City of Center, the City of Huxley, the City of Joaquin, the City of Tenaha, and the City of Timpson.

### **2) Hazards to be Addressed**

Previously, the expired plan identified 11 hazards facing the County: dam failure, drought, earthquakes, extreme heat, flooding, hazardous materials incidents, hurricanes and tropical storms, thunderstorms (lightning, hail, high winds), tornados, wildfires, and winter storm. Of the 11 hazards one is not considered a natural hazard: hazardous materials incidents. FEMA does not recognize hazardous materials as an eligible natural hazard. Nevertheless, this 2022 Plan update will continue to address hazardous materials incidents though the hazard is typically addressed in emergency management plans.

The mitigation planning regulation of the Disaster Mitigation Act<sup>1</sup> requires that mitigation plans be reviewed and updated every five years to maintain eligibility for mitigation grant funding. As part of this plan, Shelby County will develop a schedule to ensure that its hazard mitigation plan is regularly updated.

The 2022 Shelby County Multi-Hazard Mitigation Plan update will address the following natural hazards identified in the State of Texas' 2018 Hazard Mitigation Plan as threats throughout the state. Each participating jurisdiction will address the following natural hazards listed below in Table 1.

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<sup>1</sup> 44 CFR §201.6(d)(3)

**Table 1: List of Hazards Addressed**

Hazard	Jurisdiction					
	Shelby County	City of Center	City of Huxley	City of Joaquin	City of Tenaha	City of Timpson
Flooding	x	x	x	x	x	x
Hurricanes, Tropical Storms, and Depressions	x	x	x	x	x	x
Wildfire	x	x	x	x	x	x
Tornados	x	x	x	x	x	x
Drought	x	x	x	x	x	x
Extreme Cold	x	x	x	x	x	x
Extreme Heat	x	x	x	x	x	x
Hailstorm	x	x	x	x	x	x
Winter Weather	x	x	x	x	x	x
Severe Winds	x	x	x	x	x	x
Lightning	x	x	x	x	x	x
<b>Additional Optional Hazards</b>						
Coastal Erosion						
Inland Erosion						
Land Subsidence/Sinkhole						
Earthquakes	x	x	x	x	x	x
Expansive Soils						
Dam / Levee Failure	x	x	x	x	x	x
Hazardous Materials	x	x	x	x	x	x

### *Omission Statements*

Shelby County and the participating jurisdictions will not be addressing the following hazards: Expansive Soils, Land Subsidence, and Coastal/Inland Erosion. The history of impacts for all the omitted hazards have been negligible (or non-existent), therefore the County and participating jurisdictions expects that future impacts will be negligible as well, nor do the County and participating jurisdictions anticipate applying for grant funding to address any of them.

## 2. Planning Process

The Shelby County Multi-Hazard Mitigation Plan is a multi-jurisdiction plan. Representatives to the local planning team were selected by each jurisdiction. Planning team members represented the following offices and departments:

**Table 2: Local Planning Team Representatives**

Title	Jurisdiction
County Judge	Shelby County
County Judge’s Assistant	
Emergency Management Coordinator	
City Manager	City of Center
Emergency Management Coordinator	
City Mayor	City of Huxley
City Manager	
City Secretary	City of Joaquin
City Secretary	City of Tenaha
City Mayor	City of Timpson
City Secretary	

Once the planning team was established, members developed a schedule with specific goals and proposed meeting dates over the planning period.

Hazard mitigation planning team (HMPT) members contributed to the following activities throughout the planning process:

1. Providing technical assistance and necessary data to the HMPT.
2. Scheduling, coordinating, and facilitating community meetings.
3. Providing necessary materials for public planning meetings.
4. Collecting and analyzing data.
5. Developing mitigation goals and implementation strategies.
6. Preparing the first draft of the plan and providing technical writing assistance for review, editing, and formatting.

Each member of the HMPT participated in the following activities associated with development of the plan:

1. Identifying, contacting, coordinating, and implementing input from stakeholders.
2. Attending, conferencing in, or providing meeting support and information for regular HMPT meetings.
3. Identifying hazards and estimating potential losses from future hazard events.
4. Developing and prioritizing mitigation actions to address identified risks.
5. Coordinating public meetings to develop the plan.
6. Identifying community resources available to support planning effort.
7. Submitting proposed plan to all appropriate departments for review and comment and working with the County to incorporate the resulting comments into the proposed plan.

**Table 3: Plan Schedule**

Timeline									
Planning Tasks	2022								Completed
	Mar	Apr	May	June	July	Aug	Sept	Oct	
Organize Resources and Identify Planning Team	█	█							
Create Outreach Strategy	█	█	█						
Review Community Capabilities			█	█	█				
Conduct Risk Assessment			█	█	█				
Identify Mitigation Goals and Actions				█	█	█			
Develop Action Plan for Implementation				█	█	█			
Identify Plan Maintenance Procedures				█	█	█			
Review Plan Draft						█	█	█	
Submit Plan to State and FEMA							█	█	
Adopt Plan								█	TBD
Meetings									
Planning Team			5/02/22	6/28/22					
Public Outreach – Online Surveys			█				█	█	
Stakeholder Outreach					█	█			

## 1) Existing Plans, Reports, Ordinances, and Technical Information Sources

Each planning team member worked to collect and provide the input and information necessary to develop the hazard mitigation strategy. Research was coordinated and conducted by local planning team members. The local planning team reviewed the following documents during the planning process:

**Table 4: Planning Team Data Sources**

Data Source	Data Incorporation	Purpose
National Centers for Environmental Information (NCEI)	Hazard occurrences	Previous event occurrences, damage dollars, and mapping for all hazards
National Oceanic and Atmospheric Administration (NOAA)	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all hazards
National Severe Storms Laboratory (NSSL)	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all severe storms
National Weather Service (NWS), Shreveport, LA Office	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all hazards
Shelby County 2018 CHAMPS Report	Natural hazard data	Review previously compiled natural hazard histories.
Shelby County Appraisal District Data	Property values and parcel counts	Population counts, parcel data, and land use data
Shelby County Hazard Mitigation Plan, 2016-2018	Previous planning approach, hazards addressed, and mitigation actions	Previous planning team representatives, plan maintenance, hazard histories, and mitigation actions
State of Texas Hazard Mitigation Plan 2018 Update	Hazard Descriptions	Official descriptions of hazards and their potential impacts
Estimated Base Flood Elevation – Federal Emergency Management (FEMA)	Flood Zones maps	GIS mapping of flood zones and potential flooding risk areas
Toxic Release Inventory (EPA)	Historic Hazardous Materials data	Identifying sources, incidences, and severity of hazardous materials releases
US Coast Guard National Response Center	Historic Hazardous Materials data	Identifying oil, chemical, radiological, biological and etiological discharges into the environment
Shelby County Flood Damage Prevention Order	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Center Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Center Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Huxley Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
Joaquin Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact

Additional information sources included: USDA Census of Agriculture, United States Geological Survey, Vaisala, and specific details about previous natural hazard events from planning team participants. Sources are noted throughout the document. Report titles and links to the most recently accessed websites hosting the related information are also noted, where appropriate.

Area stakeholders contacted to participate in the planning process included the following offices and departments within the participating jurisdictions and neighboring jurisdictions. In many cases of non-participation, the title listed is reflective of the office the planning team tried to contact.

**Table 5: Local Stakeholders Contacted**

<b>Stakeholder</b>	<b>Title</b>	<b>Participated</b>
Panola County	Emergency Management Coordinator	N
Nacogdoches County	Emergency Management Coordinator	N
Rusk County	Emergency Management Coordinator	N
Sabine County	Emergency Management Coordinator	N
San Augustine County	County Judge	N
Nacogdoches Medical Center ER	Shelby ED Director	Y
Shelby County	Sheriff	N
Shelby County	Commissioner’s Court	N
Texas AgriLife Extension Service	Extension Agent	N
Assistant Superintendent	Center ISD	N
Fire Chief	City of Joaquin	N
Council Member	City of Joaquin	N
Constable	City of Joaquin	N
Policy Chief	City of Tenaha	N
Fire Chief	Tenaha Fire Department	N
Pastor	First Baptist Church	N
Pastor	The Lighthouse Church	N
Superintendent	Tenaha ISD	N

Area stakeholders were contacted by phone and email. In an effort to increase participation, each stakeholder was contacted at least twice. Area stakeholders who chose to participate provided important supplemental input and information that helped shape mitigation strategies for each hazard, in particular by making the planning team aware of hazard areas that had not been previously identified.



## **2) Project Meetings**

The planning team met on two separate occasions. Additional communication was regularly carried out via email and over the phone.

The first planning team meeting was held virtually on May 2, 2022. During this meeting, the planning team decided which hazards needed to be addressed in the mitigation plan and which were not relevant. To make these decisions, a hazard handout was produced to show previous occurrences of each hazard, associated deaths and injuries, and total dollar damages. The team agreed to use the collected hazard data, as the foundation for its hazard risk assessment and ongoing research into hazard extent, impact, and vulnerability. At the end of the meeting, planning team members were tasked with compiling relevant data, including city ordinances; court orders and regulations; identifying critical facilities; and providing a status update on previous mitigation actions.

The second planning team meeting was held virtually on June 28, 2022. To stay on schedule, the planning team needed to meet the following objectives: Finalize the hazards list, collect relevant ordinances and plans, review and refine the critical facilities list, and identify area stakeholders, as well as review possible mitigation actions and potential eligible projects for each participant. The planning team discussed and identified new mitigation actions, discussed changes to the plan drafts, and agreed to work on completing all deliverables for the plan. Additional work was done over email in preparation for submitting the plan for official review in October 2022.

## **3) Public Input**

Members of the public were invited to participate in two public comment periods to provide input and feedback during the planning process. Due to the COVID-19 pandemic, the public comment periods were held virtually. The first public comment period took place in May 2022. A Google Form survey was posted to the County website for a period of two weeks for members of the public to fill out. A newspaper ad was placed to announce to the public for the opportunity to provide input via online survey. The County and participating jurisdictions actively announced the online survey on their own websites and social medias. The planning team appreciated receiving responses to the survey which helped inform them when identifying and prioritizing new mitigation actions for this plan update. The survey received 51 anonymous responses.

The survey asked nine questions:

1. Where do you live?
2. Do you own or rent?

3. Shelby County is looking at addressing the following hazards. Which hazards do you believe impact the County and/or participating cities the most? Please select all that apply (multiple choice answer).
4. Which of the above hazards have affected you directly within the past five years? Please select all that apply (multiple choice answer).
5. How have you been affected by the hazards selected above? (Open-ended question)
6. Have you taken any actions to reduce your risk to these hazards? If so, what actions have you taken? (Open-ended question)
7. What is the best means of communication for you? Please select all that apply (multiple choice answer).
8. Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply (multiple choice answer).
9. Do you have any other thoughts or concerns relating to the Hazard Mitigation Plan? (Open-ended question).

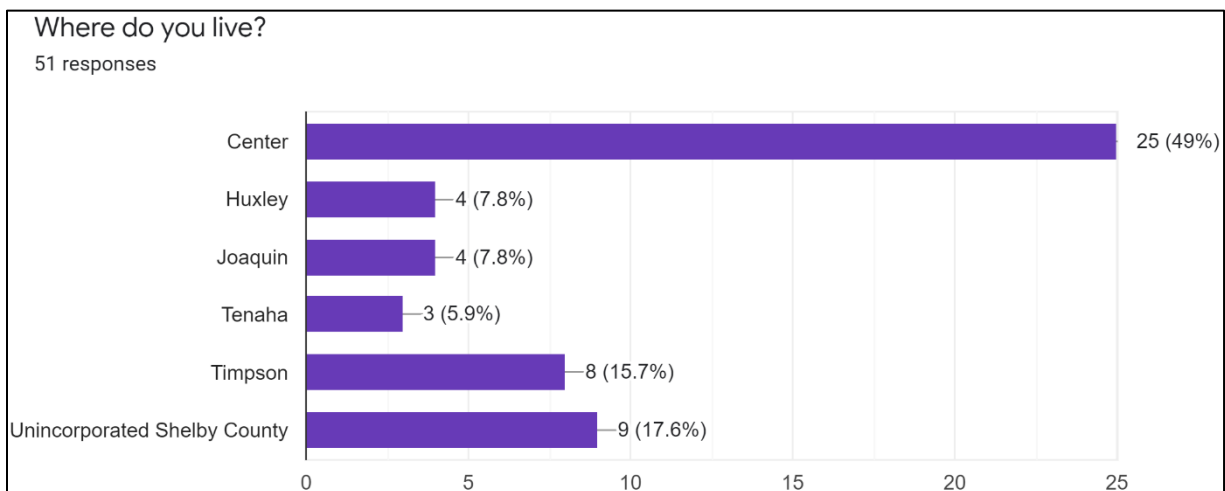


Figure 1: Survey Responses for Question 1

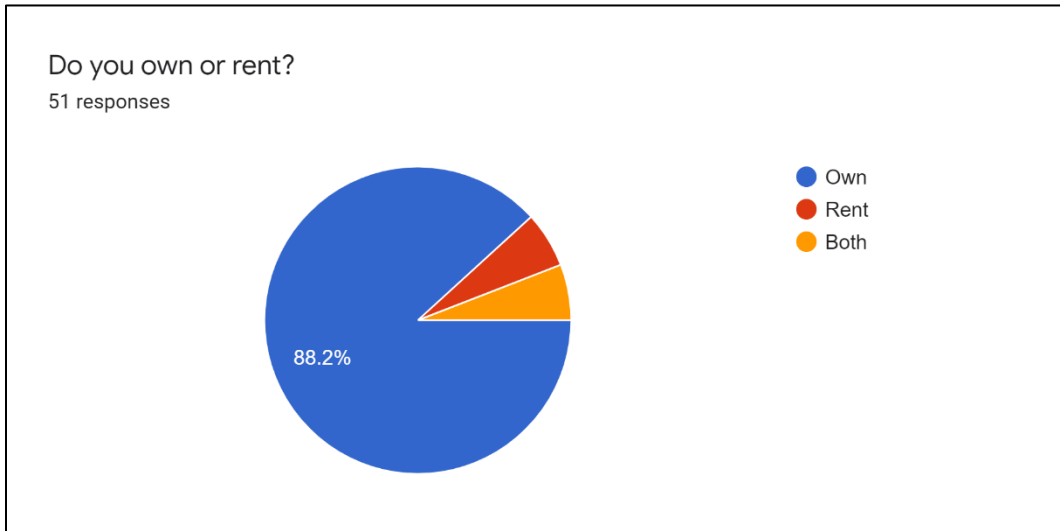


Figure 2: Survey Responses for Question 2

As Figure 1 above shows, majority of the respondents live in the City of Center. About 88.2% of respondents own their home as shown in Figure 2.

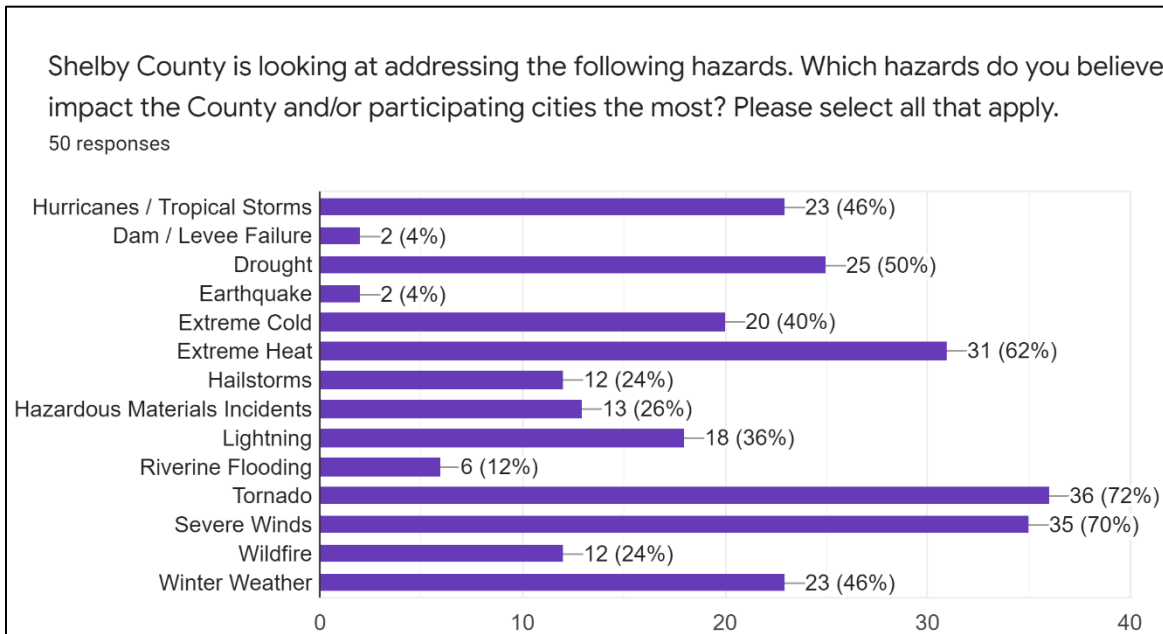


Figure 3: Survey Response for Question 3

The chart in Figure 3 above shows the breakdown of responses for survey question three. The answer choices were Hurricanes/Tropical Storms/Depressions, Dam/Levee Failure, Drought, Earthquakes, Extreme Cold, Extreme Heat, Hailstorm, Hazardous Materials Incidents, Lightning, Flooding, Tornados, Severe Winds, Wildfire, Winter Weather.

Of the 14 hazards addressed, Drought, Extreme Heat, Tornadoes, and Severe Winds ranked the

highest out of all the hazards addressed in the plan, with each choice getting more than or about 50% of the votes.

Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply.

- Provide better information about hazard risk and high-hazard areas
- Reinforce essential facilities such as police, fire, emergency medical services, hospitals, schools, etc
- Educate property owners on ways they can reduce risk and mitigate damage to their properties
- Replace or improve inadequate or vulnerable bridges and causeways
- Reinforce or improve infrastructure, such as elevating roadways and improving drainage systems
- Work on mitigating risk to utilities (electricity, communications, water/wastewater facilities, etc)
- Install or improve protective structures, such as floodwalls or levees
- Buyout flood-prone properties and maintain as open space
- Strengthen codes, ordinances, and plans to require higher hazard risk management strategies
- Assist vulnerable property owners with securing funding to mitigate impacts to their property(ies)
- Work with schools, churches, local community groups to educate and reduce hazard risks
- Other...

*Figure 4: Survey Choices for Question 8*

Figure 4 shows the choices for Question 8: Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply. Respondents could choose from 11 answers such as “Provide better information about hazard risk and high-hazard areas,” “Reinforce or improve infrastructure, such as elevating roadways and improving drainage systems,” “Install or improve protective structures, such as floodwalls or levees,” or input their own answer.

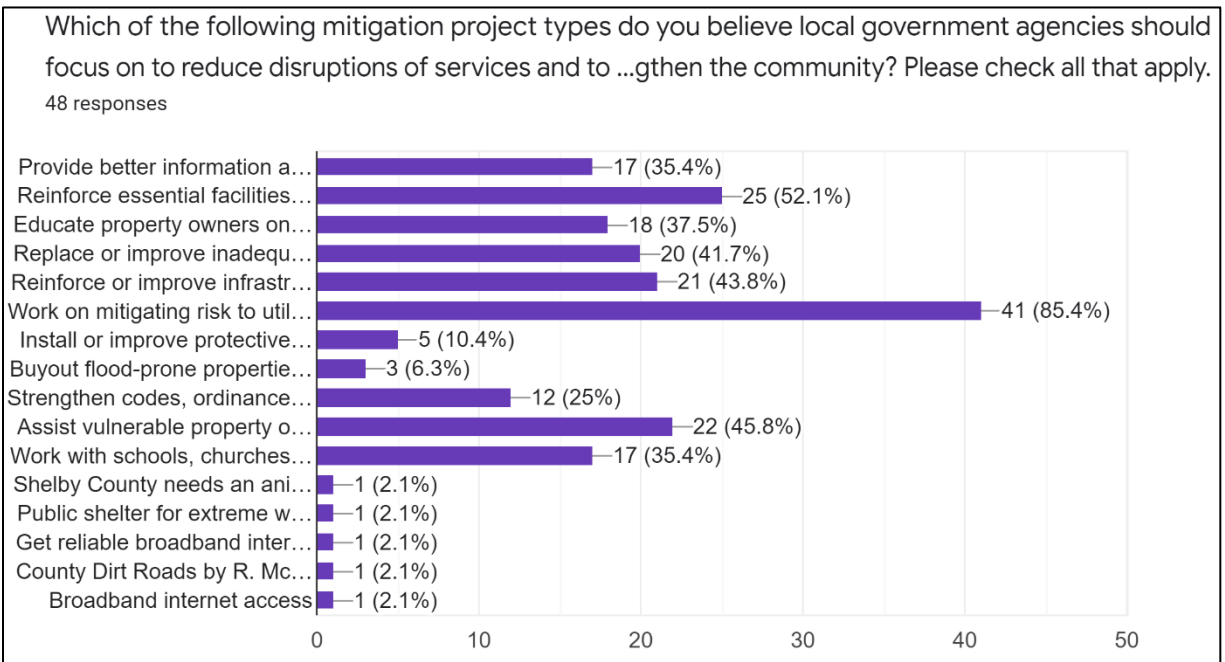


Figure 5: Response Breakdown for Question 8

Figure 5 shows the breakdown of responses to Question 8. The most popular answer was “Work on mitigating risk to utilities (electricity, communications, water/wastewater facilities, etc.),” with 85.4% of respondents voting for it. Other inputs that residents added in the survey include needs for animal shelters, public shelters for extreme weather, reliable broadband internet access, improved road infrastructure,

The second public comment period took place in September 2022. A copy of the in-progress plan draft was posted to the County website for two weeks for the public to review and comment or provide suggestions. This public comment period was advertised in the newspaper and shared on social media.

#### 4) Plan Maintenance

The hazard mitigation plan is not a static document. As conditions change and mitigation actions are implemented, the plan will need to be updated to reflect new and changing conditions in each jurisdiction.

The planning team has identified specific departments to oversee action implementation in each jurisdiction. The planning team has also identified potential funding sources and an implementation timeframe for each mitigation action. The expected timeframes will be an important component in determining whether actions are implemented efficiently. The departments or persons identified for each jurisdiction include but are not limited to:

**Table 6: Maintenance Responsibility**

<b>Title</b>	<b>Jurisdiction</b>	<b>Agency or Department</b>
County Judge	Shelby County	County Judge’s Office
County Judge’s Assistant		County Judge’s Office
Emergency Management Coordinator		Office of Emergency Management
City Manager	Center	City Council
Emergency Management Coordinator		Office of Emergency Management
City Mayor	Huxley	City Council
City Manager		City Administration
City Secretary	Joaquin	City Administration
City Secretary	Tenaha	City Administration
City Mayor	Timpson	City Council
City Secretary		City Administration

Within one year of adoption of this plan, each department or agency will review and, as appropriate, integrate implementation of their respective mitigation actions with their existing internal plans and policies relating to capital improvements, land use, design and construction, and emergency management.

On a biannual basis, representatives from each jurisdiction serving as the planning team will evaluate progress on implementing the plan’s mitigation actions. The planning team will review departmental / agency findings, public input, and future development plans to evaluate the effectiveness and appropriateness of the plan.

Considering changing funding sources, hazard vulnerability, and local mitigation priorities, the planning team will identify changes to plan goals and priorities for their respective jurisdictions, and they will report their findings to the rest of the planning team. It will be the planning team’s responsibility to identify relevant reasons for delay or obstacles to completing the plan’s mitigation actions, along with recommended strategies to overcome any deficiencies.

Any significant change to the plan, including but not limited to changing mitigation actions, abandoning mitigation actions, or pursuing new mitigation actions, will require the County and

participating jurisdictions to provide opportunities for the public to make its views and concerns known. Shelby County and the participating jurisdictions will provide notice to the public through announcements in the local paper, fliers posted at City and County offices, and on the County's website and/or social media accounts.

### **5) Plan Monitoring**

The Shelby County Emergency Management Coordinator (EMC) will be responsible for the overall continued coordination and monitoring of the mitigation plan in its entirety, including but not limited to the planning process, risk assessment, strategy, and the actions assigned for each hazard. The agency or department identified above in Table 6 shall serve as the responsible party for each respective jurisdiction. The plan monitoring worksheet outlined below will serve as the basis for revision of the plan.

At a minimum, the mitigation plan will be reviewed by the EMC and planning team representatives from each jurisdiction quarterly, during budget workshops, and as other plans are being developed or revised including comprehensive plans, capital improvement project plans, and emergency plans.

Regularly monitoring the plan implementation process in each participating jurisdiction will ensure that every component of the plan gets reviewed for potential amendments.

After adoption of this plan, it will be posted to each participating jurisdiction's website or Facebook page, and a printed copy will be available for review in the Office of Emergency Management. The goal is to create the opportunity for constant and continued feedback from local officials, stakeholders, and the public.

### **6) Plan Evaluation**

Proper evaluation will measure the progress and effectiveness of the mitigation actions identified in the plan. On a bi-annual basis the Emergency Management Coordinator along with the planning team representatives from each jurisdiction will use the following criteria, along with additional metrics as necessary, to assess the effectiveness of the plan in its entirety, including but not limited to the planning process, risk assessment, strategy, and the actions:

- Do the specified goals and objectives still address current and expected conditions?
- Has the nature, magnitude, and/or risk of any hazard changed?
- Have there been changes in land development that the plan needs to address?
- Are available resources suitable for implementing the plan?
- Is funding budgeted or available to successfully implement prioritized mitigation actions?
- Are there opportunities in the local budgeting process or local, state, and national grant funding cycles to increase funding to implement mitigation actions?

Other steps will include site visits to completed mitigation projects in each jurisdiction to measure and ensure their success. The planning team will evaluate the causes of the shortcoming in the event that a mitigation project fails to meet its goal. The planning team will use their assessment to amend the project and related projects in other jurisdictions, allocate additional resources to achieve the desired outcome for the project and related projects in other jurisdictions, or replace the project and similar projects in other jurisdictions with better projects.

The EMC and planning team members will also work to implement any additional revisions required to ensure that the plan and their respective jurisdiction is in full compliance with federal regulations and state statutes.

## **7) Plan Update**

The plan is designed to address a five-year period. In accordance with 44CFR Section 201.6, it will be updated every five years to maintain compliance with State and Federal regulations. However, at least every two years from the date of approval, and quarterly on the fifth and final year of the plan, the EMC and planning team representatives from each participating jurisdiction will thoroughly review any significant changes in their respective jurisdictions that might impact the plan update.

During the update process, planning team representatives will do the following for their respective jurisdictions: collect data on recent occurrences of each natural hazard identified in the plan, record how each natural hazard impacted their jurisdiction during the preceding years, determine whether or not implemented mitigation actions produced the desired outcomes in their jurisdiction, and determine whether or not to modify their jurisdiction's list of hazards to be addressed in the update.

Additional considerations to address on a jurisdictional level include but are not limited to changes in local development, changes in exposure to natural hazards, the development of new mitigation capabilities or techniques, and revisions to state or federal legislation.

The update process will provide continued opportunity for the public and elected officials to determine which actions succeeded, failed, or are no longer relevant. It is also an opportunity for each jurisdiction to identify recent losses due to natural hazards and to consider whether any of those losses could have been avoided.



### 3. Determining Risk

#### 1) Risk Assessment

Throughout the plan, each hazard addressed will be considered in light of its history, likelihood of future events, extent, jurisdictional vulnerability, location and impact.

**Likelihood of Future Events** is measured based on a hazard’s expected frequency of occurrence in terms of previous frequency. Each hazard’s likelihood of future events will be considered using the following standardized parameters:

- **Highly likely** – event probable in the next year
- **Likely** – event probable in the next three years
- **Occasional** – event possible in the next five years
- **Unlikely** – event possible in the next 10 years

Given this plan’s five-year duration, hazards likely to occur during that period will be given priority when selecting and prioritizing mitigation actions.

Furthermore, vulnerability risk of each hazard has risen as population increased in conjunction with new development and growth in the County since the 2016 Shelby County Hazard Mitigation Plan.

#### 2) Distribution of Property by Parcel Count and Potential Damage Values

Table 7: Estimated Values by Location<sup>2</sup>

Category	Shelby County <sup>3</sup>	City of Center	City of Huxley	City of Joaquin	City of Tenaha	City of Timpson
Total Housing Units	12,358	2,093	268	448	648	659
Housing Unit Density (per square mile)	16 units/sq. mi	266 units/sq. mi	134 units/sq. mi	212 units/sq. mi	162 units/sq. mi	264 units/sq. mi
Median Housing Value <sup>4</sup>	\$81,800	\$62,500	\$90,700	\$76,400	\$55,500	\$58,800
Estimated Value of Housing Units <sup>5</sup>	\$1.01 billion	\$130.8 million	\$24.3 million	\$34.2 million	\$35.9 million	\$38.7 million

<sup>2</sup> Source: U.S. Census 2020 American Community Survey 5-Year Estimates.

<sup>3</sup> Table [B25001](#) 2020 ACS Housing unit information for Shelby County includes totals for cities and unincorporated areas.

<sup>4</sup> Table [B25077](#) 2020 ACS

<sup>5</sup> Total value of housing units derived from median value multiplied by number of units

### 3) Distribution of Vulnerable Populations

The planning team identified a set of indicators it could use to identify each jurisdiction’s vulnerable population. The indicators include demographic data like age and income, as well as geographic data including the location of low income or subsidized housing units, concentrations of manufactured and mobile homes, and concentrations of homes in substandard condition.

#### Age, Disability, and Income

The populations of each jurisdiction were broken down into four categories: young residents, elderly residents, disabled residents, and low-income residents. Residents falling into these categories were deemed most likely to suffer disproportionate losses due to natural hazards because of their potentially limited means to prepare for and recover from a hazard event.

Table 8: Age, Disability, and Poverty Level Percentages by Jurisdiction<sup>6</sup>

Demographic Category	Shelby County	City of Center	City of Huxley	City of Joaquin	City of Tenaha	City of Timpson	Texas	U.S.
Population Under Age 5 <sup>7</sup>	7.2%	9.1%	2.7%	3.1%	11.5%	10.7%	7%	6%
Population Over Age 65	17.6%	16.3%	17.4%	20.6%	12.5%	12.9%	12.5%	16%
Disability Status <sup>8</sup>	17.3%	15.2%	12.5%	22.8%	16.4%	14.5%	11.5%	12.7%
Individuals Below Poverty Level <sup>9</sup>	20.4%	38.6%	3.3%	20.2%	27.9%	21.1%	10.9%	9.1%

#### Distribution of Vulnerable Populations

The following vulnerable populations map is based on a social vulnerability index created specifically for the planning area. The index considers six relevant Census Block Group-level factors: poverty rate, population of residents 65 years old and older, population of residents younger than 18, the population of residents without a high school diploma or GED, the

<sup>6</sup> Source: U.S. Census 2020 American Community Survey 5-Year Estimates

<sup>7</sup> Table S0101, Age and Sex, 2020 ACS 5-Year Estimates

<sup>8</sup> Table S1810, Disability Characteristics. The U.S. Census defines a person as having a work disability if one or more of the following conditions are met:

1. Persons with a health problem or disability which prevents them from working or which limits the kind or amount of work they can do
2. Persons who have retired or left a job for health reasons
3. Persons currently not in the labor force because of a disability.
4. Persons who did not work at all in the previous year because of illness or disability
5. Under 65 years old and covered by Medicare in previous year.
6. Under 65 years old and received Supplemental Security Income (SSI) in previous year.
7. Received VA disability income in previous year.

<sup>9</sup> Table DP03, Selected Economic Characteristics, 2016-2019 5-Year Estimates

population of residents with a low English proficiency, and the number of homes constructed before 1980.

To create the index, each factor is re-scaled by assigning the largest population in each category a score of 1. The remaining population counts for each category are then given a score based the ratio of the relevant population to the largest population. Once each factor has a re-scaled score, the scores for each factor are totaled to create an overall index number for each Census Block Group. The vulnerable populations map is representative of each Census Block Group's overall vulnerability, based on the six factors outlined above, relative to the other Census Block Groups in the planning area.

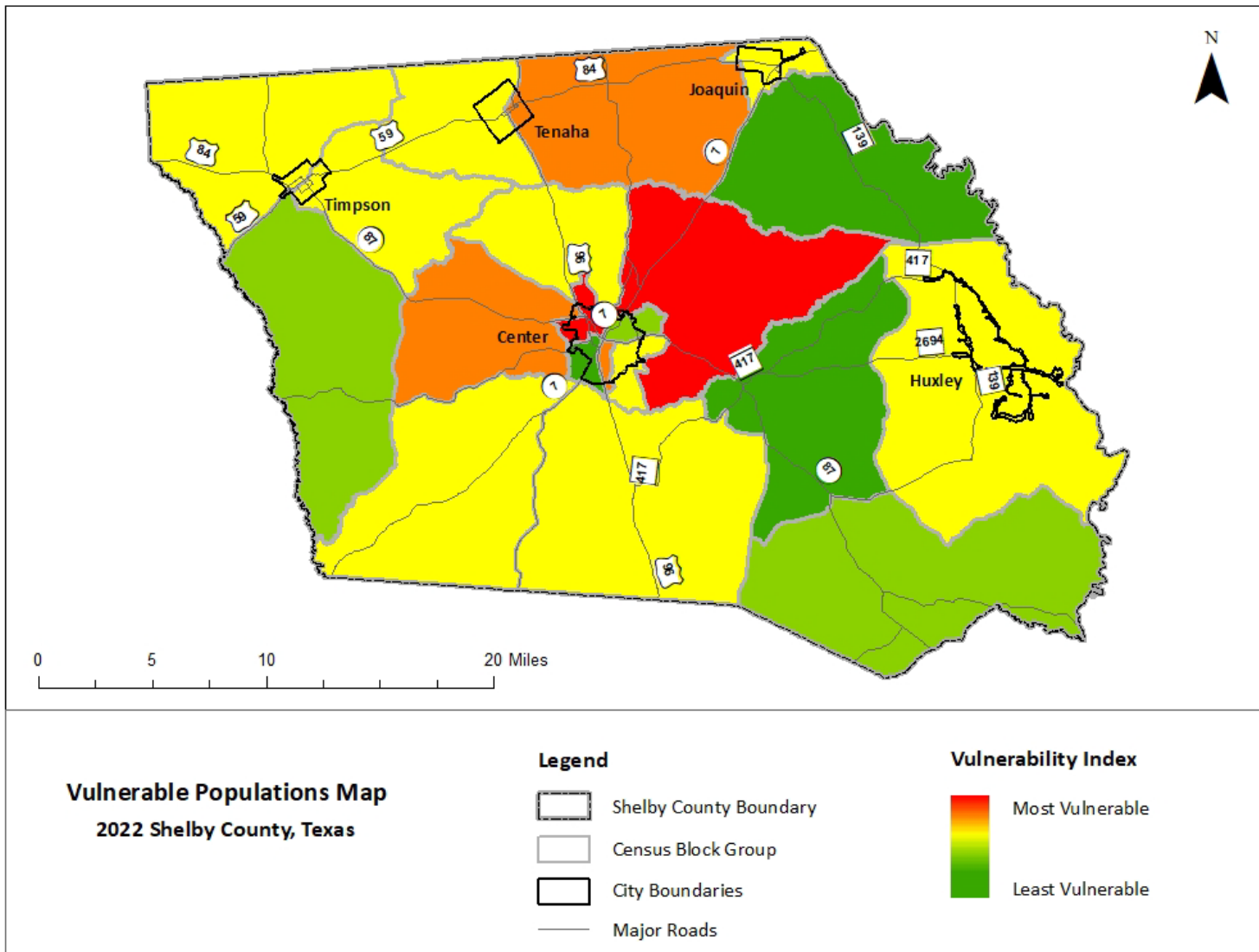


Figure 6: Shelby County Social Vulnerability Index

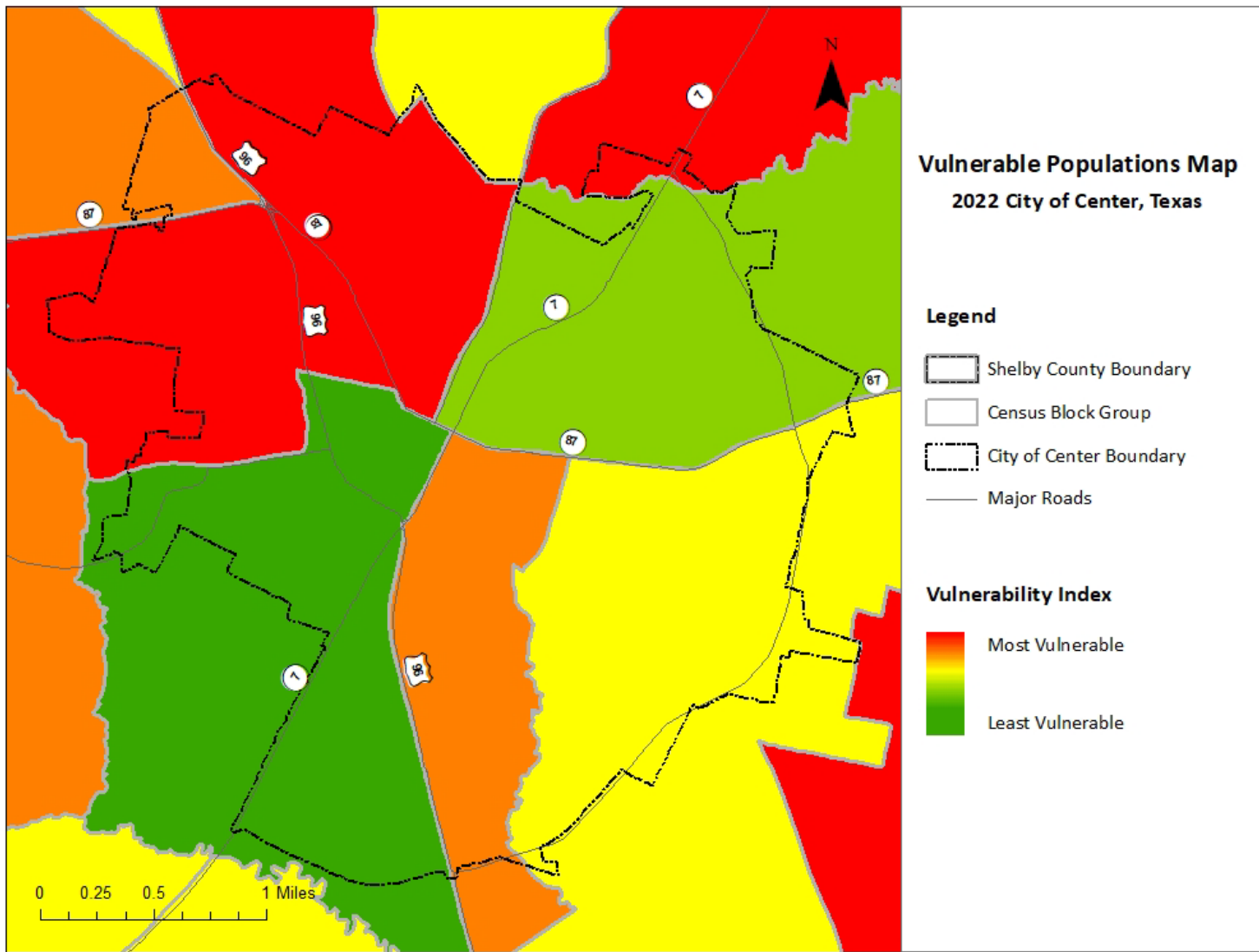


Figure 7: City of Center Social Vulnerability Index

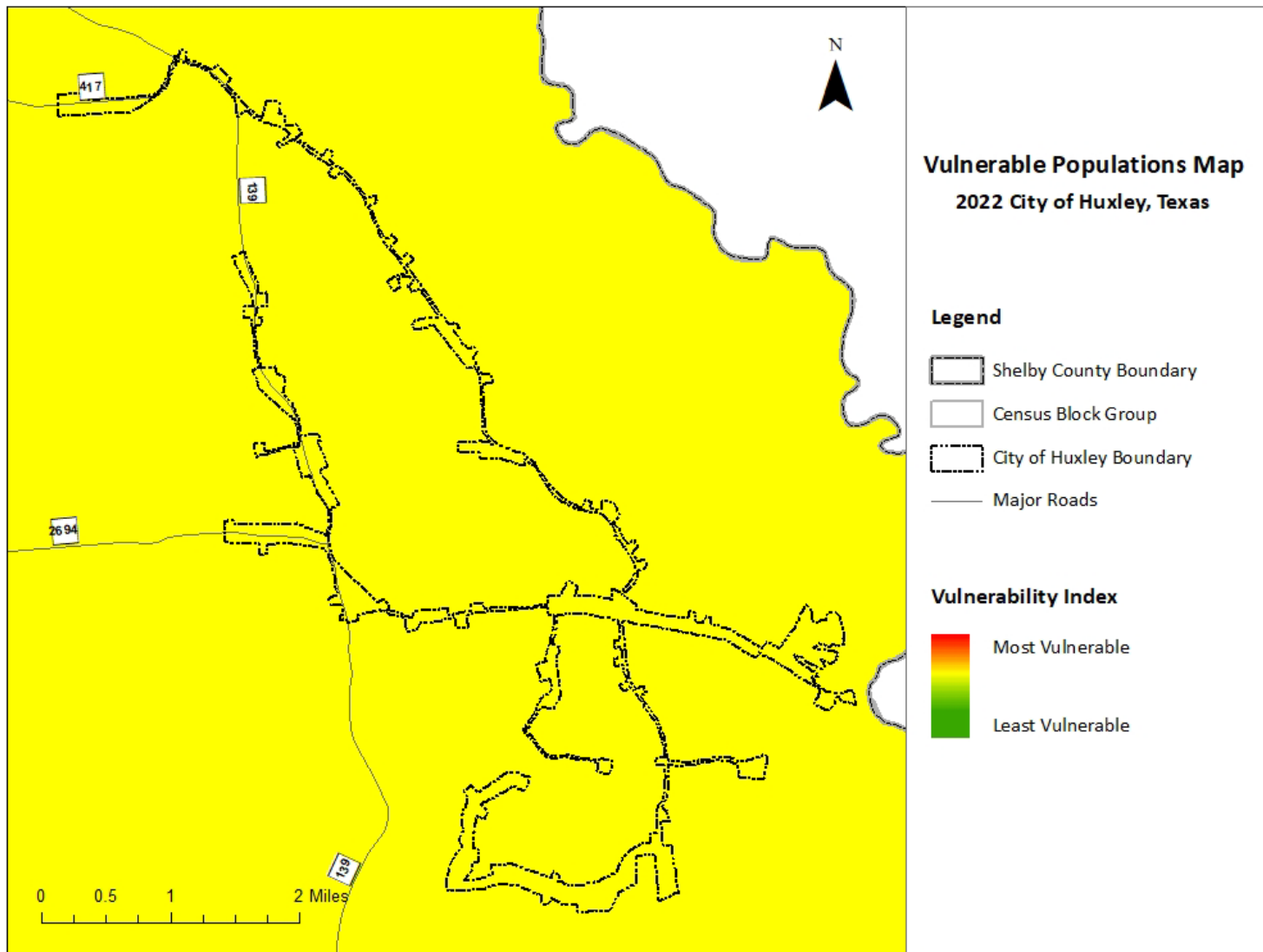


Figure 8: City of Huxley Social Vulnerability Index

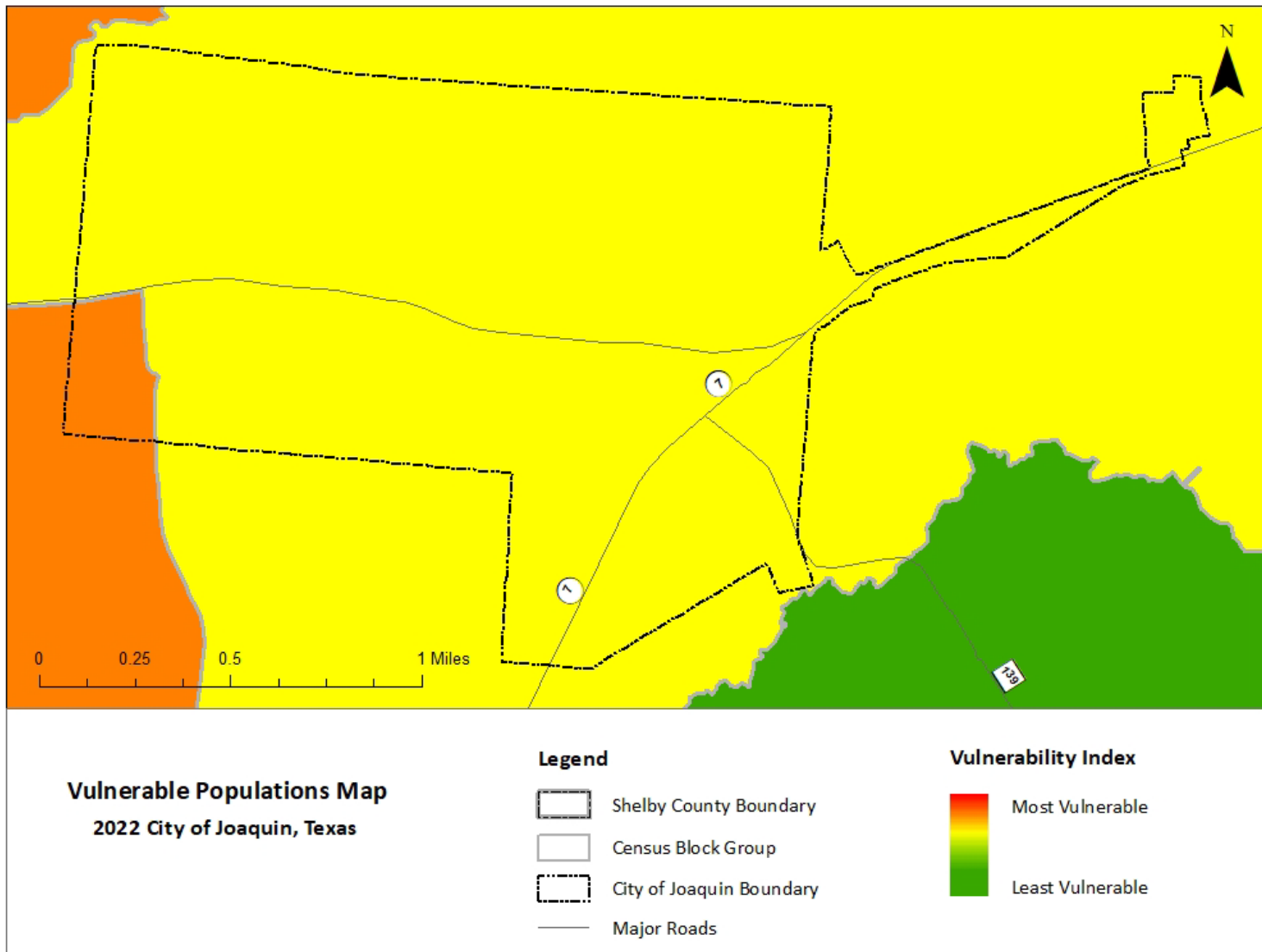


Figure 9: Joaquin Social Vulnerability Index

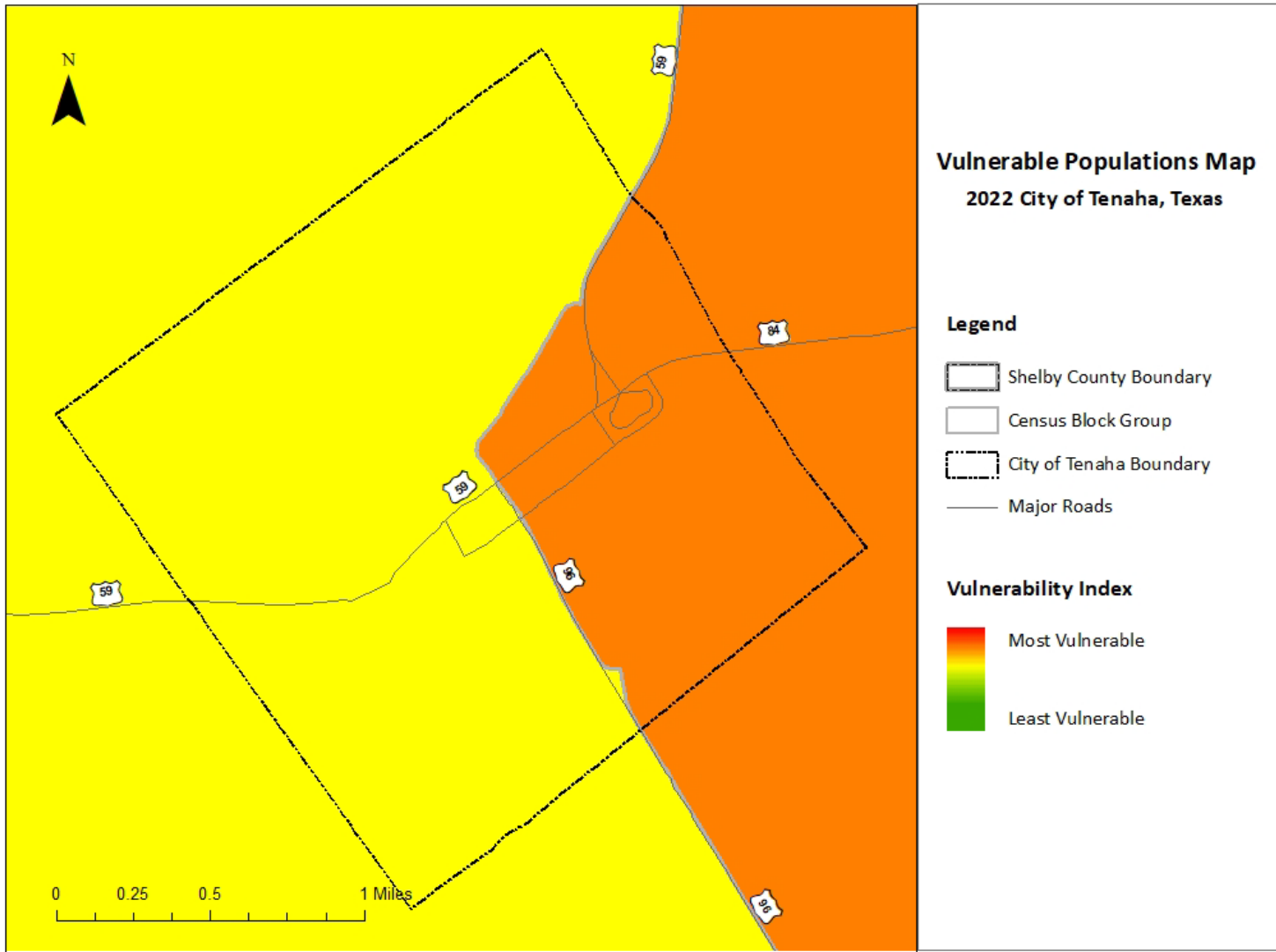


Figure 10: City of Tenaha Social Vulnerability Index



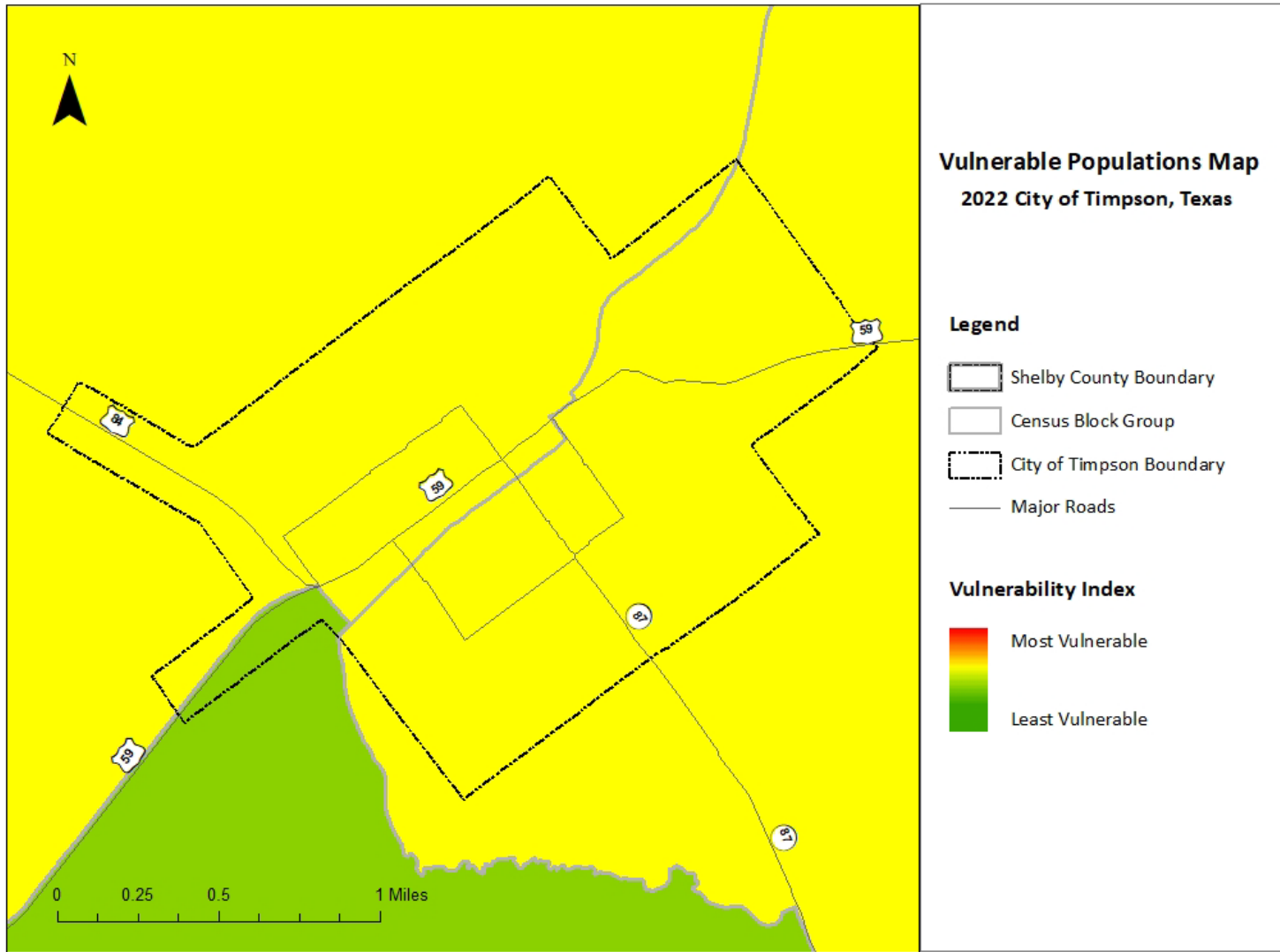


Figure 11: City of Timpson Social Vulnerability Index

### *Low Income and Subsidized Housing*

Low-income residents in Shelby County are primarily served through rental assistance programs and low-income housing. The Deep East Texas Regional Housing Authority is the primary operator of low-income housing in the County<sup>10</sup>. There are nine affordable apartment communities offering 378 units in Shelby County, the majority of which are in the City of Center; furthermore, there are 26 low-income apartments that do not offer rental assistance but are still considered affordable for low-income families<sup>11</sup>.

Residents of low-income housing and/or subsidized housing facilities are expected to suffer disproportionate losses due to natural hazards because of their potentially limited means to prepare for and recover from a hazard event.

### *Housing Type and Condition*

The participating jurisdictions have used housing type and housing conditions to identify additional vulnerable areas and concentrations of vulnerable residents.

#### *I. Manufactured / Mobile Homes*

In particular, the jurisdictions have identified areas with large numbers of mobile/manufactured housing as being disproportionately vulnerable to certain hazards including but not limited to hurricanes and tropical storms, floods, tornados, droughts, and severe winds.

Mobile and manufactured homes can be found throughout Shelby County, including several RV parks. These parks' populations fluctuate on a seasonal basis. Due to the express portability of RVs, most of these structures are expected to evacuate ahead of hazard events with significant warning times. However, RVs may not have enough time to evacuate ahead of less predictable hazard events like tornados.

Locations with clusters of three or more mobile / manufactured homes, including named mobile home parks, are shown in Figure 12 below.

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<sup>10</sup> Affordable Housing Online, 2021. <https://affordablehousingonline.com/housing-search/Texas/Shelby-County>

<sup>11</sup> Affordable Housing Online, 2021.

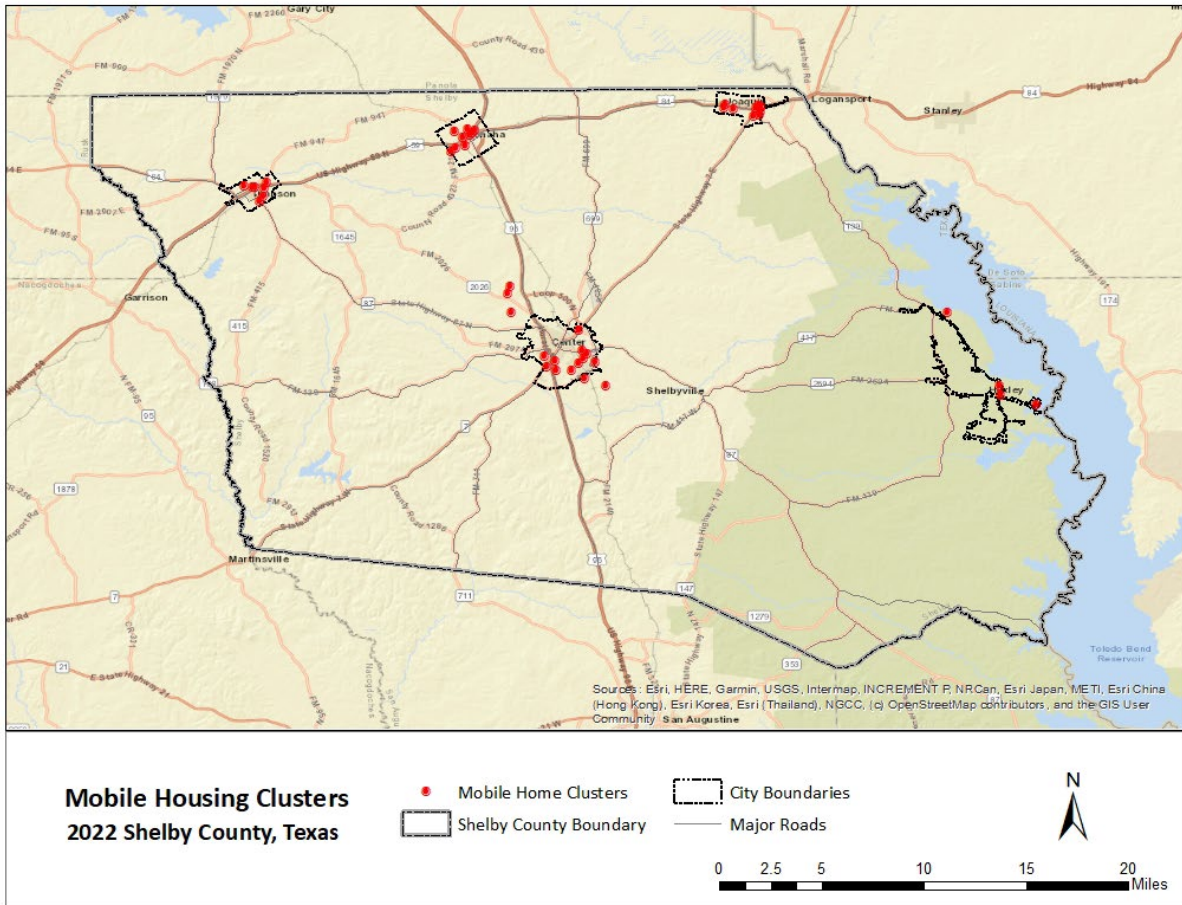


Figure 12: Mobile and Manufacturing Clusters in Shelby County and the Participating Jurisdictions

## II. Homes in Substandard Condition

The jurisdictions have determined that homes in sub-standard condition, regardless of structure type, may indicate that residents are low-income or otherwise means-limited and thus more vulnerable to certain hazards.

To be considered standard condition, a home must show few or no minor visible exterior defects such as:

- cracked, peeling, or missing paint
- cracked, sagging, rotting, or missing siding, steps, porch planks, or other wooden surfaces
- cracked or broken windowpanes
- cracked masonry, brick, or mortar surfaces
- missing or damaged roof shingles
- small rust spots on mobile homes

Structures in sub-standard condition may provide less protection to residents during certain hazard events like tropical storms, tornados, or hurricanes. Furthermore, because they're already in a state of disrepair, additional damages due to hazard events may compound existing ones and potentially make these homes uninhabitable.

## 4. Floods

According to the Texas State Hazard Mitigation Plan, Floods are defined as:

[T]he accumulation of water within a water body and the overflow of excess water into adjacent floodplain lands.

In hydrologic analysis, runoff is that portion of rainfall which, in combination with other factors, contributes to the stream flow of any surface drainage way. When runoff exceeds the carrying capacity of the stream or drainage, flooding occurs. Runoff is a product of two major groups of factors, climatic and physiographic. Climatic factors may include precipitation, evaporation, transpiration and interception. Physiographic factors would include the characteristics of the watershed such as size, shape and slope of the basin's drainage area, the general land use within the basin. Average annual runoff decreases unevenly moving east to west across Texas, the localized variations based on these factors listed above.

When surface water runoff enters into streams, rivers, or dry creek beds, riverine flooding conditions occur whenever the water carrying capacity of the water channel is compromised by excess runoff.

If the local basin drainage area is relatively flat, shallow, slow-moving floodwater can last for days. In drainage areas with substantial slope, or the channel is narrow and confined, rapidly moving and extreme high-water conditions, called a flash flood, can occur.

### 1) Flood History

The planning team relied on data from the National Centers for Environmental Information (NCEI) to develop a flood history for the County and each participating jurisdiction.

According to Shelby County's 2016 HMAP plan, the County and jurisdictions addressing the hazard recorded 34 flood events between 1993 and 2013. The 2016 plan recorded about \$1.2 million in property damages during that time, adjusted to \$2022. Flood events during 1999 reported 1 death, however no injuries were reported. The 2016 plan found that the frequency flood occurrences is high.

The following tables identify the most comprehensive list available of flood events and associated damages in the participating jurisdictions from 2016 to present. There have been no recorded events since the 2016 plan for Shelby County, City of Huxley, Tenaha, or Timpson.

**Table 9: City of Center Flood History**

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage \$2022	Local Crop Damage \$2022
Center	8/30/2017	1	Flash Flood	0	0	\$0	\$0

**Table 10: City of Joaquin Flood History**

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage \$2022	Local Crop Damage \$2022
Joaquin	4/22/2020	1	Flash Flood	0	0	\$0	\$0

***A) National Flood Insurance Program***

The National Flood Insurance Program (NFIP) is administered by FEMA to provide flood insurance coverage to the nation. Shelby County and all the participating jurisdictions are listed as participating NFIP communities in the FEMA Community Status Book Report.

While Shelby County does not have countywide FEMA Special Flood Hazard Area mapping, limited studies have been completed which shows Zones A and X within County boundaries.

The City of Center has adopted and enforced flood damage prevention ordinance in their jurisdiction. The City of Center’s Flood Damage Prevention Ordinance designates the City Manager as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements.

The City of Joaquin has adopted and enforced flood damage prevention ordinance in their jurisdiction. The City of Joaquin’s Flood Damage Prevention Ordinance designates the Mayor as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements.

The City of Tenaha has adopted and enforced flood damage prevention ordinance in their jurisdiction. The City of Tenaha’s Flood Damage Prevention Ordinance designates the City Secretary as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements.

Shelby County, and the cities of Huxley and Timpson do not currently have Flood Damage Prevention Ordinances in place. Mitigation actions have been added to Chapter 18 to address NFIP compliance for Shelby County, and the cities of Huxley and Timpson.

Floodplain management ordinances and any future updates will guide each jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction. Each jurisdiction will continue to encourage residents to purchase flood insurance to reduce their flood risk.

The flood mitigation actions outlined in Chapter 18 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling ten-year period, since 1978. According to the best information available, there are no RL properties in Shelby County.

A severe repetitive loss (SRL) property is: a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000 and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. According to the best information available, there are no SRL properties in Shelby County.

## 2) Likelihood of Future Events

In the case of the FEMA 100-year floodplain there is a 1% annual chance, while in the 500-year floodplain there is a 0.02% annual chance. Thus, the likelihood of a 100-year flood event is occasional and the likelihood of a 500-year flood event is unlikely. However, based on the frequency of previous flood events, every jurisdiction can expect to experience some type of flooding that may or may not meet the definition of a 100-year or 500-year event on a more regular basis.

The local planning team determined it is probable that Shelby County and the participating jurisdictions will experience a flood event in the next three years, meaning an event is likely.

## 3) Extent

Flood magnitude is generally measured by depth of flood waters in feet or inches. Throughout Shelby County and the participating jurisdictions, the worst flood events have been associated with flooding due to combinations of heavy rainfall, flash flooding, and riverine flooding. A flood event in 1999 resulted in the Toledo Bend flooding 8" above full pool stage.<sup>12</sup> During Hurricane Harvey, rainfall totals ranged from 3" to 10".<sup>13</sup> Furthermore, the worst flooding events in Shelby County and the participating jurisdictions have inflicted as high as \$986,153<sup>14</sup> in property damages. No crop damages have been reported as a result of flooding in NCEI data for Shelby County. One death has been reported due to floods in Shelby County.

Future worst-case flood events in Shelby County and the participating jurisdictions may meet or exceed previous worst-case 8" flood depths.

## 4) Location and Impact

Currently, FEMA Special Hazard Flood Area mapping is not available; however, the maps below were developed to demonstrate potential risk areas (Zones A and Zones X) by utilizing the Base Level Engineering (BLE) and Estimated Base Flood Elevation analysis developed by FEMA<sup>15</sup>.

Roughly 19% (102,800 acres out of 534,050) of Shelby County is in the FEMA 100-year floodplain. In contrast, only about 1.3% (7,119 acres out of 534,050) of Shelby County is in the FEMA 500-year floodplain.

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<sup>12</sup> Incident date: 1/31/1999 2016 Shelby Co. HMAP

<sup>13</sup> <https://scttx.com/articles/nws-issues-flash-flood-warning-shelby-san-augustine-sabine-counties>

<sup>14</sup> Incident date 10/17/1994, 2016 Shelby Co. HMAP, Adjusted for inflation to \$2022

<sup>15</sup> <https://webapps.usgs.gov/infrm/estbfe/>



A) Location

I. Shelby County

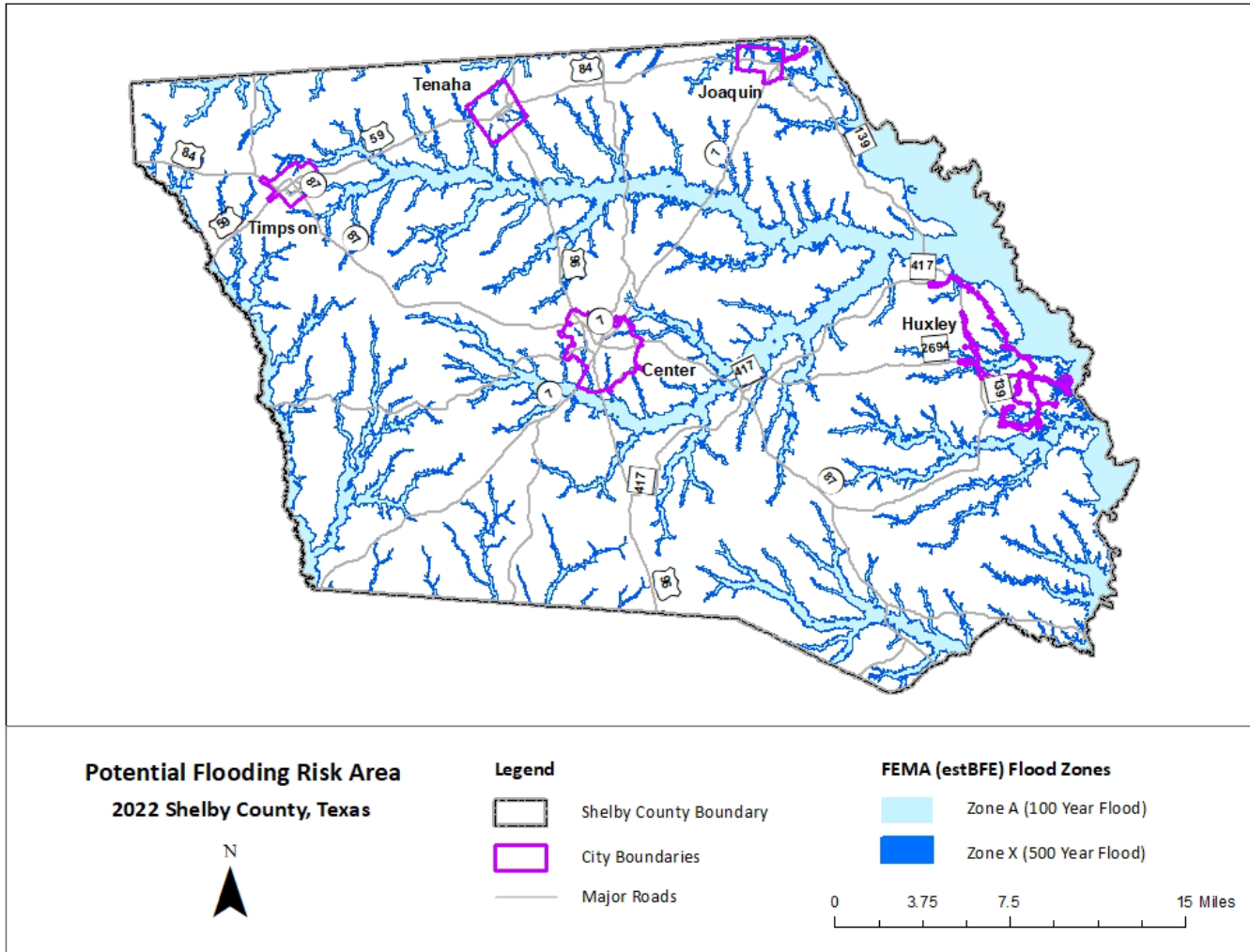


Figure 13: Shelby County FEMA (estBFE) Potential Flooding Risk

II. City of Center

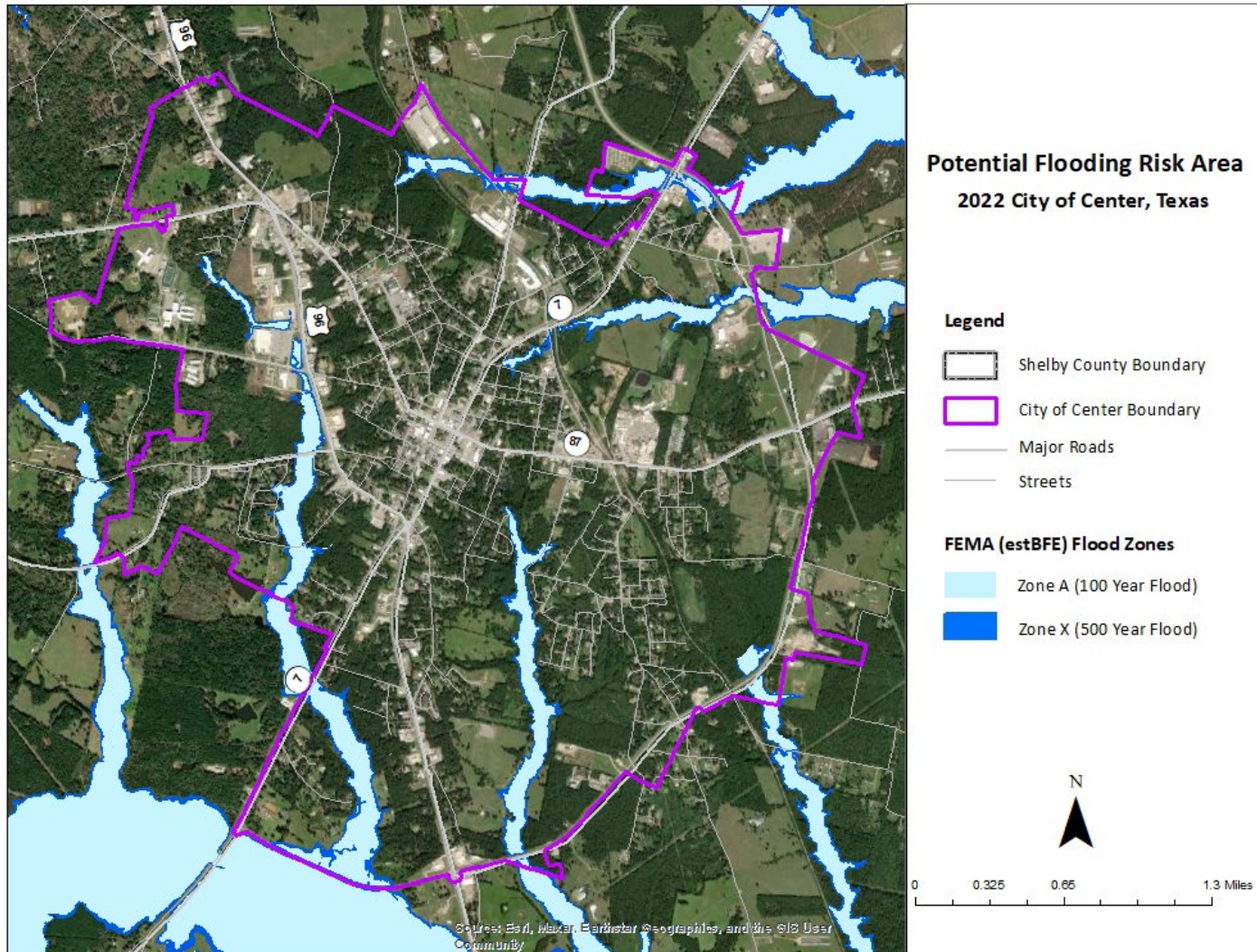


Figure 14: City of Center FEMA (estBFE) Potential Flood Risk Area

III. City of Huxley

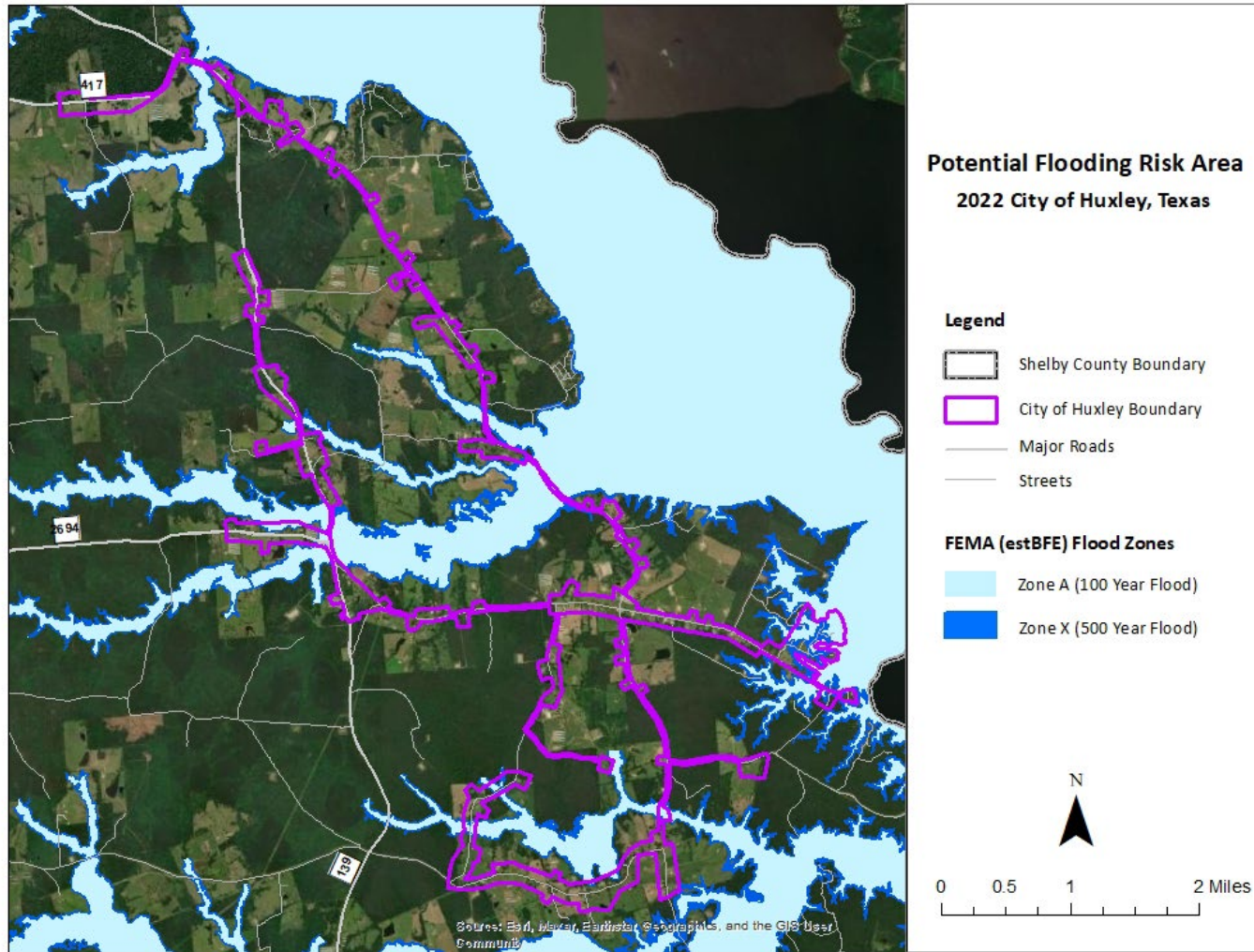


Figure 15: City of Huxley FEMA (estBFE) Potential Flood Risk Area

#### IV. City of Joaquin

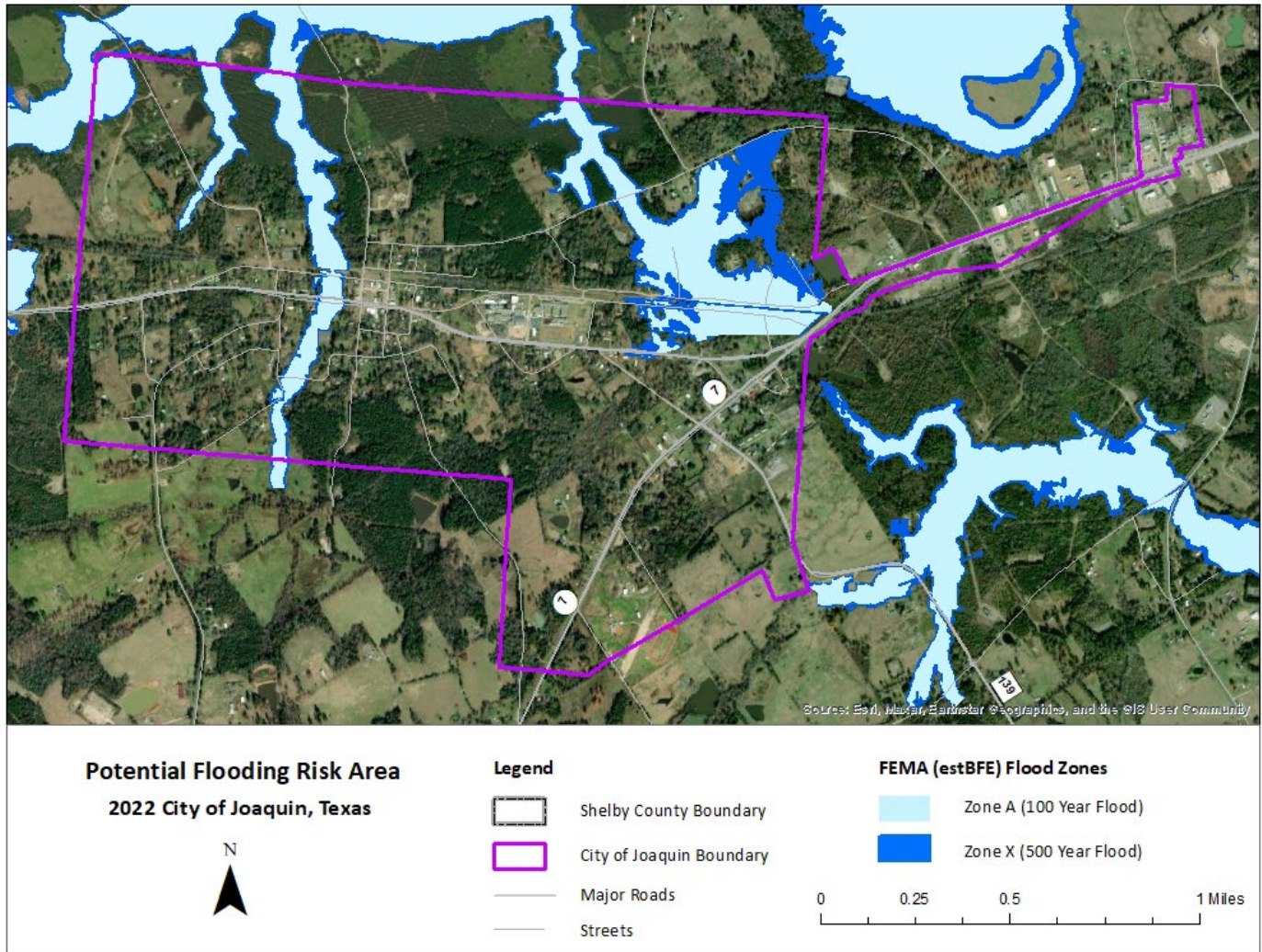


Figure 16: City of Joaquin FEMA (estBFE) Potential Flood Risk Area

V. City of Tenaha

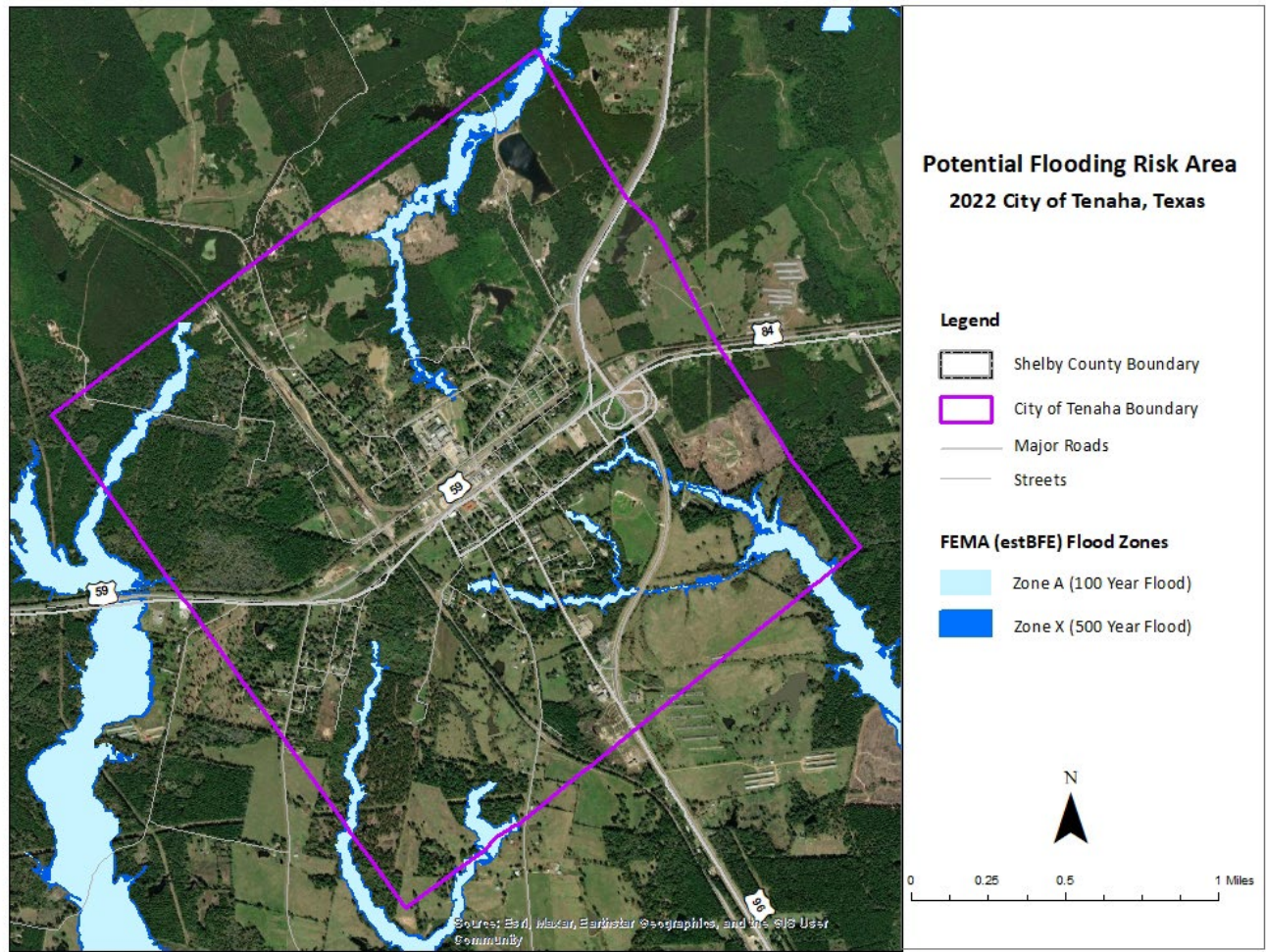


Figure 17: City of Tenaha FEMA (estBFE) Potential Flood Risk Area

## VI. City of Timpson

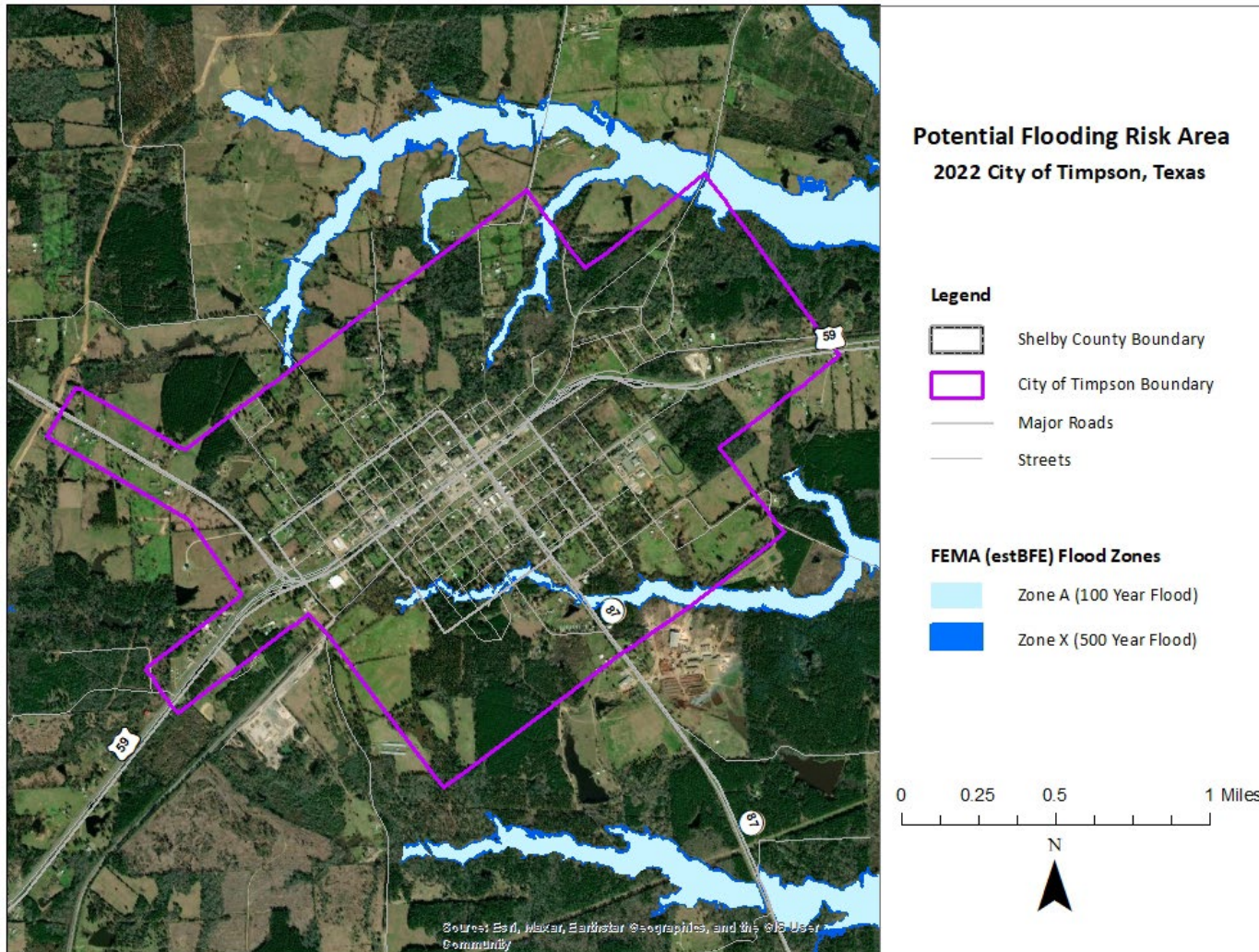


Figure 18: City of Timpson FEMA (estBFE) Potential Flood Risk Area

## **B) Impact**

Flood impact in Shelby County and the participating jurisdictions will vary depending on the location, size of the affected area, and number of structures affected. Although the likelihood of a FEMA 100-year flood event remains occasional, 1% in any given year, the floodplain crosses all of Shelby County's major thoroughfares, potentially limiting travel across, within, and around the County.

Residents in the participating jurisdictions may temporarily lose power due to downed power lines. Motorists and residents may be left stranded and needing rescue. Affected structures may be flooded, damaged by foodborne contaminants, damaged by debris flow, or even completely washed away. Crops may be damaged or destroyed. Estimated damage totals to vulnerable parcels affected during a 100-year flood event may meet the totals outlined in Tables 11 through 17.

Despite the unlikely probability of a so-called 500-year flood, 0.02% in any given year, the danger is not negligible. Moreover, the relatively limited information on the 500-year flood zone should not be interpreted to mean that a 500-year flood will only occur in the areas depicted within the 500-year flood zones. Similar to 100-year flood events, parts of the County may temporarily lose power due to downed power lines; motorists and residents may be left stranded and needing rescue; affected structures may be flooded, damaged by flood borne contaminants, damaged by debris flow, or even completely washed away; crops may be damaged or destroyed. Estimated damage totals to vulnerable parcels affected during a 500-year flood event may meet the totals outlined in Tables 11 through 17.

In addition to flooding's direct effects, the participating jurisdictions may be subject to indirect effects. These may include but aren't limited to loss of power, limited travel due to flooded and/or washed-out roads, and limited access to nearby emergency care centers.

## **5) Vulnerability**

### **A) Population**

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a flood.

Residents of mobile / manufactured housing are of particular concern. These structures are never considered safe during a flood, and depending on tie-down methods, may threaten surrounding structures.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a flood, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a flood than structures in standard condition. Existing structural weaknesses may mean increased damages, injuries, or loss of life.

**B) Critical Facilities**

The planning team identified 107 critical facilities spread across the County and participating jurisdictions. Only one facility is located within a potential Flood Zone.

**Table 11: Shelby County & Jurisdictions Critical Facilities Vulnerable to Flooding**

Critical Facilities
East Bank Wastewater Treatment Plant

**C) Vulnerable Parcels<sup>16</sup>**

The planning team developed a parcel inventory to identify estimated damage values during a flood event. Parcels vulnerable to flooding have been identified by their complete or partial location within the FEMA 100-year floodplain and the FEMA 500-year floodplain. Actual damages will vary based on the location and extent of flooding.

**Table 12: Vulnerable Parcels by Flood Zone in Shelby County**

Jurisdiction	Total Parcels	Estimated Potential Damage Value
<u>FEMA 100-Year Flood Zone A</u>		
Shelby County	1,501	\$267,987,400
<u>FEMA 500-Year Flood Zone</u>		
Shelby County	434	\$190,073,340

<sup>16</sup> County Parcel Count Includes All Parcels in Shelby County



Table 13: Vulnerable Parcels by Flood Zone in the City of Center

Jurisdiction	Total Parcels	Estimated Potential Damage Value
<u>FEMA 100-Year Flood Zone A</u>		
City of Center	46	\$16,776,070
<u>FEMA 500-Year Flood Zone</u>		
City of Center	28	\$3,382,400

Table 14: Vulnerable Parcels by Flood Zone in the City of Huxley

Jurisdiction	Total Parcels	Estimated Potential Damage Value
<u>FEMA 100-Year Flood Zone A</u>		
City of Huxley	14	\$1,108,600
<u>FEMA 500-Year Flood Zone</u>		
City of Huxley	8	\$1,036,700

Table 15: Vulnerable Parcels by Flood Zone in the Joaquin

Jurisdiction	Total Parcels	Estimated Potential Damage Value
<u>FEMA 100-Year Flood Zone A</u>		
Joaquin	48	\$1,798,380
<u>FEMA 500-Year Flood Zone</u>		
Joaquin	16	\$550,160

Table 16: Vulnerable Parcels by Flood Zone in the Tenaha

Jurisdiction	Total Parcels	Estimated Potential Damage Value
<u>FEMA 100-Year Flood Zone A</u>		
Tenaha	12	\$1,640,630
<u>FEMA 500-Year Flood Zone</u>		
Tenaha	7	\$1,429,220

Table 17: Vulnerable Parcels by Flood Zone in the Timpson

Jurisdiction	Total Parcels	Estimated Potential Damage Value
<u>FEMA 100-Year Flood Zone A</u>		
Timpson	5	\$605,420
<u>FEMA 500-Year Flood Zone</u>		
Timpson	5	\$114,630

## 5. Hurricanes / Tropical Storms

Once a tropical depression has intensified to the point where its maximum sustained winds are between 35-64 knots (39 – 73 mph), it becomes a tropical storm. At these wind speeds the storm becomes more organized and begins to become more circular in shape – resembling a hurricane. The rotation of a tropical storm is more recognizable than for a tropical depression. Tropical storms can cause many problems without becoming a hurricane. However, most of the problems a tropical storm causes stem from heavy rainfall and high winds.

According to National Oceanic and Atmospheric Administration (NOAA), a hurricane is an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher. Hurricanes are categorized according to the strength of their winds using the Saffir-Simpson Hurricane Scale. A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. These are relative terms, because lower category storms can sometimes inflict greater damage than higher category storms, depending on where they strike and the particular hazards they bring. In fact, tropical storms can also produce significant damage and loss of life, mainly due to flooding.

The ingredients for a hurricane include a pre-existing weather disturbance, warm tropical oceans, moisture, and relatively light winds aloft. If the right conditions persist long enough, they can combine to produce the violent winds, incredible waves, torrential rains, and floods associated with this phenomenon.

### 1) Hurricanes / Tropical Storms History

The planning team relied on data from the National Centers for Environmental Information (NCEI) to develop a history for the County and each participating jurisdiction.

According to Shelby County’s 2016 plan, the County and surrounding jurisdictions were hit by Hurricane Rita which caused about \$2 million in property damage in 2005, and Hurricane Ike which caused about \$400,000 in property damage in 2008.

NCEI data shows that the participating jurisdictions experienced one hurricane event since the 2016 plan, Hurricane Laura in 2020.

Table 18: Shelby County Hurricane History

Location	Date Range	Number of Hurricane & Tropical Storm Events	Hurricane & Tropical Storm Category Range	Maximum Wind Speed Range	Local Fatalities	Local Injuries	Local Property Damage \$2022	Local Crop Damage \$2022
Countywide	9/24/2005 – 8/27/2020	3	TS	20 – 70 MPH	0	0	\$3,686,008	\$0

No crop damages, injuries, or deaths due to hurricanes, tropical storms, or tropical depressions have been reported since the previous plan.

## 2) Likelihood of Future Events

Hurricanes occur in seasonal patterns between June 1 and November 30. Based on historical frequency of hurricanes and tropical storms in Shelby County and the participating jurisdictions outlined above, the likelihood of a hurricane or tropical storm affecting any or all of the participating jurisdictions is occasional, meaning an event is possible in the next five years.

## 3) Extent

Storms with winds less than 39 miles an hour are called Tropical depressions. Tropical storms have wind speeds between 39 – 74 miles an hour. Storms maintaining winds of 74 or more miles an hour are called hurricanes. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. Wind, pressure, and surge are combined to estimate potential damage. Categories 3, 4 and 5 are classified as “major” hurricanes. Major hurricanes comprise only 20 percent of total tropical cyclone landfalls, but they account for over 70 percent of the damage in the United States. Damage from hurricanes can result from spawned tornados, coastal flooding from storm surge, and inland flooding from heavy rainfall.

Table 19: Saffir-Simpson Scale

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)	Storm Surge (Feet)
1	74-95	Greater than 980	3-5
2	96-110	979-965	6-8
3	111-130	964-945	9-12
4	131-155	944-920	13-18
5	155+	Less than 920	19+

Shelby County and the participating jurisdictions are located far enough from the coast that storm surge is unlikely to have a local impact.

The worst hurricanes and tropical storms in Shelby County and the participating jurisdictions have measured as high as a Tropical Storm, dropped up to 10” in rainfall<sup>17</sup> and cause property damages of about \$2 million.

Future hurricanes and tropical storms may meet or exceed previous worst-case Hurricanes and Tropical Storms in terms of strength, rainfall, flooding, damage dollars, injuries, and deaths.

<sup>17</sup> Shelby County Hazard Mitigation Plan 2016

Based on historical events, the planning area could expect up to a Category 1 event in the future.

#### **4) Location and Impact**

##### ***A) Location***

Location is often referred to in terms of Tier I and II counties, designated by the Texas Department of Insurance (TDI) for windstorm insurance purposes, to represent differing levels of loss exposure to coastal counties and adjacent counties. Tier I are those counties adjacent to the Gulf of Mexico and Tier II are those counties adjacent to Tier I counties.

Shelby County is not a Tier I or Tier II County. However, the County and all participating jurisdictions are located within 200 miles of the Gulf coast. Although tropical storm and hurricane effects begin to diminish as they move inland, the winds alone from Hurricane Harvey reached as far as 140 miles from the eye of the storm. The County and all participating jurisdictions are considered especially susceptible to indirect impacts from hurricanes and tropical storms including high winds and flooding.

##### ***B) Impact***

The planning team determined that Shelby County is uniformly exposed to tropical storms and hurricanes.

Impacts from a hurricane or tropical Storm in Shelby County and the participating jurisdictions may include but are not limited to loss of power due to downed lines caused by flying debris or fallen trees, flooding, flooding due to damaged or destroyed roofs, damaged or broken windows, damage due to flying debris, wind damage, escaped livestock and pets, injured or killed livestock and pets, crop damage or destruction. In the worst storms, people may be injured or killed.

#### **5) Vulnerability**

##### ***A) Population***

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a hurricane or tropical storm.

Residents of mobile / manufactured housing are of particular concern. These structures are never considered safe during a hurricane, and depending on tie-down methods, may also be

unsafe during strong tropical storms. The participating jurisdictions also recognize that subdivisions or neighborhoods with only a single entrance may be cut off due to Hurricane/Tropical Storm impacts and therefore unable to obtain supplies or receive emergency services.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a tropical storm or hurricane, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a hurricane or tropical storm than structures in standard condition. Existing structural weaknesses may mean increased damages, injuries, or loss of life.

### ***B) Critical Infrastructure***

Three major hurricane evacuation routes run through Shelby County, U.S. Highway 59, U.S. Highway 84, and U.S. Highway 96. U.S. Highways 59 and 84 run directly through the City of Timpson and the City of Tenaha, while U.S. Highway 96 runs through the City of Center

Flooding along any of these routes during a hurricane evacuation could strand motorists trying to escape the storm. These drivers may need to be rescued and could be injured or killed.

### ***C) Critical Facilities***

The planning team identified 107 critical facilities spread across the County and participating jurisdictions. Because of Shelby County's proximity to the Gulf coast, the planning team determined that all critical facilities, no matter their jurisdictional location, are equally vulnerable to a hurricane or tropical storm.

Table 20: Critical Facilities Vulnerable to Tropical Storms and Hurricanes and Potential Impacts

Jurisdiction	Critical Facilities	Potential Hurricane / Tropical Storm Impacts									
		Loss of Power	Flying Debris	Uprooted Trees	Flooding	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
Shelby County	Shelby County Sheriff's Office	x	x	x	x	x	x	x	x	x	x
	Texas Department of Public Safety	x	x	x	x	x	x	x	x	x	x
	Shelbyville High School	x	x	x	x	x	x	x	x	x	x
	S.W. Carter Elementary	x	x	x	x	x	x	x	x	x	x
	Shelby County Emergency Operations Center	x	x	x	x	x	x	x	x	x	x
	Booth Rodeo Arena	x	x	x	x	x	x	x	x	x	x
	McClelland Water Supply Corp.	x	x	x	x	x	x	x	x	x	x
	Huber Water Supply Corp.	x	x	x	x	x	x	x	x	x	x
	Sand Hill Water Supply Corp.	x	x	x	x	x	x	x	x	x	x
	Paxton Water Supply	x	x	x	x	x	x	x	x	x	x
	City of Huxley Water Plant	x	x	x	x	x	x	x	x	x	x
	Timpson Utilities Department	x	x	x	x	x	x	x	x	x	x
	Shelby County Courthouse	x	x	x	x	x	x	x	x	x	x
	West Shelby Volunteer Fire Department	x	x	x	x	x	x	x	x	x	x
	Allegiance EMS	x	x	x	x	x	x	x	x	x	x
	Timpson Rural WSC	x	x	x	x	x	x	x	x	x	x
	Flat Fork WSC	x	x	x	x	x	x	x	x	x	x
	Choice WSC	x	x	x	x	x	x	x	x	x	x
	Shelbyville WSC	x	x	x	x	x	x	x	x	x	x
	East Lamar WSC	x	x	x	x	x	x	x	x	x	x
Paxton WSC Jackson Plant	x	x	x	x	x	x	x	x	x	x	
Buena Vista WSC	x	x	x	x	x	x	x	x	x	x	
Tennessee WSC	x	x	x	x	x	x	x	x	x	x	

	Shelby County Emergency Services & Diagnostic Center	x	x	x	x	x	x	x	x	x	x
	Shelbyville Grocery	x	x	x	x	x	x	x	x	x	x
	Family Dollar	x	x	x	x	x	x	x	x	x	x
	Shelby Veterinary Associates	x	x	x	x	x	x	x	x	x	x
Center	City of Center Fire Department	x	x	x	x	x	x	x	x	x	x
	City of Center Police Department	x	x	x	x	x	x	x	x	x	x
	City of Center City Hall	x	x	x	x	x	x	x	x	x	x
	City of Center - Windham Civic Center	x	x	x	x	x	x	x	x	x	x
	Aiken Water Treatment Plant	x	x	x	x	x	x	x	x	x	x
	Mill Creek Water Treatment Plant	x	x	x	x	x	x	x	x	x	x
	East Bank Wastewater Treatment Plant	x	x	x	x	x	x	x	x	x	x
	Center FL Moffett Primary	x	x	x	x	x	x	x	x	x	x
	Center Elementary	x	x	x	x	x	x	x	x	x	x
	Center High School	x	x	x	x	x	x	x	x	x	x
	Center Middle School	x	x	x	x	x	x	x	x	x	x
	Texas Quick Care	x	x	x	x	x	x	x	x	x	x
	Aurora Concepts	x	x	x	x	x	x	x	x	x	x
	Priority Family Healthcare	x	x	x	x	x	x	x	x	x	x
	Cline Family Practice	x	x	x	x	x	x	x	x	x	x
	Hope Medical Clinic- Center	x	x	x	x	x	x	x	x	x	x
	Nelson Family Practice	x	x	x	x	x	x	x	x	x	x
	Holiday Nursing Center	x	x	x	x	x	x	x	x	x	x
	Pine Grove Nursing Center	x	x	x	x	x	x	x	x	x	x
	Focused Care at Center	x	x	x	x	x	x	x	x	x	x
	Lakeside Village Assisted Living	x	x	x	x	x	x	x	x	x	x
Walmart & Walmart Pharmacy	x	x	x	x	x	x	x	x	x	x	
Brookshire & Brookshire's Pharmacy	x	x	x	x	x	x	x	x	x	x	
CVS	x	x	x	x	x	x	x	x	x	x	



	DCI Dialysis	x	x	x	x	x	x	x	x	x	x
	Ace Hardware	x	x	x	x	x	x	x	x	x	x
	Covington's Lumber	x	x	x	x	x	x	x	x	x	x
	H & S Grocery	x	x	x	x	x	x	x	x	x	x
	Murphy USA	x	x	x	x	x	x	x	x	x	x
<b>Huxley</b>	City of Huxley Volunteer Fire Department (VFD)	x	x	x	x	x	x	x	x	x	x
	City Hall	x	x	x	x	x	x	x	x	x	x
	Water Treatment Plant	x	x	x	x	x	x	x	x	x	x
	Stand Pipe		x						x		
	Possum Trot Booster Plant	x	x	x	x	x	x	x	x		
	Trails End Restaurant and Gas	x	x	x	x	x	x	x	x	x	x
<b>Joaquin</b>	Water Plant	x	x	x	x	x	x	x	x	x	x
	Joaquin Community Center	x	x	x	x	x	x	x	x	x	x
	Texas Quick Care	x	x	x	x	x	x	x	x	x	x
	Joaquin City Hall	x	x	x	x	x	x	x	x	x	x
	Brookshire Bothers – Haslam	x	x	x	x	x	x	x	x	x	x
	Dollar General	x	x	x	x	x	x	x	x	x	x
	Joaquin Quick Stop	x	x	x	x	x	x	x	x	x	x
	Word of Faith	x	x	x	x	x	x	x	x	x	x
	Joaquin First United Methodist Church	x	x	x	x	x	x	x	x	x	x
	First United Pentecostal Church of Joaquin	x	x	x	x	x	x	x	x	x	x
	First Baptist Church of Joaquin	x	x	x	x	x	x	x	x	x	x
	First Baptist Church of Haslam	x	x	x	x	x	x	x	x	x	x
	Friendship Baptist Church	x	x	x	x	x	x	x	x	x	x
	Bethlehem Missionary Baptist Church	x	x	x	x	x	x	x	x	x	x
	Fellowship Missionary Baptist Church	x	x	x	x	x	x	x	x	x	x
Blount Pharmacy	x	x	x	x	x	x	x	x	x	x	

	Worsham Grocery	x	x	x	x	x	x	x	x	x	x
Tenaha	Tenaha Fire Department	x	x	x	x	x	x	x	x	x	x
	Tenaha Police Department	x	x	x	x	x	x	x	x	x	x
	City Hall	x	x	x	x	x	x	x	x	x	x
	The Lighthouse Church	x	x	x	x	x	x	x	x	x	x
	Hope clinic	x	x	x	x	x	x	x	x	x	x
	Businessman Club	x	x	x	x	x	x	x	x	x	x
	First Baptist Church	x	x	x	x	x	x	x	x	x	x
	Quick Stop	x	x	x	x	x	x	x	x	x	x
	Beef Producers of Texas	x	x	x	x	x	x	x	x	x	x
	Tenaha Independent School District	x	x	x	x	x	x	x	x	x	x
Timpson	Timpson Elementary	x	x	x	x	x	x	x	x	x	x
	Timpson High School	x	x	x	x	x	x	x	x	x	x
	Timpson Middle School	x	x	x	x	x	x	x	x	x	x
	City of Timpson Volunteer Fire Department (VFD)	x	x	x	x	x	x	x	x	x	x
	Timpson City Hall	x	x	x	x	x	x	x	x	x	x
	Timpson Library	x	x	x	x	x	x	x	x	x	x
	Texas Quick Care	x	x	x	x	x	x	x	x	x	x
	Timpson Wastewater Treatment Plant	x	x	x	x	x	x	x	x	x	x
	Lift Station 1	x	x		x	x	x	x	x		
	Lift Station 2	x	x		x	x	x	x	x		
	Lift Station 3	x	x		x	x	x	x	x		
	Lift Station 4	x	x		x	x	x	x	x		
	Lift Station 5	x	x		x	x	x	x	x		
	Bussey Drug	x	x	x	x	x	x	x	x	x	x
	First Baptist Church Timpson	x	x	x	x	x	x	x	x	x	x
	First Methodist Church Timpson	x	x	x	x	x	x	x	x	x	x
	Timpson Quick Stop	x	x	x	x	x	x	x	x	x	x
Dollar General Timpson	x	x	x	x	x	x	x	x	x	x	

	Family Dollar Timpson	x	x	x	x	x	x	x	x	x	x
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#### ***D) Vulnerable Parcels***

Central Appraisal District data was used to estimate potential damage values for each participating jurisdiction. Given the broad nature of vulnerability, damage values were calculated on the jurisdictional level.

**Table 21: Estimated Potential Damage Values by Jurisdiction**

<b>Jurisdiction</b>	<b>Parcel Count</b>	<b>Estimated Potential Damage Value</b>
<b>Shelby County</b>	<b>19,985</b>	<b>\$2,380,087,130</b>
City of Center	2,691	\$262,915,110
City of Huxley	182	\$15,638,160
Joaquin	475	\$27,719,040
Tenaha	573	\$31,357,980
Timpson	777	\$42,502,740

## **6. Wildfire**

Wildfire is defined as a sweeping and destructive conflagration and can be further categorized as wildland, interface, or intermix fires.

Wildland fires are fueled almost exclusively by natural vegetation wildland/urban interface (WUI) fires include both vegetation and the built environment. The wildfire disaster cycle begins when homes are built adjacent to wildland areas. When what would have been rural wildfires occur, they advance through all available fuels, which can include homes and structures.

### **1) Wildfire History**

The Texas A&M Forest Service Wildfire Risk Assessment Portal provides wildfire data on fires that occurred as recently as 2015. Additional data came from local planning team members.

In the 2016 plan, the County and participating jurisdictions looked at Texas A&M Forest Service Wildfire Risk Assessment Portal data to determine wildfire risk across Shelby County. The 2016 plan reported 127 “other” fires, defined as including “rubbish, trees, brush and grass fires.”

None of the participating jurisdictions have data available on fires past 2015, though it is likely that some small fires have gone unreported.

### **2) Likelihood of Future Events**

Although the County and participating jurisdictions haven’t recorded a wildfire since 2015, given the prior frequency of wildfire events, a wildfire event in any of the jurisdictions addressing the hazard is likely, meaning an event is probable within the next three years.

### **3) Extent**

The Texas A&M Forest Service’s Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. The FIS is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. According to Texas A&M Forest Service data, Shelby County and the participating jurisdictions are rated between Class 1 and Class 4.

Table 22: Characteristic Fire Intensity Scale<sup>18</sup>

<b>Class 1</b> Very Low	Very small, discontinuous flames, usually less than one foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
<b>Class 2</b> Low	Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
<b>Class 3</b> Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
<b>Class 4</b> High	Large flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
<b>Class 5</b> Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

The National Wildfire Coordinating Group (NWCG) provides an additional way to measure extent by accounting for fire size. Based on Texas A&M Forest Service data, the average fire in Shelby County and the participating jurisdictions is a Class C event.

Table 23: National Wildfire Coordinating Group Size Class of Fire<sup>19</sup>

Class A	¼ acre or less
Class B	More than ¼ acre, but less than 10 acres
Class C	10 acres or more, but less than 100 acres
Class D	100 acres or more, but less than 300 acres
Class E	300 acres or more, but less than 1,000 acres
Class F	1,000 acres or more, but less than 5,000 acres
Class G	5,000 acres or more

<sup>18</sup> <https://www.texaswildfirerisk.com>

<sup>19</sup> <http://www.nwcg.gov/term/glossary/size-class-of-fire>

Future fire events in Shelby County and the participating jurisdictions may meet previous worst-case Class C (NWCGSCF) and Class 4 (FIS) wildfires in terms of intensity, acreage burned, and inflicted damage.

#### **4) Location and Impact**

##### ***A) Location***

Due to wildfire's ability to inflict damages to both structures and landscapes, wildfire location has been assessed by parcel, rather than by structure. Parcels have been determined to be either partially or completely vulnerable to wildfire based on TxWRAP's Wildland Urban Interface boundaries.

Because wildfires are dynamically unpredictable, the following maps and tables may not be representative of every location and parcel at risk of wildfire.

I. Shelby County Location

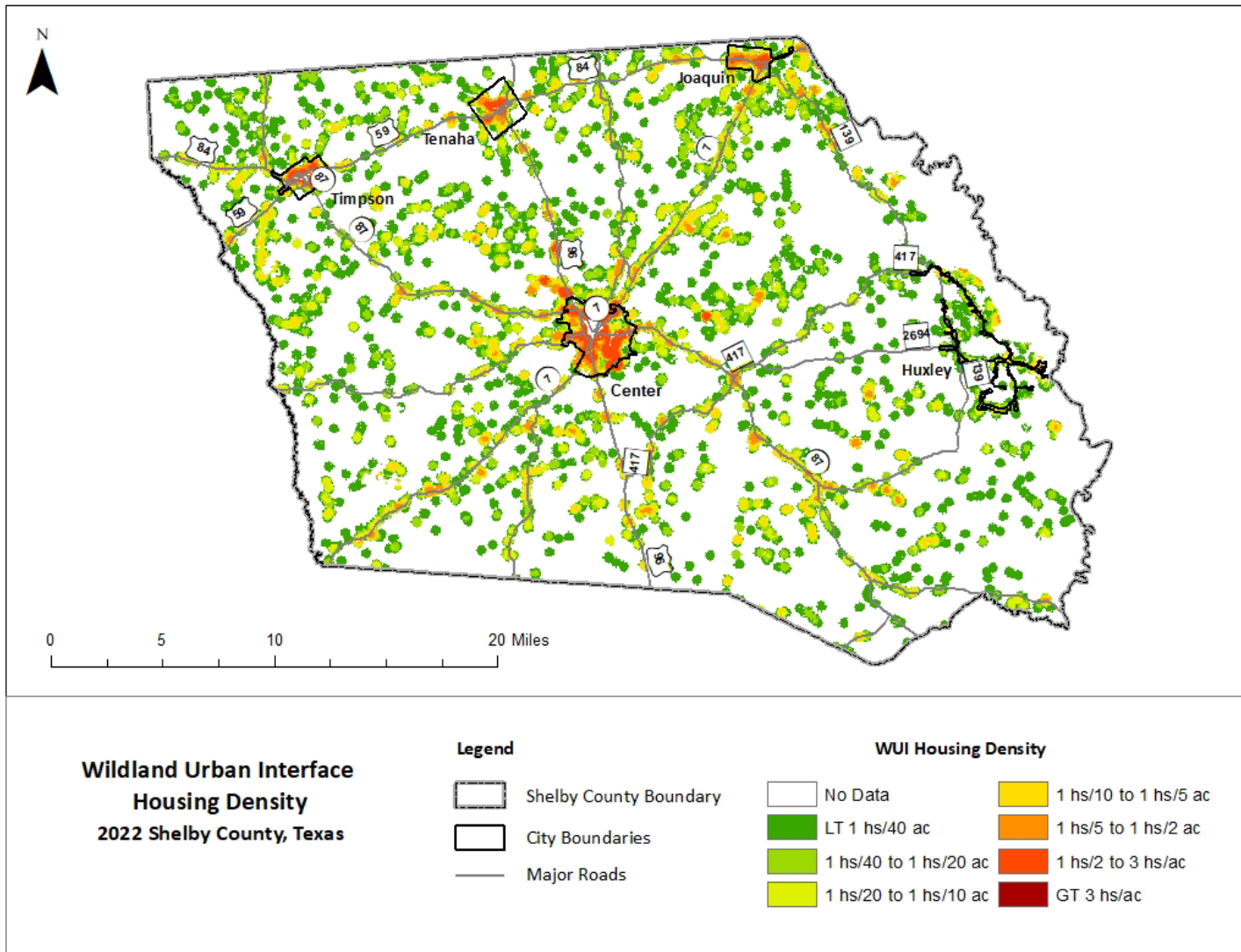


Figure 19: Shelby County Wildland Urban Interface



## II. City of Center Location

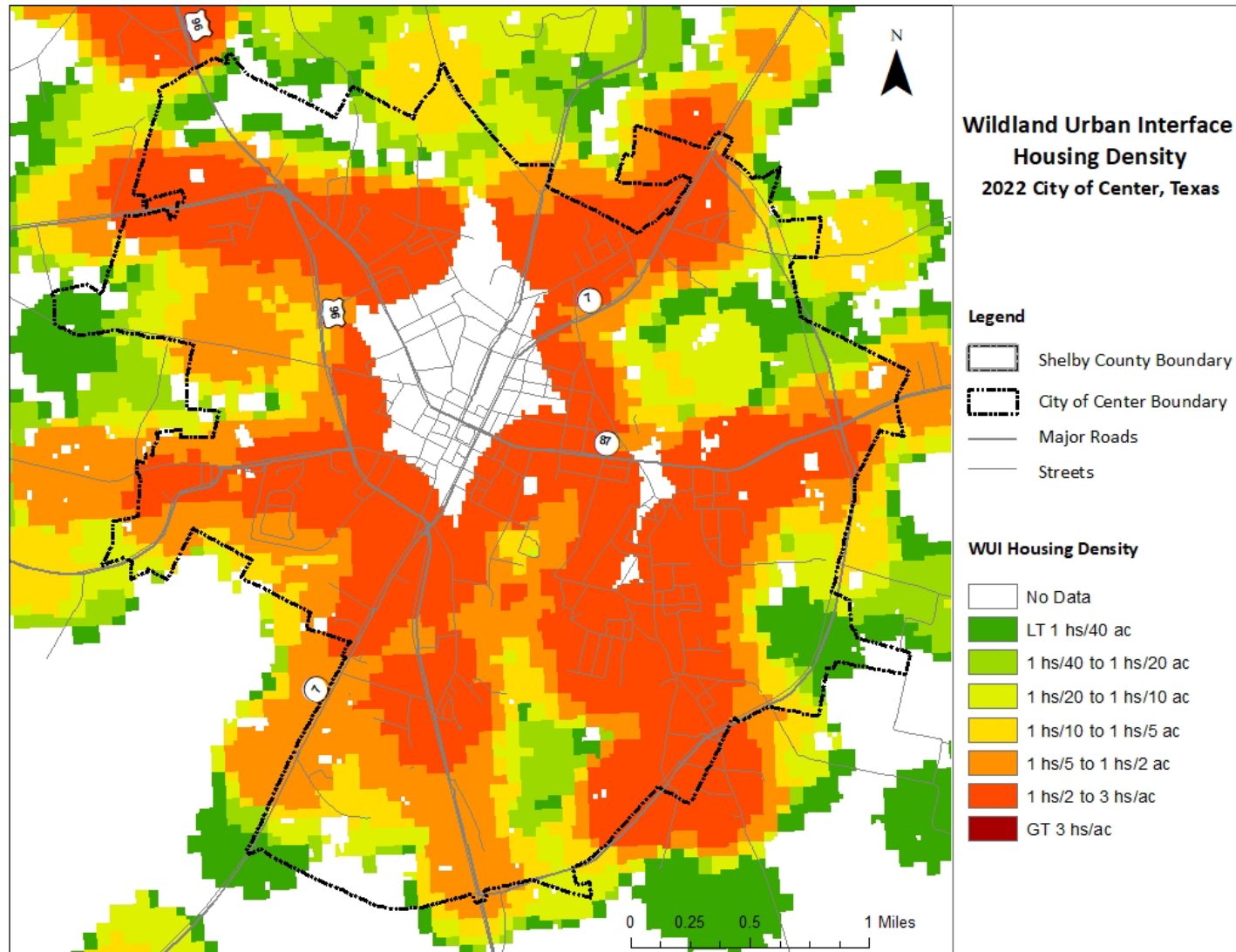


Figure 20: City of Center Wildland Urban Interface

### III. City of Huxley Location

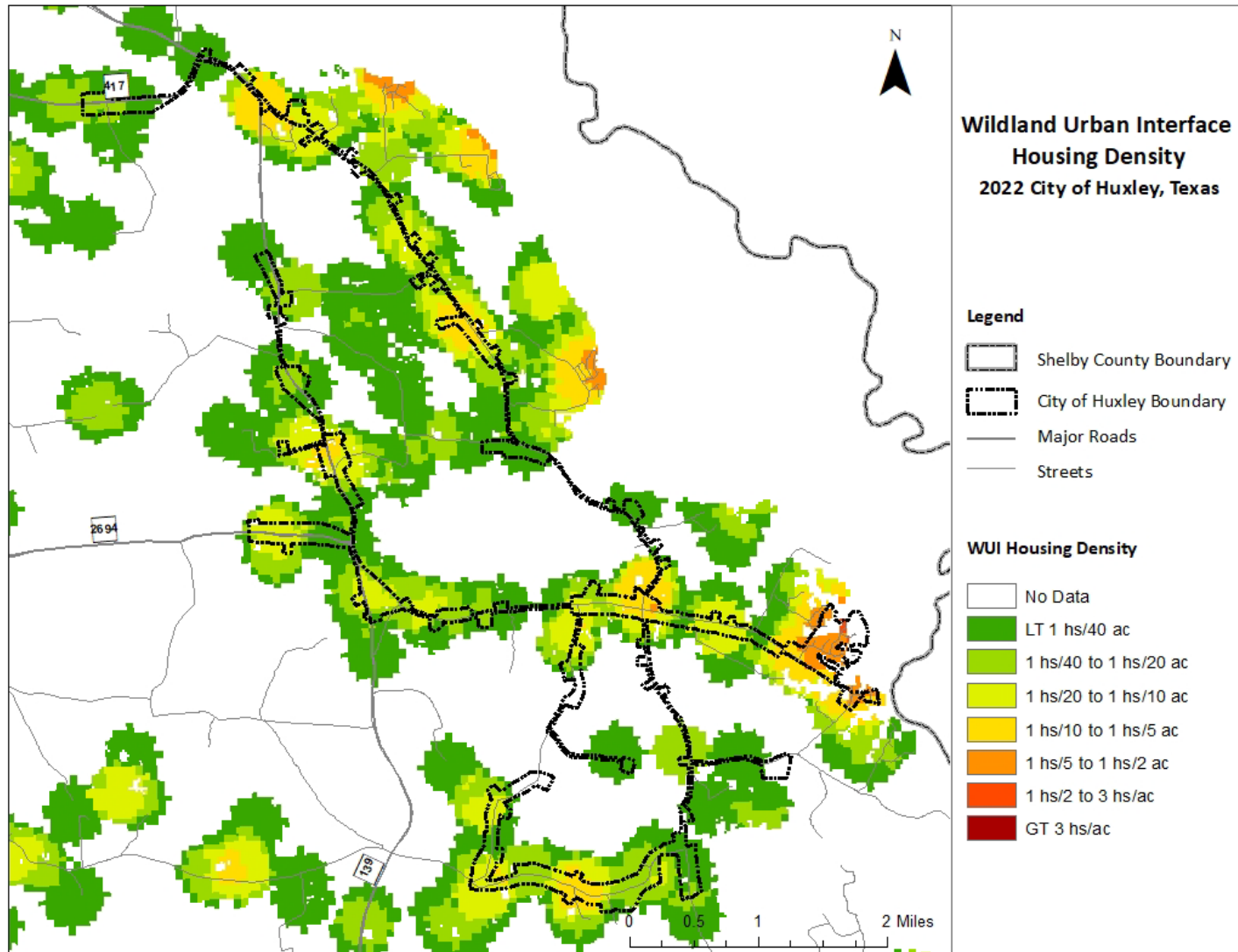


Figure 21: City of Huxley Wildland Urban Interface

IV. City of Joaquin

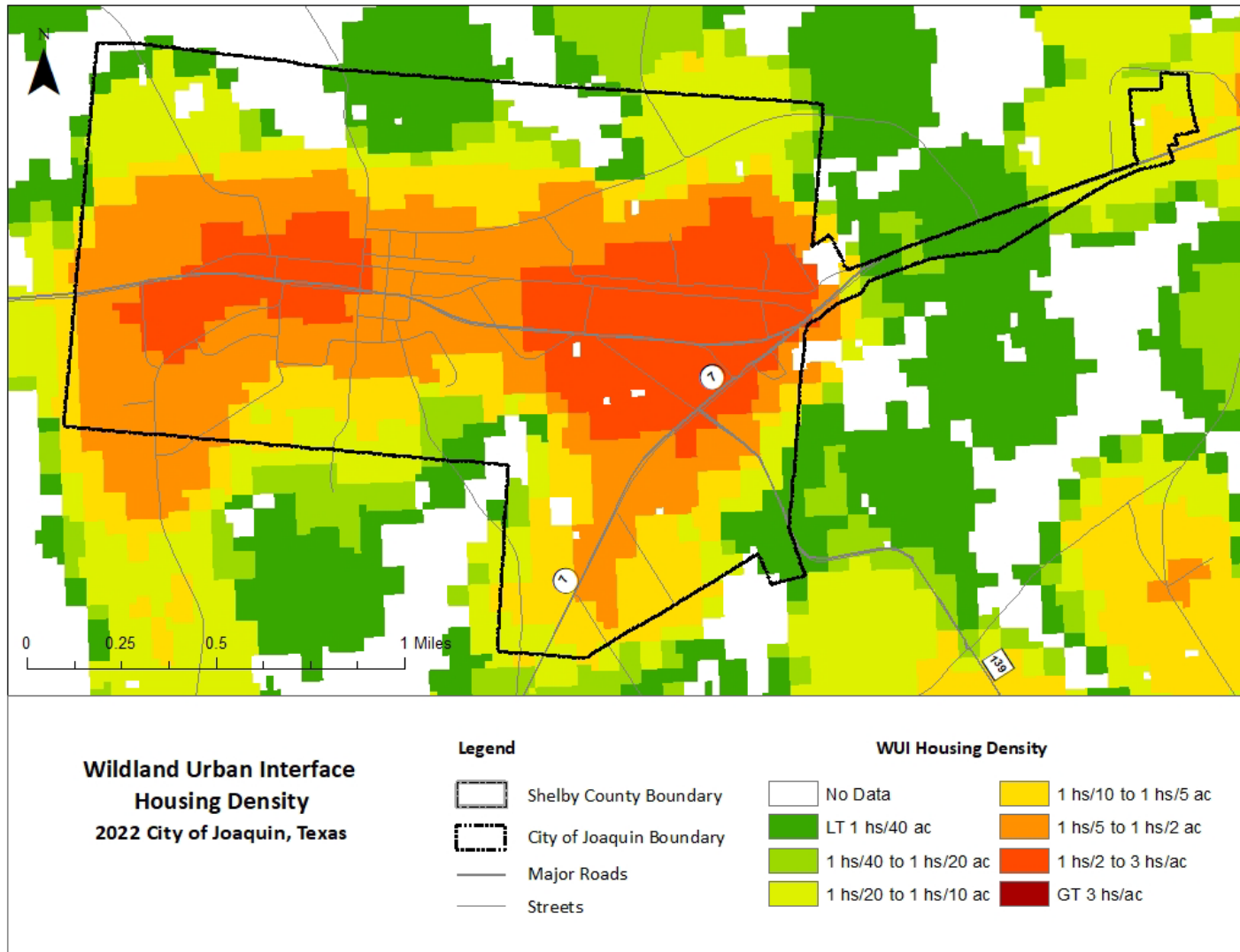


Figure 22: City of Joaquin Wildland Urban Interface

V. City of Tenaha

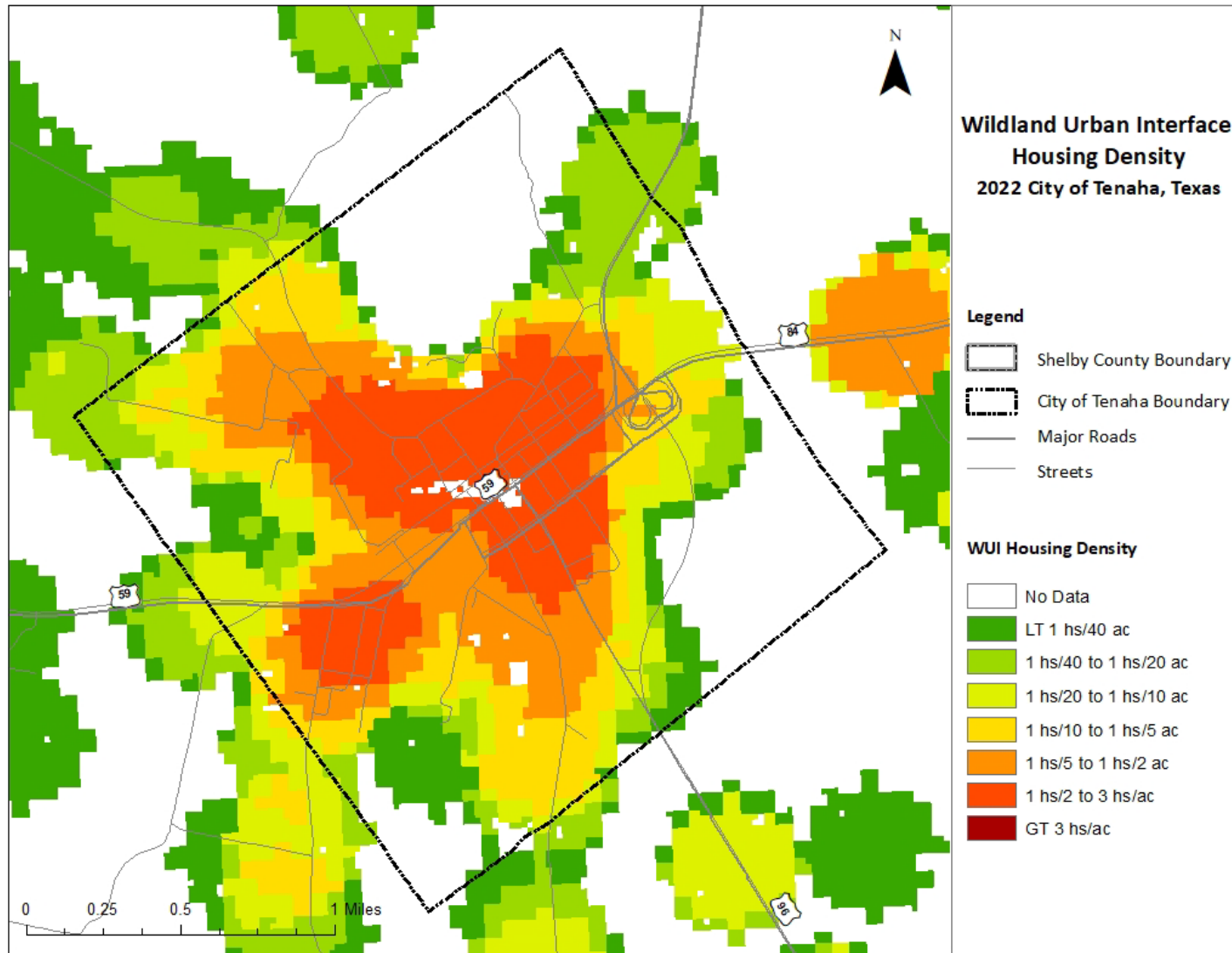


Figure 23: City of Tenaha Wildland Urban Interface

## VI. City of Timpson

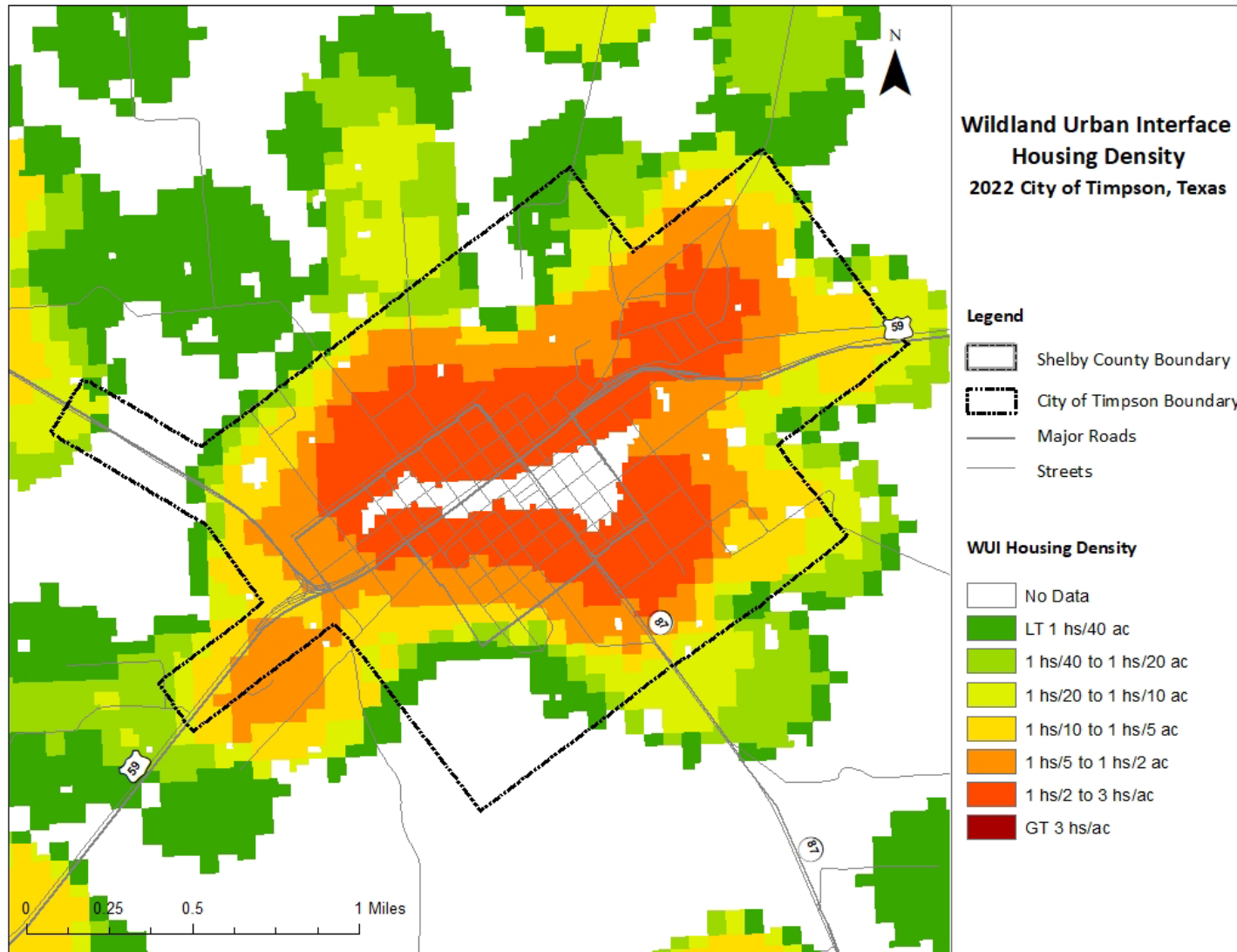


Figure 24: City of Timpson Wildland Urban Interface

## ***B) Impact***

Impacts from a wildfire in Shelby County and the participating jurisdictions may include but are not limited to: crop damage or destruction, damaged or destroyed agricultural, residential, commercial, and industrial buildings, escaped, lost, injured or killed livestock and pets. In the worst cases, residents may be injured or killed.

## **5) Vulnerability**

### ***A) Population***

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a wildfire.

Residents of mobile homes, specifically those built before HUD's Manufactured Housing and Standards requirements were introduced in 1976, are of particular concern<sup>20</sup>. These structures are more prone to fire and have a higher incidence of occupant death than modern manufactured homes.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a wildfire, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a wildfire than structures in standard condition. Exterior damages may make the homes more prone to fire by more readily exposing flammable materials to flame. Missing windows and other exterior gaps may leave residents and structures prone to smoke inhalation and smoke damage.

All of these issues may increase damages and lead to injuries or loss of life.

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<sup>20</sup> <https://www.usfa.fema.gov/downloads/pdf/statistics/rural.pdf>

**B) Critical Facilities**

There are 107 critical facilities located throughout the County and participating jurisdictions. 97 of the 107 critical facilities are located within the wildland urban interface (WUI), as defined by the Texas A&M Forest Service. Because of their location in the WUI, the density of development, and proximity to wildland areas, these facilities are believed to be particularly susceptible to future wildfire threats.

**Table 24: Critical Facilities Vulnerable to Wildfire and Potential Impacts**

Jurisdiction	Critical Facilities	Potential Wildfire Impacts				
		Destruction	Partial Destruction	Heat Damage	Smoke Damage	Water Damage
Shelby County	Shelby County Sheriff's Office	x	x	x	x	x
	Texas Department of Public Safety	x	x	x	x	x
	Shelbyville High School	x	x	x	x	x
	S.W. Carter Elementary School	x	x	x	x	x
	Shelby County Emergency Operations Center	x	x	x	x	x
	Booth Rodeo Arena	x	x	x	x	x
	McClelland Water Supply Corp.	x	x	x	x	x
	Hubber Water Supply Corp.	x	x	x	x	x
	Sand Hill Water Supply Corp.	x	x	x	x	x
	Paxton Water Supply	x	x	x	x	x
	City of Huxley Water Plant	x	x	x	x	x
	Timpson Utilities Department	x	x	x	x	x
	West Shelby Volunteer Fire Dept.	x	x	x	x	x
	Allegiance EMS	x	x	x	x	x
	Timpson Rural WSC	x	x	x	x	x
	Flat Fork WSC	x	x	x	x	x
	Choice WSC	x	x	x	x	x
	Shelbyville WSC	x	x	x	x	x
	East Lamar WSC	x	x	x	x	x
Paxton WSC Jackson Plant	x	x	x	x	x	
Buena Vista WSC	x	x	x	x	x	

	Tennessee WSC	x	x	x	x	x
	Haslam Community	x	x	x	x	x
	Woodland Shores Subdivision	x	x	x	x	x
	Shelby County Emergency Services & Diagnostic Center	x	x	x	x	x
	Shelbyville Grocery	x	x	x	x	x
	Family Dollar	x	x	x	x	x
	Shelby Veterinary Associates	x	x	x	x	x
Center	City of Center Police Dept.	x	x	x	x	x
	City of Center City Hall	x	x	x	x	x
	Windham Civic Center	x	x	x	x	x
	Mill Creek Water Treatment Plant	x	x	x	x	x
	Aiken Water Treatment Plant	x	x	x	x	x
	East Bank Wastewater Treatment Plant	x	x	x	x	x
	Center F.L. Moffett Primary School	x	x	x	x	x
	Center Elementary School	x	x	x	x	x
	Center High School	x	x	x	x	x
	Texas Quick Care	x	x	x	x	x
	Aurora Concepts	x	x	x	x	x
	Priority Family Healthcare	x	x	x	x	x
	Cline Family Practice	x	x	x	x	x
	Hope Medical Clinic- Center	x	x	x	x	x
	Nelson Family Practice	x	x	x	x	x
	Holiday Nursing Center	x	x	x	x	x
	Pine Grove Nursing Center	x	x	x	x	x
	Focused Care at Center	x	x	x	x	x
	Lakeside Village Assisted Living	x	x	x	x	x
	Walmart & Walmart Pharmacy	x	x	x	x	x
Brookshire & Brookshire's Pharmacy	x	x	x	x	x	
CVS	x	x	x	x	x	



	DCI Dialysis	x	x	x	x	x
	Ace Hardware	x	x	x	x	x
	Covington's Lumber	x	x	x	x	x
	H & S Grocery	x	x	x	x	x
	Murphy USA	x	x	x	x	x
<b>Huxley</b>	City of Huxley Volunteer Fire Dept.	x	x	x	x	x
	City of Huxley City Hall	x	x	x	x	x
	Stand Pipe	x	x	x	x	x
	Trails End Restaurant and Gas					
<b>Joaquin</b>	Joaquin Water Plant	x	x	x	x	x
	Joaquin Community Center	x	x	x	x	x
	Texas Quick Care	x	x	x	x	x
	Joaquin City Hall	x	x	x	x	x
	Brookshire Brothers – Haslam	x	x	x	x	x
	Dollar General	x	x	x	x	x
	Joaquin Quick Stop	x	x	x	x	x
	Word of Faith	x	x	x	x	x
	Joaquin First United Methodist Church	x	x	x	x	x
	First United Pentecostal Church of Joaquin	x	x	x	x	x
	First Baptist Church of Joaquin	x	x	x	x	x
	First Baptist Church of Haslam	x	x	x	x	x
	Friendship Baptist Church	x	x	x	x	x
	Bethlehem Missionary Baptist Church	x	x	x	x	x
	Fellowship Missionary Baptist Church	x	x	x	x	x
	Blount Pharmacy	x	x	x	x	x
	Worsham Grocery	x	x	x	x	x
<b>Tenaha</b>	Tenaha Fire Dept.	x	x	x	x	x
	Tenaha Police Dept.	x	x	x	x	x

	Tenaha City Hall	x	x	x	x	x
	The Lighthouse Church	x	x	x	x	x
	Hope Clinic	x	x	x	x	x
	Businessman Club	x	x	x	x	x
	First Baptist Church	x	x	x	x	x
	Quick Stop	x	x	x	x	x
	Tenaha ISD	x	x	x	x	x
<b>Timpson</b>	Timpson Elementary School	x	x	x	x	x
	Timpson Middle School	x	x	x	x	x
	Timpson High School	x	x	x	x	x
	Timpson Volunteer Fire Dept.	x	x	x	x	x
	Texas Quick Care	x	x	x	x	x
	Timpson Wastewater Treatment Plant	x	x	x	x	x
	Lift Station #1	x	x	x	x	x
	Lift Station #2	x	x	x	x	x
	Lift Station #3	x	x	x	x	x
	Lift Station #4	x	x	x	x	x
	Lift Station #5	x	x	x	x	x
	Bussey Drug	x	x	x	x	x
	First Baptist Church Timpson	x	x	x	x	x
	First Methodist Church Timpson	x	x	x	x	x
	Timpson Quick Stop	x	x	x	x	x
Dollar General Timpson	x	x	x	x	x	

**C) Vulnerable Parcels**

**Table 25: Shelby County Parcels Vulnerable to Wildfire**

Jurisdiction	Total	Estimated Potential Damage Value
Countywide	12907	\$1,186,815,750

**Table 26: City of Center Parcels Vulnerable to Wildfire**

Jurisdiction	Total	Estimated Potential Damage Value
City of Center	2171	\$225,046,460

**Table 27: City of Huxley Parcels Vulnerable to Wildfire**

Jurisdiction	Total	Estimated Potential Damage Value
City of Huxley	149	\$13,283,140

**Table 28: City of Joaquin Parcels Vulnerable to Wildfire**

Jurisdiction	Total	Estimated Potential Damage Value
City of Joaquin	467	\$26,784,150

**Table 29: City of Tenaha Parcels Vulnerable to Wildfire**

Jurisdiction	Total	Estimated Potential Damage Value
City of Tenaha	538	\$28,041,030

Table 30: City of Timpson Parcels Vulnerable to Wildfire

Jurisdiction	Total	Estimated Potential Damage Value
City of Timpson	663	\$35,991,460

## 7. Tornado

A tornado is defined as a rapidly rotating vortex or funnel of air extending ground-ward from a cumulonimbus cloud. Most of the time, vortices remain suspended in the atmosphere and are visible as a funnel cloud. However, when the lower tip of a vortex touches the ground, the tornado becomes a force of destruction. Tornado strength is currently measured using the Enhanced Fujita (EF) Scale. Like the previously used Fujita scale, the EF Scale uses damage to estimate tornado wind speeds and assign a number between 0 and 5. A rating of EF0 represents minor to no damage whereas a rating of EF5 represents destruction of buildings.

### 1) Tornado History

The 2016 Shelby County plan reported 33 tornados between 1950 – 2013 for the County and jurisdictions. The following tables identify tornado events and associated damages in Shelby County and the participating jurisdictions from 2016 to present, as reported in the NCEI database.

Table 31: Shelby County Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Countywide	4/24/2019	1	EF1	0	0	\$0	\$0

Table 32: City of Center County Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Center	1/11/2020	1	EF1	0	0	\$548,114	\$0

Table 33: City of Timpson Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Timpson	5/11/2017 – 4/12/2020	2	EF1	0	0	\$28,936	\$0

According to County records, many more tornados have occurred since 1950 than was previously reported in the 2016 plan. According to records, the largest tornado in the Shelby County area was an F4 in 1950 that caused 77 injuries and 18 deaths. The County has reported, since 1950:

Location	Number of Tornadoes
Shelby County	108
City of Center	106
City of Huxley	95
City of Joaquin	129
City of Tenaha	126
City of Timpson	132

**2) Likelihood of Future Events**

The likelihood of future tornadoes will be determined in consideration of all tornadoes in Shelby County. Tornado events in Shelby County are considered a highly likely hazard given the frequency of previous tornadoes in the County and participating jurisdictions, meaning one is possible in the next year.

**3) Extent**

Before 2007, the Fujita Scale was used for rating tornado strength. The Fujita Scale is based on damage intensity instead of wind speed, with estimated wind speed ranges based on the extent of observed damage.

Table 34: Fujita Scale

Fujita Scale			
Enhanced Fujita Category	Wind Speed (MPH)	Character	Potential Damage
Zero (F0)	40-72	Weak	Light Damage. Some damage to chimneys; branches broken off trees, shallow-rooted trees uprooted, sign boards damaged.
One (F1)	73-112	Weak	Moderate damage. Roof surfaces peeled off; mobile homes pushed foundations or overturned; moving autos pushed off road.
Two (F2)	113-157	Strong	Considerable damage. Roofs torn from frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light objects become projectiles.
Three (F3)	158-206	Strong	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
Four (F4)	207-260	Violent	Devastating damage. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
Five (F5)	260-318	Violent	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in

			excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.
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Adopted after 2007, the Enhanced Fujita Scale, or EF Scale, is the scale for rating the strength of tornados via the damage they cause. Six categories from zero to five represent increasing degrees of damage. The scale considers how most structures are designed and is thought to be an accurate representation of the surface wind speeds in the most violent tornados.

Table 35: Enhanced Fujita Scale<sup>21</sup>

Enhanced Fujita (EF) Scale		
Enhanced Fujita Category	Wind Speed (MPH)	Potential Damage
EF0	65-85	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	Devastating damage. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	200+	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

The most recent tornados in Shelby County and the participating jurisdictions have been classified as EF1s on the Enhanced Fujita Scale. Shelby County sits within Zone IV (250 mph winds) of the ICC’s wind speed map. Future tornados in Shelby County and the participating jurisdictions may meet up to EF5 on the Enhanced Fujita Category.

<sup>21</sup> Texas State Hazard Mitigation Plan, 2018 Update.

#### **4) Location and Impact**

##### ***A) Location***

Tornados are not constrained by any distinct geographic boundary. Tornados can occur across all participating jurisdictions and may freely cross from one jurisdiction into another.

##### ***B) Impact***

Impacts from a tornado may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and industrial buildings, and loss of power. Crops may be damaged or destroyed. Pets and livestock may be injured or killed by tornados or flying debris. Pets and livestock may escape due to damaged or destroyed structures and fences.

In the worst cases, tornados may cause injuries and/or be deadly.

#### **5) Vulnerability**

Tornadoes have the potential to impact the entire planning area. All existing and future buildings, critical facilities, critical infrastructure, improved property, and the population of the participating jurisdictions are considered vulnerable to this hazard.

##### ***A) Population***

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a tornado. Residents of mobile / manufactured homes are of particular concern. These structures are never considered safe during a tornado.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a tornado, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a tornado than structures in standard condition. Existing structural weaknesses, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

##### ***B) Critical Facilities and Infrastructure***

Certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to tornados. These facilities have been identified for reasons including: the number of people who use the facility or infrastructure, the facility's role in providing basic services to begin the cleanup process and get the jurisdictions running again, and the facility's ability to offer goods and materials residents will need to resume normalcy as quickly as possible. The selected



critical facilities are built from a variety of materials with varying levels of resistance to tornadic damages. Additionally, their varying ages may mean they weren't constructed to uniform building standards. Given tornados' violent nature, these facilities may experience increased levels of vulnerability to the hazards. Damage to any of these facilities may have a disproportionately negative impact on each jurisdiction's recovery from a tornado if that damage affects the facility's ability to reopen and resume normal business right away.

Table 36: Critical Facilities Vulnerable to Tornadoes and Potential Impacts

Jurisdiction	Critical Facilities	Potential Tornado Impacts									
		Loss of Power	Flying Debris	Uprooted Trees	Flooding	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
Shelby County	Shelby County Sheriff's Office	X	X	X	X	X	X	X	X	X	X
	Texas Department of Public Safety	X	X	X	X	X	X	X	X	X	X
	Shelbyville High School	X	X	X	X	X	X	X	X	X	X
	S.W. Carter Elementary	X	X	X	X	X	X	X	X	X	X
	Shelby County Emergency Operations Center	X	X	X	X	X	X	X	X	X	X
	Booth Rodeo Arena	X	X	X	X	X	X	X	X	X	X
	McClelland Water Supply Corp.	X	X	X	X	X	X	X	X	X	X
	Huber Water Supply Corp.	X	X	X	X	X	X	X	X	X	X
	Sand Hill Water Supply Corp.	X	X	X	X	X	X	X	X	X	X
	Paxton Water Supply	X	X	X	X	X	X	X	X	X	X
	City of Huxley Water Plant	X	X	X	X	X	X	X	X	X	X
	Timpson Utilities Department	X	X	X	X	X	X	X	X	X	X
	Shelby County Courthouse	X	X	X	X	X	X	X	X	X	X
	West Shelby Volunteer Fire Department	X	X	X	X	X	X	X	X	X	X
	Allegiance EMS	X	X	X	X	X	X	X	X	X	X
	Timpson Rural WSC	X	X	X	X	X	X	X	X	X	X
	Flat Fork WSC	X	X	X	X	X	X	X	X	X	X
	Choice WSC	X	X	X	X	X	X	X	X	X	X
	Shelbyville WSC	X	X	X	X	X	X	X	X	X	X
	East Lamar WSC	X	X	X	X	X	X	X	X	X	X
Paxton WSC Jackson Plant	X	X	X	X	X	X	X	X	X	X	
Buena Vista WSC	X	X	X	X	X	X	X	X	X	X	
Tennessee WSC	X	X	X	X	X	X	X	X	X	X	

	Shelbyville Grocery	X	X	X	X	X	X	X	X	X	X
	Family Dollar	X	X	X	X	X	X	X	X	X	X
Center	City of Center Fire Department	X	X	X	X	X	X	X	X	X	X
	City of Center Police Department	X	X	X	X	X	X	X	X	X	X
	City of Center City Hall	X	X	X	X	X	X	X	X	X	X
	City of Center - Windham Civic Center	X	X	X	X	X	X	X	X	X	X
	Aiken Water Treatment Plant	X	X	X	X	X	X	X	X	X	X
	Mill Creek Water Treatment Plant	X	X	X	X	X	X	X	X	X	X
	East Bank Wastewater Treatment Plant	X	X	X	X	X	X	X	X	X	X
	Center FL Moffett Primary	X	X	X	X	X	X	X	X	X	X
	Center Elementary	X	X	X	X	X	X	X	X	X	X
	Center High School	X	X	X	X	X	X	X	X	X	X
	Center Middle School	X	X	X	X	X	X	X	X	X	X
	Cline Family Practice	X	X	X	X	X	X	X	X	X	X
	Nelson Family Practice	X	X	X	X	X	X	X	X	X	X
	Holiday Nursing Center	X	X	X	X	X	X	X	X	X	X
	Pine Grove Nursing Center	X	X	X	X	X	X	X	X	X	X
	Focused Care at Center	X	X	X	X	X	X	X	X	X	X
	Lakeside Village Assisted Living	X	X	X	X	X	X	X	X	X	X
	DCI Dialysis	X	X	X	X	X	X	X	X	X	X
	Covington's Lumber	X	X	X	X	X	X	X	X	X	X
	H & S Grocery	X	X	X	X	X	X	X	X	X	X
Huxley	City of Huxley Volunteer Fire Department (VFD)	X	X	X	X	X	X	X	X	X	X
	City Hall	X	X	X	X	X	X	X	X	X	X
	Water Treatment Plant	X	X	X	X	X	X	X	X	X	X
	Stand Pipe		X					X			
	Possum Trot Booster Plant	X	X	X	X	X	X	X	X		

	Trails End Restaurant and Gas	X	X	X	X	X	X	X	X	X	X
<b>Joaquin</b>	Water Plant	X	X	X	X	X	X	X	X	X	X
	Joaquin Community Center	X	X	X	X	X	X	X	X	X	X
	Texas Quick Care	X	X	X	X	X	X	X	X	X	X
	Joaquin City Hall	X	X	X	X	X	X	X	X	X	X
	Brookshire Bothers – Haslam	X	X	X	X	X	X	X	X	X	X
	Dollar General	X	X	X	X	X	X	X	X	X	X
	Joaquin Quick Stop	X	X	X	X	X	X	X	X	X	X
	Word of Faith	X	X	X	X	X	X	X	X	X	X
	Joaquin First United Methodist Church	X	X	X	X	X	X	X	X	X	X
	First United Pentecostal Church of Joaquin	X	X	X	X	X	X	X	X	X	X
	First Baptist Church of Joaquin	X	X	X	X	X	X	X	X	X	X
	First Baptist Church of Haslam	X	X	X	X	X	X	X	X	X	X
	Friendship Baptist Church	X	X	X	X	X	X	X	X	X	X
	Bethlehem Missionary Baptist Church	X	X	X	X	X	X	X	X	X	X
	Fellowship Missionary Baptist Church	X	X	X	X	X	X	X	X	X	X
Blount Pharmacy	X	X	X	X	X	X	X	X	X	X	
Worsham Grocery	X	X	X	X	X	X	X	X	X	X	
<b>Tenaha</b>	Tenaha Fire Department	X	X	X	X	X	X	X	X	X	X
	Tenaha Police Department	X	X	X	X	X	X	X	X	X	X
	City Hall	X	X	X	X	X	X	X	X	X	X
	The Lighthouse Church	X	X	X	X	X	X	X	X	X	X
	Hope clinic	X	X	X	X	X	X	X	X	X	X
	Businessman Club	X	X	X	X	X	X	X	X	X	X
	First Baptist Church	X	X	X	X	X	X	X	X	X	X
	Quick Stop	X	X	X	X	X	X	X	X	X	X

	Beef Producers of Texas	X	X	X	X	X	X	X	X	X	X
	Tenaha Independent School District	X	X	X	X	X	X	X	X	X	X
Timpson	Timpson Elementary	X	X	X	X	X	X	X	X	X	X
	Timpson High School	X	X	X	X	X	X	X	X	X	X
	Timpson Middle School	X	X	X	X	X	X	X	X	X	X
	City of Timpson Volunteer Fire Department (VFD)	X	X	X	X	X	X	X	X	X	X
	Timpson City Hall	X	X	X	X	X	X	X	X	X	X
	Timpson Library	X	X	X	X	X	X	X	X	X	X
	Texas Quick Care	X	X	X	X	X	X	X	X	X	X
	Timpson Wastewater Treatment Plant	X	X	X	X	X	X	X	X	X	X
	Lift Station 1	X	X		X	X	X	X	X		
	Lift Station 2	X	X		X	X	X	X	X		
	Lift Station 3	X	X		X	X	X	X	X		
	Lift Station 4	X	X		X	X	X	X	X		
	Lift Station 5	X	X		X	X	X	X	X		
	Bussey Drug	X	X	X	X	X	X	X	X	X	X
	First Baptist Church Timpson	X	X	X	X	X	X	X	X	X	X
	First Methodist Church Timpson	X	X	X	X	X	X	X	X	X	X
Timpson Quick Stop	X	X	X	X	X	X	X	X	X	X	
Dollar General Timpson	X	X	X	X	X	X	X	X	X	X	
Family Dollar Timpson	X	X	X	X	X	X	X	X	X	X	

**C) Vulnerable Parcels**

Table 37: Parcels Vulnerable to Tornadoes

<b>Jurisdiction</b>	<b>Parcel Count</b>	<b>Estimated Potential Damage Value</b>
<b>Shelby County</b>	<b>19,985</b>	<b>\$2,380,087,130</b>
City of Center	2,691	\$262,915,110
City of Huxley	182	\$15,638,160
Joaquin	475	\$27,719,040
Tenaha	573	\$31,357,980
Timpson	777	\$42,502,740

## 8. Drought

Drought is defined as the consequence of a natural reduction in the amount of precipitation expected over an extended period, usually a season or more in length.

Droughts are one of the most complex natural hazards to identify because it is difficult to determine their precise beginning or end. In addition, droughts can lead to other hazards such as extreme heat and wildfires. Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants and even in severe cases, trees. A secondary hazard to drought is wildfire because dying vegetation serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

Table 38: Drought Classifications

<b>Meteorological Drought</b>	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
<b>Hydrologic Drought</b>	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
<b>Agricultural Drought</b>	Soil moisture deficiencies relative to water demands of plant life, usually crops.
<b>Socioeconomic Drought</b>	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

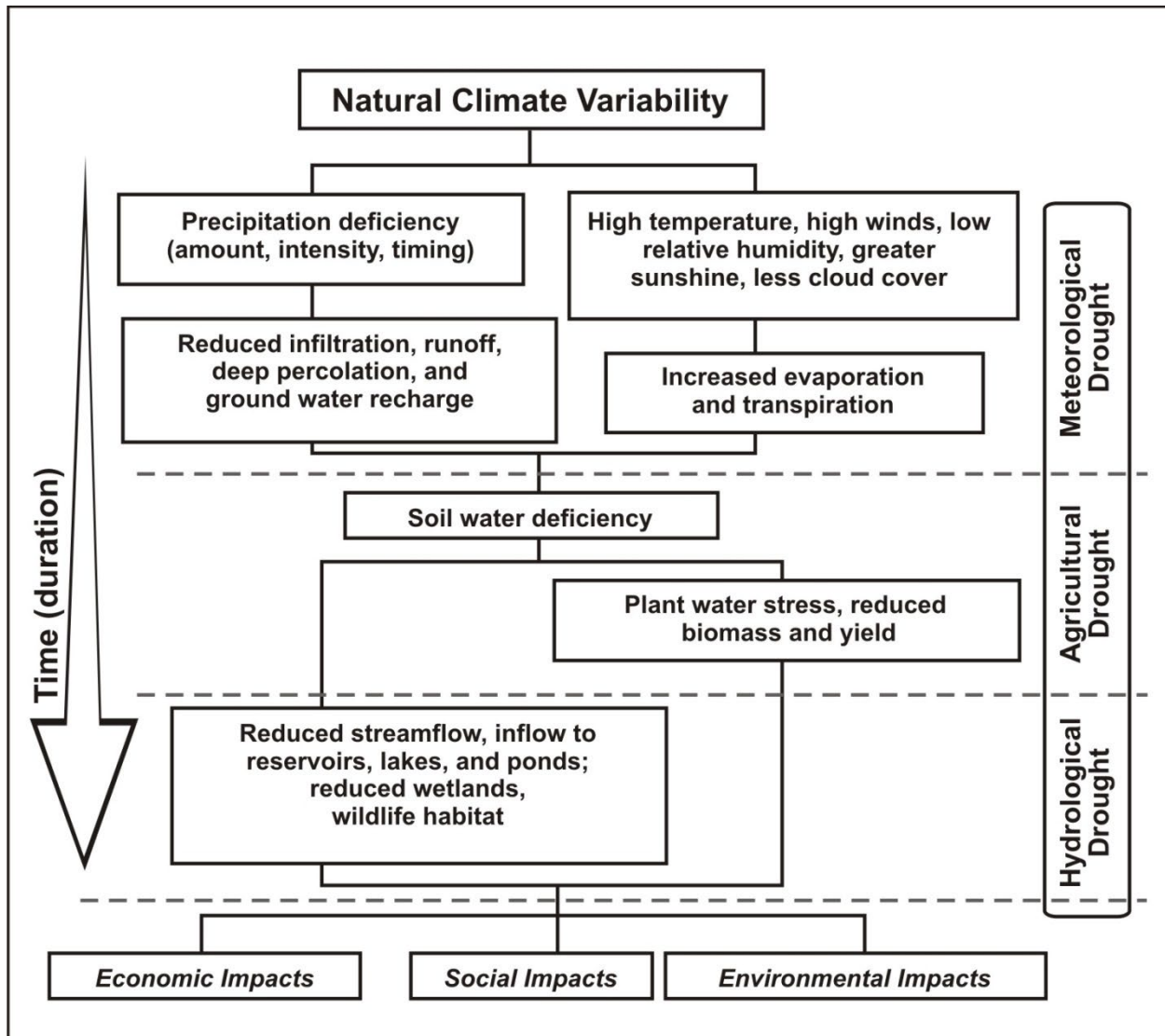


Figure 25: Sequence of Drought Occurrence and Impacts for Commonly Accepted Drought Types<sup>22</sup>

<sup>22</sup> Source: National Drought Mitigation Center, University of Nebraska-Lincoln, <http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx>



# 1) Drought History<sup>23</sup>

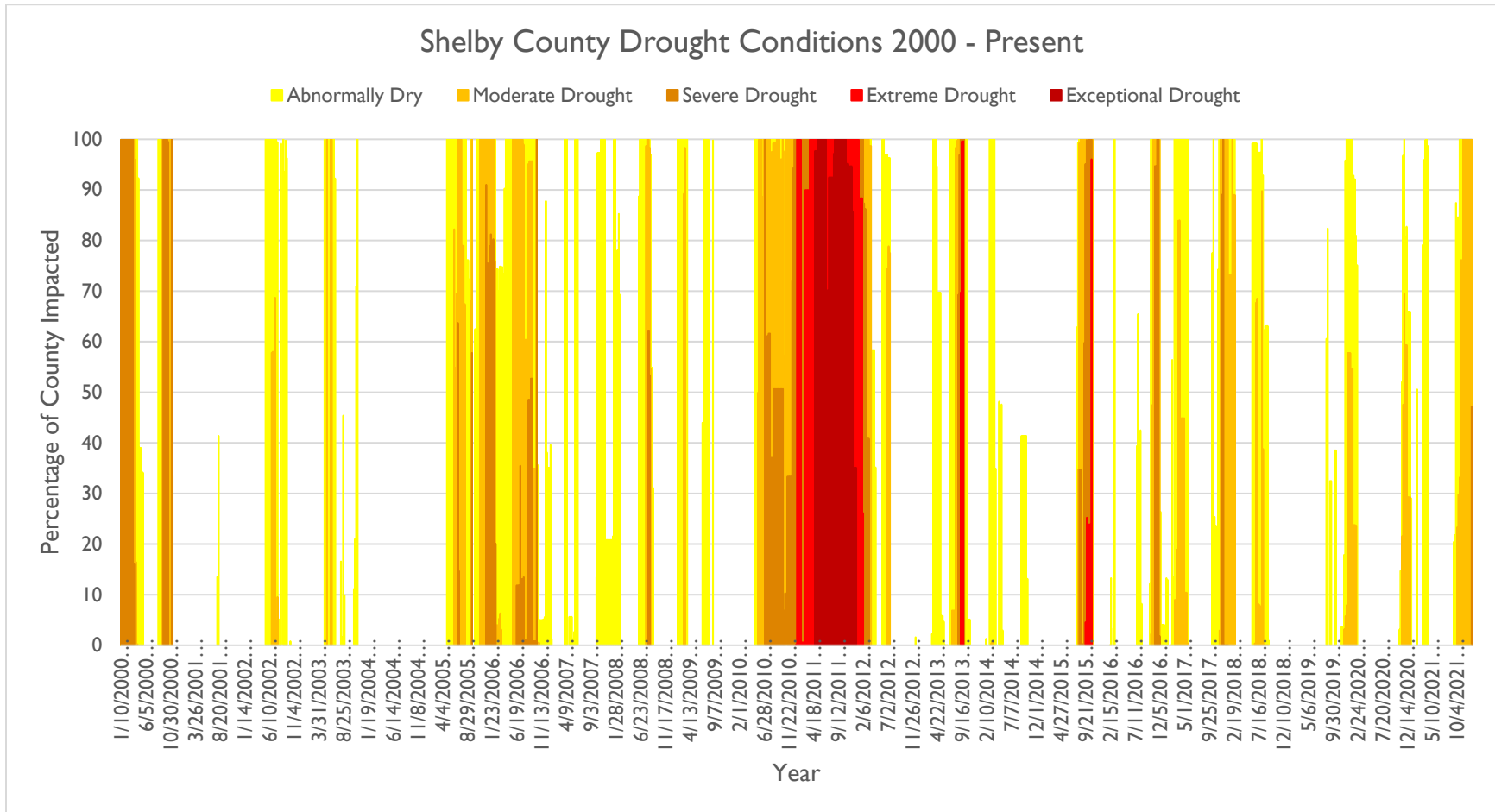


Figure 26: Shelby County Drought History

<sup>23</sup> Source: United States Drought Monitor <https://droughtmonitor.unl.edu/Data.aspx>

Drought history is recorded at the county level. However, the data is measured by the percentage of the county affected by drought. Although no specific data regarding drought’s occurrences in the individual cities is available, it’s possible to use the data in Figure 26 to infer when the participating jurisdictions addressing the hazard previously experienced drought conditions due to the fact that the conditions impacted 100% of the county. According to the data, Shelby County and the participating jurisdictions have regularly experienced drought conditions since 2000.

In Shelby County’s 2016 plan, the participating jurisdictions established a regular history of Drought with 8 events from 1999 to 2013. The 2016 Plan found that the frequency of drought occurrences is high for the entire planning area.

Table 39: Shelby County Drought History

Location	Date Range	Number of Drought Events	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Countywide	12/1/2005 – 12/30/2021	25	0	0	\$0	\$0

## 2) Likelihood of Future Events

Based on historical drought in Texas and Shelby County, it is highly likely that a future drought will affect Shelby County and the participating jurisdictions, meaning an event affecting any or all the participating jurisdictions is probable in the next year, and a major drought every 20 years.

## 3) Extent

Since 2000, Shelby County has regularly experienced county-wide droughts classified as periods ranging from abnormal dryness to exceptional drought. Between 2010 and 2012, the entire County, including all participating jurisdictions, was in a state of extreme or exceptional drought, the most severe drought categories.

The Palmer Drought Index is used to measure the extent of drought by measuring the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, with the intensity of drought during the current month dependent upon the current weather patterns plus the cumulative patterns of previous months. The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop.

Table 40: Palmer Drought Index

Drought Index	Drought Conditions Classifications						
	Extreme	Severe	Moderate	Normal	Mostly Moist	Very Moist	Extremely Moist
Z Index	-2.75 and below	-2.00 to -2.74	-1.25 to -1.99	-1.24 to +.99	+1.00 to +2.49	+2.50 to +3.49	n/a
Meteorological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above
Hydrological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above

Table 41: Palmer Drought Category Descriptions<sup>24</sup>

Category	Description	Possible Impacts	Palmer Drought Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing, or imminent, voluntary water use restrictions requested.	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies.	-5.0 or less

Drought is monitored nationwide by the National Drought Mitigation Center (NDMC). Indicators are used to describe broad scale drought conditions across the U.S. Indicators correspond to the intensity of drought.

Based on the historical occurrences of drought, Shelby County and all participating jurisdictions should anticipate experiencing droughts ranging from abnormally dry to exceptional drought or D0 to D4 based on the Palmer Drought Category. Given varying conditions, droughts may start on the low end of the Index but will intensify with duration and ongoing lack of precipitation. Future drought events may reach the intensity of D4 on the Palmer Drought Index.

<sup>24</sup> www.droughtmonitor.unl.edu

#### **4) Location and Impact**

##### **A) Location**

Drought has no distinct geographic boundary. Drought can occur across all participating jurisdictions.

##### **B) Impact**

General impacts may include water shortage, risk to public safety due to wildfire risk increases, respiratory impacts to the public due to affected air quality, and degradation of fish and wildlife habitat. Economic impacts may include increased prices for food, unemployment for farm workers and ranch hands, livestock mortality from limited grazing availability, and reduced tax revenues because of reduced supplies of agriculture products and livestock that are dependent on rainfall, along with other supply shortages.

The City of Center adopted its current Drought Contingency Plan in December 2014. The plan describes three stages of water restrictions ranging from a limitation of non-essential use to prohibition of non-essential use. Each stage is triggered by changes in the level of water demand relative to the safe operating capacity of the City's water supply facilities or the occurrence of a water supply emergency.

The City of Huxley adopted its current Drought Contingency Plan in April 2000. The plan describes three stages of water restrictions ranging from voluntary conservation to a prohibition of activities and water allocation. Each stage is triggered by changes in the level of water demand relative to the safe operating capacity of the City's water supply facilities or the occurrence of a water supply emergency.

The City of Joaquin adopted its current Drought Contingency Plan in June 2022. The plan describes six stages of water restrictions ranging from voluntary conservation to a prohibition of activities and water allocation. Each stage is triggered by changes in the level of water demand relative to the safe operating capacity of the district's water supply facilities or the occurrence of a water supply emergency.

The City of Tenaha adopted its Drought Contingency Plan in August 2000.

The City of Timpson adopted its current Drought Contingency Plan in August 2020. The plan describes six stages of water restrictions ranging from voluntary conservation to a prohibition of activities and water allocation. Each stage is triggered by changes in the level of water demand relative to the safe operating capacity of the district's water supply facilities or the occurrence of a water supply emergency.

Shelby County does not have a drought contingency plan.

## **5) Vulnerability**

Because drought has the potential to impact every jurisdiction equally, all improved property and the entire population is exposed to this hazard. General impacts may include water shortage, risk to public safety due to wildfire risk increases, respiratory impacts to the public due to affected air quality, and degradation of fish and wildlife habitat.

Economic impacts may include increased prices for food, unemployment for farm workers and ranch hands, livestock mortality from limited grazing availability, and reduced tax revenues because of reduced supplies of agriculture products and livestock that are dependent on rainfall.

Lower income populations who may not have the resources to buy large quantities of bottled water in the event of a shortage may be more vulnerable than other populations.

### **A) Population**

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a drought. Lower income populations who may not have the resources to buy large quantities of bottled water in the event of a shortage may be more vulnerable than other populations.

### **B) Critical Facilities**

In addition to triggering various components of participating jurisdictions' Drought Contingency plans, drought conditions may affect local critical facilities. Area fire departments may see increased demand for controlling wildland fire due to dry conditions. Drought is likely to require increased output from the local power companies to keep up with electrical demand. Depending on factors like time of year, temperature, and duration, increased electrical demand may cause brownouts that would impact critical facilities.

Table 42: Critical Facilities Vulnerable to Drought and Potential Impacts

Jurisdiction	Critical Facilities	Potential Drought Impacts	
		Increased Demand for Services	Economic Damages
Shelby County	Shelby County Sheriff's Office		X
	Texas Department of Public Safety	X	X
	Shelbyville High School		X
	S.W. Carter Elementary		X
	Shelby County Emergency Operations Center	X	X
	Booth Rodeo Arena		X
	McClelland Water Supply Corp.	X	X
	Huber Water Supply Corp.	X	X
	Sand Hill Water Supply Corp.	X	X
	Paxton Water Supply	X	X
	City of Huxley Water Plant	X	X
	Timpson Utilities Department	X	X
	Shelby County Courthouse		X
	West Shelby Volunteer Fire Department	X	X
	Allegiance EMS	X	X
	Timpson Rural WSC	X	X
	Flat Fork WSC	X	X
	Choice WSC	X	X
	Shelbyville WSC	X	X
	East Lamar WSC	X	X
	Paxton WSC Jackson Plant	X	X
Buena Vista WSC	X	X	
Tennessee WSC	X	X	
Shelby County Emergency Services & Diagnostic Center			
Shelbyville Grocery	X		

	Family Dollar		
	Shelby Veterinary Associates		
Center	City of Center Fire Department	X	X
	City of Center Police Department		X
	City of Center City Hall		X
	City of Center - Windham Civic Center		X
	Aiken Water Treatment Plant	X	X
	Mill Creek Water Treatment Plant	X	X
	East Bank Wastewater Treatment Plant	X	X
	Center FL Moffett Primary		X
	Center Elementary		X
	Center High School		X
	Center Middle School		X
	Texas Quick Care		X
	Aurora Concepts		X
	Priority Family Healthcare	x	X
	Cline Family Practice	X	X
	Hope Medical Clinic- Center	X	X
	Nelson Family Practice	X	X
	Holiday Nursing Center	X	X
	Pine Grove Nursing Center	X	X
	Focused Care at Center	X	X
	Lakeside Village Assisted Living	X	X
	Walmart & Walmart Pharmacy		X
	Brookshire & Brookshire's Pharmacy		X
	CVS	X	X
DCI Dialysis	X	X	
Ace Hardware	X	X	

	Covington's Lumber	x	X
	H & S Grocery	x	X
	Murphy USA		X
<b>Huxley</b>	City of Huxley Volunteer Fire Department (VFD)	X	X
	City Hall		X
	Water Treatment Plant	X	X
	Stand Pipe	X	
	Possum Trot Booster Plant	X	X
	Trails End Restaurant and Gas	x	x
<b>Joaquin</b>	Water Plant	X	X
	Joaquin Community Center	X	X
	Texas Quick Care	X	X
	Joaquin City Hall		X
	Brookshire Bothers – Haslam	X	X
	Dollar General	X	X
	Joaquin Quick Stop	X	X
	Word of Faith	X	X
	Joaquin First United Methodist Church	X	X
	First United Pentecostal Church of Joaquin	X	X
	First Baptist Church of Joaquin	X	X
	First Baptist Church of Haslam	X	X
	Friendship Baptist Church	X	X
	Bethlehem Missionary Baptist Church	X	X
	Fellowship Missionary Baptist Church	X	X
	Blount Pharmacy	x	x
	Worsham Grocery	x	x
	<b>Tenaha</b>	Tenaha Fire Department	X
Tenaha Police Department			X
City Hall			X



	The Lighthouse Church	X	X
	Hope clinic	X	X
	Businessman Club		X
	First Baptist Church	X	X
	Quick Stop	X	X
	Beef Producers of Texas		X
	Tenaha Independent School District		X
<b>Timpson</b>	Timpson Elementary		X
	Timpson High School		X
	Timpson Middle School		X
	City of Timpson Volunteer Fire Department (VFD)	X	X
	Timpson City Hall		X
	Timpson Library		X
	Texas Quick Care	X	X
	Timpson Wastewater Treatment Plant	X	X
	Lift Station 1	X	
	Lift Station 2	X	
	Lift Station 3	X	
	Lift Station 4	X	
	Lift Station 5	X	
	Bussey Drug		X
	First Baptist Church Timpson		X
	First Methodist Church Timpson		X
	Timpson Quick Stop		X
	Dollar General Timpson		X
Family Dollar Timpson		x	

### C) Vulnerable Parcels

Given drought’s geographic reach, all parcels within the participating jurisdictions are equally vulnerable to the hazard. However, given the limited damages inflicted by previous droughts, future damages are expected to be similarly limited.

Table 43: Parcels Vulnerable to Drought

Jurisdiction	Parcel Count	Estimated Potential Damage Value
<b>Shelby County</b>	<b>19,985</b>	<b>\$2,380,087,130</b>
City of Center	2,691	\$262,915,110
City of Huxley	182	\$15,638,160
City of Joaquin	475	\$27,719,040
City of Tenaha	573	\$31,357,980
City of Timpson	777	\$42,502,740

#### I. Agricultural Production

According to the USDA 2017 Census of Agriculture<sup>25</sup>, the total market value of agricultural products sold, including direct sales, in Shelby County was \$467,557,000. About \$440,238 in indemnities was paid to farmers in Shelby County between 1995 and 2020<sup>26</sup>. That is roughly \$17,609 per year. Although the proportion of indemnities paid to cover losses due to drought isn’t identifiable, given Shelby County’s recent drought history, it is likely that at least some of the dollars paid were related to drought-caused damages.

Given agriculture’s role in the County, drought-caused losses will have impacts beyond any individual and may lead to contraction in the wider economy. However, because the data is recorded at the county level, there is no specific information regarding agricultural losses to due drought for the individual participating jurisdictions.

<sup>25</sup>[https://www.nass.usda.gov/Publications/AgCensus/2017/Full\\_Report/Volume\\_1,\\_Chapter\\_2\\_County\\_Level/Texas/st48\\_2\\_0001\\_0001.pdf](https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/Texas/st48_2_0001_0001.pdf)

<sup>26</sup> [https://farm.ewg.org/cropinsurance.php?fips=48419&summpage=IN\\_REGPAGE](https://farm.ewg.org/cropinsurance.php?fips=48419&summpage=IN_REGPAGE)

## 9. Extreme Cold

Extreme cold can happen anywhere in the state, although its levels can range extensively. In the panhandle extreme cold means days below zero Fahrenheit while in the Rio Grande Valley it means reaching temperatures below freezing. Extreme cold is an issue any time winter temperatures drop significantly below normal and make staying warm and safe a challenge.

Extreme cold can accompany winter weather, but it can also be independent of those storms. For that reason, the impacts of extreme cold are presented here separately from the impacts of winter weather.

### 1) Extreme Cold History

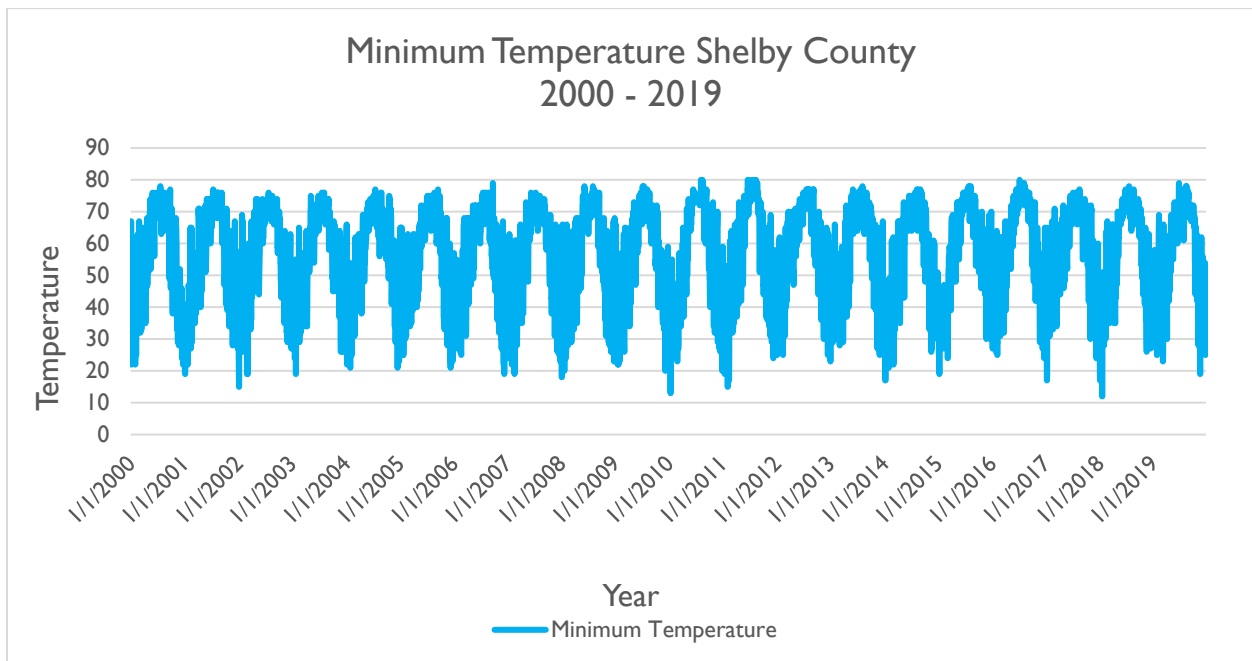


Figure 27: Minimum Recorded Daily Temperature 2000-2019<sup>27</sup>

Shelby County and the jurisdictions addressing the hazard have not previously included extreme cold in their mitigation plan as a standalone hazard. Prior to the 2018 update to the State of Texas mitigation plan, extreme cold was considered part of the winter weather hazard.

Minimum temperature in the NOAA Climate Dataset was only available to 2019 for Shelby County. Between 2000 to 2019, Shelby County experienced 843 days with a minimum temperature of 32°F or colder. At least 15 of those days had a maximum temperature of 32°F or below. During the same timeframe, the coldest temperature recorded was 12°F on January 17, 2018.

<sup>27</sup> Source: National Centers for Environmental Information, <https://www.ncdc.noaa.gov/cdo-web/datasets> (minimum recorded temperature climate data only available to 2019)

Temperature data is recorded at the county level. However, given the nature of extreme cold and the proximity of all jurisdictions to each other, the jurisdictions addressing the hazard experienced the same extreme cold events. The following table are the only events recorded in the NCEI database from 2000 – 2022, however it is likely that more events have gone unreported.

Table 44: Shelby County Extreme Cold History

Location	Date Range	Number of Extreme Cold Events	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Countywide	1/7/2010 – 2/14/2021	3	0	0	\$97,583	0

### 2) Likelihood of Future Occurrence

Based on historic weather data, extreme cold in Shelby County and the participating jurisdictions is likely, meaning an event affecting any or all the participating jurisdictions is probable in the next three years.

### 3) Extent

The magnitude or intensity of an extreme cold event is measured according to temperature in relation to wind speed. The relationship is referred to as the “Wind Chill,” and is depicted in Figure 28.



# Wind Chill Chart

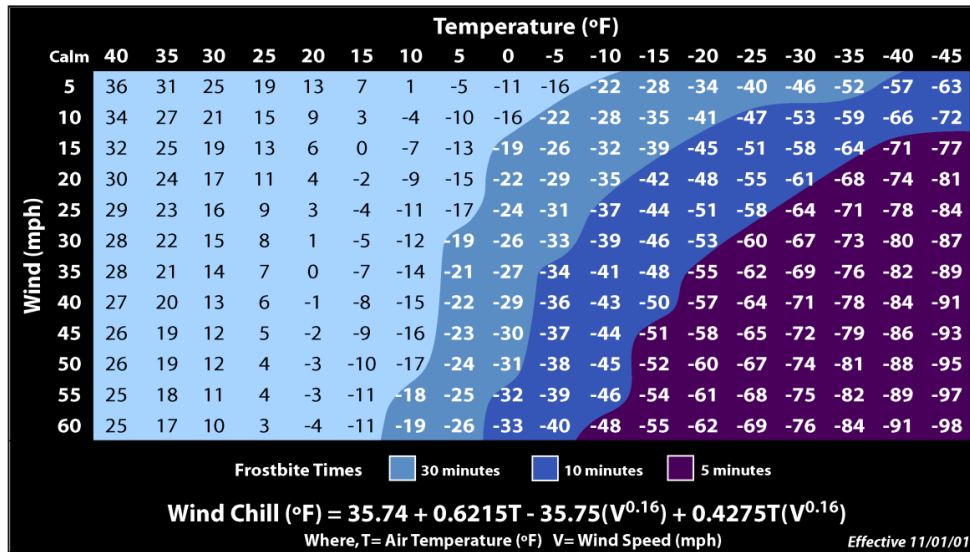


Figure 28: NOAA's NWS Wind Chill Index

As displayed in Figure 28, the wind chill temperature is a measurement of how cold the wind makes the air feel to the human body. Since wind can dramatically accelerate heat loss from the body, a 20° day could feel just as cold as a calm day with 0° temperatures. The Wind Chill Chart factors the wind chill; it is not applicable in calm winds or when the temperature is over 50°.

The coldest temperatures in Shelby County and the participating jurisdictions may meet the current record temperature of 12°F. Future extreme cold events may be as intense, long-lasting, and dangerous as previous ones.

#### 4) Location and Impact

##### A) Location – All Jurisdictions

Extreme cold has no distinct geographic boundary. Extreme cold can occur across the entire planning area and uniformly affect all participating jurisdictions.

##### B) Impact – All Jurisdictions

The potential impact of extreme cold is normally minor, resulting in few, if any, injuries. No property or crop damage specifically tied to extreme cold events has been recorded in any of the participating jurisdictions. No deaths related to extreme cold have ever been reported in the participating jurisdictions. However, based on the hazard’s potential, in the worst cases,

especially if combined with winter weather, the hazard may inflict property or crop damages, and it can even be deadly. Any shutdown of facilities due to extreme cold is expected to be temporary.

## **5) Vulnerability**

### ***A) Population***

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Areas with concentrations of young, elderly, and low-income residents may feel greater impacts from extreme cold due to those populations' limited ability to properly address the hazard. Deficiencies may include but aren't limited to lack of heating in their homes or vehicles, lack of access to heated public spaces during the coldest part of the day or night, and frozen pipes that may jeopardize access to drinking water, and in the worst cases, lead to severe structural damage that can render a home unlivable. The consequences for these populations' exposure to extreme cold may include but are not limited to complications for those suffering from hypertension, hypothyroidism, and diabetes, as well as exhaustion, hypothermia, trench foot, or death.

### ***B) Critical Facilities***

While all the jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to damages significant enough to interrupt or stop normal operations. Therefore, any estimated property losses associated with the hazard are anticipated to be minimal across the area.

## 10. Extreme Heat

Extreme heat is defined as summertime temperatures that are substantially hotter and/or more humid than average for a given location at that time of year. Humid conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

Although heat can damage buildings and facilities, it presents a more significant threat to the safety and welfare of citizens. The major human risks associated with severe summer heat include heat cramps; sunburn; dehydration; fatigue; heat exhaustion; and heat stroke. The most vulnerable population to heat casualties are children and the elderly or infirm, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their wellbeing.

Severe summer heat is an invisible killer. Although a heat wave does not happen with the spectacle of other hazards such as tornados and floods, the National Center for Environmental Health reports that extreme heat caused 7,415 heat-related deaths in the United States from 1999 to 2010<sup>28</sup>. Extreme heat kills more people than hurricanes, floods, tornados, and lightning combined, according to the National Weather Service. In 2001, 300 deaths were caused by excessive heat exposure.

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<sup>28</sup> [http://www.bt.cdc.gov/disasters/extremeheat/heat\\_guide.asp](http://www.bt.cdc.gov/disasters/extremeheat/heat_guide.asp)

## 1) Extreme Heat History

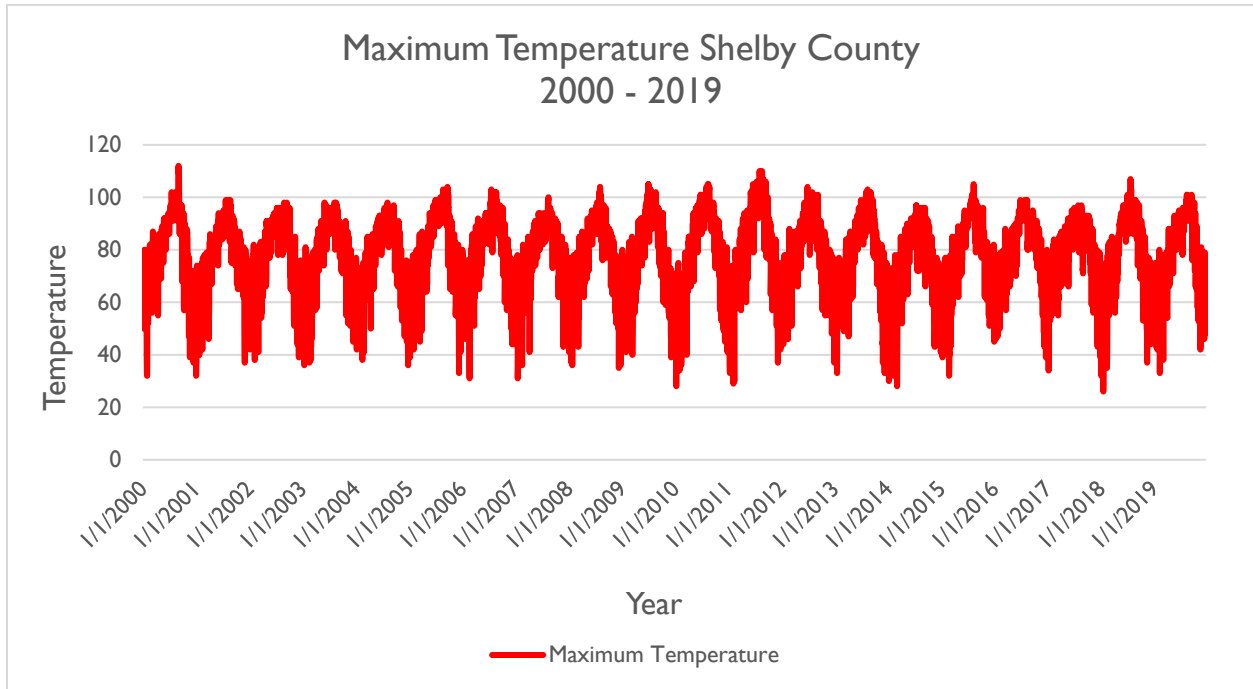


Figure 29: Maximum Recorded Daily Temperature 2000-2019<sup>29</sup>

In the 2016 HMAP, Shelby County and the participating jurisdictions reported 5 excessive heat events from 1950 to 2013, although many occurrences may have gone unreported. The 2016 HMAP also reported that it is highly likely Shelby County, and its jurisdictions, will experience extreme heat with urban areas possibly being at greater risk than within rural areas.

Maximum temperature in the NOAA Climate Dataset was only available to 2019 for Shelby County. Between 2000 to 2019, Shelby County and the participating jurisdictions experienced 251 days with a maximum temperature of 100°F or hotter and 452 days where the combination of humidity and moderate-to-high temperatures warranted a heat advisory, if not an extreme heat warning.

Extreme heat data is recorded at the county level. However, given the nature of extreme heat and the proximity of all jurisdictions to each other, every jurisdiction experienced the same extreme heat events. The following table are events reported in the NCEI that have occurred since the 2016 plan. There have been no recorded events past 2020.

<sup>29</sup> Source: National Centers for Environmental Information, <https://www.ncdc.noaa.gov/cdo-web/datasets> (climate data only available through 2019)



Table 45: Shelby County Extreme Heat History

Location	Date Range	Number of Extreme Heat Events	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Countywide	7/12/2020	1	0	0	\$0	\$0

### 2) Likelihood of Future Events

Based on historic weather data, extreme heat in Shelby County and the participating jurisdictions is highly likely, meaning an event affecting any or all of the participating jurisdictions is probable in the next year.

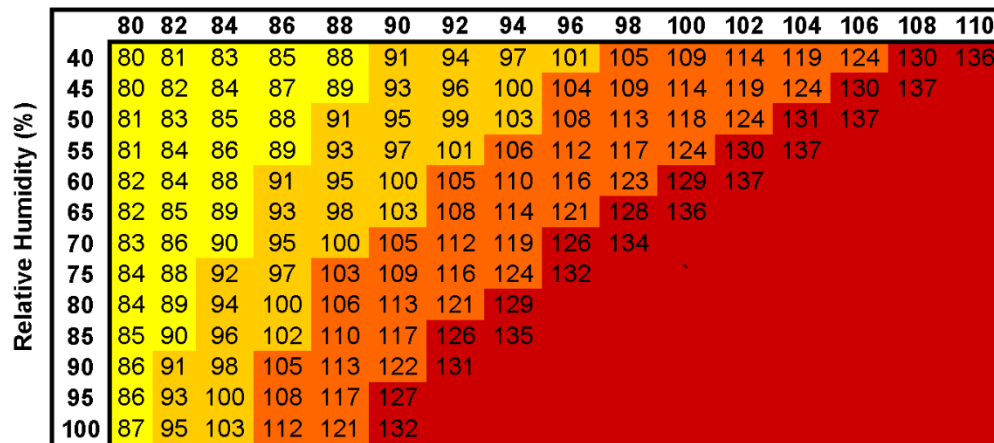
### 3) Extent

The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the “Heat Index,” and is depicted in Figure 30. This index measures how hot it feels outside when humidity is combined with high temperatures.

## NOAA's National Weather Service

### Heat Index

Temperature (°F)



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

- Caution
- Extreme Caution
- Danger
- Extreme Danger

Figure 30: NOAA's NWS Heat Index Chart<sup>30</sup>

<sup>30</sup> <http://www.nws.noaa.gov/om/heat/ht-images/heatindexchart.png>

The extent scale in Figure 30 displays varying degrees of caution depending on the relative humidity combined with the temperature. For example, when the temperature is below 90°F, caution should be exercised if the humidity level is at or above 40 percent.

The shaded zones on the chart indicate varying symptoms or disorders that could occur depending on the magnitude or intensity of the event. “Caution” is the first level of intensity where fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps or heat exhaustion are possible, whereas a “Danger” level means that these symptoms are likely. “Extreme Danger” indicates that heat stroke is likely.

The National Weather Service (NWS) initiates alerts based on the Heat Index as shown in Table 46.

**Table 46: Heat Intensity**

Intensity	Description
Heat Advisory	Extreme heat index making it feel hot, typically between 105°F to 110°F for 3 hours or more during the day and at or above 75°F at night.
Excessive Heat Warning	Extreme heat index making it feel very hot, typically above 105°F for 3 hours or more during the day and at or above 80°F at night.

Given an estimated daily average relative humidity level of 75%<sup>31</sup>, highs as low as 89°F can produce a heat index temperature of 106°F. The combination of high humidity and moderate temperatures creates an environment that reaches the Danger Zone on NOAA’s Heat Index Chart and may trigger an NWS Heat Advisory.

Between 2000 and 2019 Shelby County and the participating jurisdictions experienced 452 days with highs of 89°F or hotter and overnight lows of 75°F or hotter. Based on the NWS descriptions in Table 46 above, and the average daily humidity level, these days likely warranted a heat advisory.

The hottest temperature recorded in Shelby County in the recent past, 112°F, was reached on September 2, 2000. Based on the NWS descriptions in Table 46 above, at least 13 of the 452

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<sup>31</sup> Used Houston Average, closest to County - <https://www.currentresults.com/Weather/Texas/humidity-annual.php>

heat advisory days warranted an excessive heat warning based on daytime highs, the average daily humidity level, and overnight lows not falling below 80°F.

Future extreme heat events may meet the heat index requirements for issuing an Excessive Heat Warning as described in the Heat Intensity scale in Table 46 above. The hottest temperatures in Shelby County and the participating jurisdictions may meet the current record temperature of 112°F. Future extreme heat events may be as intense, long-lasting, and dangerous as previous ones.

#### **4) Location and Impact**

##### ***A) Location – All Jurisdictions***

Extreme heat has no distinct geographic boundary. Extreme heat can occur across the entire planning area and uniformly affect all participating jurisdictions.

##### ***B) Impact – All Jurisdictions***

The potential impact of excessive summer heat is normally minor, resulting in few, if any, injuries. No property or crop damage specifically tied to extreme heat events has been recorded in any of the participating jurisdictions. No deaths related to extreme heat have ever been reported in the participating jurisdictions. However, based on the hazard's potential, in the worst cases, especially if combined with drought conditions, the hazard may inflict property or crop damages, and it can even be deadly. Any shutdown of facilities due to extreme heat is expected to be temporary.

#### **5) Vulnerability**

##### ***C) Population***

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Vulnerable populations may feel greater impacts from extreme heat due to these populations' limited ability to properly address the hazard due to deficiencies including but not limited to lack of air conditioning in their homes or vehicles, lack of access to air-conditioned public spaces during the hottest part of the day, insufficient numbers of box or ceiling fans, or lack of access to other means of cooling. The consequences for these populations' exposure to extreme heat can include but are not limited to heat cramps, sunburn, dehydration, fatigue, heat exhaustion, heat stroke, or death.

##### ***D) Critical Facilities***

While all of the jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to damages significant enough to interrupt or stop normal operations. Therefore, any estimated property losses associated with the hazard are anticipated to be minimal across the area.

## 11. Hailstorm

Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and subsequent cooling of the air mass. Frozen droplets gradually accumulate into ice crystals until they fall as precipitation that is round or irregularly shaped masses of ice. The size<sup>32</sup> of hailstones is a direct result of the size and severity of the storm.

High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a byproduct of heating on the Earth's surface. Higher temperature gradients above Earth's surface result in increased suspension time and hailstone size.

Texas officials estimate that up to 40 percent of all homeowners' insurance claims in the state result from hail damage.

### 1) Hailstorm History

In the 2016 HMAP, Shelby County profiled "Thunderstorm," which included hail, lightning, and wind. This plan update will address each hazard separately. The 2016 plan reported that Shelby County and the participating jurisdictions experienced 132 hail events between 1957 and 2012. Six injuries were also reported, however are not specifically associated with hail. Historically, the County reported high probability of hailstorms, particularly in association with seasonal patterns during the spring and early fall.

The following tables identify the most comprehensive list available of hailstorm events and associated damages in Shelby County and the participating jurisdictions from 2016 to present. No participating jurisdiction has recorded a hailstorm more recently than what is listed below.

Table 47: Shelby County Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Countywide	4/13/2019	1	1	0	0	\$0	\$0

Table 48: City of Center Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Center	4/2/2017	2	1 – 1.5	0	0	\$0	\$0

<sup>32</sup> As of January 5, 2010, the national minimum size for severe hail increased from ¾" to 1".

**Table 49: City of Huxley Hailstorm History**

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Huxley	4/19/2020	1	1.25	0	0	\$0	\$0

**Table 50: City of Joaquin Hailstorm History**

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Joaquin	5/20/2017	1	1.5	0	0	\$0	\$0

**Table 51: City of Tenaha Hailstorm History**

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Tenaha	4/6/2018	2	1 - 2	0	0	\$0	\$0

**Table 52: City of Timpson Hailstorm History**

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Timpson	1/21/2016 – 4/26/2017	2	0.88 - 1	0	0	\$0	\$0

## 2) Likelihood of Future Events

Based on the history of hailstorms, a hailstorm in Shelby County and each of the participating jurisdictions is likely, meaning that an event is probable within the next three years.

## 3) Extent

The severity of hail events ranges based on the size of the hail, wind speed, and the number and types of structures in the path of the hailstorm. Storms that produce high winds in addition to hail are most damaging and can result in numerous broken windows and damaged siding.

When hail breaks windows, water damage from accompanying rains can also be significant. A major hailstorm can easily cause damage running into the millions of dollars. Nationwide hail is responsible for over \$1 billion in property and crop damages per year. The scale showing intensity categories in

Table 53 was developed by combining data from National Climatic Data Center (NCDC) and the Tornado and Storm Research Organization (TORRO).

Table 53: Hailstorm Intensity<sup>33,34</sup>

Size Code	Intensity Category	Size (Diameter in inches)	Descriptive Term	Typical Damage
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33-.060	Mothball	Slight damage to plants and crops
H2	Significant	.060-.080	Penny	Significant damage to fruit, crops, and vegetation
H3	Severe <sup>35</sup>	0.80-1.20	Nickel – Half dollar	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Half dollar – Ping pong ball	Widespread glass damage and vehicle bodywork damage
H5	Destructive	1.6-2.0	Ping pong ball – hen egg	Wholesale destruction of glass, damage to tiled roofs, and significant risk of injuries
H6	Destructive	2.0-2.4	Hen egg – tennis ball	Bodywork of grounded aircraft dented, and brick walls pitted
H7	Destructive	2.4-3.0	Tennis ball – Baseball	Severe roof damage and risk of serious injuries
H8	Destructive	3.0-3.5	Hockey puck	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0	Softball	Extensive structural damage could cause fatal injuries
H10	Super Hailstorms	4.0+	Greater than softball-sized	Extensive structural damage could cause fatal injuries

According to NCEI data, the worst hailstorms in Shelby County and the participating jurisdictions have produced hail up to 2” in diameter, H6 on the Hailstorm Intensity Scale.

Future hailstorms may meet previous worst-case H6 storms in terms of strength, intensity, hailstone size, damage dollars inflicted, and the number of residents injured or killed.

<sup>33</sup> <http://www1.ncdc.noaa.gov/pub/data/cmb/extremes/scec/reports/SCEC-Hail-Guide.pdf>

<sup>34</sup> <http://www.torro.org.uk/hscale.php>

<sup>35</sup> Hail must be 1” or larger to be classified as severe

#### **4) Location and Impact**

##### ***A) Location***

Hailstorms vary in terms of size, location, intensity, and duration but are considered frequent occurrences in the planning area. Each jurisdiction is uniformly exposed to hail events just as each is uniformly exposed to the thunderstorms that typically produce the hail events.

##### ***B) Impact***

The severity of a hailstorm's impact is considered limited since they generally result in injuries treatable with first aid, shut down critical facilities and services for 24 hours or less, and less than ten percent of affected properties are destroyed or suffer major damage. All existing and future buildings, facilities, and populations in the participating jurisdictions are considered exposed to this hazard and could potentially be impacted.

#### **5) Vulnerability**

##### ***A) Population***

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

Since hailstorms arise with little to no warning, the participating jurisdictions recognize that vulnerable populations may primarily need additional help recovering from a hailstorm. Residents of sub-standard structures are of particular concern. Structures in sub-standard condition ahead of a hailstorm, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may sustain more damages than structures in standard condition.

Existing weaknesses, especially those related to the condition of a structure's roof, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

##### ***B) Critical Facilities***

The presence of older structures that have not been hardened against hailstorms, and / or the presence of metal buildings that may be more susceptible to hail. Thus, the following critical facilities were determined to be especially vulnerable to hailstorms due to the presence of structures with flat roofs and its increased vulnerability.

Table 54: Critical Facilities Vulnerable to Hailstorms and Potential Impacts

Jurisdiction	Critical Facilities	Potential Hailstorm Impacts		
		Damaged or Destroyed Roof	Damaged Windows	Water damage due to Physical Damages
Shelby County	Shelby County Sheriff's Office	X	X	X
	Texas Department of Public Safety	X	X	X
	Shelbyville High School	X	X	X
	S.W. Carter Elementary	X	X	X
	Shelby County Emergency Operations Center	X	X	X
	Booth Rodeo Arena	X	X	X
	McClelland Water Supply Corp.	X	X	X
	Huber Water Supply Corp.	X	X	X
	Sand Hill Water Supply Corp.	X	X	X
	Paxton Water Supply	X	X	X
	City of Huxley Water Plant	X	X	X
	Timpson Utilities Department	X	X	X
	Shelby County Courthouse	X	X	X
	West Shelby Volunteer Fire Department	X	X	X
	Allegiance EMS	X	X	X
	Timpson Rural WSC	X		x
	Flat Fork WSC	X		x
	Choice WSC	X		x
	Shelbyville WSC	X	X	x
	East Lamar WSC	X		x
Paxton WSC Jackson Plant	X	x	x	
Buena Vista WSC	X		X	
Tennessee WSC	X		X	
Center	City of Center Fire Department	X	X	X
	City of Center Police Department	X	X	X
	City of Center City Hall	X	X	X
	City of Center - Windham Civic Center	X	X	X
	Aiken Water Treatment Plant	X	X	X
	Mill Creek Water Treatment Plant	X	X	X
	East Bank Wastewater Treatment Plant	X	X	X
	Center FL Moffett Primary	X	X	X
	Center Elementary	X	X	X
	Center High School	X	X	X



	Center Middle School	X	X	X
	Texas Quick Care	X	x	X
	Aurora Concepts	x	X	x
	Priority Family Healthcare	x	X	x
	Cline Family Practice	x	X	x
	Hope Medical Clinic- Center	x	X	x
	Nelson Family Practice	x	X	x
	Holiday Nursing Center	x	X	x
	Pine Grove Nursing Center	x	X	x
	Focused Care at Center	x	X	x
	Lakeside Village Assisted Living	x	X	x
	Walmart & Walmart Pharmacy	x	X	x
	Brookshire & Brookshire's Pharmacy	x	X	x
	CVS	x	X	x
	DCI Dialysis	x	X	x
	Ace Hardware	x	X	x
	Covington's Lumber	x	X	x
	H & S Grocery	x	X	x
	Murphy USA	x	X	x
<b>Huxley</b>	City of Huxley Volunteer Fire Department (VFD)	X	X	X
	City Hall	X	X	X
	Water Treatment Plant	X	X	X
	Stand Pipe	X		X
	Possum Trot Booster Plant	X	X	X
	Trails End Restaurant and Gas	x	x	x
<b>Joaquin</b>	Water Plant	X	X	X
	Joaquin Community Center	X	X	X
	Texas Quick Care	X	X	X
	Joaquin City Hall	X	X	X
	Brookshire Bothers – Haslam	X	X	X
	Dollar General	X	X	X
	Joaquin Quick Stop	X	X	X
	Word of Faith	X	X	X
	Joaquin First United Methodist Church	X	X	X
	First United Pentecostal Church of Joaquin	X	X	X
	First Baptist Church of Joaquin	X	X	X
First Baptist Church of Haslam	X	X	X	

	Friendship Baptist Church	X	X	X
	Bethlehem Missionary Baptist Church		X	X
	Fellowship Missionary Baptist Church		X	X
	Blount Pharmacy	X	x	X
	Worsham Grocery	x	X	x
<b>Tenaha</b>	Tenaha Fire Department	X	X	X
	Tenaha Police Department	X	X	X
	City Hall	X	X	X
	The Lighthouse Church	X	X	X
	Hope clinic	X	X	X
	Businessman Club	X	X	X
	First Baptist Church	X	X	X
	Quick Stop	X	X	X
	Beef Producers of Texas	X	X	X
	Tenaha Independent School District	X	X	X
<b>Timpson</b>	Timpson Elementary	X	X	X
	Timpson High School	X	X	X
	Timpson Middle School	X	X	X
	City of Timpson Volunteer Fire Department (VFD)	X	X	X
	Timpson City Hall	X	X	X
	Timpson Library	X	X	X
	Texas Quick Care	X	X	X
	Timpson Wastewater Treatment Plant	X	X	X
	Lift Station 1	X		X
	Lift Station 2	X		X
	Lift Station 3	X		X
	Lift Station 4	X		X
	Lift Station 5	X		X
	Bussey Drug	x	x	X
	First Baptist Church Timpson		x	X
	First Methodist Church Timpson		x	X
	Timpson Quick Stop	x	x	X
	Dollar General Timpson	x	x	X
	Family Dollar Timpson	x	x	x

### **C) Vulnerable Commercial Structures**

Every structure is vulnerable to damage from hail. However, commercial structures with large and/or flat roofs are especially vulnerable due to the increased exposure that large and/or flat roofs create. According to the Texas State Comptroller’s 2021 Property Value Study, Shelby County has commercial real property valued at \$62,711,291 <sup>36</sup>.

### **D) Vulnerable Parcels**

Table 55: All Parcels Vulnerable to Hailstorms

<b>Jurisdiction</b>	<b>Parcel Count</b>	<b>Estimated Potential Damage Value</b>
<b>Shelby County</b>	<b>19,985</b>	<b>\$2,380,087,130</b>
City of Center	2,691	\$262,915,110
City of Huxley	182	\$15,638,160
City of Joaquin	475	\$27,719,040
City of Tenaha	573	\$31,357,980
City of Timpson	777	\$42,502,740

<sup>36</sup> <https://comptroller.texas.gov/auto-data/PT2/PVS/2020F/1540000001A.php>

## **12. Winter Weather**

Winter weather is defined by extreme cold and heavy concentrations of snowfall or ice. Due to low frequency, severe winter weather storms affect Texas more severely compared to other regions that experience severe winter weather more frequently. The types of severe winter storms which Texans are most familiar with are snowstorms, blizzards, cold waves, and ice storms.

Snowfall with an accumulation of four or more inches in a 12-hour period is considered a heavy snowfall. Snowfall of any amount is rare south of a line from Del Rio to Port Arthur, and it is this rarity of event, coupled with a lack of preparedness for such an event, that creates a severe weather condition.

Blizzards are the most perilous of all winter storms, characterized by low temperatures and strong winds more than 35 mph, bearing large amounts of blowing or drifting snow. Blizzards take a terrible toll on livestock and people caught in the open. In Texas, blizzards are most likely to occur in the Panhandle and South Plains Regions.

The passage of a winter cold front with a drastic drop in temperature heralds the arrival of a cold wave, usually referred to as a “blue north’er.”

An ice storm occurs when rain falls out of the warm and moist upper layers of the atmosphere into a cold and dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. If a half inch of rain freezes on trees and utility wires, damage can occur, especially if accompanied by high winds, thus half an inch is used as the criteria before an icing event is categorized as an “ice storm.”

### **1) Severe Winter Storm History**

In the 2016 HMAP, Shelby County and the participating jurisdictions reported 4 winter weather events between 1995 and 2016. These events reported no damages. The 2016 plan found that the frequency of occurrences of severe winter storms is occasional, with an event probable in the next five years.

NCEI data shows that the participating jurisdictions experienced 6 winter storm events between January 2017 and December 2021. None are reported to have caused any injuries or fatalities however some property damage was reported. The most recent winter weather event was Winter Storm Uri in February 2021. During that event, Shelby County received between three to six inches of snow and sleet, along with a period of freezing rain with quarter to half inch ice accretion. Many objects, such as tree limbs and power lines, were heavily impacted due to the weight of accumulated snow and ice causing significant disruptions including power outages and boil bans.

Table 56: Shelby County Severe Winter Storm History

Location	Date Range	Number of Severe Winter Storms	Winter Storm Types	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Countywide	12/7/2017 – 2/16/2021	6	Winter Weather, Winter Storm	0	0	\$31,411	\$0

## 2) Likelihood of Future Events

Future winter storms in Shelby County and the participating jurisdictions are considered likely due to the significant impacts of the historic winter weather, meaning an event affecting any or all of the participating jurisdictions is probable in the next three years.

## 3) Extent

Table 57 below displays the magnitude of severe winter storms.

Table 57: Winter Weather Extent Scale<sup>37</sup>

<b>Frost Advisory*</b>	Issued when nighttime minimum temperatures are expected to range from 33°F to 36°F in the growing season.
<b>Freeze Warning*</b>	Issued when nighttime minimum temperatures are expected to reach 32°F or lower in the growing season. They are usually issued to highlight the first few freezes of the fall or unusually late freezes in the spring. <i>A Freeze Watch is issued when these conditions may be met 12 to 48 hours in the future.</i>
<b>Snow Advisory</b>	Issued when accumulating snow of 2 to 4 inches is expected. An advisory may still be warranted if lesser accumulations will produce travel difficulties, especially early in the winter season.
<b>Blowing Snow Advisory</b>	Issued when blowing snow is expected to occasionally reduce visibilities to 1/4 mile or less with winds generally 25 to 34 mph. The event should last at least 3 hours.
<b>Snow and Blowing Snow Advisory</b>	Issued when winds of 25 to 34 mph are expected to be accompanied by falling snow and blowing snow, occasionally reducing the visibility to 1/4 mile or less. The event should last at least 3 hours
<b>Freezing Rain / Drizzle Advisory</b>	Issued for freezing rain when ice accumulations are expected to cause travel problems, but not exceed 1/4".
<b>Sleet Advisory</b>	Issued for accumulating sleet of 1/4" to 1". Because sleet usually occurs with other precipitation types, a winter weather advisory will almost always be used in such cases.

<sup>37</sup> Source: National Weather Service Weather Forecast Office; Norman, Oklahoma.  
<http://www.srh.noaa.gov/oun/?n=spotter-wwa-definitions>

<b>Winter Weather Advisory</b>	Issued for a winter weather event in which there is more than one hazard present, but all precipitation is expected to remain below warning criteria. For example, it would be issued if 2 inches of snow were expected with a small amount of sleet mixing in at times.
<b>Wind Chill Advisory<sup>38</sup></b>	Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure, and, if caution is not exercised, could lead to hazardous exposure.
<b>Wind Chill Warning<sup>39</sup></b>	Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.
<b>Ice Storm Warning</b>	Issued when a period of freezing rain is expected to produce ice accumulations of 1/4" or greater, or cause significant disruptions to travel or utilities.
<b>Heavy Sleet Warning</b>	Issued when a period of sleet is expected to produce ice accumulations of 1" or greater, or cause significant disruptions to travel or utilities.
<b>Heavy Snow Warning</b>	Issued when snow is expected to accumulate 4 inches or more in 12 hours, or 6 inches or more in 24 hours.
<b>Winter Storm Warning</b>	Issued for a winter weather event in which there is more than one hazard present, and one of the warning criteria listed above is expected to be met. For example, it would be issued if 5 inches of snow were expected in 12 hours, with some sleet mixing in at times. It is commonly issued for heavy snow with strong winds of 25-34 mph that will cause blowing and drifting of the snow. <i>A Winter Storm Watch is issued when these conditions may be met 12 to 48 hours in the future.</i>
<b>Blizzard Warning</b>	Issued for sustained wind or frequent gusts greater than or equal to 35 mph accompanied by falling and/or blowing snow, frequently reducing visibility to less than 1/4 mile for three hours or more. <i>A Blizzard Watch is issued when these conditions may be met 12 to 48 hours in the future.</i>

\* - Non-precipitation watch / warning / advisory

Based on previous winter storm events, future storms in Shelby County and the participating jurisdictions may see snow accumulation of up to 6" and see ice accumulation of up to .5".

**4) Location and Impact**

**A) Location – All Jurisdictions**

Severe winter weather has no distinct geographic boundary. Severe winter weather can occur across the entire planning area and uniformly affect all participating jurisdictions.

<sup>38</sup> [https://www.osha.gov/dts/weather/winter\\_weather/windchill.html](https://www.osha.gov/dts/weather/winter_weather/windchill.html)

<sup>39</sup> [https://www.osha.gov/dts/weather/winter\\_weather/windchill.html](https://www.osha.gov/dts/weather/winter_weather/windchill.html)

## **B) Impact – All Jurisdictions**

The potential impact of a severe winter storm is normally minor, resulting in few, if any, injuries. Because of the rarity of winter storm events in Shelby County and the participating jurisdictions, drivers, especially those unfamiliar with or unable to drive in icy conditions, may be at the highest risk of crashing their vehicle and sustaining injuries.

Beyond accidents caused by icy conditions, severe winter weather has the potential to cause widespread power outages. Trees and other vegetation that grow along or near power lines and utility lines can become overburdened by ice and snow accumulation. Falling limbs or trees can easily take down power and utility lines. Neglected vegetation is especially at risk of failure due to increased weight loads. Power outages can create a cascading effect depending on residents' ability to heat their homes without electricity, especially for those young, elderly, and low-income residents as identified in Section 3 of Chapter 3 above. Although no deaths related to severe winter storms have been reported in the participating jurisdictions, in the worst cases, the hazard has the potential to be deadly.

Severe winter storms will likely cause only minor property damage and minimal disruption to the quality of life in the participating jurisdictions.

Depending on when the event happens, a severe winter storm may damage or destroy crops.

## **5) Vulnerability**

### **A) Infrastructure**

While all of the participating jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to significant damage caused by severe winter storm events. This determination was made based on the expectation that most roofs can support 20 lbs. / square foot of snow<sup>40</sup>. The worst snowstorm in any participating jurisdiction dropped 6". Although it's not impossible<sup>41</sup> for that much snow to cause structural damage, given that the snow weight is well below the threshold where damage is likely, structural damages are not expected. Additionally, 1" of ice is roughly equivalent in weight per square foot to 1" of snow. Considering the worst ice storms in the participating jurisdictions cause ice accumulations of ½", it's unlikely, but not impossible, that an ice storm causing structural ice accumulations of less than 4" will cause significant structural damages.

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<sup>40</sup> <https://disastersafety.org/freezing-weather/prevent-roof-collapse-homes/>

<sup>41</sup> [https://www.fema.gov/media-library-data/7d8c55d1c4f815edf3d7e7d1c120383f/FEMA957\\_Snowload\\_508.pdf](https://www.fema.gov/media-library-data/7d8c55d1c4f815edf3d7e7d1c120383f/FEMA957_Snowload_508.pdf) - The weight of a foot a snow can vary widely based on how wet the snow is, between 3 and 21 lbs. per square foot. However, wet snow primarily affects the East Coast, Pacific Northwest, and southwestern Alaska.

However, significant damages may be incurred indirectly. Examples include, but are not limited to, trees and limbs that fall after being overburdened with snow or ice, building strikes due to vehicles losing traction on snow or ice-covered roads, and power outages that affect building temperature regulation and allow pipes to freeze and burst.

**B) Population**

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Areas with concentrations of young, elderly, and low-income residents may feel greater impacts from severe winter weather due to those populations’ limited ability to properly address the hazard. Deficiencies may include but aren’t limited to lack of heating in their homes or vehicles, lack of access to heated public spaces during the coldest part of the day or night, and frozen pipes that may jeopardize access to drinking water, and in the worst cases, lead to severe structural damage that can render a home unlivable. The consequences for these populations’ exposure to severe winter weather can include but are not limited to complications for those suffering from hypertension, hypothyroidism, and diabetes, as well as exhaustion, hypothermia, trench foot, or death.

**C) Critical Facilities**

Any shutdown of critical facilities due to severe winter weather is expected to be temporary. However, based on the proximity of trees and powerlines on their properties, the following critical facilities may be at a higher risk of losing power due to falling limbs.

Table 58: Critical Facilities Vulnerable to Winter Storms

Jurisdiction	Critical Facilities	Potential Severe Winter Storm Impacts
		Falling Tree Limbs
Shelby County	Shelby County Sheriff's Office	x
	Texas Department of Public Safety	x
	Shelbyville High School	x
	S.W. Carter Elementary	x
	Shelby County Emergency Operations Center	x
	Booth Rodeo Arena	x
	McClelland Water Supply Corp.	x
	Huber Water Supply Corp.	x
	Sand Hill Water Supply Corp.	x
	Paxton Water Supply	x
	City of Huxley Water Plant	x
	Timpson Utilities Department	x
Shelby County Courthouse	x	



	West Shelby Volunteer Fire Department	x
	Allegiance EMS	x
	Timpson Rural WSC	X
	Flat Fork WSC	X
	Choice WSC	X
	Shelbyville WSC	X
	East Lamar WSC	X
	Paxton WSC Jackson Plant	X
	Buena Vista WSC	x
	Shelby Veterinary Associates	x
<b>Center</b>	City of Center Fire Department	x
	City of Center Police Department	x
	City of Center City Hall	x
	City of Center - Windham Civic Center	x
	Aiken Water Treatment Plant	x
	Mill Creek Water Treatment Plant	x
	East Bank Wastewater Treatment Plant	x
	Center FL Moffett Primary	x
	Center Elementary	x
	Center High School	x
	Center Middle School	x
	Texas Quick Care	X
	Aurora Concepts	X
	Priority Family Healthcare	x
	Nelson Family Practice	X
	Holiday Nursing Center	X
	Pine Grove Nursing Center	X
Focused Care at Center	X	
DCI Dialysis	x	
Covington's Lumber	x	
<b>Huxley</b>	City of Huxley Volunteer Fire Department (VFD)	x
	City Hall	x
	Water Treatment Plant	x
	Stand Pipe	x
	Possum Trot Booster Plant	x
<b>Joaquin</b>	Water Plant	x
	Joaquin Community Center	x
	Texas Quick Care	x
	Joaquin City Hall	x
	Brookshire Bothers – Haslam	x
	Dollar General	x
	Joaquin Quick Stop	x
	Word of Faith	x

	Joaquin First United Methodist Church	x
	First United Pentecostal Church of Joaquin	x
	First Baptist Church of Joaquin	x
	First Baptist Church of Haslam	x
	Friendship Baptist Church	x
	Bethlehem Missionary Baptist Church	x
	Fellowship Missionary Baptist Church	x
	Blount Pharmacy	x
<b>Tenaha</b>	Tenaha Fire Department	x
	Tenaha Police Department	x
	City Hall	x
	The Lighthouse Church	x
	Hope clinic	x
	Businessman Club	x
	First Baptist Church	x
	Quick Stop	x
	Beef Producers of Texas	x
	Tenaha Independent School District	x
<b>Timpson</b>	Timpson Elementary	x
	Timpson High School	x
	Timpson Middle School	x
	City of Timpson Volunteer Fire Department (VFD)	x
	Timpson City Hall	x
	Timpson Library	x
	Texas Quick Care	x
	Timpson Wastewater Treatment Plant	x
	Lift Station 1	x
	Lift Station 2	x
	Lift Station 3	x
	Lift Station 4	x
	Lift Station 5	x
First Methodist Church Timpson	x	

### 13. Severe Winds

A windstorm<sup>42</sup> is classified as any wind that is strong enough to cause at least light damage to trees and buildings, which may or may not be accompanied by precipitation. Wind speeds during a windstorm typically exceed 41 knots. Damage can be attributed to gusts or longer periods of sustained winds.

Windstorms may last for just a few minutes when caused by downbursts from thunderstorms, or they may last for hours (and even several days) when they result from large-scale weather systems. A windstorm that travels in a straight line and is caused by the gust front (the boundary between descending cold air and warm air at the surface) of an approaching thunderstorm is called a derecho. Derechos are capable of causing widespread damage and landscape devastation.

#### 1) Windstorm History

In the 2016 HMAP, Shelby County and the participating jurisdictions did not identify a specific hazard history for windstorms. Instead, wind was generally included as part of a Thunderstorm hazard history. In the 2016 plan, Shelby County and participating jurisdictions recorded 171 thunderstorm events from 1971 and 2014. There were no injuries or fatalities associated with thunderstorms for these events. The 2016 plan recorded \$15,058,172 in property damages during that time adjusted to \$2022, there was no record of crop damages. Historically, the County reported high probability of thunderstorms, and therefore increase risk of severe winds.

The following tables identify the most comprehensive list available of severe wind events and associated damages in Shelby County and the participating jurisdictions from 2016 to present. No participating jurisdiction has recorded a severe wind event more recently than 2019.

Table 59: Shelby County Severe Wind History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Countywide	4/13/2019	2	61	0	0	\$0	\$0

Table 60: City of Center Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Center	4/2/2017	1	56	0	0	\$0	\$0

<sup>42</sup> <https://www.britannica.com/science/windstorm>

**Table 61: City of Huxley Severe Wind History**

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Huxley	6/20/2019	1	52	0	0	\$0	\$0

**Table 62: City of Timpson Severe Wind History**

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
Timpson	5/3/2017-5/11/2017	5	61	0	0	\$0	\$0

Severe windstorm data is generally recorded at the county or city level, so there is no specific information regarding severe windstorm events in Joaquin or Tenaha. However, given that it is located within Shelby County, Joaquin and Tenaha’s severe wind history is known to be similar to the County and surrounding areas.

**2) Likelihood of Future Events**

Shelby County and the participating jurisdictions have experienced a damaging severe wind event roughly once every three to five years. Given the frequency of past events in all jurisdictions, a damaging severe wind event in the future is likely, meaning that an event is probable in the next three years.

**3) Extent**

The generally accepted extent scale for wind events is the Beaufort Wind Scale. The following table lists categories, measurement, classification, and appearance descriptions.

**Table 63: Beaufort Wind Scale<sup>43</sup>**

Beaufort Wind Scale				
Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move

<sup>43</sup> Source: [www.spc.noaa.gov/faq/tornado/beaufort.html](http://www.spc.noaa.gov/faq/tornado/beaufort.html)

3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 feet becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 feet taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 feet, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 feet, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 feet) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 feet), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 feet) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (30-45 feet) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 feet, sea completely white with driving spray, visibility greatly reduced	

The worst severe wind events in Shelby County and the participating jurisdictions have ranged up to a 12 on the Beaufort Wind Scale. No recent severe wind events in any of the participating jurisdictions have caused any injuries, deaths, or crop damages. Future severe wind events may meet previous worst-case Force 12 events in terms of strength and intensity of wind speed.

#### **4) Location and Impact**

##### ***A) Location***

Windstorms are not constrained by any distinct geographic boundary. Windstorms can occur across all participating jurisdictions.

##### ***B) Impact***

Impacts from a windstorm may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and industrial buildings. Crops may be damaged or destroyed. Pets and livestock may be injured or killed by flying debris. Pets and livestock may escape due to damaged or destroyed structures and fences.

In the worst cases, windstorms may cause injuries and/or be deadly.

#### **5) Vulnerability**

Windstorms have the potential to impact all participating jurisdictions. Therefore, each jurisdiction is equally exposed to the hazard. Improved property, critical facilities, critical infrastructure, and the entire population are considered vulnerable to windstorms.

Based on windstorm data collected for the participating jurisdictions, windstorms primarily damage physical structures. However, there is no uniformity with respect to the type of structures that have been damaged by windstorms in any of the participating jurisdictions. Windstorm damages can be directly caused by the wind itself, flying debris, and falling trees, or indirectly by damages like power outages.

##### ***A) Population***

As described in Section 3 of Chapter 3 above, Shelby County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a windstorm.

Residents of mobile / manufactured homes are of particular concern. These structures may not be safe during a windstorm.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a windstorm, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a windstorm than structures in standard condition.

Existing structural weaknesses, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

### ***B) Critical Facilities***

Certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to severe wind similar to hurricane and tornado events. These facilities have been identified for reasons including: the number of people who use the facility or infrastructure, the facility's role in providing basic services to begin the cleanup process and get the jurisdictions running again, and the facility's ability to offer goods and materials residents will need to resume normalcy as quickly as possible. The selected critical facilities are built from a variety of materials with varying levels of resistance to wind damages. Additionally, their varying ages mean they weren't constructed to uniform building standards. Given wind's potentially violent nature, these facilities may experience increased levels of vulnerability to the hazards. Damage to any of these facilities may have a disproportionately negative impact on each jurisdiction's recovery from a windstorm if that damage affects the facility's ability to reopen and resume normal business right away.

Table 64: Critical Facilities Vulnerable to Severe Winds and Potential Impacts

Jurisdiction	Critical Facilities	Potential Severe Wind Impacts									
		Loss of Power	Flying Debris	Uprooted Trees	Flooding	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
Shelby County	Shelby County Sheriff's Office	X	X	X	X	X	X	X	X	X	X
	Texas Department of Public Safety	X	X	X	X	X	X	X	X	X	X
	Shelbyville High School	X	X	X	X	X	X	X	X	X	X
	S.W. Carter Elementary	X	X	X	X	X	X	X	X	X	X
	Shelby County Emergency Operations Center	X	X	X	X	X	X	X	X	X	X
	Booth Rodeo Arena	X	X	X	X	X	X	X	X	X	X
	McClelland Water Supply Corp.	X	X	X	X	X	X	X	X	X	X
	Huber Water Supply Corp.	X	X	X	X	X	X	X	X	X	X
	Sand Hill Water Supply Corp.	X	X	X	X	X	X	X	X	X	X
	Paxton Water Supply	X	X	X	X	X	X	X	X	X	X
	City of Huxley Water Plant	X	X	X	X	X	X	X	X	X	X
	Timpson Utilities Department	X	X	X	X	X	X	X	X	X	X
	Shelby County Courthouse	X	X	X	X	X	X	X	X	X	X
	West Shelby Volunteer Fire Department	X	X	X	X	X	X	X	X	X	X
	Allegiance EMS	X	X	X	X	X	X	X	X	X	X
	Timpson Rural WSC	X	X	X	X	X	X	X	X	X	X
	Flat Fork WSC	X	X	X	X	X	X	X	X	X	X
	Choice WSC	X	X	X	X	X	X	X	X	X	X
	Shelbyville WSC	X	X	X	X	X	X	X	X	X	X
	East Lamar WSC	X	X	X	X	X	X	X	X	X	X
Paxton WSC Jackson Plant	X	X	X	X	X	X	X	X	X	X	
Buena Vista WSC	X	X	X	X	X	X	X	X	X	X	
Tennessee WSC	X	X	X	X	X	X	X	X	X	X	
Shelbyville Grocery	X	X	X	X	X	X	X	X	X	X	



	Family Dollar	X	X	X	X	X	X	X	X	X	X
<b>Center</b>	City of Center Fire Department	X	X	X	X	X	X	X	X	X	X
	City of Center Police Department	X	X	X	X	X	X	X	X	X	X
	City of Center City Hall	X	X	X	X	X	X	X	X	X	X
	City of Center - Windham Civic Center	X	X	X	X	X	X	X	X	X	X
	Aiken Water Treatment Plant	X	X	X	X	X	X	X	X	X	X
	Mill Creek Water Treatment Plant	X	X	X	X	X	X	X	X	X	X
	East Bank Wastewater Treatment Plant	X	X	X	X	X	X	X	X	X	X
	Center FL Moffett Primary	X	X	X	X	X	X	X	X	X	X
	Center Elementary	X	X	X	X	X	X	X	X	X	X
	Center High School	X	X	X	X	X	X	X	X	X	X
	Center Middle School	X	X	X	X	X	X	X	X	X	X
	Cline Family Practice	X	X	X	X	X	X	X	X	X	X
	Nelson Family Practice	X	X	X	X	X	X	X	X	X	X
	Holiday Nursing Center	X	X	X	X	X	X	X	X	X	X
	Pine Grove Nursing Center	X	X	X	X	X	X	X	X	X	X
	Focused Care at Center	X	X	X	X	X	X	X	X	X	X
	Lakeside Village Assisted Living	X	X	X	X	X	X	X	X	X	X
	DCI Dialysis	X	X	X	X	X	X	X	X	X	X
	Covington's Lumber	X	X	X	X	X	X	X	X	X	X
	H & S Grocery	X	X	X	X	X	X	X	X	X	X
<b>Huxley</b>	City of Huxley Volunteer Fire Department (VFD)	X	X	X	X	X	X	X	X	X	X
	City Hall	X	X	X	X	X	X	X	X	X	X
	Water Treatment Plant	X	X	X	X	X	X	X	X	X	X
	Stand Pipe		X					X			
	Possum Trot Booster Plant	X	X	X	X	X	X	X	X		
	Trails End Restaurant and Gas	X	X	X	X	X	X	X	X	X	X
<b>Joaquin</b>	Water Plant	X	X	X	X	X	X	X	X	X	X
	Joaquin Community Center	X	X	X	X	X	X	X	X	X	X
	Texas Quick Care	X	X	X	X	X	X	X	X	X	X

	Joaquin City Hall	X	X	X	X	X	X	X	X	X	X
	Brookshire Bothers – Haslam	X	X	X	X	X	X	X	X	X	X
	Dollar General	X	X	X	X	X	X	X	X	X	X
	Joaquin Quick Stop	X	X	X	X	X	X	X	X	X	X
	Word of Faith	X	X	X	X	X	X	X	X	X	X
	Joaquin First United Methodist Church	X	X	X	X	X	X	X	X	X	X
	First United Pentecostal Church of Joaquin	X	X	X	X	X	X	X	X	X	X
	First Baptist Church of Joaquin	X	X	X	X	X	X	X	X	X	X
	First Baptist Church of Haslam	X	X	X	X	X	X	X	X	X	X
	Friendship Baptist Church	X	X	X	X	X	X	X	X	X	X
	Bethlehem Missionary Baptist Church	X	X	X	X	X	X	X	X	X	X
	Fellowship Missionary Baptist Church	X	X	X	X	X	X	X	X	X	X
	Blount Pharmacy	x	x	x	x	x	x	x	x	x	x
	Worsham Grocery	x	x	x	x	x	x	x	x	x	x
<b>Tenaha</b>	Tenaha Fire Department	X	X	X	X	X	X	X	X	X	X
	Tenaha Police Department	X	X	X	X	X	X	X	X	X	X
	City Hall	X	X	X	X	X	X	X	X	X	X
	The Lighthouse Church	X	X	X	X	X	X	X	X	X	X
	Hope clinic	X	X	X	X	X	X	X	X	X	X
	Businessman Club	X	X	X	X	X	X	X	X	X	X
	First Baptist Church	X	X	X	X	X	X	X	X	X	X
	Quick Stop	X	X	X	X	X	X	X	X	X	X
	Beef Producers of Texas	X	X	X	X	X	X	X	X	X	X
	Tenaha Independent School District	X	X	X	X	X	X	X	X	X	X
<b>Timpson</b>	Timpson Elementary	X	X	X	X	X	X	X	X	X	X
	Timpson High School	X	X	X	X	X	X	X	X	X	X
	Timpson Middle School	X	X	X	X	X	X	X	X	X	X
	City of Timpson Volunteer Fire Department (VFD)	X	X	X	X	X	X	X	X	X	X
	Timpson City Hall	X	X	X	X	X	X	X	X	X	X

Timpson Library	X	X	X	X	X	X	X	X	X	X	X
Texas Quick Care	X	X	X	X	X	X	X	X	X	X	X
Timpson Wastewater Treatment Plant	X	X	X	X	X	X	X	X	X	X	X
Lift Station 1	X	X		X	X	X	X	X			
Lift Station 2	X	X		X	X	X	X	X			
Lift Station 3	X	X		X	X	X	X	X			
Lift Station 4	X	X		X	X	X	X	X			
Lift Station 5	X	X		X	X	X	X	X			
Bussey Drug	X	X	X	X	X	X	X	X	X	X	X
First Baptist Church Timpson	X	X	X	X	X	X	X	X	X	X	X
First Methodist Church Timpson	X	X	X	X	X	X	X	X	X	X	X
Timpson Quick Stop	X	X	X	X	X	X	X	X	X	X	X
Dollar General Timpson	X	X	X	X	X	X	X	X	X	X	X
Family Dollar Timpson	X	X	X	X	X	X	X	X	X	X	X

**C) Vulnerable Parcels**

Table 65: Parcels Vulnerable to Windstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
<b>Shelby County</b>	<b>19,985</b>	<b>\$2,380,087,130</b>
City of Center	2,691	\$262,915,110
City of Huxley	182	\$15,638,160
Joaquin	475	\$27,719,040
Tenaha	573	\$31,357,980
Timpson	777	\$42,502,740

## 14. Lightning

Lightning is a massive electrostatic discharge between electrically charged regions within clouds, or between a cloud and the Earth's surface.

Lightning damage can result in electrocution of humans and animals; vaporization of materials along the path of the strike; fire caused by the high temperature produced by the strike; and sudden power surges that can damage electrical and electronic equipment. Millions of dollars of direct and indirect damages result from lightning strikes on electric utility substations and distribution lines. While property damage is the major hazard associated with lightning, it should be noted that lightning strikes kill nearly 49 people<sup>44</sup> each year in the United States.

### 1) Lightning History

According to NCEI data, Shelby County and the participating jurisdictions have not experienced any lightning events since 2016. However, lightning events often go unreported, so it is likely that events have occurred since the last plan. There is no data documenting a lightning event more recent than 2015. Shelby County and the participating jurisdictions did not include lightning as a standalone hazard in the 2016 Hazard Mitigation Action Plan; however, the planning team determined that 4 lightning events occurred between 2000 and 2015.

### 2) Likelihood of Future Events

Lightning is especially associated with thunderstorms. Despite the lack of officially reported instances of lightning-caused damages, a lightning event is highly likely, meaning an event affecting any or all of the participating jurisdictions is probable in the next year. According to information from VAISALA<sup>45</sup>, most of Shelby County can expect about 13 to 20 lightning flashes per square miles per year.

### 3) Extent

The extent for lightning can be expressed in terms of the number of strikes within an interval. Given the lack of lightning history data, it is expected that Shelby County and all participating jurisdictions may experience lightning events between LAL 1 and LAL 5. Dry thunderstorms, LAL 6, are not expected.

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<sup>44</sup> <https://www.weather.gov/safety/lightning-victims>

<sup>45</sup> <https://www.vaisala.com/sites/default/files/documents/WEA-MET-Annual-Lightning-Report-2020-B212260EN-A.pdf>

Table 66: Lightning Activity Levels<sup>46</sup>

Lightning Activity Level (LAL)		
Activity levels are valuable guidance tools to aid in the preparation for possible fire initiation from cloud-to-ground lightning.		
LAL	Cloud and Storm Development	Lightning Strikes per 15 Minutes
1	No thunderstorms.	-
2	Cumulus clouds are common but only a few reaches the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common, and lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	25+
6	Similar to LAL 3 except thunderstorms are dry.	

#### 4) Location and Impact

##### A) Location

Lightning strikes have no distinct geographic boundary. Lightning can occur across each participating jurisdiction.

##### B) Impact

Impacts from lightning in all jurisdictions may include but are not limited to loss of power due to electrical surges, damaged or destroyed personal property including computers and other electronics, damaged or destroyed agricultural, residential, commercial, and industrial buildings. Crops may be damaged or destroyed. Livestock may be injured or killed by lightning. In the worst cases, lightning may cause injuries or even loss of life.

<sup>46</sup> Source: <http://www.prh.noaa.gov/hnl/pages/LAL.php>

## 5) Vulnerability

According to the Lightning Protection Institute, it is a myth<sup>47</sup> that lightning always strikes the tallest objects. Given lightning's indiscriminate nature, it is impossible to identify buildings that are at an increased risk of being struck by lightning. All existing and future buildings, critical facilities, critical infrastructure, improved property, and the population are exposed to this hazard. However, structures without adequate lightning protection and those with large concentrations of electronic equipment like computers, servers, and printers, are most vulnerable, as are locations that may have outside crowds during a lightning event.

### A) Critical Facilities

Table 67: Critical Facilities Vulnerable to Lightning and Potential Impacts

Jurisdiction	Critical Facilities	Potential Lightning Impacts			
		Physical Damage	Electrical Damage	Data Damage or Loss	Fire
Shelby County	Shelby County Sheriff's Office	X	X	X	X
	Texas Department of Public Safety	X	X	X	X
	Shelbyville High School	X	X	X	X
	S.W. Carter Elementary	X	X	X	X
	Shelby County Emergency Operations Center	X	X	X	X
	Booth Rodeo Arena	X	X	X	X
	McClelland Water Supply Corp.	X	X	X	X
	Huber Water Supply Corp.	X	X	X	X
	Sand Hill Water Supply Corp.	X	X	X	X
	Paxton Water Supply	X	X	X	X
	City of Huxley Water Plant	X	X	X	X
	Timpson Utilities Department	X	X	X	X
	Shelby County Courthouse	X	X	X	X
	West Shelby Volunteer Fire Department	X	X	X	X
	Allegiance EMS	X	X	X	X
	Timpson Rural WSC	X	X	X	X
	Flat Fork WSC	X	X	X	X
	Choice WSC	X	X	X	X
	Shelbyville WSC	X	X	X	X
	East Lamar WSC	X	X	X	X
	Paxton WSC Jackson Plant	X	X	X	X
	Buena Vista WSC	X	X	X	X
Tennessee WSC	X	X	X	X	
Shelby County Emergency Services & Diagnostic Center	X	X	X	X	
Shelbyville Grocery	X	X	X	X	

<sup>47</sup> [http://lightning.org/wp-content/uploads/2015/06/LPI\\_lightning\\_infographic\\_2015.jpg](http://lightning.org/wp-content/uploads/2015/06/LPI_lightning_infographic_2015.jpg)

	Family Dollar	X	X	X	X
	Shelby Veterinary Associates	X	X	X	X
<b>Center</b>	City of Center Fire Department	X	X	X	X
	City of Center Police Department	X	X	X	X
	City of Center City Hall	X	X	X	X
	City of Center - Windham Civic Center	X	X	X	X
	Aiken Water Treatment Plant	X	X	X	X
	Mill Creek Water Treatment Plant	X	X	X	X
	East Bank Wastewater Treatment Plant	X	X	X	X
	Center FL Moffett Primary	X	X	X	X
	Center Elementary	X	X	X	X
	Center High School	X	X	X	X
	Center Middle School	X	X	X	X
	Texas Quick Care	X	X	X	X
	Aurora Concepts	X	X	X	X
	Priority Family Healthcare	X	X	X	X
	Cline Family Practice	X	X	X	X
	Hope Medical Clinic- Center	X	X	X	X
	Nelson Family Practice	X	X	X	X
	Holiday Nursing Center	X	X	X	X
	Pine Grove Nursing Center	X	X	X	X
	Focused Care at Center	X	X	X	X
	Lakeside Village Assisted Living	X	X	X	X
	Walmart & Walmart Pharmacy	X	X	X	X
	Brookshire & Brookshire's Pharmacy	X	X	X	X
	CVS	X	X	X	X
	DCI Dialysis	X	X	X	X
	Ace Hardware	X	X	X	X
Covington's Lumber	X	X	X	X	
H & S Grocery	X	X	X	X	
Murphy USA	X	X	X	X	
<b>Huxley</b>	City of Huxley Volunteer Fire Department (VFD)	X	X	X	X
	City Hall	X	X	X	X
	Water Treatment Plant	X	X	X	X
	Stand Pipe	X	X		X
	Possum Trot Booster Plant	X	X	X	X
	Trails End Restaurant and Gas	X	X	X	X
<b>Joaquin</b>	Water Plant	X	X	X	X
	Joaquin Community Center	X	X	X	X
	Texas Quick Care	X	X	X	X
	Joaquin City Hall	X	X	X	X
	Brookshire Bothers – Haslam	X	X	X	X



	Dollar General	X	X	X	X
	Joaquin Quick Stop	X	X	X	X
	Word of Faith	X	X	X	X
	Joaquin First United Methodist Church	X	X	X	X
	First United Pentecostal Church of Joaquin	X	X	X	X
	First Baptist Church of Joaquin	X	X	X	X
	First Baptist Church of Haslam	X	X	X	X
	Friendship Baptist Church	X	X	X	X
	Bethlehem Missionary Baptist Church	X	X	X	X
	Fellowship Missionary Baptist Church	X	X	X	X
	Blount Pharmacy	X	X	X	X
	Worsham Grocery	X	X	X	X
<b>Tenaha</b>	Tenaha Fire Department	X	X	X	X
	Tenaha Police Department	X	X	X	X
	City Hall	X	X	X	X
	The Lighthouse Church	X	X	X	X
	Hope clinic	X	X	X	X
	Businessman Club	X	X	X	X
	First Baptist Church	X	X	X	X
	Quick Stop	X	X	X	X
	Beef Producers of Texas	X	X	X	X
	Tenaha Independent School District	X	X	X	X
<b>Timpson</b>	Timpson Elementary	X	X	X	X
	Timpson High School	X	X	X	X
	Timpson Middle School	X	X	X	X
	City of Timpson Volunteer Fire Department (VFD)	X	X	X	X
	Timpson City Hall	X	X	X	X
	Timpson Library	X	X	X	X
	Texas Quick Care	X	X	X	X
	Timpson Wastewater Treatment Plant	X	X	X	X
	Lift Station 1	X	X		X
	Lift Station 2	X	X		X
	Lift Station 3	X	X		X
	Lift Station 4	X	X		X
	Lift Station 5	X	X		X
	Bussey Drug	X	X	X	X
	First Baptist Church Timpson	X	X	X	X
	First Methodist Church Timpson	X	X	X	X
	Timpson Quick Stop	X	X	X	X
	Dollar General Timpson	X	X	X	X
Family Dollar Timpson	X	X	X	X	

**B) Vulnerable Parcels**

Table 68: Parcels Vulnerable to Lightning

<b>Jurisdiction</b>	<b>Parcel Count</b>	<b>Estimated Potential Damage Value</b>
<b>Shelby County</b>	<b>19,985</b>	<b>\$2,380,087,130</b>
City of Center	2,691	\$262,915,110
City of Huxley	182	\$15,638,160
Joaquin	475	\$27,719,040
Tenaha	573	\$31,357,980
Timpson	777	\$42,502,740

## 15. Earthquake

Earthquakes are defined as a shaking or trembling of the earth that is volcanic or tectonic in origin.

A quake with magnitude 3 may do no more than startle people and rattle dishes within a one-square mile region. However, a magnitude 7 would be felt by people over the entire State of Texas, and could do significant damage to buildings, bridges, and dams over a considerable region.

### 1) Earthquake History

The 2016 Shelby County HMAP recorded one 2.7 magnitude earthquake event in 2013, 2 miles south of Timpson. The County has elected to address this hazard because of the possibility that earthquakes may become a local issue within the current planning period.

Table 69: Earthquakes for Shelby County and surrounding areas

Location	Date	Earthquake Events	Magnitude (Richter Scale)	Fatalities	Injuries	Property Damage \$2022	Crop Damage \$2022
South of Timpson	5/10/2012 - 7/27/2019	6	2.0 – 4.7	0	0	\$0	\$0

Despite the relatively minor event in 2019 recording zero damage, planning team members can confirm that the earthquake did in fact cause some structural damage to commercial and residential properties. Additionally, the planning team recovered news reports from 2012 that identified 5 earthquakes occurring that Spring near Timpson, the strongest being a 4.7 magnitude and causing damage to buildings.

### 2) Likelihood of Future Events

Given the proximity but infrequency of earthquakes in the surrounding area, an earthquake that could affect any or all of the participating jurisdictions is occasional, meaning that one is possible in the next 5 years.

### 3) Extent

Earthquake strength is generally measured on the Richter Magnitude Scale. The Modified Mercalli Intensity Scale for Earthquakes provides an additional means of describing an earthquake's effects.

Table 70: Richter Magnitude Scale

Richter Magnitude Scale		
Magnitude	Earthquake Effects	Estimated number each year
2.5 or less	Usually not felt but can be recorded by seismograph	900,000
2.5 to 5.4	Often felt, but only causes minor damage	30,000
5.5 to 6.0	Slight damage to buildings and other structures	500
6.1 to 6.9	May cause a lot of damage in very populated areas	100
7.0 to 7.9	Major earthquake, serious damage	20
8.0 or greater	Great earthquake; can destroy communities near the epicenter	One every 5 to 10 years.

Table 71: Modified Mercalli Intensity Scale for Earthquakes

Modified Mercalli Intensity Scale			
Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only by seismographs	<4.2
II	Feeble	Some people feel it	
III	Slight	Felt by people resting, like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway, suspended objects swing, objects fall off shelves	<5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	<6.9
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7.3

XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes, and cables destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall or ground rises and falls in waves	>8.1

A future earthquake affecting Shelby County and the participating jurisdictions may meet or exceed previous events up to a 5.0 on the Richter Magnitude Scale or a V-slightly strong on the Modified Mercalli Intensity Scale.

**4) Location and Impact**

*A) Location*

Earthquakes have no distinct geographic boundary in Shelby County. Earthquakes can equally affect all jurisdictions addressing the hazard. Despite the lack of geographic boundary, damages are expected to be negligible in most participating jurisdictions.

*B) Impact*

Impacts may include structural damages to buildings of all types. Road networks that pass through the participating jurisdictions may be damaged to the point of failure as the ground shifts. Water and wastewater systems may fail due to cracks and breaks in underground tanks and pipe networks.

**5) Vulnerability**

*A) Population*

As described in Section 3 of Chapter 3 above, the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from an earthquake.

Structures in substandard condition ahead of an earthquake may be more likely to suffer additional damages, including irreparable foundation or structural damages as the ground shifts. Depending on their means, these residents may require additional assistance recovering from earthquake-caused damages.

*B) Critical Facilities & Infrastructure*

The planning team identified the following critical facilities that may be affected by earthquakes which could affect the participating jurisdictions. Because earthquakes don't recognize

geographic boundaries, all critical facilities, no matter their jurisdictional location, are equally vulnerable to earthquakes.

**Table 72: Shelby County Critical Facilities Vulnerable to Earthquakes**

Jurisdiction	Critical Facilities	Potential Earthquake Impacts			
		Structural Damage	Water/Wastewater Line Damages	Increased Demand For Services	Economic Damages
Shelby County	Shelby County Sheriff's Office	X	X	X	X
	Texas Department of Public Safety	X	X	X	X
	Shelbyville High School	X	X		X
	S.W. Carter Elementary	X	X		X
	Shelby County Emergency Operations Center	X	X	X	X
	Booth Rodeo Arena	X	X		X
	McClelland Water Supply Corp.	X	X	X	X
	Huber Water Supply Corp.	X	X	X	X
	Sand Hill Water Supply Corp.	X	X	X	X
	Paxton Water Supply	X	X	X	X
	City of Huxley Water Plant	X	X	X	X
	Timpson Utilities Department	X	X	X	X
	Shelby County Courthouse	X	X		X
	West Shelby Volunteer Fire Department	X	X	X	X
	Allegiance EMS	X	X	X	X
	Timpson Rural WSC	X	X	X	X
	Flat Fork WSC	X	X	X	X
	Choice WSC	X	X	X	X
	Shelbyville WSC	X	X	X	X
	East Lamar WSC	X	X	X	X
	Paxton WSC Jackson Plant	X	X	X	X
	Buena Vista WSC	X	X	X	X
	Tennessee WSC	X	X	X	X
Shelby County Emergency Services & Diagnostic Center	X	X	X	X	
Shelbyville Grocery	X	X	X	X	
Family Dollar	X	X	X	X	

	Shelby Veterinary Associates	x	x	x	x
<b>Center</b>	City of Center Fire Department	x	x	x	x
	City of Center Police Department	x	x	x	x
	City of Center City Hall	x	x	x	x
	City of Center - Windham Civic Center	x	x	x	x
	Aiken Water Treatment Plant	x	x	x	x
	Mill Creek Water Treatment Plant	x	x	x	x
	East Bank Wastewater Treatment Plant	x	x	x	x
	Center FL Moffett Primary	x	x		x
	Center Elementary	x	x		x
	Center High School	x	x		x
	Center Middle School	x	x		x
	Texas Quick Care	x	x	x	x
	Aurora Concepts	x	x	x	x
	Priority Family Healthcare	x	x	x	x
	Cline Family Practice	x	x	x	x
	Hope Medical Clinic- Center	x	x	x	x
	Nelson Family Practice	x	x	x	x
	Holiday Nursing Center	x	x	x	x
	Pine Grove Nursing Center	x	x	x	x
	Focused Care at Center	x	x	x	x
	Lakeside Village Assisted Living	x	x	x	x
	Walmart & Walmart Pharmacy	x	x	x	x
	Brookshire & Brookshire's Pharmacy	x	x	x	x
	CVS	x	x	x	x
DCI Dialysis	x	x	x	x	
Ace Hardware	x	x	x	x	
Covington's Lumber	x	x	x	x	
H & S Grocery	x	x	x	x	
Murphy USA	x	x	x	x	
<b>Huxley</b>	City of Huxley Volunteer Fire Department (VFD)	x	x	x	x
	City Hall	x	x	x	x
	Water Treatment Plant	x	x	x	x

	Stand Pipe	X	X	X	X
	Possum Trot Booster Plant	X	X	X	X
	Trails End Restaurant and Gas	x	x	x	x
<b>Joaquin</b>	Water Plant	X	X	X	X
	Joaquin Community Center	X	X	X	X
	Texas Quick Care	X	X	X	X
	Joaquin City Hall	X	X	X	X
	Brookshire Bothers – Haslam	X	X	X	X
	Dollar General	X	X	X	X
	Joaquin Quick Stop	X	X	X	X
	Word of Faith	X	X	X	X
	Joaquin First United Methodist Church	X	X	X	X
	First United Pentecostal Church of Joaquin	X	X	X	X
	First Baptist Church of Joaquin	X	X	X	X
	First Baptist Church of Haslam	X	X	X	X
	Friendship Baptist Church	X	X	X	X
	Bethlehem Missionary Baptist Church	X	X	X	X
	Fellowship Missionary Baptist Church	X	X	X	X
	Blount Pharmacy	x	x	x	x
	Worsham Grocery	x	x	x	x
	<b>Tenaha</b>	Tenaha Fire Department	X	X	X
Tenaha Police Department		X	X	X	X
City Hall		X	X	X	X
The Lighthouse Church		X	X	X	X
Hope clinic		X	X	X	X
Businessman Club		X	X		X
First Baptist Church		X	X	X	X
Quick Stop		X	X	X	X
Beef Producers of Texas		X	X		X
Tenaha Independent School District		X	X		X
<b>Timpson</b>	Timpson Elementary	X	X		X
	Timpson High School	X	X		X
	Timpson Middle School	X	X		X



	City of Timpson Volunteer Fire Department (VFD)	X	X	X	X
	Timpson City Hall	X	X	X	X
	Timpson Library	X	X		X
	Texas Quick Care	X	X	X	X
	Timpson Wastewater Treatment Plant	X	X	X	X
	Lift Station 1	X	X	X	X
	Lift Station 2	X	X	X	X
	Lift Station 3	X	X	X	X
	Lift Station 4	X	X	X	X
	Lift Station 5	X	X	X	X
	Bussey Drug	X	X	X	X
	First Baptist Church Timpson	X	X	X	X
	First Methodist Church Timpson	X	X	X	X
	Timpson Quick Stop	X	X	X	X
	Dollar General Timpson	X	X	X	X
	Family Dollar Timpson	X	X	X	X

### ***C) Vulnerable Parcels***

All structures within the participating jurisdictions are equally vulnerable to earthquakes. However, given the minor structural damage inflicted by previous events, future structural damages are expected to be similarly limited.

**Table 73: Estimated Potential Damage Values**

<b>Jurisdiction</b>	<b>Parcel Count</b>	<b>Estimated Potential Damage Value</b>
<b>Shelby County</b>	<b>19,985</b>	<b>\$2,380,087,130</b>
City of Center	2,691	\$262,915,110
City of Huxley	182	\$15,638,160
Joaquin	475	\$27,719,040
Tenaha	573	\$31,357,980
Timpson	777	\$42,502,740

## 16. Dam Failure

A dam is defined as any barrier, wall, or embankment, along with its abutments and appurtenant works, constructed for the purpose of storing water or other liquid material either temporarily or permanently. The term dam failure means that the dam is overtopped or fails to operate in the manner for which it was designed. A catastrophic failure would be a breach that would allow the dam's reservoir to suddenly drain. Dam failure can occur with little or no warning, or it can be an anticipated event. Dam failure can cause mass fatalities, mass structural damage and/or a cascading potential if a populated area is located below the dam structure.

### 1) Dam History

Neither Shelby County nor the participating jurisdictions have documented histories of damages caused by dam failure. Despite the lack of high hazard dams in the county, the planning team has determined that certain dams pose a hazard due to their age, areas of concern, and/or proximity to the participating jurisdictions.

There are eight dams of concern in Shelby County and one in Louisiana that could affect the jurisdictions. They are known as the Attoyac Bayou WS SCS Site 9 Dam, the Attoyac Bayou SCS Site 12 Dam, the Crystal Lake Dam, the Lake Center Dam, the Lake Timpson Dam, the Pinkston Dam, the Valmac Lake Dam, the Whiddon Lake Dam and the Toledo Bend Dam (in Sabine, Louisiana). The Attoyac Bayou WS SCS Site 9 Dam is owned by the Attoyac Bayou Watershed Authority, has a maximum storage capacity of 1,345 acre-feet, and is primarily a flood risk reduction dam. It was built in 1981 and last inspected in 2013. The Attoyac Bayou WS SCS Site 12 Dam is owned by the Attoyac Bayou Watershed Authority, has a maximum storage capacity of 1,673 acre-feet, and is primarily a flood risk reduction dam. It was built in 1976 and last inspected in 2011. The Crystal Lake Dam is privately owned, has a maximum storage of 104 acre-feet, and is considered primarily a recreational dam. The dam was built originally in 1919. The Lake Center Dam is owned by the City of Center and creates Center Lake with a maximum storage of 1,825 acre-feet and is considered primarily a water supply dam. The dam was built in 1953 and last inspected in 2018. The Lake Timpson Dam is owned by the Shelby County FWSD #1 and creates Lake Timpson with a maximum storage of 5,280 acre-feet. The reservoir is primarily a recreation and water supply. The dam was built in 1956 and last inspected in 2011. The Pinkston Dam is owned by the City of Center and creates Pinkston Reservoir with a maximum storage of 13,500 acre-feet and is considered primarily a water supply dam. The dam was built in 1977 and last inspected in 2018. The Valmac Lake Dam is owned by Tyson Foods, Inc. and creates Valmac Lake with a maximum storage of 156 acre-feet and is considered primarily a fire protection reservoir. The dam was built in 1950. The Whiddon Lake Dam is privately owned with a maximum storage of 58 acre-feet and is considered primarily a

recreational dam. The dam was built in 1958. The Toledo Bend Dam is located in Sabine, Louisiana, owned by Tribal Government and creates the Toledo Bend Reservoir with a maximum storage of 5,097,500 acre-feet and is considered primarily a hydroelectric and water supply reservoir. The dam was built in 1966 and last inspected in 2020.

### 2) Likelihood of Future Occurrence

Given the lack of a prior dam failure in the participating jurisdictions, dam failure is considered unlikely, meaning that one is possible in the next 10 years.

As information on the hazard is gathered more closely moving forward, its likelihood will be revised accordingly.

### 3) Extent

FEMA’s classification system for dam failures is a simple and straight-forward three tier system. It is based on whether there is any probability of a loss of human life, and whether there is a large economic, environmental, or lifeline loss. The low hazard potential classification is used for failures that will not result in any loss of human life, and the economic, environmental, and lifeline losses are low and generally limited to the dam owner. The significant hazard potential classification is used for failures that will not result in any loss of human life, but the economic, environmental, and lifeline losses would have a great impact on the community. The high hazard potential classification is used when the dam failure will cause the loss of at least one human life, regardless of what the economic, environmental, and lifeline losses are. A way to consider the hazard extent is to use the storage capacity behind the dam to estimate the ground surface that would be covered with a foot of water.

An acre-foot is 325,851 gallons and would cover one acre of land with a foot of water. A 1,000-acre-foot body of water could cover 40 acres with an average depth of 25 feet, and the volume of 1,000 acre-feet is approximately 326 million gallons of water.

Table 74: Dam Failure Extent Classification

Hazard Potential Classification	Loss of Human Life	Dam Storage Capacity
Low	None Expected	Less than 10,000 acre-feet
Significant	Probable (1-6)	Between 10,000 – 100,000 acre-feet

High	Loss of Life Expected (7 or more)	100,000 acre-feet or more
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There are 23 dams in Shelby County. According to the National Inventory of Dams, all of the dams are less than 15,000 acre-feet.

Most dams in Shelby County are considered low hazard. They hold less than 10,000 acre-feet of water, and no loss of life is expected should any fail. The only high hazard dam of concern is the Toledo Bend Dam located in Sabine, Louisiana. Due to the location of this dam, 79 miles downstream from the City of Huxley, a failure would not cause inundation anywhere in Shelby County, however, it could affect the City of Huxley’s water supply. Due to the lack of flood inundation concern, this dam will not be fully profiled, but it was important to note that the City of Huxley’s water supply comes from the Toledo Bend Reservoir. The remaining dams were profiled due to their age, areas of concern, and/or proximity to the jurisdictions.

If a failure of the Attoyac Bayou WS SCS Site 9 Dam were to occur, approximately 53.8 acres of land could be inundated with an average depth of 25 feet.

If a failure of the Attoyac Bayou WS SCS Site 12 Dam were to occur, approximately 66.92 acres of land could be inundated with an average depth of 25 feet.

If a failure of the Crystal Lake Dam were to occur, approximately 4.16 acres of land could be inundated with an average depth of 25 feet.

If a failure of the Lake Center Dam were to occur, approximately 73 acres of land could be inundated with an average depth of 25 feet.

If a failure of the Lake Timpson Dam were to occur, approximately 211.2 acres of land could be inundated with an average depth of 25 feet.

If a failure of the Pinkston Dam were to occur, approximately 540 acres of land could be inundated with an average depth of 25 feet.

If a failure of the Valmac Lake Dam were to occur, approximately 6.24 acres of land could be inundated with an average depth of 25 feet.

If a failure of the Whiddon Lake Dam were to occur, approximately 2.32 acres of land could be inundated with an average depth of 25 feet.

#### 4) Location and Impact

##### A) Location

The figures below show the location of all dams of concern within Shelby County as well as their proximity to the participating jurisdictions.

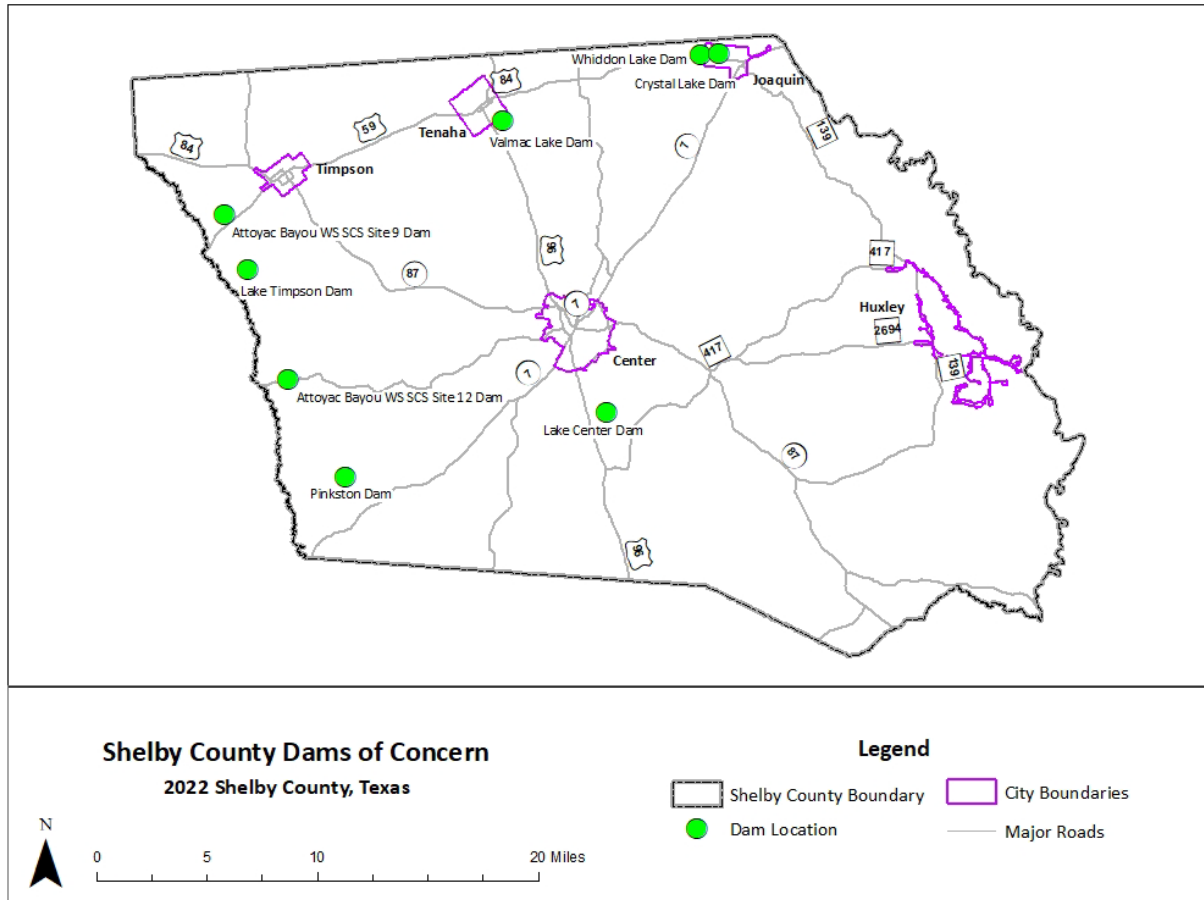


Figure 32: Shelby County Dams of Concern

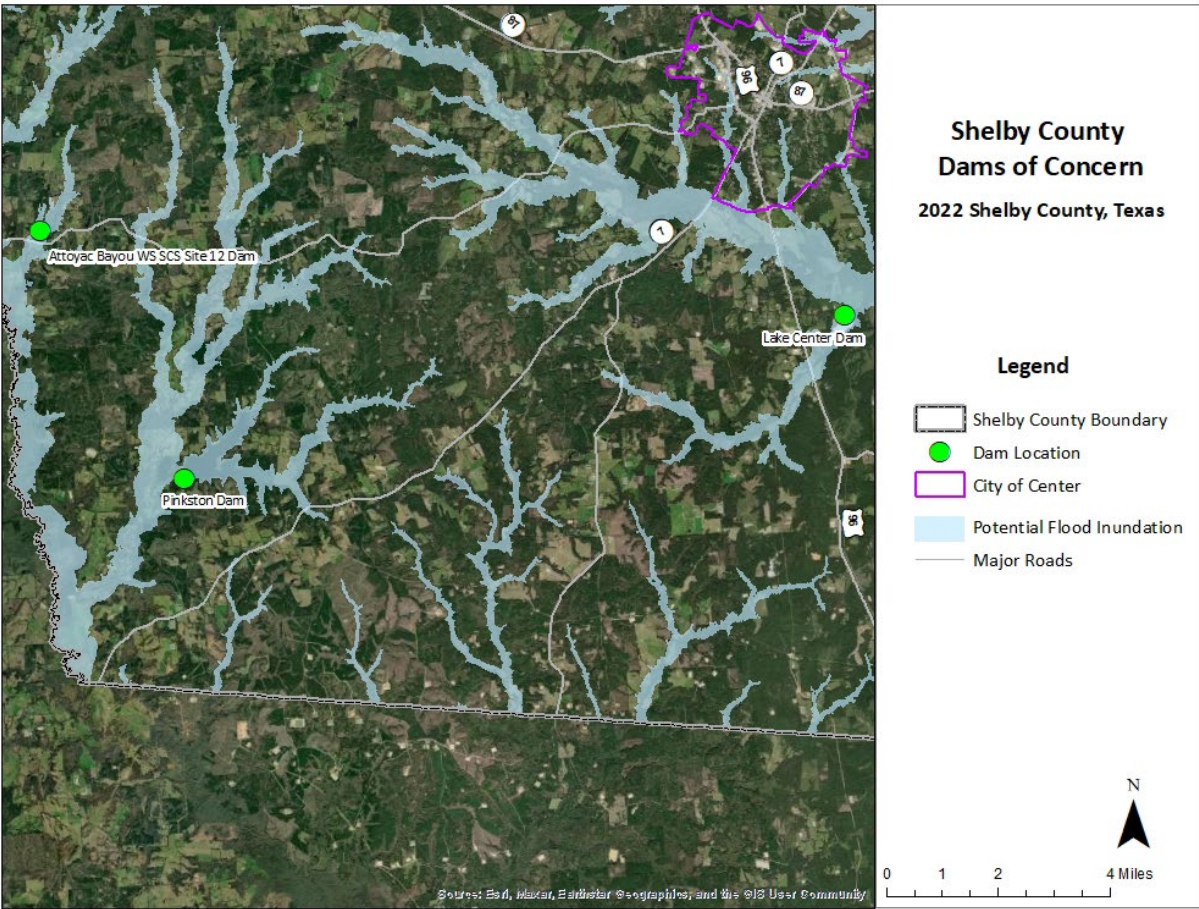


Figure 33: Dams of Concern near City of Center

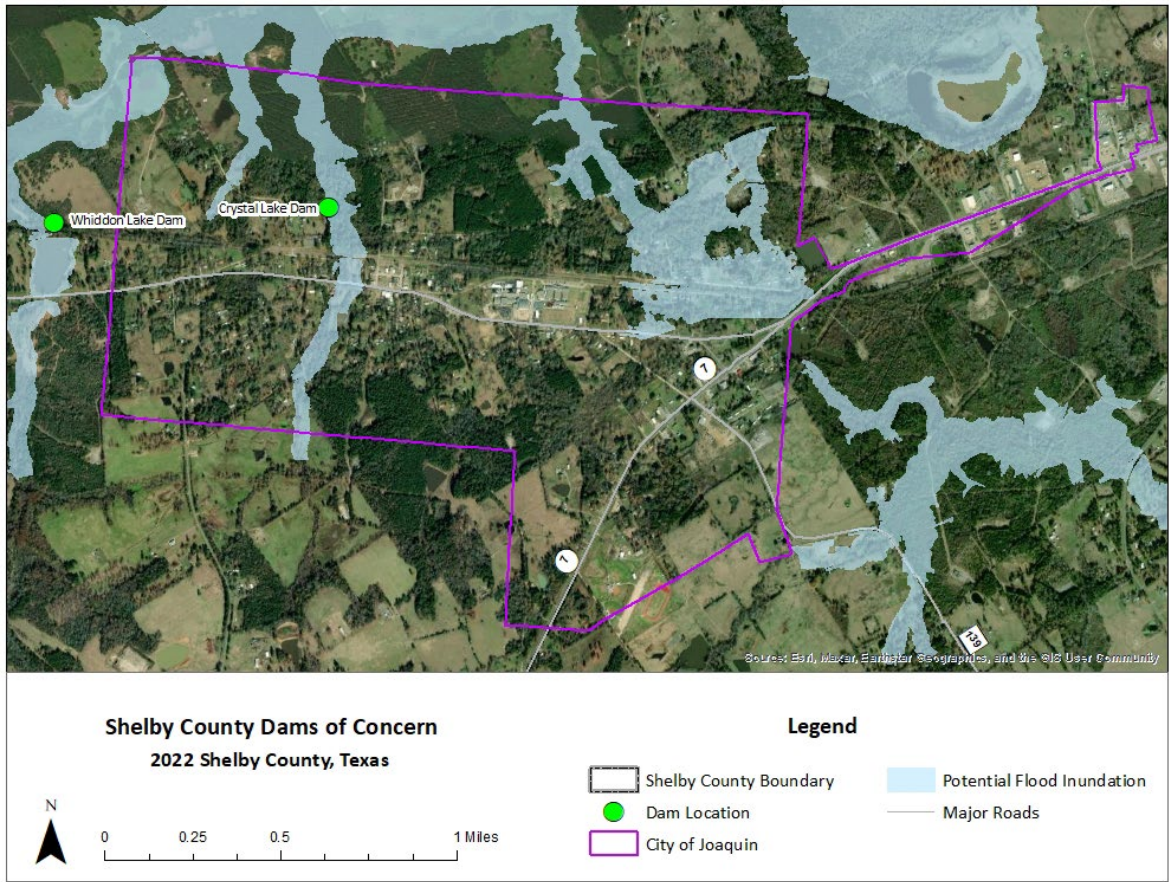


Figure 34: Dams of Concern near City of Joaquin



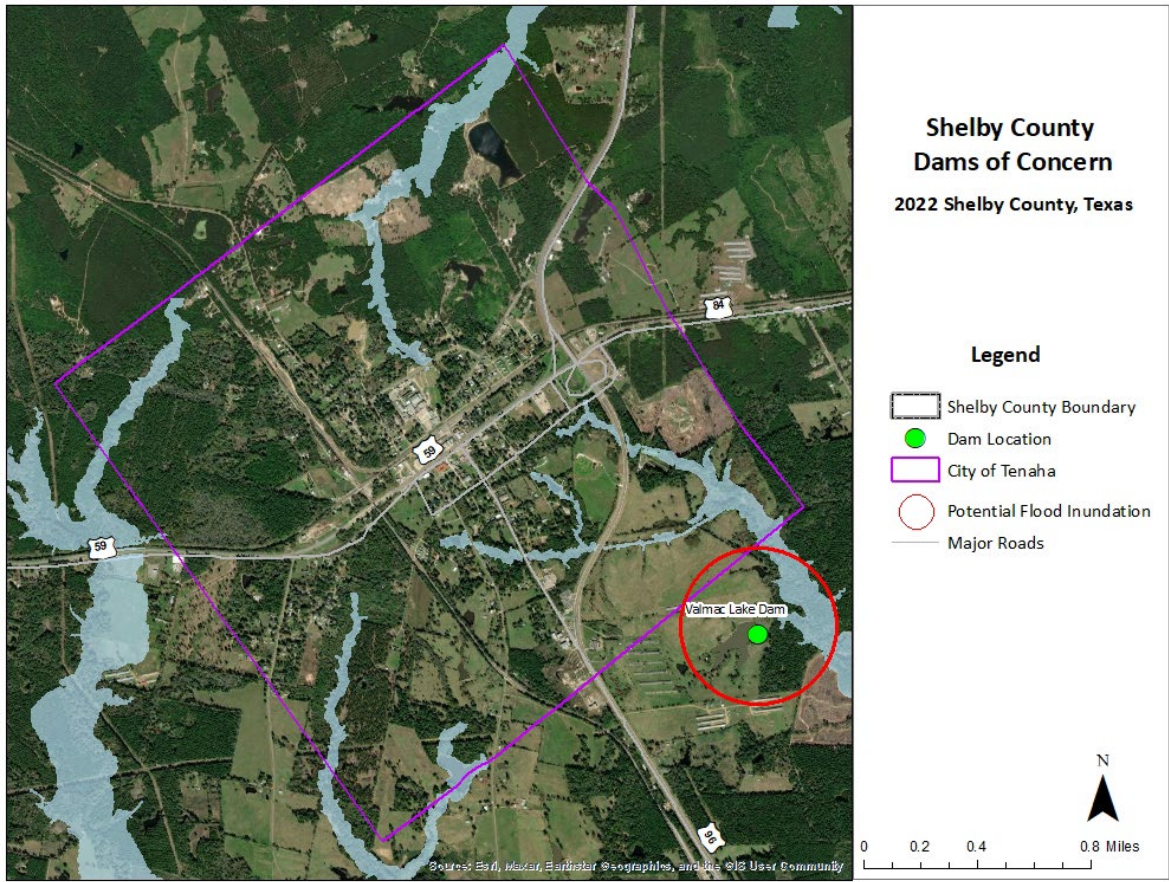


Figure 35: Dams of Concern near City of Tenaha

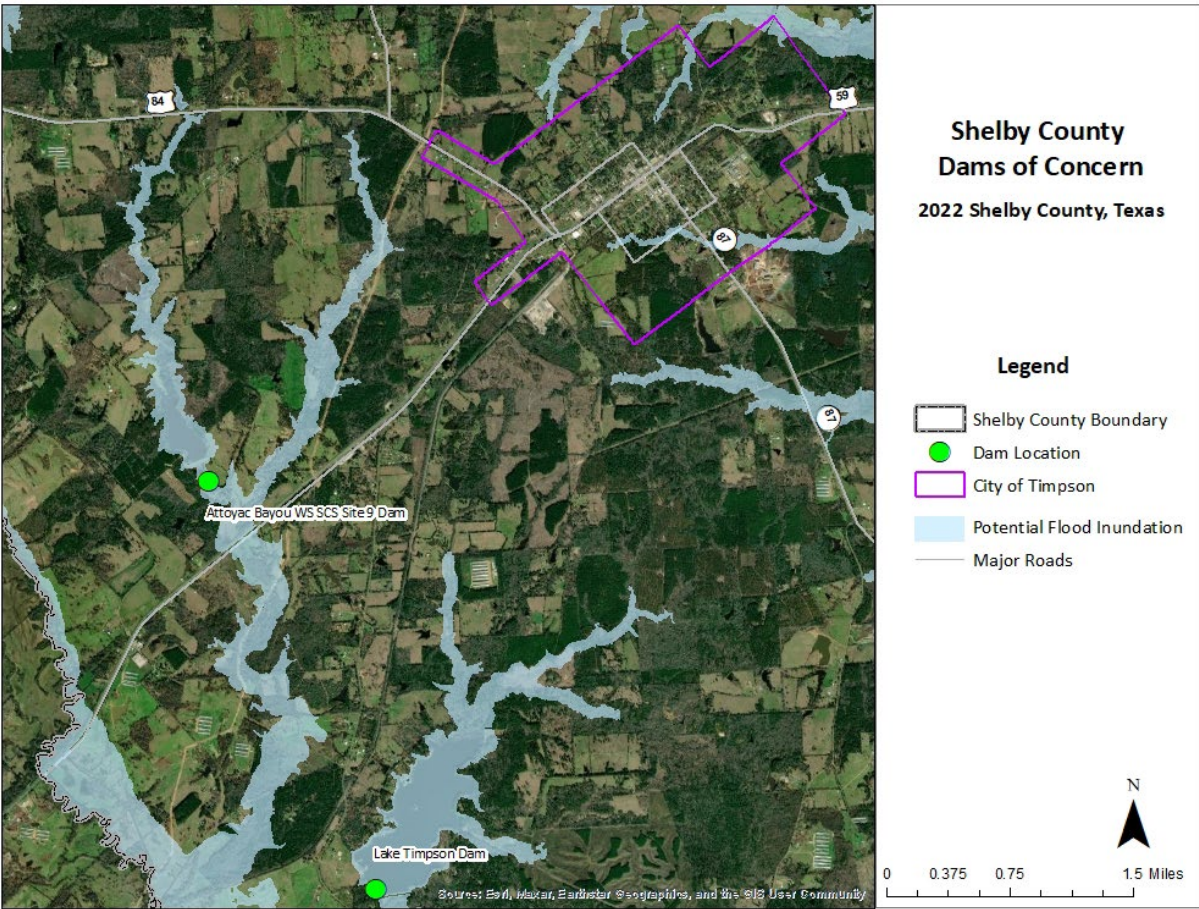


Figure 36: Dams of Concern near City of Timpson

**B) Impact**

Structures at risk of dam failure may be flooded, damaged by floodborne contaminants, damaged by debris flow, or even completely washed away. Although no loss of life to dam failure is expected in Cass County, under the right conditions injury or loss of life are possible.

**5) Vulnerability**

**A) Population**

None of the profiled dams are considered high hazard, and the majority have inundation zones in rural areas. Therefore, negative impacts on the population are unlikely.

**B) Critical Facilities**

The planning team identified 107 critical facilities spread across the County and participating jurisdictions. Only one facility is located within a potential inundation zone.

Table 75: Critical Facilities Vulnerable to Flooding

<b>Critical Facilities</b>
Mill Creek Water Treatment Plant

## 17. Hazardous Materials Incidents

### 1) Hazardous Materials Incidents

The following description for hazardous materials is provided by the Federal Emergency Management Agency (FEMA):

*Chemicals are found everywhere. They purify drinking water, are used in agriculture and industrial production, fuel our vehicles and machines, and simplify household chores. But chemicals also can be hazardous to humans or the environment if used or released improperly. Hazards can occur during production, storage, transportation, use, or disposal. The community is at risk if a chemical is used unsafely or released in harmful amounts.*

*Hazardous materials in various forms can cause fatalities, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines.*

*Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites.*

*Varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States--from major industrial plants to local dry-cleaning establishments or gardening supply stores.*

*Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.<sup>48</sup>*

Hazardous material incidents are technological (meaning non-natural hazards created or influenced by humans) events that involve large-scale releases of chemical, biological or radiological materials. Hazardous materials incidents generally involve releases at fixed-site facilities that manufacture, store, process or otherwise handle hazardous materials or along transportation routes such as major highways, railways, navigable waterways and pipelines<sup>49</sup>.

The Environmental Protection Agency (EPA) is the federal agency authorized to protect the environment and public health. Congress writes the laws and the President signs them into law. The EPA is a regulatory agency with the duty to prepare administrative rules and procedures on how these laws and Presidential Executive Orders will be implemented and enforced.

The U.S. Environmental Protection Agency requires industry to report information on toxic chemical releases and water management activities, through the Toxics Release Inventory (TRI) Program. In the previous decade TRI reporting requirements were lessened; thereby

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<sup>48</sup> <https://www.fema.gov/pdf/areyouready/technohazards.pdf>

<sup>49</sup> <https://www.fema.gov/sites/default/files/2020-07/hazardous-materials-incidents.pdf>

limiting available data on chemical releases and disposal. The federal government in recent years reinstated stricter reporting requirements for industrial and federal facilities that release toxic substances with potential to threaten human health and the environment. Those requirements went into effect in April of 2009 and data from these reports is now available.

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA), acting through the Office of Pipeline Safety (OPS), administers the national regulatory program to assure the safe transportation of natural gas, petroleum, and other hazardous materials by pipeline<sup>50</sup>. Further, the Pipeline and Hazardous Material Safety Administration Office of Hazardous Materials Safety<sup>51</sup> (OHMS) is the Federal safety authority for ensuring the safe transport of hazardous material by air, rail, highway and water, with the exception of bulk transportation of hazmat by vessel.

## 2) Likelihood of Future Events

Based on the EPA Toxic Report Inventory, there were 48 incidences of toxic releases between 2013 - 2020. Additionally, based on the National Response Center reports for Shelby County, from 2013 to April 2022, there were 19 reports of spills of hazardous materials. That recurrence interval equates to a **High** probability of future occurrence classification according to the definitions set forth in Section 3.

## 3) Location and Impact

### A) Location

The location of the most concentrated and potentially hazardous materials in the planning area are: fixed industrial facilities including oil and gas wells and storage facilities, pipelines, industrial complexes that use or process chemicals or petroleum products, highways, and railroads. The potential release of hazardous materials from pipelines is a significant issue in Shelby County. Additionally, between 2013-2020 (the most current available data), the Tyson Food Processing plant in Center and the Pilgrim's Pride facility in Tenaha have reported the highest number of toxic release incidents according to the EPA Toxic Release Inventory<sup>52</sup>.

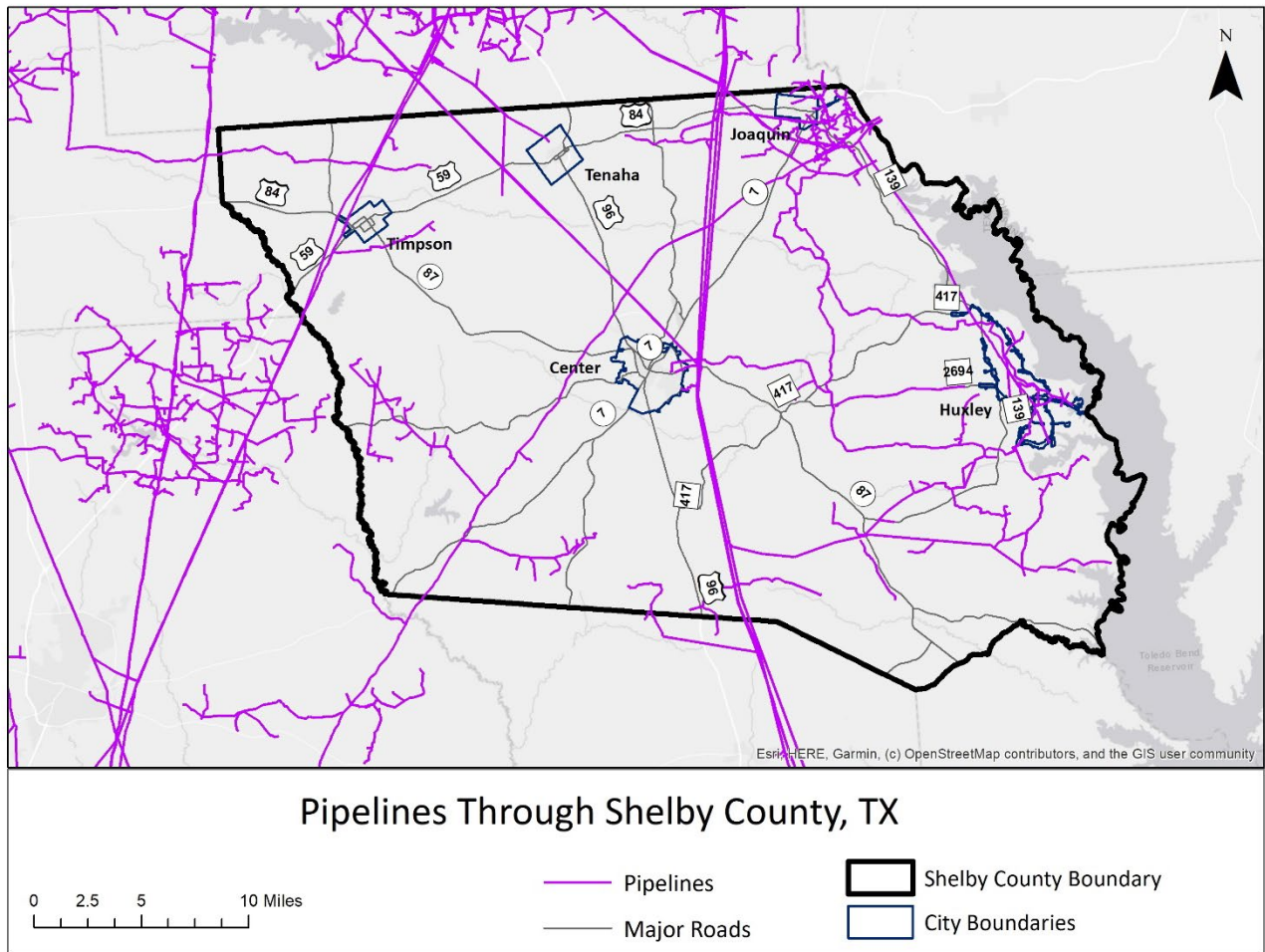
Figure 37 indicates the location of pipelines in Shelby County. Numerous other sources are also present across the planning area, including storage areas for insecticides, herbicides, and fertilizers, wrecking yards, and retail fueling stations.

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<sup>50</sup> <https://www.phmsa.dot.gov/>

<sup>51</sup> <https://www.phmsa.dot.gov/about-phmsa/offices/office-hazardous-materials-safety>

<sup>52</sup> <https://www.epa.gov/toxics-release-inventory-tri-program/tri-basic-data-files-calendar-years-1987-present>



*Figure 37: Pipelines Through Shelby County*

### **B) Impact**

The U.S. Environmental Protection Agency requires industry to report information on toxic chemical releases and water management activities, through the Toxics Release Inventory (TRI) Program. In the past, TRI reporting requirements were lessened; thereby limiting available data on chemical releases and disposal. In 2009, the federal government reinstated stricter reporting requirements for industrial and federal facilities that release toxic substances with potential to threaten human health and the environment. Data from these reports is available via the TRI website<sup>53</sup>.

There were 2 fixed-site facilities that filed reports with the TRI in the planning area between 2013- 2020 (the most current data available). These indicated a total of 48 incidents. The following table provides data on the amount of materials released in Shelby County. The Tyson Foods, Inc. Processing Plant in Center and the Pilgrim’s Pride facility in Tenaha are the largest

<sup>53</sup> <https://www.epa.gov/toxics-release-inventory-tri-program/tri-basic-data-files-calendar-years-1987-present>

contributors to the amount of materials released, with 24 incidents respectively, and a total of 48 incidents.

Table 76: Toxic Release Inventory by Category, Shelby County 2013-2020<sup>54</sup>

Release Category	Pounds Released
Release to Surface Waters	4,192,195
Fugitive Air Emissions	180,580
Stack Air	2,966
Other	1268
Off Site Release	278
Total On-Site and Off-Site Disposal or Other Releases	4,377,287

The most comprehensive dataset available, the National Response Center<sup>55</sup>, through the U.S. Coast Guard, serves as the sole national point of contact for reporting all oil, chemical, radiological, biological and etiological discharges into the environment anywhere in the United States and its territories. According to the National Response Center from 2013 - April, 2022, specific to Shelby County, there were 19 reports of spills of hazardous materials. The National Response Center details each of the spills noted above. The inclusion of detailed data for each incident such as incident date, nearest city, the affected environment, and material spilled is beyond the scope of this document; however, the data is available online and was used to tally the total number of spills reported.

#### 4) Vulnerability

The magnitude and severity of a hazardous material release depends upon the type of material released, the amount of the release, and the proximity to populations. As previous hazardous material incidents have shown in the State, the release of materials can and does result in fatalities and evacuations of large numbers of people. Based on the locations of facilities with previously documented toxic releases and spills, as well as the concentration of pipelines and related oil/gas infrastructure in the county, residents of the county are vulnerable to the effects of future releases and spills.

<sup>54</sup> <https://www.epa.gov/toxics-release-inventory-tri-program/tri-basic-data-files-calendar-years-1987-present>

<sup>55</sup> <https://nrc.uscg.mil/Default.aspx>

## 18. Mitigation Strategy

### 1) Capability Assessment

Shelby County and the participating jurisdictions have shown themselves to be highly capable, especially in terms of implementing hazard mitigation actions. All six jurisdictions participated in the 2016 plan. Each of these jurisdictions completed, or is in the process of completing, many of the actions recommended in the 2016 plan.

In addition to reviewing previous actions and the steps taken to implement them, the planning team reviewed existing regulatory capabilities and opportunities for establishing new capabilities and enhancing existing ones. At this time, all jurisdictions could improve their hazard mitigation capabilities through the following efforts: budgeting for mitigation actions and support, passing policies and procedures to implement mitigation actions, adopting, and implementing stricter mitigation regulations, approving the hiring, and training of staff for mitigation activities, and approving mitigation updates and additions to existing plans as new needs are recognized. The participating cities could further improve their capabilities by creating and adopting regularly updated comprehensive plans.

Table 77: Capability Assessment by Jurisdiction

<b>Shelby County</b> <b>Administrative, Financial, Regulatory, and Technical Abilities</b>
Emergency Management
Road and Bridge Management
Grant Writing
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

<b>City of Center</b> <b>Administrative, Financial, Regulatory, and Technical Abilities</b>
Floodplain management
Emergency Management
Subdivision
Zoning
Building Code Enforcement
Nuisance Abatement
Substandard Structures Abatement
Water Conservation Planning
Drought Contingency Planning



Comprehensive Planning
Economic Development
Grant Writing
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

<b>City of Huxley</b> <b>Administrative, Financial, Regulatory, and Technical Abilities</b>
Drought Contingency Planning
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

<b>City of Joaquin</b> <b>Administrative, Financial, Regulatory, and Technical Abilities</b>
Emergency Management
Drought Contingency Planning
Road and Bridge Maintenance
Economic Development
Grant Writing
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

<b>City of Tenaha</b> <b>Administrative, Financial, Regulatory, and Technical Abilities</b>
Floodplain management
Emergency Management
Water Conservation Planning
Road & Bridge Maintenance
Drought Contingency Planning
Economic Development

Grant Writing
General Budgeting
CDBG Funding
State and Federal Grant Funding

<b>City of Timpson Administrative, Financial, Regulatory, and Technical Abilities</b>
Emergency Management
Drought Contingency Planning
Nuisance Abatement
Road and Bridge Management
Comprehensive Planning
Economic Development
General Budgeting
CDBG Funding
State and Federal Grant Funding

**2) Goals and Objectives Overview**

The hazard analysis has shown that Shelby County and the participating jurisdictions are at risk of multiple natural hazards. The following goals and objectives take a broad approach to improving outcomes before, during, and after these anticipated natural hazard events.

The goals and objectives in this plan reflect the overarching priorities identified by the communities and are similar to the goals listed in the 2016 plan. They have been expanded to include public services, public infrastructure, economic impacts, civic resources, and cultural resources as priorities in addition to reducing loss of life, injury, property damage, and preservation of natural resources. The mitigation actions the County and participating jurisdictions have selected are designed to address specific hazard-related issues in support of achieving the desired goals and objectives.

**3) Long-Term Vision**

The hazard mitigation plan must strike a balance between identifying long-term goals and objectives and prioritized mitigation actions that may be addressed sooner, depending on funding availability and local priorities. The result is that certain goals and objectives don't have a corresponding mitigation action. Instead, by taking the long view, the local planning team has created a framework that can be developed as the plan is updated over time.

#### 4) Goals

##### **A) Goal 1: To reduce loss of life and injury to persons**

###### *Objective 1.1*

Improve the delivery and effectiveness of warning messages

###### *Objective 1.2*

Preserve public and private emergency response capability (9-1-1, law enforcement, fire services, emergency medical services, hospitals).

###### *Objective 1.3*

Utilize available mitigation measures to prevent or reduce life-threatening impacts of natural hazards.

###### *Objective 1.4*

Reduce obstacles to timely and safe evacuation of flood hazard areas.

###### *Objective 1.5*

Reduce vulnerability of individuals living in mobile homes / manufactured housing.

###### *Objective 1.6*

Reduce life or health threatening impacts on individuals with special physical care requirements.

###### *Objective 1.7*

Reduce secondary impacts to health and safety from cascading effects.

##### **B) Goal 2: To reduce disruptions to essential public services and infrastructure**

###### *Objective 2.1*

Minimize disruption to and enhance rapid restoration of utilities.

###### *Objective 2.2*

Minimize disruption to and enhance rapid restoration of essential transportation infrastructure.

###### *Objective 2.3*

Minimize disruption to governmental, educational, and other institutions providing services to the public.

##### **C) Goal 3: To reduce economic impacts to individuals, businesses, and area institutions**

###### *Objective 3.1*

Increase home and business owner investment in available mitigation measures for private property.

*Objective 3.2*

Increase home and business owner participation in appropriate insurance programs.

*Objective 3.3*

Increase public and private sector development and use of operations continuity strategies.

*Objective 3.4*

Utilize available mitigation measures to prevent or reduce economic losses from natural hazards.

*Objective 3.5*

Reduce vulnerability of existing development by encouraging property owners to participate in buy-out or flood-proofing opportunities.

*Objective 3.6*

Reduce vulnerability of future development by utilizing available planning and structural standards.

***D) Goal 4: To reduce losses to civic, cultural, and environmental resources***

*Objective 4.1*

Protect public investment in community-owned facilities and infrastructure through appropriate structural, non-structural, and financial methods.

*Objective 4.2*

Reduce future losses to the non-profit sector through participation in available mitigation opportunities.

*Objective 4.3*

Reduce vulnerability of historically or culturally significant structures.

*Objective 4.4*

Minimize environmental impacts from cascading effects.

**5) Mitigation Action Plan**

***A) Mitigation Action Prioritization***

The planning team members have identified at least two mitigation actions per natural hazard. The previous plan had a prioritization process utilizing the STAPLEE criteria and benefit-cost review, their prioritization considered cost effectiveness; technical feasibility; and environmental soundness of each action; project implementation; and administrative barriers. For this update, action items were identified and prioritized in consideration of the following criteria:

- 1) Life safety and property protection improvements
- 2) Cost effectiveness – do the action’s future benefits exceed its implementation costs
- 3) Technical feasibility – is the action reasonable given its technical requirements
- 4) Political acceptability
- 5) Administrative capabilities and legal authorities for implementation
- 6) Funding availability
- 7) The action’s environmental impacts
- 8) The action’s social acceptability
- 9) The action’s ability to reduce risk to more than one hazard
- 10) The ease of implementation
- 11) The availability of a local champion
- 12) The action’s relationship to other community objectives

In addition to considering an action’s cost effectiveness as described above, the planning team considered TDEM’s Cost-Effectiveness, Environmental Soundness and Technical Feasibility requirements as they relate to construction projects. Mitigation actions relating to physical infrastructure will meet the State’s standards as outlined below:

- A. Any state government construction project, regardless of potential funding source, has to be cost effective, technically feasible and meet all of the appropriate federal, state, and local environmental laws and regulations before it is started.
- B. State government projects funded by Federal Mitigation Grant Programs administered by TDEM have to meet specific criteria related to cost effectiveness, environmental soundness and technical feasibility. These are outlined in the applicable FEMA grant program guidance for that particular funding program.

#### ***B) Incorporation and Integration of Existing Capabilities and Hazard Mitigation***

As previously outlined, the planning team reviewed a range of codes, ordinances, and planning studies that have been adopted by the participating jurisdictions. The planning team’s goal was to understand how these existing capabilities might affect mitigation actions in terms of implementation and enforcement.

#### **Mitigation Action Status – 2016 Plan**

In addition to reviewing existing codes, ordinances, and planning studies, the planning team also examined the status of each mitigation action identified in the 2016 plan.

A slight increase in local development is not known to have affected local vulnerability to the natural hazards this plan addresses or to those addressed in the 2016 plan.

Mitigation actions marked as incomplete are no longer considered relevant as written to the participating jurisdictions.

Table 78: Previous Mitigation Actions – All Jurisdictions

Shelby County Mitigation Actions Status		
Hazards Addressed	Mitigation Actions	Status
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	Elevate and reinforce roadways and bridges prone to inundation from flooding. Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.	<i>In progress</i>
Wildfire	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.	<i>Abandoned: Deferred to Texas State Forest Service &amp; Local Jurisdictions Fire Services</i>
Hurricanes, Tornado, Drought, Ice Storm	Upgrade existing debris management disposal procedures and capabilities in coordination with TCEQ requirements and recommendations (when applicable).	<i>In progress</i>
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire	Install warning sirens at strategic locations for use during disaster events.	<i>Abandoned: No longer deemed relevant</i>
Hurricane, Thunderstorm, Tornado, Winter Storm, Drought	Inventory and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways.	<i>In progress</i>
Hurricanes/Tropical Storms	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center (EOC) during a hazard event.	<i>Deferred to Plan Update</i>
Flood, Hurricanes, Thunderstorms, Tornadoes	Storm-harden and/or retrofit existing and newly constructed critical facilities. Actions can include but are not limited to: installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	<i>Deferred to Plan Update</i>
Dam Failure, Earthquake, Extreme Heat, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm	Install electrical generators for critical facilities and infrastructure.	<i>In progress</i>

Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	Upgrade stormwater conveyance capacity via drainage improvement projects. Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	<i>In progress</i>
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials/Pipeline Failure Incidents, Hurricane/Tropical Storm, Thunderstorm, Tornado, Wildfire, Winter Storm	Educate the residents of Shelby County and participating jurisdictions on safety and planning for the hazards identified in this plan.	<i>In progress</i>
Tornados	Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	Acquire flood prone/repetitive loss properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	<i>Abandoned: No Longer Deemed Relevant</i>
Wildfire	Incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	<i>In progress</i>
Dam Failure, Flood, Hurricane	Pursue participation in the NFIP for Shelby County since it is currently not participating and develop thorough floodplain administration procedures.	<i>Completed</i>
Wildfire	Educate homeowners and builders on the importance of maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	<i>In progress</i>
Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm	Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	<i>In progress</i>
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm	Develop-upgrade contact info database for 1st responders, volunteers, special needs populations.	<i>In progress</i>

Tornados	Provide instruction for homeowners to install safe rooms to provide protection from tornados and straight line winds in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
Tornados	Construct tornado-safe shelters in low-moderate income manufactured home parks with more than 20 units, in compliance with Housing and Urban Development standards for CDBG funding assistance and National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
Extreme Heat, Winter Storm	Retrofit existing structures to act as cooling centers during extreme heat events, and warming centers during winter storms.	<i>Deferred to Plan Update</i>
Wildfire	Conduct mechanical thinning to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	<i>Abandoned: Deferred to Texas State Forest Service &amp; Local Jurisdictions Fire Services</i>
Drought, Flood, Hurricane/Tropical Storm, Thunderstorm, Wildfire	Construct storm water detention/retention ponds at strategic locations for improved stormwater storage to hold storm water run-off and as a mitigation measure for drought and wildfire.	<i>Abandoned: No Longer Deemed Relevant</i>
Drought	Educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	<i>In progress</i>
Hurricane, Thunderstorm, Tornado, Winter Storm	Install frangible links (break away line power line connections) on electrical and telephone poles.	<i>Abandoned: Responsibility given to Power Companies</i>
Hurricanes/Tropical Storms	Construct new or retrofit appropriate existing structures to act as shelters of last resort to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	<i>Deferred to Plan Update</i>
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire	Acquire electronic message board for use during disaster response and recovery operations.	<i>Completed</i>
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane,	Acquire and distribute radios and transmitters for first responders and volunteers. Acquire and distribute NOAA weather radios for vulnerable populations.	<i>In progress</i>



Thunderstorm, Tornado, Wildfire, Winter Storms		
Dam Failure	Perform research to gather more refined data depicting dam failure inundation zones or work to generate such data.	<i>In progress</i>

<b>City of Center Mitigation Actions Status</b>		
<b>Hazards Addressed</b>	<b>Mitigation Actions</b>	<b>Status</b>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Elevate and reinforce roadways and bridges prone to inundation from flooding. Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.	<i>In Progress</i>
<b>Wildfire</b>	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.	<i>Deferred to Plan Update</i>
<b>Hurricanes, Tornado, Drought, Ice Storm</b>	Upgrade existing debris management disposal procedures and capabilities in coordination with TCEQ requirements and recommendations (when applicable).	<i>In Progress</i>
<b>Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire</b>	Install warning sirens at strategic locations for use during disaster events.	<i>Abandoned: Adopted use of weather warning call system (CodeRed)</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm, Drought</b>	Inventory and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways.	<i>In Progress</i>
<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center (EOC) during a hazard event.	<i>Completed</i>
<b>Flood, Hurricanes, Thunderstorms, Tornadoes</b>	Storm-harden and/or retrofit existing and newly constructed critical facilities. Actions can include but are not limited to: installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations),	<i>In Progress</i>

	fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	
<b>Dam Failure, Earthquake, Extreme Heat, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical generators for critical facilities and infrastructure.	<i>In Progress</i>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Upgrade stormwater conveyance capacity via drainage improvement projects. Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	<i>In Progress</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials/Pipeline Failure Incidents, Hurricane/Tropical Storm, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Educate the residents of Shelby County and participating jurisdictions on safety and planning for the hazards identified in this plan.	<i>In Progress</i>
<b>Tornados</b>	Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Completed</i>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Acquire flood prone/repetitive loss properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	<i>Deferred to Plan Update</i>
<b>Wildfire</b>	Incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	<i>In Progress</i>
<b>Dam Failure, Flood, Hurricane</b>	Pursue participation in the NFIP for Shelby County since it is currently not participating and develop thorough floodplain administration procedures.	<i>Completed</i>
<b>Wildfire</b>	Educate homeowners and builders on the importance of maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	<i>In Progress</i>

<b>Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	<i>In Progress</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Develop-upgrade contact info database for 1st responders, volunteers, special needs populations.	<i>Completed</i>
<b>Tornados</b>	Provide instruction for homeowners to install safe rooms to provide protection from tornados and straight line winds in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
<b>Tornados</b>	Construct tornado-safe shelters in low-moderate income manufactured home parks with more than 20 units, in compliance with Housing and Urban Development standards for CDBG funding assistance and National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
<b>Extreme Heat, Winter Storm</b>	Retrofit existing structures to act as cooling centers during extreme heat events, and warming centers during winter storms.	<i>In Progress</i>
<b>Wildfire</b>	Conduct mechanical thinning to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	<i>In Progress</i>
<b>Drought, Flood, Hurricane/Tropical Storm, Thunderstorm, Wildfire</b>	Construct storm water detention/retention ponds at strategic locations for improved stormwater storage to hold storm water run-off and as a mitigation measure for drought and wildfire.	<i>In Progress</i>
<b>Drought</b>	Educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	<i>In Progress</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm</b>	Install frangible links (break away line power line connections) on electrical and telephone poles.	<i>In Progress</i>

<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit appropriate existing structures to act as shelters of last resort to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	<i>Deferred to Plan Update</i>
<b>Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire</b>	Acquire electronic message board for use during disaster response and recovery operations.	<i>Completed</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storms</b>	Acquire and distribute radios and transmitters for first responders and volunteers. Acquire and distribute NOAA weather radios for vulnerable populations.	<i>In Progress</i>
<b>Dam Failure</b>	Perform research to gather more refined data depicting dam failure inundation zones or work to generate such data.	<i>In Progress</i>
<b>Dam Failure, Flood, Hurricane</b>	Continue participation in the NFIP and development of thorough floodplain administration procedures.	<i>Completed</i>
<b>Flood, Hurricanes, Thunderstorms, Tornados</b>	Pursue retrofit projects specifically storm-hardening of the Emergency Operations Center (EOC) building and other critical facilities.	<i>In Progress</i>
<b>Hazardous Materials</b>	Perform Tier 2 chemical storage facility inspections in conjunction with the county.	<i>Completed</i>

<b>City of Huxley Mitigation Actions Status</b>		
<b>Hazards Addressed</b>	<b>Mitigation Actions</b>	<b>Status</b>
<b>Wildfire</b>	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.	<i>Deferred to Plan Update</i>

<b>Hurricanes, Tornado, Drought, Ice Storm</b>	Upgrade existing debris management disposal procedures and capabilities in coordination with TCEQ requirements and recommendations (when applicable).	<i>Deferred to Plan Update</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm, Drought</b>	Inventory and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways.	<i>Deferred to Plan Update</i>
<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center (EOC) during a hazard event.	<i>Deferred to Plan Update</i>
<b>Flood, Hurricanes, Thunderstorms, TORNADOS</b>	Storm-harden and/or retrofit existing and newly constructed critical facilities. Actions can include but are not limited to: installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	<i>Deferred to Plan Update</i>
<b>Earthquake, Extreme Heat, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical generators for critical facilities and infrastructure.	<i>Completed</i>
<b>Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials/Pipeline Failure Incidents, Hurricane/Tropical Storm, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Educate the residents of Shelby County and participating jurisdictions on safety and planning for the hazards identified in this plan.	<i>Deferred to Plan Update</i>
<b>TORNADOS</b>	Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
<b>Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Acquire flood prone/repetitive loss properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	<i>Deferred to Plan Update</i>
<b>Wildfire</b>	Incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	<i>Deferred to Plan Update</i>
<b>Flood, Hurricane</b>	Pursue participation in the NFIP for Shelby County since it is currently not participating and develop thorough floodplain administration procedures.	<i>Abandoned: No Longer Deemed Relevant</i>

<b>Wildfire</b>	Educate homeowners and builders on the importance of maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	<i>Deferred to Plan Update</i>
<b>Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	<i>Deferred to Plan Update</i>
<b>Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Develop-upgrade contact info database for 1st responders, volunteers, special needs populations.	<i>In Progress</i>
<b>Tornados</b>	Provide instruction for homeowners to install safe rooms to provide protection from tornados and straight line winds in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
<b>Tornados</b>	Construct tornado-safe shelters in low-moderate income manufactured home parks with more than 20 units, in compliance with Housing and Urban Development standards for CDBG funding assistance and National Performance Criteria for Tornado Shelters specifications.	<i>Abandoned: Lack of infrastructure</i>
<b>Extreme Heat, Winter Storm</b>	Retrofit existing structures to act as cooling centers during extreme heat events, and warming centers during winter storms.	<i>Deferred to Plan Update</i>
<b>Wildfire</b>	Conduct mechanical thinning to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	<i>Deferred to Plan Update</i>
<b>Drought, Flood, Hurricane/Tropical Storm, Thunderstorm, Wildfire</b>	Construct storm water detention/retention ponds at strategic locations for improved stormwater storage to hold storm water run-off and as a mitigation measure for drought and wildfire.	<i>Deferred to Plan Update</i>
<b>Drought</b>	Educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	<i>Deferred to Plan Update</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm</b>	Install frangible links (break away line power line connections) on electrical and telephone poles.	<i>Abandoned: Not within scope</i>
<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit appropriate existing structures to act as shelters of last resort to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	<i>Abandoned: Lack of infrastructure</i>

<b>Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire</b>	Acquire electronic message board for use during disaster response and recovery operations.	<i>Deferred to Plan Update</i>
<b>Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storms</b>	Acquire and distribute radios and transmitters for first responders and volunteers. Acquire and distribute NOAA weather radios for vulnerable populations.	<i>Deferred to Plan Update</i>
<b>Flood, Hurricane</b>	Continue participation in the NFIP and development of thorough floodplain administration procedures.	<i>Deferred to Plan Update</i>
<b>Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Upgrade stormwater conveyance capacity via drainage improvement projects. Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	<i>Deferred to Plan Update</i>

<b>City of Joaquin Mitigation Actions Status</b>		
<b>Hazards Addressed</b>	<b>Mitigation Actions</b>	<b>Status</b>
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	Elevate and reinforce roadways and bridges prone to inundation from flooding. Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.	<i>In Progress</i>
Wildfire	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.	<i>In Progress</i>
Hurricanes, Tornado, Drought, Ice Storm	Upgrade existing debris management disposal procedures and capabilities in coordination with TCEQ requirements and recommendations (when applicable).	<i>In Progress</i>
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire	Install warning sirens at strategic locations for use during disaster events.	<i>Deferred to Plan Update</i>
Hurricane, Thunderstorm, Tornado, Winter Storm, Drought	Inventory and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways.	<i>In Progress</i>
Hurricanes/Tropical Storms	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center (EOC) during a hazard event.	<i>Deferred to Plan Update</i>

Flood, Hurricanes, Thunderstorms, TORNADOS	Storm-harden and/or retrofit existing and newly constructed critical facilities. Actions can include but are not limited to: installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	<i>Deferred to Plan Update</i>
Dam Failure, Earthquake, Extreme Heat, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm	Install electrical generators for critical facilities and infrastructure.	<i>Deferred to Plan Update</i>
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	Upgrade stormwater conveyance capacity via drainage improvement projects. Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	<i>In Progress</i>
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials/Pipeline Failure Incidents, Hurricane/Tropical Storm, Thunderstorm, Tornado, Wildfire, Winter Storm	Educate the residents of Shelby County and participating jurisdictions on safety and planning for the hazards identified in this plan.	<i>In Progress</i>
TORNADOS	Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	Acquire flood prone/repetitive loss properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	<i>Abandoned: No Longer Deemed Relevant</i>
Wildfire	Incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	<i>In Progress</i>
Dam Failure, Flood, Hurricane	Pursue participation in the NFIP for Shelby County since it is currently not participating and develop thorough floodplain administration procedures.	<i>In Progress</i>
Wildfire	Educate homeowners and builders on the importance of maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	<i>In Progress</i>
Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm	Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and	<i>Deferred to Plan Update</i>



	residential development to consider underground electric and communications lines.	
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm	Develop-upgrade contact info database for 1st responders, volunteers, special needs populations.	<i>In Progress</i>
Tornados	Provide instruction for homeowners to install safe rooms to provide protection from tornados and straight line winds in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
Tornados	Construct tornado-safe shelters in low-moderate income manufactured home parks with more than 20 units, in compliance with Housing and Urban Development standards for CDBG funding assistance and National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
Extreme Heat, Winter Storm	Retrofit existing structures to act as cooling centers during extreme heat events, and warming centers during winter storms.	<i>Deferred to Plan Update</i>
Wildfire	Conduct mechanical thinning to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	<i>Abandoned: Forest Service responsibility</i>
Drought, Flood, Hurricane/Tropical Storm, Thunderstorm, Wildfire	Construct storm water detention/retention ponds at strategic locations for improved stormwater storage to hold storm water run-off and as a mitigation measure for drought and wildfire.	<i>Deferred to Plan Update</i>
Drought	Educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	<i>In Progress</i>
Hurricane, Thunderstorm, Tornado, Winter Storm	Install frangible links (break away line power line connections) on electrical and telephone poles.	<i>Abandoned: Power companies' responsibility</i>
Hurricanes/Tropical Storms	Construct new or retrofit appropriate existing structures to act as shelters of last resort to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	<i>Deferred to Plan Update</i>
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire	Acquire electronic message board for use during disaster response and recovery operations.	<i>In Progress</i>

Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storms	Acquire and distribute radios and transmitters for first responders and volunteers. Acquire and distribute NOAA weather radios for vulnerable populations.	<i>In Progress</i>
Dam Failure	Perform research to gather more refined data depicting dam failure inundation zones or work to generate such data.	<i>In Progress</i>
Dam Failure, Flood, Hurricane	Continue participation in the NFIP and development of thorough floodplain administration procedures.	<i>In Progress</i>

<b>City of Tenaha Mitigation Actions Status</b>		
<b>Hazards Addressed</b>	<b>Mitigation Actions</b>	<b>Status</b>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Elevate and reinforce roadways and bridges prone to inundation from flooding. Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.	<i>In Progress</i>
<b>Wildfire</b>	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.	<i>Deferred to Plan Update</i>
<b>Hurricanes, Tornado, Drought, Ice Storm</b>	Upgrade existing debris management disposal procedures and capabilities in coordination with TCEQ requirements and recommendations (when applicable).	<i>In Progress</i>
<b>Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire</b>	Install warning sirens at strategic locations for use during disaster events.	<i>Completed</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm, Drought</b>	Inventory and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways.	<i>In Progress</i>
<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center (EOC) during a hazard event.	<i>Completed</i>
<b>Flood, Hurricanes, Thunderstorms, Tornadoes</b>	Storm-harden and/or retrofit existing and newly constructed critical facilities. Actions can include but are not limited to: installing window	<i>Deferred to Plan Update</i>

	screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	
<b>Dam Failure, Earthquake, Extreme Heat, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical generators for critical facilities and infrastructure.	<i>Completed</i>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Upgrade stormwater conveyance capacity via drainage improvement projects. Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	<i>Deferred to Plan Update</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials/Pipeline Failure Incidents, Hurricane/Tropical Storm, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Educate the residents of Shelby County and participating jurisdictions on safety and planning for the hazards identified in this plan.	<i>In Progress</i>
<b>Tornados</b>	Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>In Progress</i>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Acquire flood prone/repetitive loss properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	<i>Deferred to Plan Update</i>
<b>Wildfire</b>	Incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	<i>Deferred to Plan Update</i>
<b>Dam Failure, Flood, Hurricane</b>	Pursue participation in the NFIP for Shelby County since it is currently not participating and develop thorough floodplain administration procedures.	<i>In Progress</i>
<b>Wildfire</b>	Educate homeowners and builders on the importance of maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	<i>In Progress</i>
<b>Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	<i>Deferred to Plan Update</i>

<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Develop-upgrade contact info database for 1st responders, volunteers, special needs populations.	<i>In Progress</i>
<b>Tornados</b>	Provide instruction for homeowners to install safe rooms to provide protection from tornados and straight line winds in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>In Progress</i>
<b>Tornados</b>	Construct tornado-safe shelters in low-moderate income manufactured home parks with more than 20 units, in compliance with Housing and Urban Development standards for CDBG funding assistance and National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
<b>Extreme Heat, Winter Storm</b>	Retrofit existing structures to act as cooling centers during extreme heat events, and warming centers during winter storms.	<i>Deferred to Plan Update</i>
<b>Wildfire</b>	Conduct mechanical thinning to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	<i>Deferred to Plan Update</i>
<b>Drought, Flood, Hurricane/Tropical Storm, Thunderstorm, Wildfire</b>	Construct storm water detention/retention ponds at strategic locations for improved stormwater storage to hold storm water run-off and as a mitigation measure for drought and wildfire.	<i>Deferred to Plan Update</i>
<b>Drought</b>	Educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	<i>In Progress</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm</b>	Install frangible links (break away line power line connections) on electrical and telephone poles.	<i>In Progress</i>
<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit appropriate existing structures to act as shelters of last resort to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	<i>Deferred to Plan Update</i>
<b>Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire</b>	Acquire electronic message board for use during disaster response and recovery operations.	<i>Deferred to Plan Update</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storms</b>	Acquire and distribute radios and transmitters for first responders and volunteers. Acquire and distribute NOAA weather radios for vulnerable populations.	<i>Completed</i>

Dam Failure	Perform research to gather more refined data depicting dam failure inundation zones or work to generate such data.	<i>In Progress</i>
Dam Failure, Flood, Hurricane	Continue participation in the NFIP and development of thorough floodplain administration procedures.	<i>In Progress</i>

<b>City of Timpson Mitigation Actions Status</b>		
<b>Hazards Addressed</b>	<b>Mitigation Actions</b>	<b>Status</b>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Elevate and reinforce roadways and bridges prone to inundation from flooding. Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.	<i>Completed</i>
<b>Wildfire</b>	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Hurricanes, Tornado, Drought, Ice Storm</b>	Upgrade existing debris management disposal procedures and capabilities in coordination with TCEQ requirements and recommendations (when applicable).	<i>Completed</i>
<b>Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire</b>	Install warning sirens at strategic locations for use during disaster events.	<i>Completed</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm, Drought</b>	Inventory and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways.	<i>In Progress</i>
<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center (EOC) during a hazard event.	<i>Completed</i>
<b>Flood, Hurricanes, Thunderstorms, Tornadoes</b>	Storm-harden and/or retrofit existing and newly constructed critical facilities. Actions can include but are not limited to: installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	<i>Completed</i>

<b>Dam Failure, Earthquake, Extreme Heat, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical generators for critical facilities and infrastructure.	<i>Completed</i>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Upgrade stormwater conveyance capacity via drainage improvement projects. Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	<i>In Progress</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials/Pipeline Failure Incidents, Hurricane/Tropical Storm, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Educate the residents of Shelby County and participating jurisdictions on safety and planning for the hazards identified in this plan.	<i>In Progress</i>
<b>Tornados</b>	Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Deferred to Plan Update</i>
<b>Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm</b>	Acquire flood prone/repetitive loss properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	<i>Completed</i>
<b>Wildfire</b>	Incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Dam Failure, Flood, Hurricane</b>	Pursue participation in the NFIP for Shelby County since it is currently not participating and develop thorough floodplain administration procedures.	<i>Completed</i>
<b>Wildfire</b>	Educate homeowners and builders on the importance of maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	<i>In Progress</i>
<b>Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	<i>Completed</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm</b>	Develop-upgrade contact info database for 1st responders, volunteers, special needs populations.	<i>Completed</i>

<b>Tornados</b>	Provide instruction for homeowners to install safe rooms to provide protection from tornados and straight line winds in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Tornados</b>	Construct tornado-safe shelters in low-moderate income manufactured home parks with more than 20 units, in compliance with Housing and Urban Development standards for CDBG funding assistance and National Performance Criteria for Tornado Shelters specifications.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Extreme Heat, Winter Storm</b>	Retrofit existing structures to act as cooling centers during extreme heat events, and warming centers during winter storms.	<i>Deferred to Plan Update</i>
<b>Wildfire</b>	Conduct mechanical thinning to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Drought, Flood, Hurricane/Tropical Storm, Thunderstorm, Wildfire</b>	Construct storm water detention/retention ponds at strategic locations for improved stormwater storage to hold storm water run-off and as a mitigation measure for drought and wildfire.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Drought</b>	Educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	<i>Completed</i>
<b>Hurricane, Thunderstorm, Tornado, Winter Storm</b>	Install frangible links (break away line power line connections) on electrical and telephone poles.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Hurricanes/Tropical Storms</b>	Construct new or retrofit appropriate existing structures to act as shelters of last resort to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	<i>Abandoned: no longer deemed relevant</i>
<b>Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire</b>	Acquire electronic message board for use during disaster response and recovery operations.	<i>Abandoned: No Longer Deemed Relevant</i>
<b>Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storms</b>	Acquire and distribute radios and transmitters for first responders and volunteers. Acquire and distribute NOAA weather radios for vulnerable populations.	<i>Completed</i>
<b>Dam Failure</b>	Perform research to gather more refined data depicting dam failure inundation zones or work to generate such data.	<i>Deferred to Plan Update</i>

<b>Dam Failure, Flood, Hurricane</b>	Continue participation in the NFIP and development of thorough floodplain administration procedures.	<i>Completed</i>
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Each jurisdiction has its own established process for integrating new actions, codes, ordinances, plans, and studies into its existing capabilities. Currently, integration of the previous 2016 plan into other planning mechanisms within the County is unknown. Therefore, new tracking measures may be implemented to ensure future staff are aware of plan integration moving forward. The planning team will ensure that each jurisdiction’s various departments continue to integrate hazard mitigation actions into their day-to-day processes.



Table 79: Plan Integration

Department	All Departments	Commissioners' Court, Road and Bridge, Mayor's Office/Council, Public Works, Economic Development	Planning, Zoning, Economic Development, Public Works, Mayor's Office, Floodplain Manager	Office of Emergency Management, Mayor's Office, Mayor and Council, Commissioners' Court	Office of Emergency Management, Mayor's Office, Chief of Fire Department	Office of Emergency Management, Mayor's Office, Administrative Office	Floodplain Manager, Mayor's Office
Activity	Annual Budget	Capital Improvement Projects	Comprehensive Master Plan	Public Involvement	Emergency Operations	Grant Application	Floodplain Management
Time Frame	Quarterly/ Annual workshops	Bi-annually	Every 10 Years	As Needed	Annually	Annual Funding Cycles	Annually
Integration Process	Discuss integration of medium and high priority actions with Commissioners' Court, Council, or Schoolboard (as appropriate) concerning feasibility, potential funding sources, and a preliminary cost benefit review.	Discuss inclusion of mitigation actions with CIPs. Ensure CIPs are consistent with mitigation actions, NFIP compliance, and any new land use development.	Review existing floodplain and land use controls to ensure that long term goals are consistent with actions in the HMAP.	Utilize jurisdictional web sites, social media, and other forms of advertising to make announcements of any periodic review activities concerning potential amendments or updating of the HMAP	Review prevention and protection projects for continued relevance. Ensure appropriate actions and information are included in the Emergency Operation Plan.	Review and update mitigation actions as necessary based on funding opportunities available through FEMA FMA, FEMA PDM, FEMA HMGP, and other grant funding sources.	Update and maintain floodplain information including but not limited to: maps, construction practices, permitting, and NFIP compliance.
Jurisdiction							
Shelby County	X	X	X	X	X	X	
City of Center	X	X	X	X	X	X	X
City of Huxley	X	X		X		X	
City Joaquin	X	X		X		X	
City of Tenaha	X	X		X	X	X	X
City of Timpson	X	X	X	X	X	X	

Each new mitigation action below outlines the following requirements: the identified responsible department head or delegate will research all relevant information to confirm the action’s feasibility and prioritization, will formulate a plan of action, and will confirm funding sources and identify any fiscal liabilities associated with the mitigation action.

As part of each jurisdiction’s commitment to transparency, all relevant information, including but not limited to that described above and in each action’s description, will be presented to the public before the action is formally adopted for implementation. After public notification, the integration process will resemble the one outlined in Table 81 below.

**Table 80: Integration Process**

<b>Jurisdiction</b>	<b>Integration Process</b>
Shelby County	<p>After considering integrating mitigation actions with the activities outlined in Table 79 above, mitigation actions will be presented, considered, and formally adopted by the County Commissioners’ Court and County Judge.</p> <p>Shelby County will also use the Shelby County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>
City of Center	<p>After considering integrating mitigation actions with the activities outlined in Table 79 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor.</p> <p>The City of Center will also use the Shelby County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>
City of Huxley	<p>After considering integrating mitigation actions with the activities outlined in Table 79 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor.</p> <p>The City of Huxley will also use the Shelby County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>
City of Joaquin	<p>After considering integrating mitigation actions with the activities outlined in Table 79 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor.</p> <p>The City of Joaquin will also use the Shelby County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>
City of Tenaha	<p>After considering integrating mitigation actions with the activities outlined in Table 79 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor.</p>

	The City of Tenaha will also use the Shelby County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
City of Timpson	<p>After considering integrating mitigation actions with the activities outlined in Table 79 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor.</p> <p>The City of Timpson will also use the Shelby County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.</p>

***C) Mitigation Actions by Jurisdiction and by Hazard***

Each jurisdiction has selected actions that were identified as high or medium priority and that are in line with TDEM’s recommended mitigation actions. However, many of the mitigation actions below are dependent upon outside grant funding for implementation. For all actions likely to require grant funding, potential sources have been identified. However, grant funding is awarded on a competitive basis, thus applying for funding doesn’t guarantee that funds will be received. Shelby County and the participating jurisdictions have a successful history of applying for and receiving grant funding to implement physical infrastructure actions. Budget constraints will remain the determining factor for how and when each action is implemented.

i. **Shelby County**

**Multi-Hazard Actions**

The following mitigation action items may indicate an asterisk (\*) in the case the new actions reflect actions that were deferred from the previous 2016 plan.

Mitigation Action	Educational Outreach *
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure, Hazardous Materials
Priority	Medium
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source (s)	Shelby County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Implement a Tree Trimming Program
Objective	This action will develop and implement a tree trimming program to reduce wildfire fuels and minimize the amount of debris generated during natural hazard events. Projects may include but are not limited to trees along power lines within the jurisdiction that are connected to critical facilities and creating firebreaks.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Weather, Severe Winds
Priority	Medium
Estimated Cost	\$10,000 - \$500,0000
Potential Funding Source(s)	Shelby County, FEMA PDM, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Set up Cooling and Heating Centers *
Objective	The action's goal is to increase resilience by limiting vulnerable populations' exposure to extreme weather by creating new or opening existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Weather
Priority	Medium
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source (s)	Shelby County, FEMA PDM, FEMA HMGP
Responsible Department	County Commissioners' Court & Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Install and/or Purchase Back Up Power Generators
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure, Hazardous Materials
Priority	Medium
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	Shelby County, FEMA PDM, FEMA HMGP
Responsible Department	Commissioners' Court & Emergency Management
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Install and Expand Warning Systems/Weather Radio *
Objective	Warning systems will help limit local vulnerability to tornados by giving residents an opportunity to take shelter before one occurs.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure, Hazardous Materials
Priority	Medium
Estimated Cost	\$1,000 - \$100,000 per device
Potential Funding Source (s)	Shelby County, FEMA BRIC, FEMA HMGP

Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	Short Term – 1 - 5 Years
Target	Existing and future population

Mitigation Action	Establish Community Safe Rooms *
Objective	The action's goal is to provide a place of temporary refuge and or supply distribution location for the vulnerable public before, after, and during Hurricane/Tropical Storm and Tornado events. This action proposes constructing new or retrofit existing structures to serve as a safe room.
Hazard	Hurricane/Tropical Storm, Tornado
Priority	High
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	Shelby County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court & Emergency Management
Implementation Schedule	Short Term: 1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Harden Facilities *
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment.
Hazard	Hurricane/Tropical Storm, Tornado, Hailstorm, Windstorm, Drought
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	Shelby County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	Greater than 5 Years
Target	Existing infrastructure

### Single Hazard Actions

Mitigation Action	Develop and Implement a Flood Damage Prevention Ordinance
Objective	The jurisdiction will re-evaluate all existing flood damage prevention measures to identify strengths and weaknesses in order to develop and enforce a new flood damage prevention ordinance and identify a floodplain manager, in compliance with the NFIP.
Hazard	Flood
Priority	Low
Estimated Cost	Less than \$50,000
Potential Funding Source (s)	County
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Construct or Upgrade Storm Drainage Infrastructure
Objective	This action proposes constructing new storm drainage infrastructure to reduce the potential impacts of future flood events.
Hazard	Flooding
Priority	Medium
Estimated Cost	More than \$100,000
Potential Funding Source (s)	Shelby County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Commissioners' Court
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Install Automated Flood Warning System
Objective	An automated flood warning system will help limit local vulnerability to floods by giving residents an opportunity to take shelter before an event occurs.
Hazard	Flooding
Priority	High
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	Shelby County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court, Police Department, and Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

<b>Mitigation Action</b>	<b>Replace Water Fixtures with Low Flow Units</b>
Objective	This action's goal is to limit water consumption at County-owned and maintained facilities by replacing traditional water fixtures with low flow units.
Hazard	Drought
Priority	Medium
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source (s)	Shelby County, FEMA BRIC, FEMA HMGP, GLO
Responsible Department	County Commissioners' Court
Implementation Schedule	Medium Term: 3-5 Years
Target	Existing and Future infrastructure

<b>Mitigation Action</b>	<b>Install Surge Protection and Grounding Systems to Protect Electronic Assets</b>
Objective	This action will install surge protection at all County facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	\$1,000 - \$50,000
Potential Funding Source (s)	Shelby County, FEMA PDM, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	0 - 2 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Conduct Dam Failure Studies</b>
Objective	This action will install surge protection at all County facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	County, FEMA PDM, FEMA HMGP
Responsible Department	Commissioner's Court, Emergency Management, City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure



<b>Mitigation Action</b>	<b>Restrict development in high hazard areas</b>
Objective	This action will re-evaluate all existing floodplain construction restrictions to identify strengths and weaknesses in order to produce a new ordinance that will reduce potential flood impacts due to dam / levee failure by restricting development in areas that may be subject to inundation due to dam / levee failure.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$10,000
Potential Funding Source (s)	City
Responsible Department	Mayor and Council, Planning, Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Mandate Freeboard on Structures to Reduce Flooding Damage</b>
Objective	This action updating the City's flood ordinance to mandate freeboard on structures to improve the City's resilience and minimize damages to future construction.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City
Responsible Department	Mayor and Council, Planning, Ordinance, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Future development

ii. City of Center

The following mitigation action items may indicate an asterisk (\*) in the case the new actions reflect actions that were deferred from the previous 2016 plan.

**Multi-Hazard Actions**

Mitigation Action	Educational Outreach *
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	High
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source(s)	City of Center, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Emergency Management & City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Install and Expand Warning Systems/Weather Radio *
Objective	Warning systems will help limit local vulnerability to tornados by giving residents an opportunity to take shelter before one occurs.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$100,000 per device
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management & City Administration
Implementation Schedule	Short Term – 1 - 5 Years
Target	Existing and future population

Mitigation Action	Implement a Tree Trimming Program *
Objective	This action will develop and implement a tree trimming program to reduce wildfire fuels and minimize the amount of debris generated during natural hazard events. Projects may include but are not

	limited to trees along power lines within the jurisdiction that are connected to critical facilities and creating firebreaks.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Weather, Severe Winds
Priority	Medium
Estimated Cost	\$10,000 - \$500,0000
Potential Funding Source(s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department	Public Works
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

<b>Mitigation Action</b>	<b>Set up Cooling and Heating Centers in Facilities *</b>
Objective	The action's goal is to increase resilience by limiting vulnerable populations' exposure to extreme heat by creating new or opening existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Weather
Priority	Low
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council & Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Install Impact and Wind-resistant Windows and Doors at Public Facilities</b>
Objective	This action proposes hardening facilities. Hardening will include adding impact and wind-resistant doors and windows at critical and public facilities in the City.
Hazard	Hurricane / Tropical Storm, Tornados, Hailstorm, Severe Winds
Priority	Medium
Estimated Cost	\$100,000
Potential Funding Source(s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and City Council, Building Code, City Administration
Implementation Schedule	5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Establish Community Safe Rooms *</b>
Objective	The action's goal is to provide a place of temporary refuge and or supply distribution location for the vulnerable public before, after, and during Hurricane/Tropical Storm and Tornado events. This

	action proposes constructing new or retrofit existing structures to serve as a safe room.
Hazard	Hurricane/Tropical Storm, Tornado
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Emergency Management, City Administration
Implementation Schedule	Short Term: 1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Harden Facilities *
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment.
Hazard	Hurricane/Tropical Storm, Tornado, Hailstorm, Windstorm, Drought
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	Greater than 5 Years
Target	Existing infrastructure

Mitigation Action	Install and/or Purchase Back Up Power Generators *
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	High
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council, City Administration
Implementation Schedule	5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Property Acquisition *</b>
Objective	Acquire flood properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.
Hazard	Hurricane/Tropical Storm, Flood, Dam Failure
Priority	Medium
Estimated Cost	Greater than \$100,000s
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, GLO
Responsible Department	Mayor & Council, Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Construct Storm Drainage Infrastructure *</b>
Objective	This action proposes constructing new storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to detention ponds.
Hazard	Flooding, Hurricanes/Tropical Storms
Priority	Medium
Estimated Cost	More than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works & City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

### *Single Hazard Actions*

<b>Mitigation Action</b>	<b>Install Automated Flood Warning System</b>
Objective	An automated flood warning system will help limit local vulnerability to floods by giving residents an opportunity to take shelter before an event occurs.
Hazard	Flooding
Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City of Center, FEMA BRIC, FEMA HMGP
Responsible Department	Fire Department, Police Department, and Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

<b>Mitigation Action</b>	<b>Create Drainage Master Plan</b>
Objective	This action proposes creating a drainage master plan for the City, in conjunction with the County, that will provide the City with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.

Hazard	Flood
Priority	High
Estimated Cost	Less than \$100,000
Potential Funding Source (s)	City of Center, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	City Administration & Emergency Management
Implementation Schedule	5 Years
Target	Existing and future infrastructure

Mitigation Action	Wildfire CWPP*
Objective	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.
Hazard	Wildfire
Priority	Medium
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source(s)	City of Center, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1-5 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Drought Contingency Plan
Objective	Re-evaluate all existing drought control measures to identify strengths and weaknesses in order to develop and enforce a new or updated drought contingency plan.
Hazard	Drought
Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source(s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1-5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Develop and Implement a New Water Conservation Ordinance
Objective	Jurisdiction will re-evaluate all existing water conservation and reduction measures to identify strengths and weaknesses in order to develop and enforce a new water conservation ordinance.
Hazard	Drought
Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and City Council, Public Works, Ordinance, City Administration

Implementation Schedule	Short Term – 1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Replace Current Landscaping with Drought Resistant Plant Varieties
Objective	This action's goal is to limit water consumption and maintained facilities by replacing existing landscaping with more drought resistant types.
Hazard	Drought
Priority	Medium
Estimated Cost	Less than \$100,000
Potential Funding Source (s)	City of Center, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	0 – 2 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs
Objective	The City will re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Severe Winds
Priority	Medium
Estimated Cost	Less than \$100,000
Potential Funding Source (s)	City of Center, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Building Code, Ordinance, City Administration
Implementation Schedule	0 – 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Install Surge Protection and Grounding Systems to Protect Electronic Assets
Objective	This action will install surge protection at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department	Public Works, City Administration, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing infrastructure

Mitigation Action	Update Building Code Requirements
Objective	This action will update building requirements to include techniques and materials that mitigate against earthquakes.
Hazard	Earthquake
Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council, Building Code, Planning, Ordinances, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure



### iii. City of Huxley

The following mitigation action items may indicate an asterisk (\*) in the case the new actions reflect actions that were deferred from the previous 2016 plan.

#### Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	High
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	City Administration, Shelby County
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Implement a Tree Trimming Program*
Objective	This action will develop and implement a tree trimming program to reduce wildfire fuels and minimize the amount of debris generated during natural hazard events. Projects may include but are not limited to trees along power lines within the jurisdiction that are connected to critical facilities and creating firebreaks.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Weather, Severe Winds
Priority	Medium
Estimated Cost	\$10,000 - \$500,0000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

<b>Mitigation Action</b>	<b>Establish Community Safe Rooms *</b>
Objective	The action's goal is to provide a place of temporary refuge and or supply distribution location for the vulnerable public before, after, and during Hurricane/Tropical Storm and Tornado events. This action proposes constructing new or retrofit existing structures to serve as a safe room.
Hazard	Hurricane/Tropical Storm, Tornado
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Emergency Management, City Administration
Implementation Schedule	Short Term: 1 - 2 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Harden Facilities *</b>
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment, etc.
Hazard	Hurricane/Tropical Storm, Tornado, Hailstorm, Windstorm, Drought, Wildfire
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	Greater than 5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Install Impact and Wind-resistant Windows and Doors at Public Facilities</b>
Objective	This action proposes hardening facilities. Hardening will include adding impact and wind-resistant doors and windows at critical and public facilities in the City.
Hazard	Hurricane / Tropical Storm, Tornados, Hailstorm, Severe Winds
Priority	Low
Estimated Cost	\$100,000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department	City Administration, Mayor and City Council

Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Purchase Back Up Power Generators
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	City Administration & Public Works
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Set up Cooling and Heating Centers in Facilities *
Objective	The action's goal is to increase resilience by limiting vulnerable populations' exposure to extreme heat by creating new or opening existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Weather
Priority	Low
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council & Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Property Acquisition *
Objective	Acquire flood properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.

Hazard	Hurricane/Tropical Storm, Flood, Dam Failure
Priority	Medium
Estimated Cost	Greater than \$100,000s
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Install and Expand Warning Systems/Weather Radio *</b>
Objective	Warning systems will help limit local vulnerability to tornados by giving residents an opportunity to take shelter before one occurs.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$100,000 per device
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management & City Administration
Implementation Schedule	Short Term – 1 - 5 Years
Target	Existing and future population

<b>Mitigation Action</b>	<b>Construct Storm Drainage Infrastructure *</b>
Objective	This action proposes constructing new storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to detention ponds.
Hazard	Flooding, Hurricanes/Tropical Storms
Priority	Medium
Estimated Cost	More than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works & City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Upgrade Existing Debris Management *	
Objective	Upgrade existing debris management disposal procedures and capabilities in coordination with TCEQ requirements and recommendations (when applicable).	<i>It is important to note that this action is considered a response action and not a mitigation action. Thus, TDEM/FEMA would not consider this action under mitigation funding. However, the jurisdiction would like to include this action in the plan as it has been deferred from the previous 2016 Plan.</i>
Hazard	Hurricanes, Tornado, Drought, Ice Storm	
Priority	Low	
Estimated Cost	\$10,000 - \$500,0000	
Potential Funding Source(s)	City and External Sources	
Responsible Department	City Administration & Public Works	
Implementation Schedule	1 - 5 Years	
Target	Existing and future infrastructure	

Mitigation Action	Underground Electrical and Communications Lines *	
Objective	This action will Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	
Hazard	Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm	
Priority	Low	
Estimated Cost	\$10,000 - \$100,000	
Potential Funding Source(s)	City, FEMA BRIC	
Responsible Department(s)	Mayor and City Council, Public Works, City Administration	
Implementation Schedule	1 -5 Years	
Target	Existing and future infrastructure	

### Single Hazard Actions

Mitigation Action	Wildfire CWPP *	
Objective	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.	
Hazard	Wildfire	
Priority	Low	
Estimated Cost	\$10,000 - \$100,000	
Potential Funding Source(s)	City, FEMA BRIC	

Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Incorporate Firewise Construction Methods and Materials *
Objective	This action will incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.
Hazard	Wildfire
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source(s)	City, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Implement Mechanical Thinning Processes *
Objective	This action proposes conducting mechanical thinning to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.
Hazard	Wildfire
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source(s)	City of Center, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a Flood Damage Prevention Ordinance
Objective	The jurisdiction will re-evaluate all existing flood damage prevention measures to identify strengths and weaknesses in order to develop and enforce a new flood damage prevention ordinance and identify a floodplain manager, in compliance with the NFIP.
Hazard	Flood
Priority	Low
Estimated Cost	Less than \$50,000
Potential Funding Source(s)	City

Responsible Department(s)	Mayor and City Council
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Install Surge Protection and Grounding Systems to Protect Electronic Assets *</b>
Objective	This action will install surge protection at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	City of Huxley, FEMA PDM, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	1 - 5 Years
Target	Existing infrastructure

**iv. City of Joaquin**

The following mitigation action items may indicate an asterisk (\*) in the case the new actions reflect actions that were deferred from the previous 2016 plan.

**Multi-Hazard Actions**

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	City Administration, Emergency Management, Public Works, Fire Department
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Set up Cooling and Heating Centers in Facilities *
Objective	The action's goal is to increase resilience by limiting vulnerable populations' exposure to extreme heat by creating new or opening existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Weather
Priority	Low
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council & Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure



<b>Mitigation Action</b>	<b>Purchase Back Up Power Generators *</b>
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Low
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Public Works, Emergency Management
Implementation Schedule	5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Install and Expand Warning Systems/Weather Radio *</b>
Objective	Warning systems will help limit local vulnerability to tornados by giving residents an opportunity to take shelter before one occurs.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	High
Estimated Cost	\$1,000 - \$100,000 per device
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management & City Administration
Implementation Schedule	Short Term – 1 - 5 Years
Target	Existing and future population

<b>Mitigation Action</b>	<b>Harden Facilities *</b>
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment, etc.

Hazard	Hurricane/Tropical Storm, Tornado, Hailstorm, Windstorm, Drought, Wildfire
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration, Public Works, Emergency Management
Implementation Schedule	Greater than 5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Establish Community Safe Rooms *</b>
Objective	The action's goal is to provide a place of temporary refuge and or supply distribution location for the vulnerable public before, after, and during Hurricane/Tropical Storm and Tornado events. This action proposes constructing new or retrofit existing structures to serve as a safe room.
Hazard	Hurricane/Tropical Storm, Tornado
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Emergency Management, City Administration
Implementation Schedule	Short Term: 1 - 2 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Construct/Upgrade Storm Drainage Infrastructure *</b>
Objective	This action proposes constructing new or upgrade storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to detention ponds.
Hazard	Flooding, Hurricanes/Tropical Storms
Priority	Medium
Estimated Cost	More than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works & City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Implement a Tree Trimming Program</b>
Objective	This action will develop and implement a tree trimming program to reduce wildfire fuels and minimize the amount of debris generated during natural hazard events. Projects may include but are not limited to trees along power lines within the jurisdiction that are connected to critical facilities and creating firebreaks.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Weather, Severe Winds
Priority	Medium
Estimated Cost	\$10,000 - \$500,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	City Administration, Public Works
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

<b>Mitigation Action</b>	<b>Construct Storm Drainage Infrastructure</b>
Objective	This action proposes constructing new storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to detention ponds.
Hazard	Flooding, Hurricanes/Tropical Storms
Priority	Medium
Estimated Cost	More than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works & City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Underground Electrical and Communications Lines *</b>
Objective	This action will Install electrical and communications lines underground for future and proposed critical facilities. Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.
Hazard	Hurricane, Thunderstorm, Tornado, Wildfire, Winter Storm
Priority	Low
Estimated Cost	\$10,000 - \$100,000

Potential Funding Source(s)	City, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, City Administration
Implementation Schedule	1 -5 Years
Target	Existing and future infrastructure

### Single Hazard Actions

Mitigation Action	Install Automated Flood Warning System
Objective	An automated flood warning system will help limit local vulnerability to floods by giving residents an opportunity to take shelter before an event occurs.
Hazard	Flooding
Priority	High
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration, Public Works, Fire Department, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Replace Water Fixtures with Low Flow Units
Objective	This action's goal is to limit water consumption at County-owned and maintained facilities by replacing traditional water fixtures with low flow units.
Hazard	Drought
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration, Public Works
Implementation Schedule	Medium Term: 3-5 Years
Target	Existing and Future infrastructure

Mitigation Action	Install Surge Protection and Grounding Systems to Protect Electronic Assets *
Objective	This action will install surge protection at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.

Hazard	Lightning
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	City Administration, Public Works
Implementation Schedule	1 - 5 Years
Target	Existing infrastructure

Mitigation Action	Update Building Code Requirements
Objective	This action will update building requirements to include techniques and materials that mitigate against earthquakes.
Hazard	Earthquake
Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council, Building Code, Planning, Ordinances, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Incorporate Firewise Construction Methods and Materials *
Objective	This action will incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.
Hazard	Wildfire
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source(s)	City, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

**v. City of Tenaha**

The following mitigation action items may indicate an asterisk (\*) in the case the new actions reflect actions that were deferred from the previous 2016 plan.

**Multi-Hazard Actions**

Mitigation Action	Educational Outreach *
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	High
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	City Court, Public Works, Emergency Management & City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Set up Cooling and Heating Centers in Facilities *
Objective	The action's goal is to increase resilience by limiting vulnerable populations' exposure to extreme heat by creating new or opening existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Weather
Priority	Low
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council, Planning, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Purchase Back Up Power Generators *
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure

Priority	High
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Public Works, Emergency Management
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Harden Facilities *
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment, etc.
Hazard	Hurricane/Tropical Storm, Tornado, Hailstorm, Windstorm, Drought, Wildfire
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration, Public Works, Emergency Management
Implementation Schedule	Greater than 5 Years
Target	Existing infrastructure

Mitigation Action	Install and Expand Warning Systems/Weather Radio *
Objective	Warning systems will help limit local vulnerability to tornados by giving residents an opportunity to take shelter before one occurs.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$100,000 per device
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management & City Administration
Implementation Schedule	Short Term – 1 - 5 Years
Target	Existing and future population

<b>Mitigation Action</b>	<b>Implement a Tree Trimming Program *</b>
Objective	This action will develop and implement a tree trimming program to reduce wildfire fuels and minimize the amount of debris generated during natural hazard events. Projects may include but are not limited to trees along power lines within the jurisdiction that are connected to critical facilities and creating firebreaks.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Weather, Severe Winds
Priority	Medium
Estimated Cost	\$10,000 - \$500,0000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Public Works
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

<b>Mitigation Action</b>	<b>Property Acquisition *</b>
Objective	Acquire flood properties and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.
Hazard	Hurricane/Tropical Storm, Flood, Dam Failure
Priority	Medium
Estimated Cost	Greater than \$100,000s
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Establish Community Safe Rooms *</b>
Objective	The action's goal is to provide a place of temporary refuge and or supply distribution location for the vulnerable public before, after, and during Hurricane/Tropical Storm and Tornado events. This action proposes constructing new or retrofit existing structures to serve as a safe room.
Hazard	Hurricane/Tropical Storm, Tornado
Priority	Low
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP



Responsible Department	Mayor & Council, Emergency Management, City Administration
Implementation Schedule	Short Term: 1 - 2 Years
Target	Existing and future population and infrastructure

### Single Hazard Actions

Mitigation Action	Wildfire CWPP *
Objective	Develop a Community Wildfire Protection Plan (CWPP) with the assistance of a contractor.
Hazard	Wildfire
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source(s)	City, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1 -5 Years
Target	Existing and future infrastructure

Mitigation Action	Incorporate Firewise Construction Methods and Materials *
Objective	This action will incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.
Hazard	Wildfire
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source(s)	City, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1 -5 Years
Target	Existing and future infrastructure

Mitigation Action	Upgrade Existing Drainage Pump Stations
Objective	This action proposes upgrading existing drainage pump stations to reduce the potential impacts of future flood events.
Hazard	Flooding
Priority	Medium
Estimated Cost	\$10,000 - \$100,0000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Public Works

Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Construct/Upgrade Storm Drainage Infrastructure *
Objective	This action proposes constructing new or upgrade storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to detention ponds.
Hazard	Flooding, Hurricanes/Tropical Storms
Priority	Medium
Estimated Cost	More than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works & City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Install Check Valves
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Flooding
Priority	Medium
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor & Council, Public Works
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Install Automated Flood Warning System
Objective	An automated flood warning system will help limit local vulnerability to floods by giving residents an opportunity to take shelter before an event occurs.
Hazard	Flooding

Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration, Public Works, Fire Department, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

<b>Mitigation Action</b>	<b>Install Surge Protection and Grounding Systems to Protect Electronic Assets *</b>
Objective	This action will install surge protection at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	City Administration, Public Works
Implementation Schedule	1 - 5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Update Building Code Requirements</b>
Objective	This action will update building requirements to include techniques and materials that mitigate against earthquakes.
Hazard	Earthquake
Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council, Building Code, Planning, Ordinances, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Conduct Dam Failure Studies
Objective	This action will install surge protection at all County facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council, Planning, Emergency Management, City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

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*Multi-Hazard Actions*

Mitigation Action	Educational Outreach *
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Drought, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Low
Estimated Cost	Less than \$10,000 per hazard
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor & Council, Public Work, Fire Department, Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Establish Community Safe Rooms *
Objective	The action's goal is to provide a place of temporary refuge and or supply distribution location for the vulnerable public before, after, and during Hurricane/Tropical Storm and Tornado events. This action proposes constructing new or retrofit existing structures to serve as a safe room.
Hazard	Hurricane/Tropical Storm, Tornado
Priority	Medium
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Public Work, Fire Department, Emergency Management, City Administration
Implementation Schedule	Short Term: 1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Implement a Tree Trimming Program *
Objective	This action will develop and implement a tree trimming program to reduce wildfire fuels and minimize the amount of debris generated during natural hazard events. Projects may include but are not limited

	to trees along power lines within the jurisdiction that are connected to critical facilities and creating firebreaks.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Weather, Severe Winds
Priority	Medium
Estimated Cost	\$10,000 - \$500,0000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor & Council, Public Work, Fire Department, Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

<b>Mitigation Action</b>	<b>Install Impact and Wind-resistant Windows and Doors at Public Facilities</b>
Objective	This action proposes hardening facilities. Hardening will include adding impact and wind-resistant doors and windows at critical and public facilities in the City.
Hazard	Hurricane / Tropical Storm, Tornados, Hailstorm, Severe Winds
Priority	Medium
Estimated Cost	\$100,000
Potential Funding Source(s)	City of Center, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and City Council, Emergency Management, City Administration
Implementation Schedule	5 Years
Target	Existing infrastructure

<b>Mitigation Action</b>	<b>Purchase Back Up Power Generators *</b>
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Hurricane/Tropical Storm, Flood, Wildfire, Tornado, Extreme Heat, Hailstorm, Extreme Cold, Winter Weather, Severe Winds, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than \$100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than \$100,000 Each for Portable Generators

Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor & Council, Public Works, Emergency Management, City Administration
Implementation Schedule	5 Years
Target	Existing infrastructure

Mitigation Action	Harden Facilities *
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment, etc.
Hazard	Hurricane/Tropical Storm, Tornado, Hailstorm, Windstorm, Drought, Wildfire
Priority	High
Estimated Cost	Greater than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Public Works, Emergency Management, City Administration
Implementation Schedule	Greater than 5 Years
Target	Existing infrastructure

### Single Hazard Actions

Mitigation Action	Upgrade Existing Drainage Pump Stations
Objective	This action proposes upgrading existing drainage pump stations to reduce the potential impacts of future flood events.
Hazard	Flooding
Priority	High
Estimated Cost	\$10,000 - \$100,0000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor & Council, Public Works, Emergency Management, City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Construct/Upgrade Storm Drainage Infrastructure *
Objective	This action proposes constructing new or upgrade storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to detention ponds.
Hazard	Flooding, Hurricanes/Tropical Storms
Priority	Medium
Estimated Cost	More than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor & Council, Public Works, Emergency Management, City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Install Check Valves
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Flooding
Priority	Medium
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor & Council, Public Works, Emergency Management, City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Purchase Portable or Permanent Pumps
Objective	This action proposes purchasing portable or permanent pumps that can be deployed as needed to reduce the potential impacts of future flood events.
Hazard	Flooding
Priority	Medium
Estimated Cost	\$10,000 to \$100,000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP, FEMA FMA, TWDB



Responsible Department	Mayor & Council, Public Works, Emergency Management, City Administration
Implementation Schedule	0 - 2 Years
Target	Existing infrastructure

Mitigation Action	Install Automated Flood Warning System
Objective	An automated flood warning system will help limit local vulnerability to floods by giving residents an opportunity to take shelter before an event occurs.
Hazard	Flooding
Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor & Council, Public Works, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Create Drainage Master Plan
Objective	This action proposes creating a drainage master plan for the City, in conjunction with the County, that will provide the City with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.
Hazard	Flood
Priority	Medium
Estimated Cost	Less than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Mayor & Council, Public Works, Ordinance & Emergency Management
Implementation Schedule	5 Years
Target	Existing and future infrastructure

Mitigation Action	Wildfire Fuels Reduction in WUI
Objective	This action will develop and implement a program to identify and prioritize lands in the Wildland Urban Interface in need of fuels reduction and then reduce or remove wildfire fuels through various methods as appropriate.

Hazard	Wildfire
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Public Works, Fire Department, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a Flood Damage Prevention Ordinance
Objective	The jurisdiction will re-evaluate all existing flood damage prevention measures to identify strengths and weaknesses in order to develop and enforce a new flood damage prevention ordinance and identify a floodplain manager, in compliance with the NFIP.
Hazard	Flood
Priority	High
Estimated Cost	Less than \$50,000
Potential Funding Source(s)	City
Responsible Department(s)	Mayor and City Council, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Develop and Implement a New Drought Contingency Plan
Objective	Re-evaluate all existing drought control measures to identify strengths and weaknesses in order to develop and enforce a new or updated drought contingency plan.
Hazard	Drought
Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration, Emergency Management
Implementation Schedule	1-5 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Replace Current Landscaping with Drought Resistant Plant Varieties</b>
Objective	This action's goal is to limit water consumption at City-owned and maintained facilities by replacing existing landscaping with more drought resistant types.
Hazard	Drought
Priority	Medium
Estimated Cost	Less than \$10,000
Potential Funding Source(s)	City, FEMA PDM, FEMA HMGP
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration, Emergency Management
Implementation Schedule	0 - 2 Years
Target	Existing and future infrastructure

<b>Mitigation Action</b>	<b>Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs</b>
Objective	The City will re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Severe Winds
Priority	Medium
Estimated Cost	Less than \$100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Mayor and City Council, Public Works, Ordinance, City Administration, Emergency Management
Implementation Schedule	0 – 2 Years
Target	Existing and future population and infrastructure

<b>Mitigation Action</b>	<b>Install Surge Protection and Grounding Systems to Protect Electronic Assets *</b>
Objective	This action will install surge protection at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP

Responsible Department	Mayor and City Council, Public Works, Ordinance, City Administration, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing infrastructure

Mitigation Action	Mandate Freeboard on Structures to Reduce Flooding Damage
Objective	This action updating the City’s flood ordinance to mandate freeboard on structures to improve the City’s resilience and minimize damages to future construction.
Hazard	Dam Failure
Priority	Low
Estimated Cost	Less than \$10,000
Potential Funding Source (s)	City
Responsible Department	Mayor and City Council, Public Works, Ordinance, City Administration, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Future development

Mitigation Action	Restrict development in high hazard areas
Objective	This action will re-evaluate all existing floodplain construction restrictions to identify strengths and weaknesses in order to produce a new ordinance that will reduce potential flood impacts due to dam / levee failure by restricting development in areas that may be subject to inundation due to dam / levee failure.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$10,000
Potential Funding Source (s)	City
Responsible Department	Mayor and City Council, Public Works, Ordinance, City Administration, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Conduct Dam Failure Studies
Objective	This action will install surge protection at all County facilities to prevent damage to critical electronic devices including but not

	limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	\$1,000 - \$100,000
Potential Funding Source (s)	City, FEMA PDM, FEMA HMGP
Responsible Department	Mayor and Council, Public Works
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

<b>Mitigation Action</b>	<b>Incorporate Firewise Construction Methods and Materials *</b>
Objective	This action will incorporate Firewise construction methods and materials for future and proposed public facilities. Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.
Hazard	Wildfire
Priority	Low
Estimated Cost	\$10,000 - \$100,000
Potential Funding Source(s)	City, FEMA BRIC
Responsible Department(s)	Mayor and City Council, Public Works, Ordinance, City Administration
Implementation Schedule	1 -5 Years
Target	Existing and future infrastructure