



# CALCASIEU

## PARISH HAZARD MITIGATION

### UPDATE - 2015

Prepared by:



\*\*\*This Page Left Intentionally Blank\*\*\*

# CALCASIEU HAZARD MITIGATION PLAN UPDATE

*Prepared for:*

**Calcasieu Parish**



*Prepared by:*

**Stephenson Disaster Management Institute**

**Ms. Lauren Stevens**

**Ms. Alexa Andrews**

**Dr. Carol J. Friedland, P.E., Ph.D., C.F.M.**

**Mr. Joseph B. Harris**

**Mr. Brant Mitchell**

Louisiana State University - Business Education Complex  
Baton Rouge, LA 70806



December 2015

\*\*\*This Page Left Intentionally Blank\*\*\*



## ACKNOWLEDGMENTS

This 2015 Calcasieu Parish Hazard Mitigation Plan Update was coordinated by the Calcasieu Parish Hazard Mitigation Plan Update Steering Committee, in collaboration with the participating jurisdictions as well as community stakeholders and the general public. The participating jurisdictions are made up of the following communities:

Calcasieu Parish  
City of Lake Charles  
City of DeQuincy  
City of Sulphur  
City of Westlake  
Town of Iowa  
Town of Vinton

Special thanks is directed to all of those who assisted in contributing feedback and expertise on this document, especially the Calcasieu Parish Office of Homeland Security and Emergency Management. These combined efforts have made this project possible. The Parish Steering Committee consists of the following individuals, who are credited in the creation of this document:

Dick Gremillion	Calcasieu OHSEP
Norman Bourdeau	Calcasieu OHSEP
Marc Ferguson	Calcasieu OHSEP
Rob Daughdril	Calcasieu OHSEP
Cade McLemore	Calcasieu OHSEP
Emily Abshire	Calcasieu Parish Government
Jennifer Cobian	Calcasieu Parish Government
Mary Jo Bayles	City of DeQuincy
Keith Barry	City of Sulphur
John Reon	Gravity Drainage Dist. 8 Ward 1
Eddie Hebert	Gravity Drainage Dist. 8 Ward 1
Terri Hawes	City of Westlake
Mary Vice	Town of Vinton
Lori Marinovich	City of Lake Charles
Lennie LaFleur	Lake Charles Fire Department
Carl Chance	Sabine River Authority
Sandra Turley	Town of Iowa

The 2015 Calcasieu Parish Hazard Mitigation Plan Update was written by the Stephenson Disaster Management Institute, Louisiana State University. Further comments should be directed to the Calcasieu Parish Office of Homeland Security and Emergency Preparedness: 901 Lakeshore Drive, Suite 200 Lake Charles, LA 70601.

## Contents

1	Introduction .....	1-1
	History .....	1-2
	Location, Demography, and Economy .....	1-4
	Location.....	1-4
	Economy.....	1-4
	Hazard Mitigation .....	1-6
	General Strategy .....	1-7
	2015 Plan Update.....	1-8
2	Hazard Identification and Parish-Wide Risk Assessment.....	2-1
	Prevalent Hazards to the Community .....	2-1
	Previous Occurrences .....	2-3
	Probability of Future Hazard Events .....	2-3
	Inventory of Assets for the Entire Parish .....	2-4
	Essential Facilities of the Parish .....	2-6
	Future Development Trends .....	2-15
	Future Hazard Impacts.....	2-17
	Land Use.....	2-17
	Hazard Identification.....	2-19
	Drought .....	2-19
	Expansive Soils .....	2-23
	Extreme Heat .....	2-27
	Flooding.....	2-30
	Sinkholes .....	2-61
	Thunderstorms.....	2-64
	Tornadoes .....	2-79
	Tropical Cyclones .....	2-88
	Tsunamis .....	2-105
	Wildfires .....	2-107
	Winter Storms.....	2-117
	Subsidence/Coastal Land Loss .....	2-120
3	Capability Assessment .....	3-1
	Policies, Plans and Programs .....	3-1

Building Codes, Permitting, Land Use Planning and Ordinances .....	3-2
Administration, Technical, and Financial .....	3-3
Education and Outreach .....	3-4
Flood Insurance and Community Rating System .....	3-5
NFIP Worksheets.....	3-9
4 Mitigation Strategy .....	4-1
Introduction .....	4-1
Goals .....	4-3
2015 Mitigation Actions and Update on Previous Plan Actions .....	4-4
Calcasieu 2010 Hazard Mitigation Actions Update.....	4-5
City of Lake Charles 2010 Mitigation Action Update .....	4-9
Unincorporated Calcasieu New Mitigation Actions.....	4-11
City of DeQuincy New Mitigation Actions.....	4-15
City of Sulphur New Mitigation Actions.....	4-19
Town of Vinton New Mitigation Actions.....	4-23
City of Westlake New Mitigation Actions .....	4-26
City of Lake Charles New Mitigation Actions .....	4-32
Action Prioritization .....	4-35
Appendix A: Planning Process.....	A-1
Purpose .....	A-1
The Calcasieu Parish Hazard Mitigation Plan Update.....	A-1
Planning .....	A-3
Coordination .....	A-3
Neighboring Community, Local and Regional Planning Process Involvement .....	A-3
Program Integration.....	A-6
Meeting Documentation and Public Outreach Activities .....	A-7
Meeting #1: Coordination Conference Call .....	A-7
Meeting #2: Hazard Mitigation Plan Update Kick-Off.....	A-7
Meeting #3 Risk Assessment Overview .....	A-9
Meeting #3: Public Meeting.....	A-11
Outreach Activity #1: Public Opinion Survey .....	A-13
Outreach Activity #2: Incident Questionnaire .....	A-23
Outreach Activity #3: Mapping Activities .....	A-24

Public Plan Review Documentation .....	A-25
Appendix B: Plan Maintenance .....	B-1
Purpose .....	B-1
Monitoring, Evaluating, and Updating the Plan.....	B-1
Responsible Parties .....	B-1
Methods for Monitoring and Evaluating the Plan and Plan Evaluation Criteria.....	B-2
Updating the Plan .....	B-4
2015 Plan Version Plan Method and Schedule Evaluation .....	B-4
Incorporation into Existing Planning Programs .....	B-4
Continued Public Participation .....	B-6
Appendix C: Essential Facilities .....	C-1
Calcasieu Parish Essential Facilities – All Jurisdictions.....	C-1
Appendix D: Plan Adoption .....	D-1
Appendix E: State Required Worksheets .....	E-1
Mitigation Planning Team .....	E-2
Capability Assessment .....	E-3
Calcasieu Unincorporated.....	E-3
City of DeQuincy .....	E-6
City of Lake Charles .....	E-9
City of Sulphur.....	E-12
City of Westlake .....	E-15
Town of Iowa.....	E-18
Town of Vinton.....	E-21
Building Inventory.....	E-24
National Flood Insurance Program (NFIP) .....	E-30
Calcasieu Parish.....	E-30

## 1 Introduction

Hazard Mitigation is defined as sustained actions taken to reduce or eliminate long-term risk from hazards and their effects. Hazard Mitigation Planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are determined, prioritized, and implemented.

In that regard, this plan (a) documents the Calcasieu Parish Hazard Mitigation Plan Update process; (b) identifies natural hazards and risks within the parish; and (c) identifies the parish's hazard mitigation strategy to make Calcasieu Parish less vulnerable and more disaster resistant. It also includes mitigation project scoping to further identify scopes of work, estimated costs, and implementation timing requirements of proposed selected mitigation projects. Information in the plan will be used to help guide and coordinate mitigation activities and local policy decisions affecting future land use.

The Calcasieu Parish Hazard Mitigation Plan is a multi-jurisdictional plan that includes the following jurisdictions which participated in the planning process:

- City of Lake Charles
- City of DeQuincy
- City of Sulphur
- City of Westlake
- Town of Iowa
- Town of Vinton

The Federal Emergency Management Agency (FEMA), now under the Department of Homeland Security, has made reducing losses from natural disasters one of its primary goals. The Hazard Mitigation Plan (HMP) and subsequent implementation of recommended projects, measures, and policies is the primary means to achieving these goals. Mitigation planning and project implementation has become even more significant in a post-Katrina and Rita environment in south Louisiana.

This hazard mitigation plan is a comprehensive plan for disaster resiliency in Calcasieu Parish. The parish is subject to natural hazards that threaten life and health and have caused extensive property damage. To better understand these hazards and their impacts on people and property, and to identify ways to reduce those impacts, the Parish's Office of Homeland Security and Emergency Preparedness undertook this Natural Hazards Mitigation Plan.

"Hazard mitigation" does not mean that all hazards are stopped or prevented. It does not suggest complete elimination of the damage or disruption caused by such incidents. Natural forces are powerful and most natural hazards are well beyond our ability to control. Mitigation does not mean quick fixes. It is a long term approach to reduce hazard vulnerability. As defined by the FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event.

Why this plan? Every community faces different hazards and every community has different resources and interests to bring to bear on its problems. Because there are many ways to deal with natural hazards and many agencies that can help, there is no one solution or cookbook for managing or mitigating their effects.

Planning is one of the best ways to correct these shortcomings and produce a program of activities that will best mitigate the impact of local hazards and meet other local needs. A well-prepared plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most



appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and with other goals and programs, preventing conflicts and reducing the costs of implementing each individual activity.

Mitigation activities need funding. Under the Disaster Mitigation Act of 2000 (42 USC 5165), a mitigation plan is a requirement for federal mitigation funds. Therefore, a mitigation plan will both guide the best use of mitigation funding and meet the prerequisite for obtaining such funds from FEMA. FEMA also recognizes plans through its Community Rating System, a program that reduces flood insurance premiums in participating communities. This program is described at the end of this chapter.

This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by natural hazards. It fulfills the federal mitigation planning requirements, qualifies for Community Rating System credit, and provides the parish and its municipalities with a blueprint for reducing the impacts of these natural hazards on people and property.

### History

Calcasieu Parish is located in southwestern Louisiana with elevations ranging from near sea level to 85 feet above sea level. The planning area covers approximately 1,094 square miles, including roughly 23 square miles of water area. Calcasieu Parish is bounded by Beauregard Parish to the north, Jefferson Davis Parish to the east, Cameron Parish to the south, and the Sabine River / Newton and Orange County, Texas, to the west.



*Figure 1-1: Location of Calcasieu Parish within the State of Louisiana*

The parish includes six incorporated municipalities - Iowa, Lake Charles, Sulphur, Vinton, Westlake, and DeQuincy. Vinton is located on the western boundary of the parish; Sulphur, Westlake and Lake Charles near the center of the parish, DeQuincy on the northern boundary, and Iowa on the eastern boundary of the parish. Calcasieu Parish was formed out of St. Landry Parish by an act of the State Legislature on March 24, 1840. The name Calcasieu comes from the Atakapan word, "*quelqueshue*", meaning 'the call of a hunting eagle'. It was originally the name of an Atakapa tribal chief who led charges into battle with a piercing yell similar to the scream of an eagle.

European settlement of the area began around 1815 along the Calcasieu River. As quoted from the legislative act of formation, when the parish was formed, its boundaries were "...all the territory in the parish of St. Landry, within the following boundaries, to-wit: Commencing at the mouth of the River Mermentau, thence up said river to the mouth of the Bayou Nez Pique, thence up said bayou to the mouth of Cedar Creek, thence due north to the dividing line between the parishes of St. Landry and Rapides, thence along said line to the Sabine River, thence down the said river to the mouth, thence along the sea coast to the place of beginning...".

Calcasieu Parish is governed by an elected body known as the Police Jury. There are 15 single member Police Jury districts. Each district has one juror elected for representation. This is in line with the decision of the U.S. Supreme Court of the "one man, one vote" theory. The U.S. Department of Justice requires redistricting of the parish following each official census to insure that each juror represents approximately the same number in population.

For several decades, the chemical and refining industries have been a major component of the local economy. With the creation in the mid-1980's of the Chennault Industrial Airpark in Lake Charles, aircraft refurbishment and maintenance has become another important component of the local economy. This area, the former Chennault Air Force Base, is located on 960 acres with buildings and aircraft hangars served by paved streets and utilities. With the approval of gaming in Louisiana, Calcasieu Parish witnessed the development of a new industry since the mid-1990's. Multiple riverboat casinos are located in the parish, supporting the local economy by way of tourism, employment, and revenues.

A one mile, four-lane bridge with 135 foot vertical clearance links downtown Lake Charles and western Calcasieu Parish. Just south of Lake Charles, a magnificent curving bridge spans the Calcasieu Ship Channel. Unique in design, the bridge itself is an object of engineering beauty and provides a vital link between Lake Charles and the area's industrial complex. The Port of Lake Charles is accessible to ocean-going vessels and is only 34 miles from the Gulf of Mexico, the shortest distance of any deep water port in Louisiana. Lake Charles is the home of McNeese State University, a four-year, fully-accredited institution which offers courses in liberal arts, commerce, science, agriculture, and engineering. Sowela Technical Community College, also located in Lake Charles, is one of the state's largest vocational schools and is nationally recognized for its fine training program.

## Location, Demography, and Economy

### Location

Calcasieu Parish is located in Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) Region 5.

As noted above, Calcasieu Parish is located in the western region of Louisiana.



Figure 1-2: Louisiana Homeland Security Regions

Table 1-1: Calcasieu Parish Population  
(Source: U.S. Census Bureau)

	2010 Census	2013 Census	Estimate (Current Year)	Percent Change 2010 - 2013	Percent Change 2013 - (Current Year)
Total Population	192,768	195,782	197,204	1.60%	2.30%
Population Density (Pop/Sq. Mi.)	181.2	—	—	—	—
Total Households	73,726	73,726	—	—	—

While Calcasieu Parish is faced with a variety of natural hazards and all the problems that accompany growth and decline in growth, it also has the potential to mitigate their adverse effects through current and new programs and projects.

### Economy

In the midst of economic growth, Calcasieu Parish has managed to retain its traditional community spirit and easygoing lifestyle. Calcasieu Parish, as with most of Southwest Louisiana are ground for the flourishing of many major companies and small to medium businesses.

The petrochemical industry is the mainstay economically for the parish, and the past decade has seen the aerospace and gaming industries broaden that base. The Port of Lake Charles is accessible to ocean-going

vessels and is only 34 miles from the Gulf of Mexico, the closest of any deep-water port in Louisiana. Chennault International Airpark is a major feature for the area with more than 10,000 feet of runway, capable of handling most commercial aircraft. Lake Charles is the home of McNeese State University, a four-year, fully accredited university, as well as Sowela Technical Community College, one of Louisiana's largest vocational schools. An abundance of streams, rivers, and lakes, along with museums, art galleries, and festivals, make the parish a true paradise.

The Southwest Louisiana Alliance Foundation and the Southwest Louisiana Economic Development Alliance serves Calcasieu Parish to facilitate and support programs of economic and industrial development in an effort to create new job opportunities for the people of the parish. The mission of the Chamber Southwest is to develop Southwest Louisiana by creating economic opportunity, and demanding responsible government and quality education. The Chamber SWLA has over 1,500 members from large and small businesses from across the region. <sup>1</sup>

*Table 1-2: Business Patterns in Calcasieu Parish  
(Source: enstats.census.gov)*

Business Description	Number of Employees	Number of Establishments	Annual Payroll (\$1,000)
<b>Retail Trade</b>	10,605	763	248,362
<b>Manufacturing</b>	8,585	129	702,598
<b>Health Care, Social Assistance</b>	12,613	523	474,202
<b>Mining, Oil and Gas Extraction</b>	386	9	26,177
<b>Transportation / Warehousing</b>	2,773	151	114,647
<b>Construction</b>	4,600	361	222,153
<b>Administration, Support, Waste Management, Remediation Services</b>	3,312	177	112,868
<b>Real Estate, Rental, Leasing</b>	1,039	216	43,667
<b>Wholesale Trade</b>	2,647	226	127,856
<b>Other Services, except Public Administration</b>	3,318	420	78,916
<b>Accommodation, Food Services</b>	11,126	382	217,135
<b>Financial and Insurance</b>	2,072	320	97,811
<b>Professional, Scientific, Technical Services</b>	4,388	444	256,907
<b>Information</b>	694	51	26,292
<b>Educational Services</b>	1,034	47	26,270
<b>Arts, Entertainment, Recreation</b>	492	63	8,716
<b>Management of Companies and Enterprises</b>	298	14	12,243

<sup>1</sup> Source <http://allianceswla.org>

*Table 1-3: Major Employers  
(Source: louisianasiteselection.com)*

Major Employers	Product/Service	Number of Employees
Isle of Capri	Hotels/Motels	2,021
St Charles Gaming Co Inc	Hotels/Motels	2,000
PNK	Hotels/Motels	2,000
Bollinger Calcasieu	Shipbuilding/Repair	1,800
Southwest Louisiana Hospital Assn	Medical and Surgical	1,500
PPG Industries	Paints and Applied Products	1,350
Mc Neese State University	Colleges and Universities	888
ConocoPhillips Holding Co	Industrial	860
Parish of Calcasieu	Legislative Bodies	700
Northrop Grumman Systems	Business Services	600

Calcasieu Parish is also home to the SEED Center (The Southwest Louisiana Entrepreneurial and Economic Development Center). The SEED Center project nurtures entrepreneurship and further diversifies the economic base of SWLA and is part of the Parishes Long Term Community Recovery Plan.

In other words, while nature has presented the parish with a variety of hazards, the parish has the human resources that can face those hazards and manage the impact they have on people and property.

This plan will discuss hazards affecting Calcasieu Parish. Hazard Profiles (see Section Two) contain detailed information on the likelihood of occurrence, possible magnitude or intensity, areas of the parish that could be affected and conditions that could influence the manifestation of the hazard.

### Hazard Mitigation

To fully understand hazard mitigation efforts in Calcasieu Parish and throughout Louisiana, it is first crucial to understand how hazard mitigation relates to the broader concept of emergency management. In the early 1980s, the newly-created Federal Emergency Management Agency (FEMA) was charged with developing a structure for how the federal, state, and local governments would respond to disasters. FEMA developed the *four phases of emergency management*, an approach which can be applied to all disasters. The four phases are as follows:

- **Hazard Mitigation**—described by FEMA and the Disaster Mitigation Act of 2000 (DMA 2000) as “any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.” The goal of mitigation is to save lives and reduce property damage. Besides significantly aiding in the obviously desirous goal of saving human lives, mitigation can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities and minimize community disruption, helping communities return to usual daily living in the aftermath of disaster. Examples of mitigation involve a range of activities and actions including the following: land-use planning, adoption and enforcement of building codes, and construction projects (e.g., flood proofing homes through elevation, or acquisition or relocation away from floodplains).
- **Emergency Preparedness**—includes plans and preparations made to save lives and property and to facilitate response operations before a disaster event.



- **Disaster Response**—includes actions taken to provide emergency assistance, save lives, minimize property damage, and speed recovery immediately following a disaster.
- **Disaster Recovery**—includes actions taken to return to a normal or improved operating condition following a disaster.

Figure 1-3 illustrates the basic relationship between these phases of emergency management. While hazard mitigation may occur both before and after a disaster event, it is significantly more effective when implemented before an event occurs. This is one of the key elements of this Plan and its overall strategy: reduce risk before disaster strikes in order to minimize the need for post-disaster response and recovery.



*Figure 1-3: The four phases of emergency management and their relation to future hazard mitigation*  
 (Source: Louisiana State Hazard Mitigation Plan 2014)

As Figure 1-3 demonstrates, mitigation relies on updating in the wake of disaster. This can give the appearance that mitigation is only reactive rather than proactive. In reality, however, post-disaster revision is a vital component of improving mitigation. Each hazardous event affords an opportunity to reduce the consequences of future occurrences.

Unfortunately, this cycle can be painful for a community. For instance, the risks of disasters that could create catastrophic incidents in Louisiana were thought to be relatively well-understood prior to 2005. However, the impact of the 2005 hurricane season on the Gulf Coast region of the United States prompted a new level of

planning and engagement related to disaster response, recovery, and hazard mitigation. Hurricanes Katrina and Rita hit three weeks apart and together caused astonishing damage to human life and to property. The two storms highlighted a hurricane season that spawned 28 storms—unparalleled in American history. The 2005 hurricane season confirmed Louisiana's extreme exposure to natural disasters and both the positive effects and the concerns resulting from engineered flood-protection solutions.

The catastrophic events of 2005 had profound impacts on emergency management and hazard mitigation throughout Louisiana. As detailed later in this document, significant funding has been made available to the State of Louisiana and its parishes for the purpose of hazard mitigation planning. The storms also raised awareness of the importance of hazard mitigation among decision-makers and the general population, which has been particularly important since natural hazards will likely be increasing in frequency, magnitude, and impact in the coming years due to climate change.

### General Strategy

During the last update the Louisiana State Hazard Mitigation Plan, the State Hazard Mitigation Team (SHMT) began a long-term effort to better integrate key components of all plans with hazard mitigation implications in Louisiana to ensure that the programs, policies, recommendations, and implementation strategies are internally consistent. As each of these documents has been adopted by various agencies within the state, the SHMT has worked to incorporate this information into the decision process.

Part of the ongoing integration process is that GOHSEP encourages the parishes and the local municipalities with independent hazard mitigation plans to utilize the same plan format and methodologies as the State Hazard Mitigation Plan in order to create continuity of information from local to state mitigation plans and programs.

The 2015 Calcasieu Parish Hazard Mitigation Plan maintains much of the information from the 2006 and 2010 plan versions, but it now reflects the order and methodologies of the 2011 Louisiana State Hazard Mitigation Plan. The sections in the 2010 Calcasieu Hazard Mitigation Plan were as follows:

- Section One           Prerequisites
- Section Two           Planning Process
- Section Three        Risk Assessment
- Section Four         Mitigation Strategy
- Section Five         Plan Maintenance
- Appendices

This plan update now also coheres with the Plain Writing Act of 2010, which requires federal agencies to use clear communication that is accessible, consistent, understandable, and useful to the public. While the State of Louisiana and its political subdivisions are not required to meet such standards, the Act aligns with best practices in hazard mitigation. Since successful hazard mitigation relies on full implementation and cooperation at all levels of government and community, a successful hazard mitigation plan must also be easily used at all of these levels. Nevertheless, the Calcasieu Parish Hazard Mitigation Steering Committee was not ignorant or dismissive of the successful analysis and mitigation planning executed in previous plan updates. This plan update remains coherent with those documents, retaining language and content when needed, deleting it when appropriate, and augmenting it when constructive.

### 2015 Plan Update

This 2015 plan update proceeds with the six previous goals of the Calcasieu Parish hazard mitigation plan. The current goals are as follows:

- Reduce or prevent injury and loss of life
- Reduce or prevent damage to property and material assets
- Reduce or prevent future damage to critical facilities (fire, rescue, law enforcement, communications, command and control) essential for protection and public safety
- Reduce or prevent future damage to special facilities including: schools, nursing homes, health care facilities, prisons, historical and cultural resources
- Reduce or prevent future damage to infrastructure including: stormwater conveyance structures, utility systems, pipelines, railroads, highways, bridges, and navigable waterways
- Reduce or prevent future damage to commercial facilities
- Reduce or prevent future damage to higher risk facilities that, if damaged, may result in significant loss of human life, damage to the environment, or significant harm to the local economy including: hazardous material handling facilities, dams, flood control facilities, and other high security facilities

This plan update makes a number of textual changes throughout, but the most obvious changes are data related and structural edits. First, the Spatial Hazard Events and Losses Database for the United States (SHELDUS) was used as a data source for hazard identification because it incorporates all storm event data from the National Climatic Data Center (NCDC) Storm Events Database used in previous plans, as well as storm event data from other sources including the NOAA Storm Prediction Center, National Hurricane Center,

and U.S. Fire Administration. Furthermore, all of the sections were updated to reflect the most current information and the most current vision of the plan update. Second, instead of eleven, separate sections for numerous tables, maps, and appendices, the present plan update has five sections and five appendices. The most significant changes are the newly developed hazard profiles and risk assessments, as well as the removal of repetition between sections from the previous plan updates. The 2015 plan update is organized generally as follows:

- Section One Introduction
- Section Two Hazard Identification and Parish-wide Risk Assessment
- Section Three Capability Assessment
- Section Four Mitigation Strategies
- Appendix A Planning Process
- Appendix B Plan Maintenance
- Appendix C Essential Facilities
- Appendix D Plan Adoption
- Appendix E State Required Worksheets

*Table 1-4: Plan Crosswalk*

2010 Plan	Revised Plan (2015)
Section 1: Prerequisites	Section 1: Introduction
Section 2: Planning Process	Appendix A: Planning Process
Section 3: Risk Assessment	Section 2: Risk Assessment
Section 4: Mitigation Strategy	Section 3: Mitigation Strategy
Section 5: Plan Maintenance	Appendix B: Plan Maintenance
Appendices	Appendix A: Planning Process; Appendix B: Plan Maintenance; Appendix C: Essential Facilities; Appendix D: Plan Adoption; Appendix E: State Required Worksheets

Despite changes in this plan update, the plan remains consistent in its emphasis on the few types of hazards that pose the most risk to loss of life, injury, and property in Calcasieu Parish and its municipalities. The extent of this risk is dictated primarily by its geographic location. Most significantly, Calcasieu Parish remains at high risk of water inundation from various sources, including flooding, failure of dams/levees and forced drainage systems, tornadoes, and tropical cyclone activity. All of the parish is also at high risk of damages from high winds and wind-borne debris caused by various meteorological phenomena. Other hazards threaten the parish and/or its municipalities, although not to such great degrees and not in such widespread ways. In all cases, the relative social vulnerability of areas threatened and affected plays a significant role in how governmental agencies and their partners (local, parish, state, and federal) prepare for and respond to disasters.

Mitigation efforts related to particular hazards are highly individualized by jurisdiction. Flexibility in response and planning is essential. The most important step forward to improve hazard management capability is to improve coordination and information sharing between the various levels of government regarding hazards.

\*\*\*This Page Left Intentionally Blank\*\*\*

## 2 Hazard Identification and Parish-Wide Risk Assessment

This section assesses the various hazard risks Calcasieu Parish faces in order to identify a strategy for mitigation. Having identified the categories of hazards, emergencies, disasters, and catastrophes, this section details the major climatological and natural/human-influenced hazards by (1) defining them, (2) explaining how they are measured, (3) describing their geographic extent, (4) surveying their previous occurrences, and (5) evaluating their future likelihood of occurrences.

The table below provided an overview of the hazards that had been previously profiled in the Calcasieu Parish Hazard Mitigation plan published in 2010, as well as the hazards that were identified in the state's 2014 Hazard Mitigation Plan that were considered to be of high or medium risk for the parish by the state. Those hazards identified as high or medium risk by the state or previously identified as a risk by the parish, have been determined to provide a risk to the parish and will be profiled in this section.

*Table 2-1: Hazard Profile Summary*

Hazard	Profiled in Last Plan	Considered Medium or High Risk in the State's HM Plan	Profiled in the 2015 Update
Subsidence/Coastal Land Loss		X	X
Drought	X		X
Earthquakes			
Expansive Soils	X		
Fog			
Flooding	X	X	X
Extreme Heat	X		X
Sinkholes	X	X	X
Thunderstorms (Hail, Lightning, & Wind)	X	X	X
Tornadoes	X	X	X
Tropical Cyclones	X	X	X
Tsunamis	X		
Wildfires	X		X
Winter Storms	X		X

### Prevalent Hazards to the Community

While many of the hazards identified in [Table 2-1](#) occur in the parish, the determination was made to focus attention and resources on the most prevalent hazards, which include the hazards previously profiled, along with sinkholes.



The following hazards have been selected to be included in this risk assessment:

- a) Flooding (backwater, riverine, localized stormwater event)
- b) Tropical Cyclones (flooding and high winds)
- c) Wildfires
- d) Tornadoes
- e) Sinkholes
- f) Extreme Heat
- g) Thunderstorms (Hail, Lightning, Wind)
- h) Drought
- i) Winter Storms
- j) Tsunamis
- k) Subsidence/Coastal Land Loss

For analysis purposes, the impact of the critical and prevalent hazards is summarized as follows:

- Flooding from rivers and waterways, rain storms, tropical cyclones, and hurricanes in the following forms:
  - a) Riverine
  - b) Stormwater
  - c) Surge
  - d) Backwater flooding (as the result of river flooding and surge)
- High wind damage most commonly resulting from hurricanes, thunderstorms, and tornadoes
- Property and crop damage resulting from drought, extreme heat, and wildfires

The potential destructive power of tropical cyclones and flooding were determined to be the most prevalent hazards to the parish. Twelve of the thirteen presidential declarations Calcasieu Parish has received resulted from either tropical cyclones (7 declarations) or flooding (5 declarations), which validates these as the most significant hazards. Therefore, the issues of hurricanes and floods will both serve as the main focus during the mitigation planning process. Hurricanes present risks from the potential for flooding, primarily resulting from storm surge, and high wind speeds. While storm surge is considered the hazard with the most potential destructive potential, the risk assessment will also assess non-storm surge flooding as well. Flooding can also occur from non-hurricane events, as flash floods are a common occurrence due to heavy rainfall.

Hurricanes, tropical storms, and heavy storms are fairly common occurrences, and resultant wind damage is of utmost concern. Damage from high winds can include roof damage, destruction of homes and commercial buildings, downed trees and power lines, and damage and disruption to services caused by heavy debris. A wind map for Calcasieu Parish is included in the hurricane risk assessment.

Calcasieu Parish is also susceptible to tornadoes. Tornadoes can spawn from tropical cyclones or severe weather systems that pass through Calcasieu Parish. High winds produced by tornadoes have the potential to destroy residential and commercial buildings, as well as create wind-borne objects from the

debris produced by the destruction of the natural and human environment, such as building materials and trees.

### Previous Occurrences

Table 2-2 summarizes federal disaster declarations for Calcasieu Parish since 1965. Information includes names, dates, and types of disaster.

*Table 2-2: Calcasieu Parish Major Disaster Declarations*

Disaster Declaration Number	Date	Type of Disaster
315	10/13/1971	Tropical Cyclone - Hurricane Edith
604	9/25/1979	Severe Storm, Flood
622	5/21/1980	Severe Storm, Flood
675	1/11/1983	Severe Storm, Flood
829	5/20/1989	Severe Storm, Flood
835	7/17/1989	Tropical Cyclone – Tropical Cyclone Allison
956	8/26/1992	Tropical Cyclone – Hurricane Andrew
1169	3/18/1997	Severe Winter Storm
1603	8/29/2005	Tropical Cyclone – Hurricane Katrina
1607	9/24/2005	Tropical Cyclone – Hurricane Rita
1668	11/2/2006	Severe Storm, Flood
1786	9/2/2008	Tropical Cyclone – Hurricane Gustav
1792	9/13/2008	Tropical Cyclone – Hurricane Ike

### Probability of Future Hazard Events

The probability of a hazard event occurring in Calcasieu Parish is estimated on the following page. The percent chance of an event happening during any given year was calculated by posting past events and dividing by the time period. Unless otherwise indicated, the time period used to access probability followed the method used in the State of Louisiana's most current Hazard Mitigation Plan. The primary source for historical data used throughout the plan is the Spatial Hazards Events and Losses Database (SHELDUS), which provides historical hazard data from 1960 to 2014. In staying consistent with the state plan, the SHELDUS database was evaluated for the last twenty five years (1989 – 2014) in order to determine future probability of a hazard occurring. While the 25-year record used by the State was adopted for the purpose of determining the overall probability, in order to assist with determining estimated losses, unless otherwise stated, the full 54-year record was used when Hazus-MH wasn't available to determine losses. This full record was used to provide a more extensive record to determine losses. All assessed damages were adjusted for inflation in order to reflect the equivalent amount of damages with the value of the U.S. dollar today. In addition, the National Climatic Data Center (NCDC) was also used to help identify hazard data specific to the municipalities. This was used due to it containing specific data for cities, whereas the data within SHELDUS is limited to parishes.

The following table shows the annual probability for each hazard occurring across the parish and in separate jurisdictions:

*Table 2-3: Probability of Future Hazard Reoccurrence*

Hazard	Probability						
	Calcasieu Parish (Unincorporated)	DeQuincy	Iowa	Lake Charles	Sulphur	Vinton	Westlake
Drought	12%	12%	12%	12%	12%	12%	12%
Subsidence/Coastal Land Loss	100%	<1%	<1%	<100%	100%	100%	100%
Expansive Soils	<1%	< 1%	< 1%	<1%	<1%	<1%	<1%
Extreme Heat	4%	4%	4%	4%	4%	4%	4%
Flooding	100%	32%	24%	100%	60%	40%	32%
Sinkholes	<1%	<1%	<1%	<1%	<1%	<1%	<1%
Thunderstorms (Hail)	32%	32%	32%	32%	32%	32%	32%
Thunderstorms (Lightning)	60%	60%	60%	60%	60%	60%	60%
Thunderstorms (Wind)	100%	100%	100%	100%	100%	100%	100%
Tornadoes	88%	88%	88%	88%	88%	88%	88%
Tropical Cyclones	36%	36%	36%	36%	36%	36%	36%
Tsunamis	<1%	< 1%	< 1%	<1%	<1%	<1%	<1%
Wildfires	8%	8%	8%	8%	8%	8%	8%
Winter Storms	16%	16%	16%	16%	16%	16%	16%

As shown in [Table 2-3](#), flooding events for unincorporated Calcasieu Parish and Lake Charles; subsidence/coastal land loss for unincorporated Calcasieu Parish, Lake Charles, Sulphur, Vinton, and West Lake; along with thunderstorm winds for the entire planning area, have the highest annual chance of occurrence in the parish (100%). Flood events and subsidence/coastal land loss in the remaining incorporated areas have a slightly lower chance of occurring annually. Tornadoes have an 88% annual chance of reoccurrence, followed by lightning (60%), tropical cyclones (36%), and hail (32%). Winter storms (16%), drought (12%), wildfires (8%), and extreme heat (4%) have the lowest annual chance of occurrence in Calcasieu Parish. Both expansive soils and tsunamis were discounted since the annual chance of occurrence was calculated at less than 1% for both hazards.

### [Inventory of Assets for the Entire Parish](#)

As part of the Risk Assessment, the planning team identified essential facilities throughout the parish. Several methods were used to assist in identifying all essential facilities, including field data collected by the Louisiana Governor's Office of Homeland Security and Emergency Preparedness on critical infrastructure from a previous hazard mitigation project.

Within the entire planning area, there is an estimated value of \$18,611,725,000 in structures throughout the parish. The tables on the following page provide the total estimated value for each type of structure by occupancy.

*Table 2-4: Estimated Total of Potential Losses throughout Calcasieu Parish*

Occupancy	Calcasieu Parish	Unincorporated Calcasieu	DeQuincy	Iowa	Lake Charles	Sulphur
Agricultural	\$34,779,000	\$18,151,000	\$339,000	\$0	\$12,780,000	\$2,849,000
Commercial	\$2,613,894,000	\$626,850,000	\$70,787,000	\$28,077,000	\$1,524,645,000	\$284,556,000
Government	\$91,657,000	\$24,647,000	\$2,697,000	\$1,451,000	\$52,732,000	\$4,094,000
Industrial	\$562,260,000	\$302,147,000	\$18,340,000	\$3,253,000	\$158,915,000	\$56,056,000
Religion	\$375,372,000	\$95,012,000	\$12,321,000	\$7,605,000	\$207,353,000	\$33,214,000
Residential	\$14,769,798,000	\$5,987,875,000	\$232,548,000	\$240,678,000	\$6,052,589,000	\$1,650,403,000
Education	\$163,965,000	\$40,515,000	\$6,439,000	\$502,000	\$88,323,000	\$15,149,000
<b>Total</b>	<b>\$18,611,725,000</b>	<b>\$7,095,197,000</b>	<b>\$343,471,000</b>	<b>\$281,566,000</b>	<b>\$8,097,337,000</b>	<b>\$2,046,321,000</b>

*Table 2-4: Estimated Total of Potential Losses (Continued)*

Occupancy	Vinton	Westlake
Agricultural	\$446,000	\$214,000
Commercial	\$23,624,000	\$55,355,000
Government	\$1,632,000	\$4,404,000
Industrial	\$2,178,000	\$21,371,000
Religion	\$8,718,000	\$11,149,000
Residential	\$225,671,000	\$380,034,000
Education	\$6,020,000	\$7,017,000
<b>Total</b>	<b>\$268,289,000</b>	<b>\$479,544,000</b>

## Essential Facilities of the Parish

Below are the locations and names of the essential facilities within the parish:

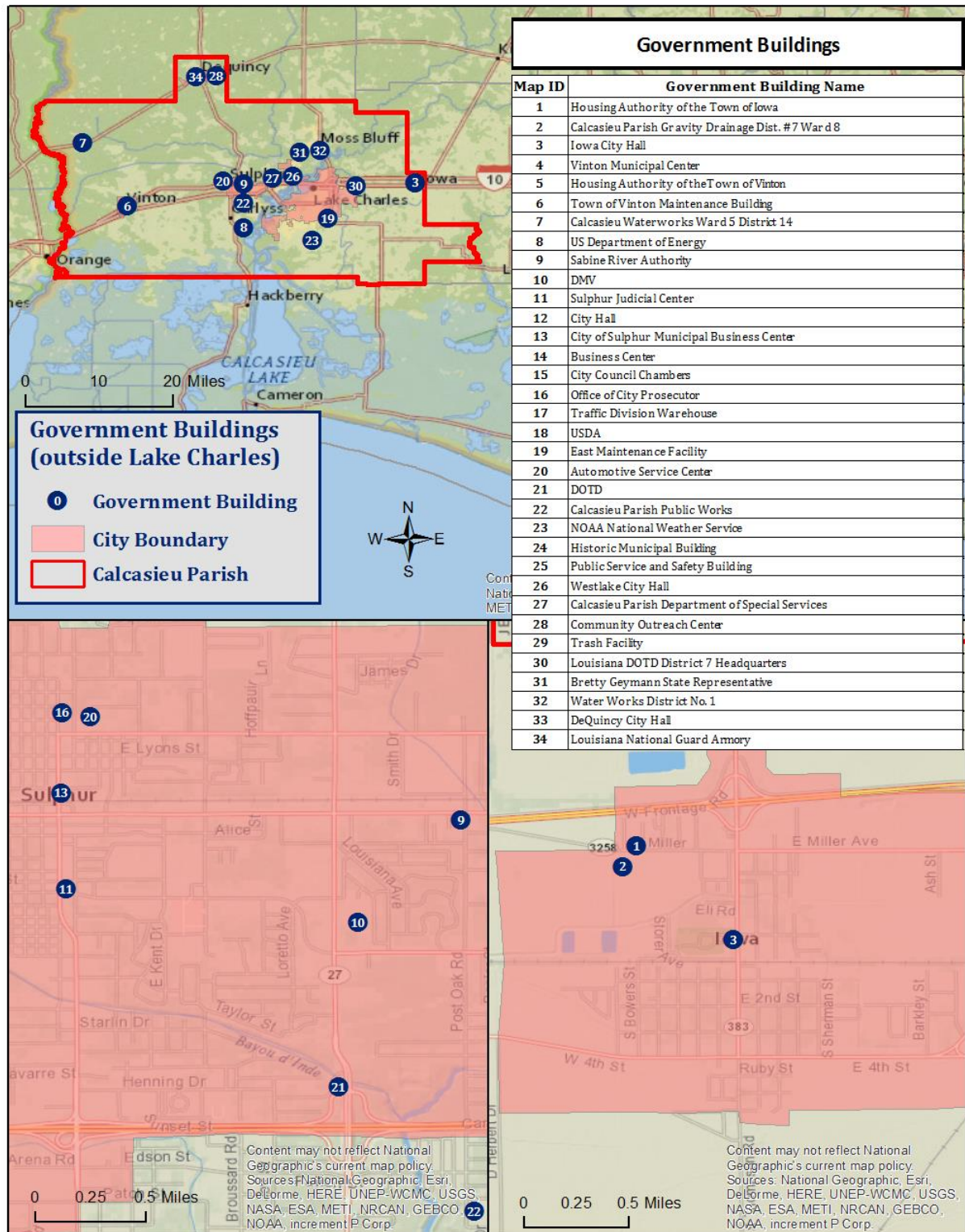


Figure 2-1: Government Buildings outside of Lake Charles



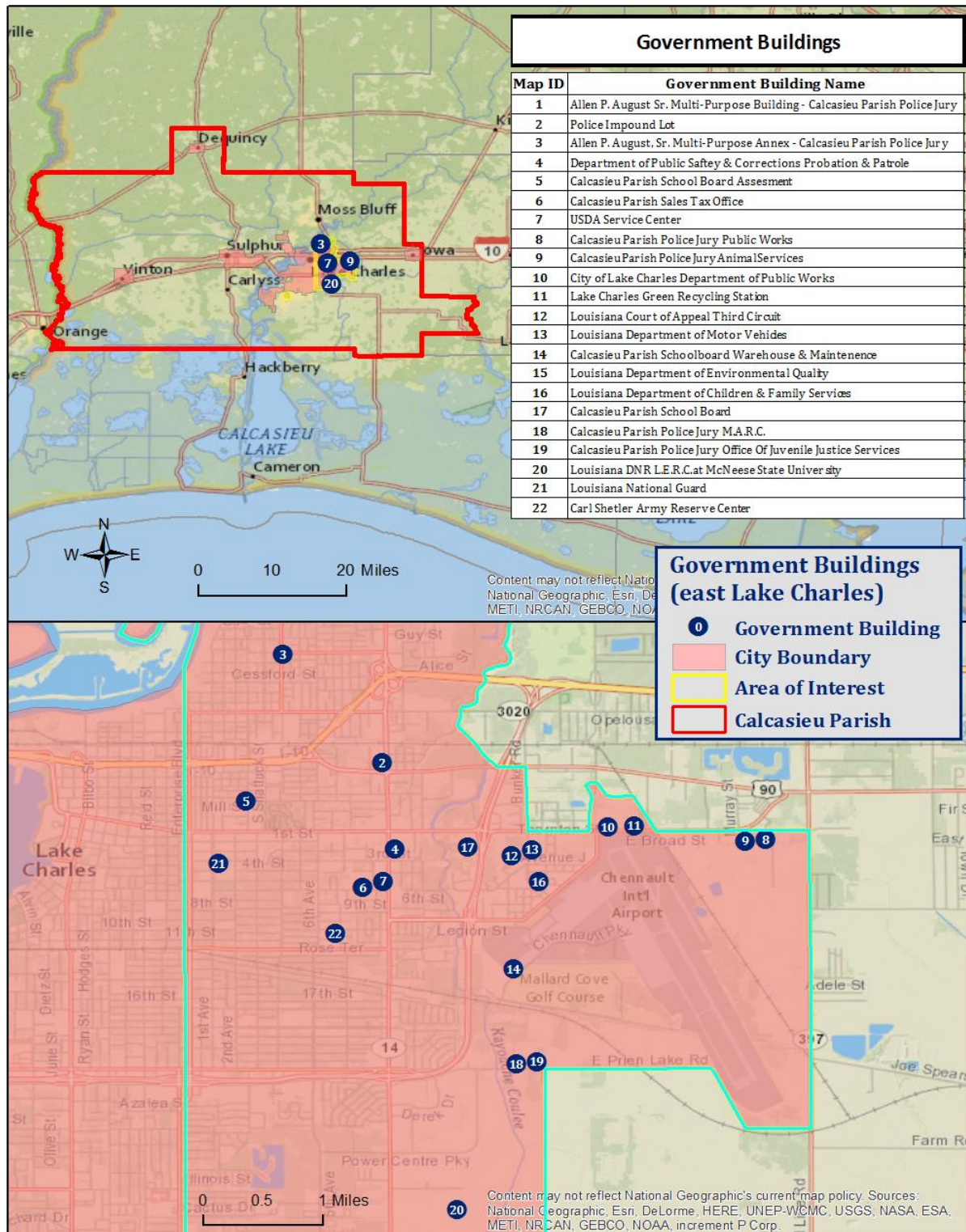


Figure 2-2: Government Buildings in east Lake Charles

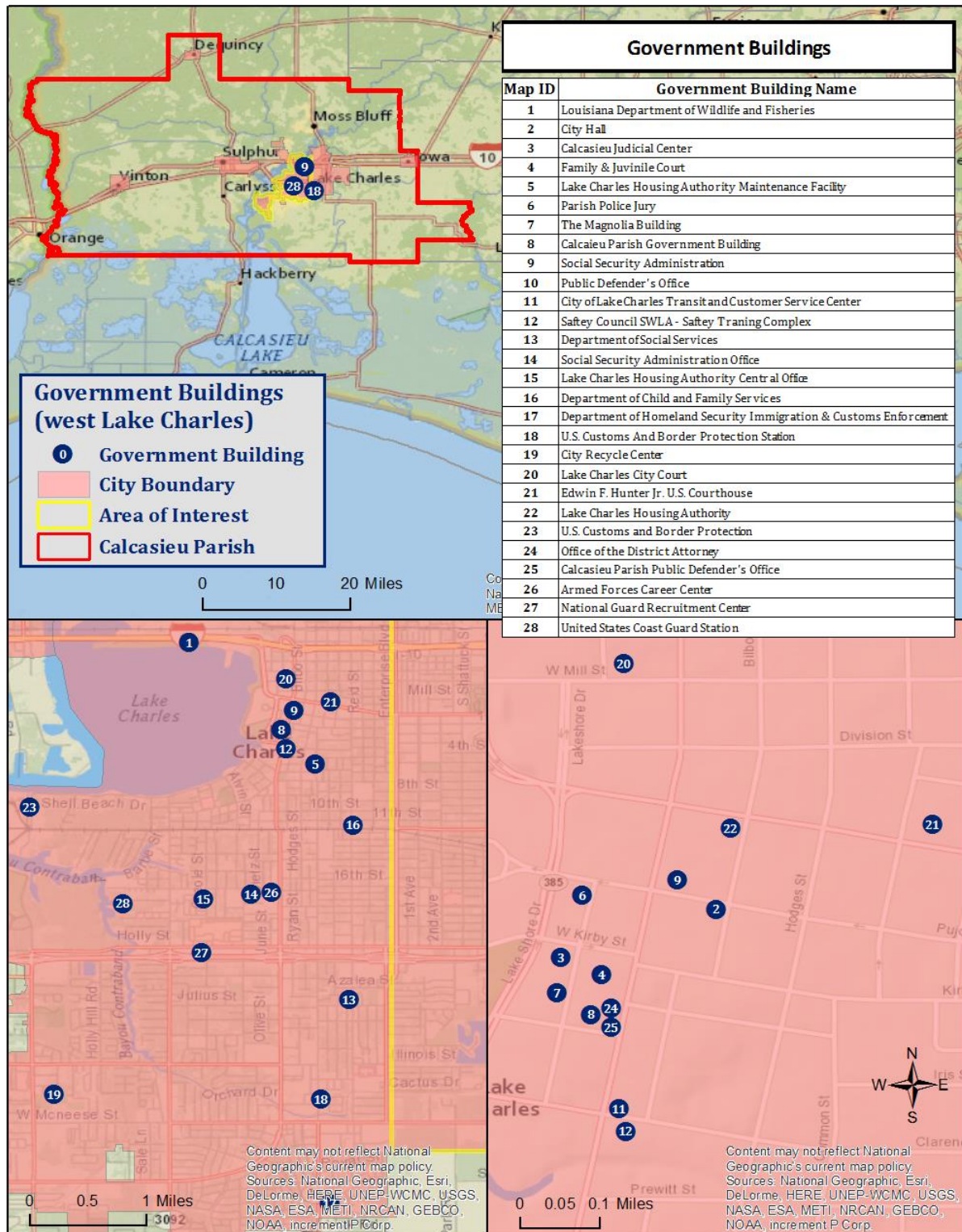


Figure 2-3: Government Buildings in west Lake Charles



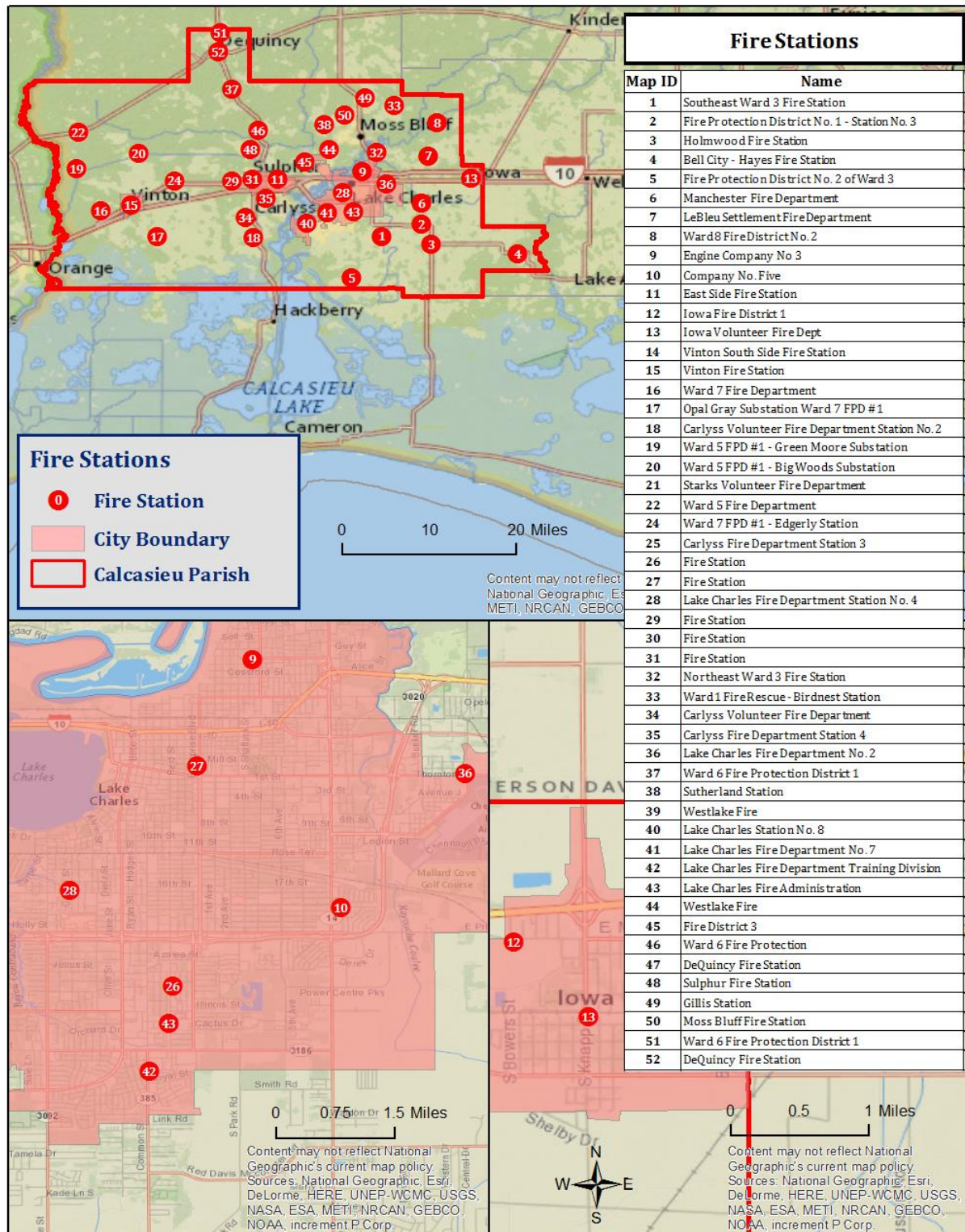


Figure 2-4: Fire Stations throughout Calcasieu Parish

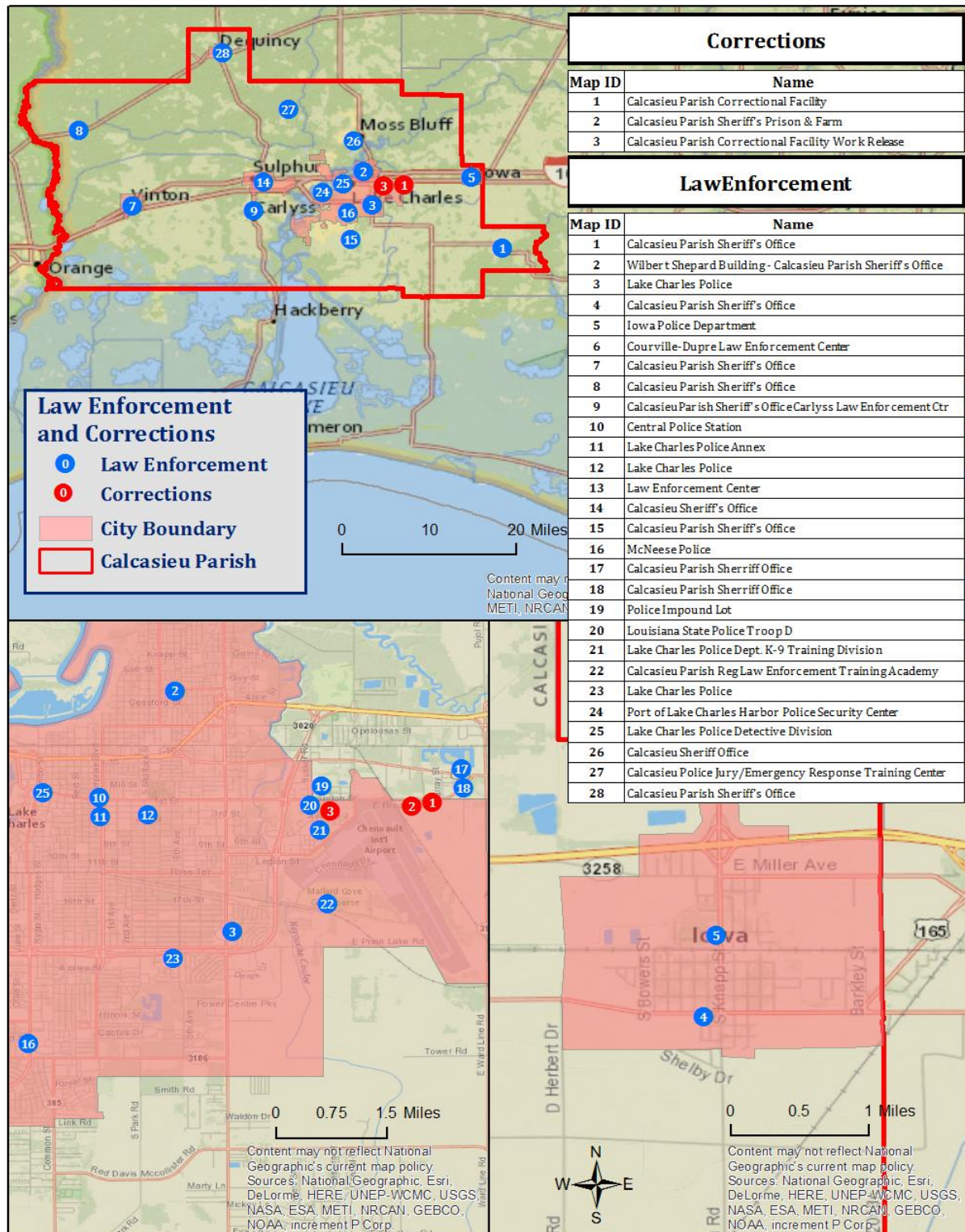


Figure 2-5: Law Enforcement Facilities in Calcasieu Parish



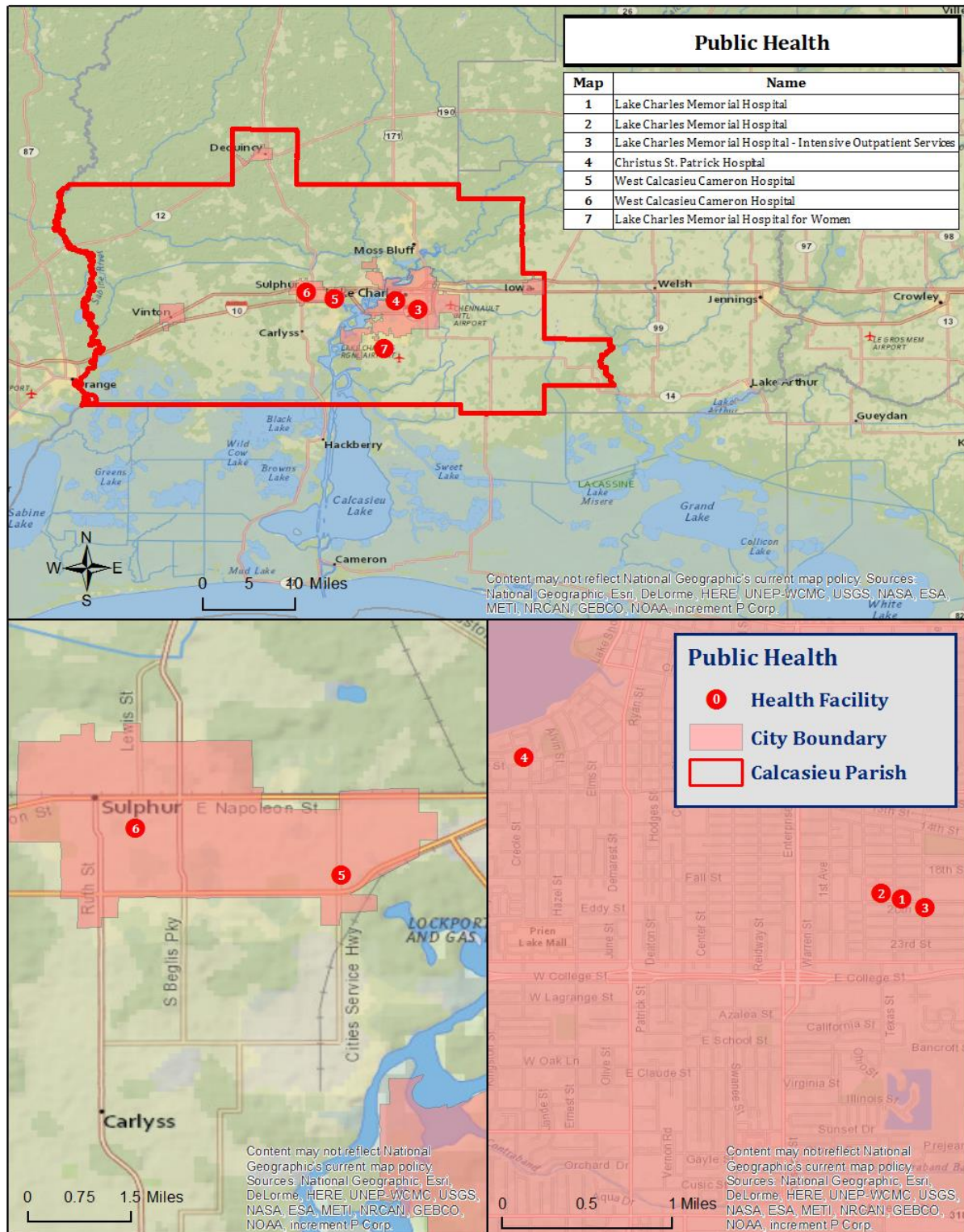


Figure 2-6: Public Health Facilities in Calcasieu Parish



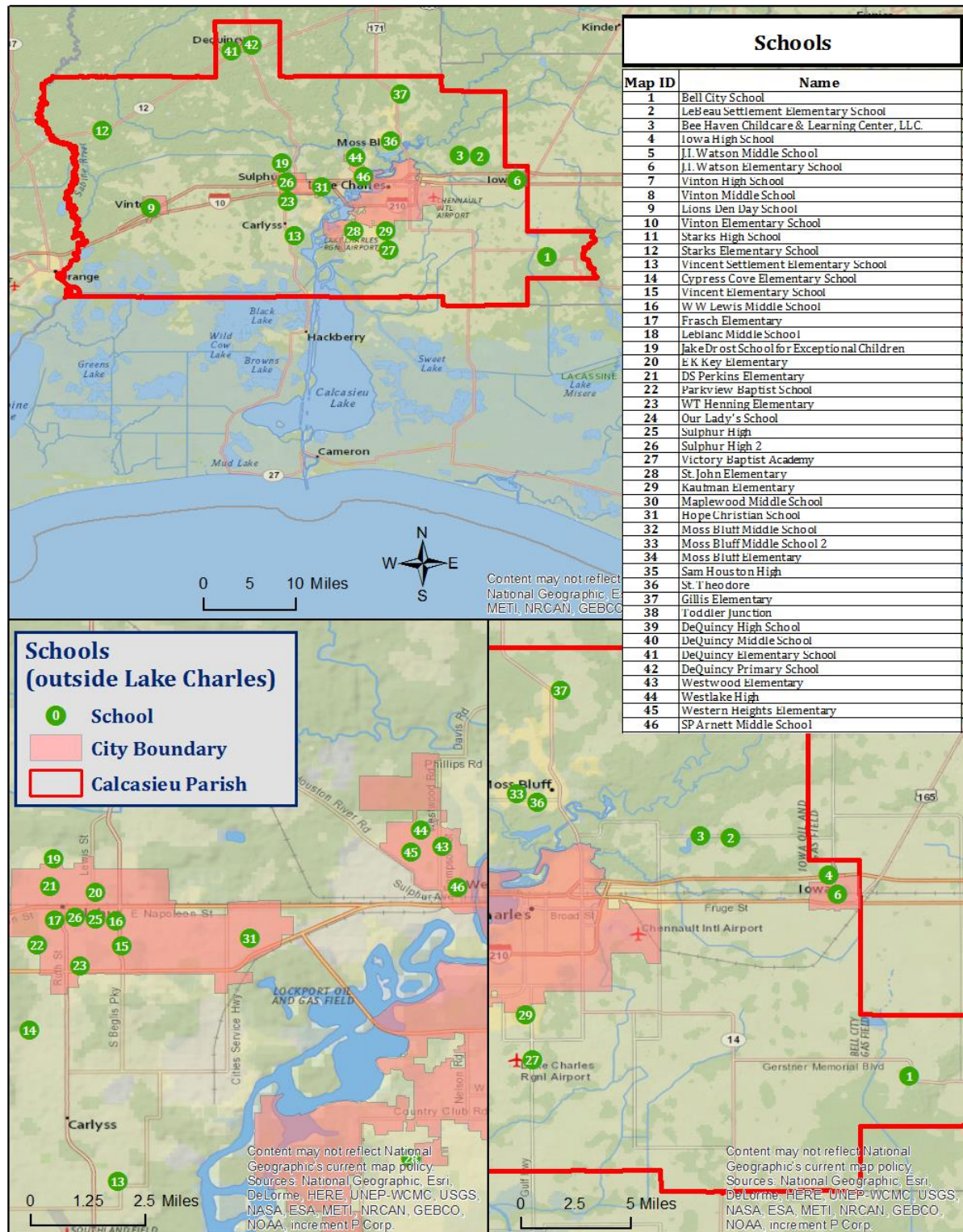


Figure 2-7: Educational Facilities outside of Lake Charles



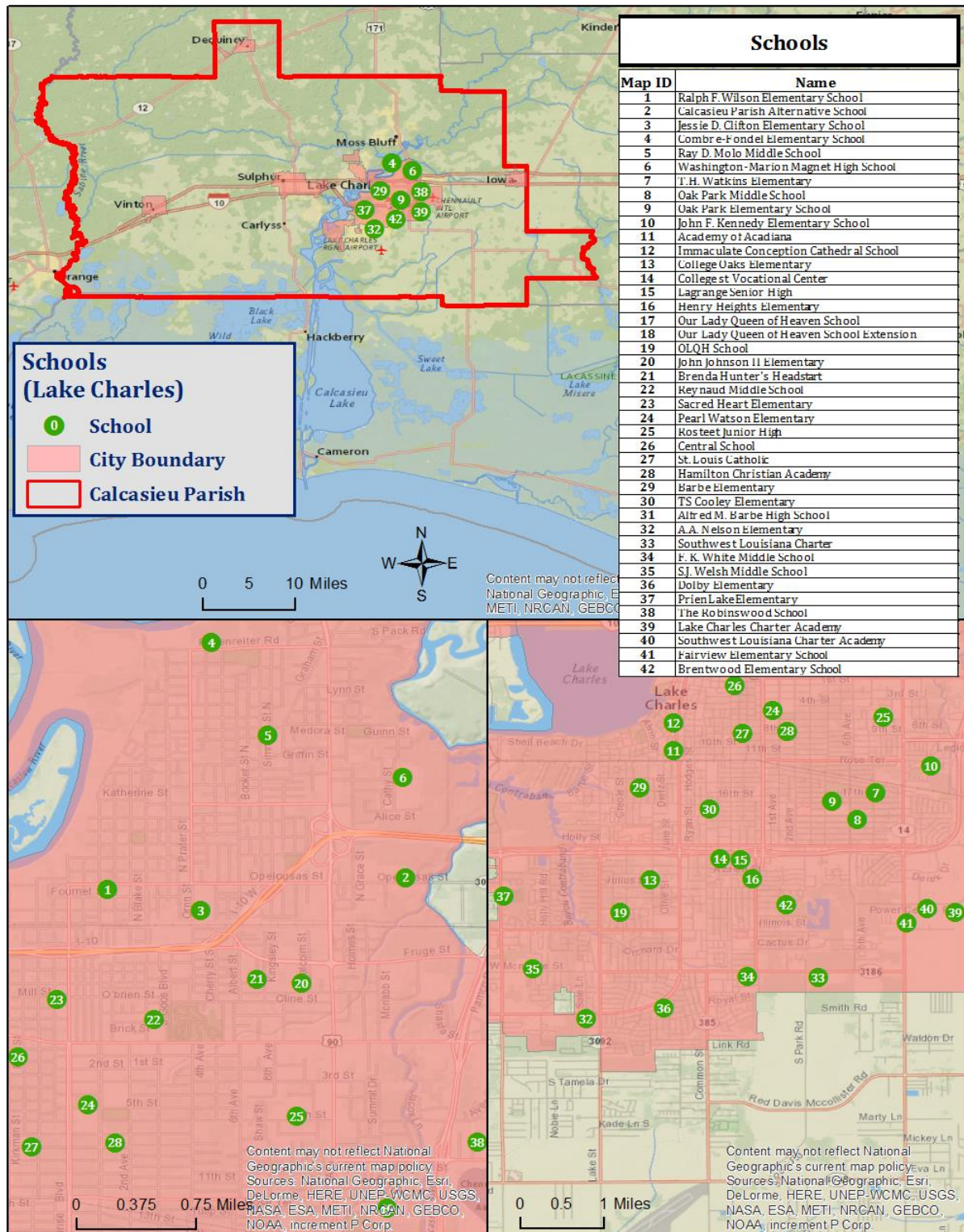


Figure 2-8: Educational Facilities in Lake Charles



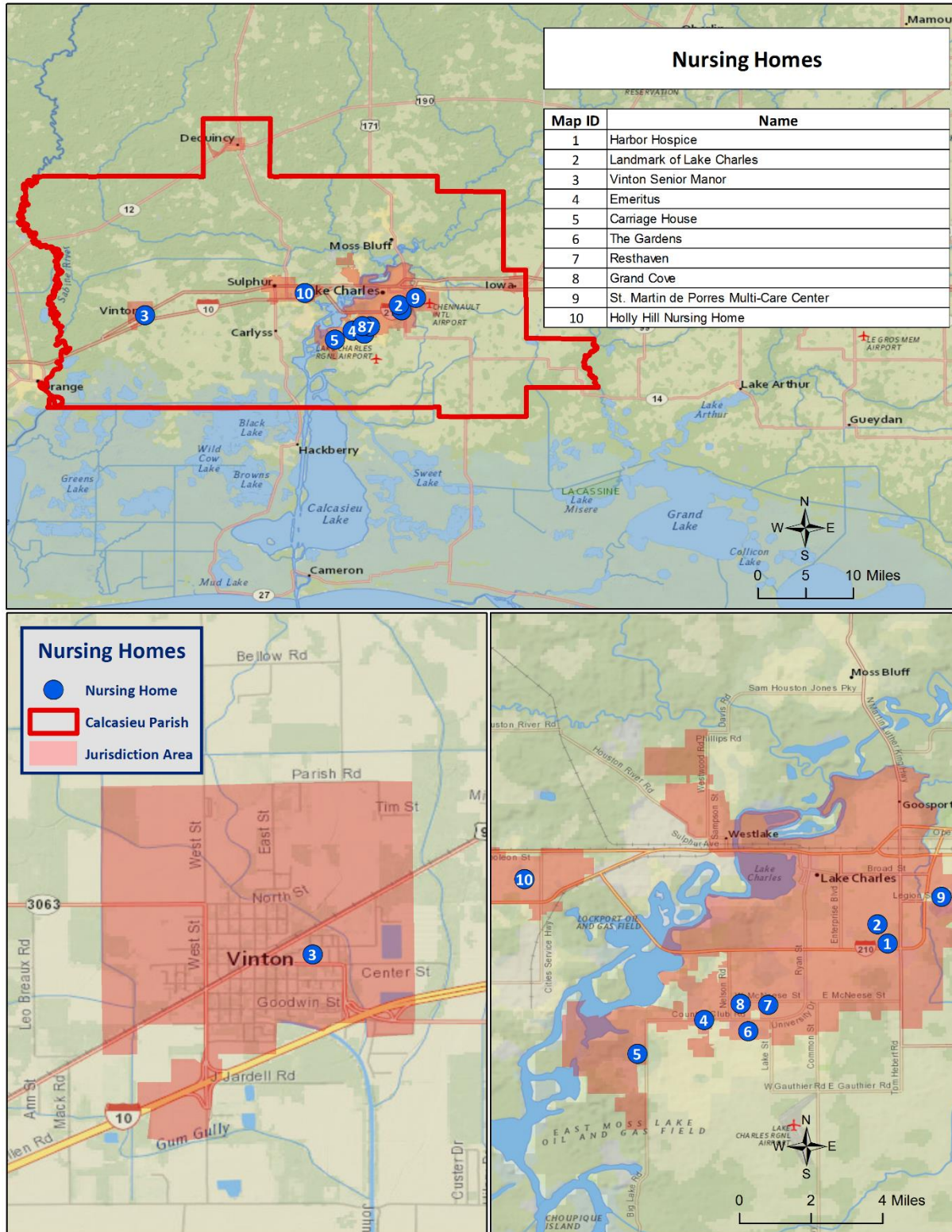


Figure 2-9: Nursing Home Facilities in Calcasieu Parish



### Future Development Trends

Calcasieu Parish experienced a small growth in population and housing between the years of 2000 and 2013, growing from a population of 183,577 with 75,995 housing units in 2000 to a population of 193,528 with 82,998 housing units in 2013. This growth was largely in the unincorporated areas of Calcasieu Parish and in the incorporated area of Iowa from the years 2000 to 2010, and in the incorporated areas of Iowa and Lake Charles from 2010 to 2013. The incorporated areas of Sulphur, DeQuincy, Vinton, and Westlake experienced a decline in population from the years of 2000 to 2010. This decline continued during the period of 2010 to 2013 for DeQuincy and Sulphur, while Vinton and Westlake experienced a slight increase. The future population and number of buildings can be estimated using U.S. Census Bureau housing and population data. The following tables show population and housing unit estimates from 2000 to 2013:

*Table 2-5: Population Growth Rate for Calcasieu Parish*

Total Population	Calcasieu Parish	Calcasieu (Unincorporated)	DeQuincy	Iowa	Lake Charles	Sulphur	Vinton	Westlake
1-Apr-00	183,577	77,241	3,398	2,663	71,757	20,512	3,338	4,668
1-Apr-10	192,768	86,354	3,235	2,996	71,993	20,410	3,212	4,568
1-Jul-13	193,528	86,389	3,213	3,028	72,826	20,279	3,221	4,572
Population Growth between 2000 – 2010	5.0%	11.8%	-4.8%	12.5%	0.3%	-0.5%	-3.8%	-2.1%
Average Annual Growth Rate between 2000 – 2010	0.5%	1.2%	-0.5%	1.3%	0.0%	0.0%	-0.4%	-0.2%
Population Growth between 2010 – 2013	0.4%	0.0%	-0.7%	1.1%	1.2%	-0.6%	0.3%	0.1%
Average Annual Growth Rate between 2010 – 2013	0.13%	0.01%	-0.23%	0.36%	0.39%	-0.21%	0.09%	0.03%

Table 2-6: Housing Growth Rate for Calcasieu Parish

Total Housing Units	Calcasieu Parish	Calcasieu (Unincorporated)	DeQuincy	Iowa	Lake Charles	Sulphur	Vinton	Westlake
1-Apr-00	75,995	29,972	1,500	1,041	31,429	8,665	1,452	1,936
1-Apr-10	82,058	34,432	1,465	1,173	32,469	9,053	1,487	1,979
1-Jul-13	82,998	34,222	1,371	1,253	33,640	8,867	1,448	2,197
Housing Growth between 2000 – 2010	8.0%	14.9%	-2.3%	12.7%	3.3%	4.5%	2.4%	2.2%
Average Annual Growth Rate between 2000 – 2010	0.8%	1.5%	-0.2%	1.3%	0.3%	0.4%	0.2%	0.2%
Housing Growth between 2010 – 2013	1.1%	-0.6%	-6.4%	6.8%	3.6%	-2.1%	-2.6%	11.0%
Average Annual Growth Rate between 2010 – 2013	0.4%	-0.2%	-2.1%	2.3%	1.2%	-0.7%	-0.9%	3.7%

As shown in [Table 2-5](#) and [Table 2-6](#), Calcasieu Parish has experienced slight growth in both population and housing units. Housing growth rates grew at 0.8% annually from 2000 to 2010, and at 0.4% annually from 2010 to 2013. Population growth rates for the parish were slightly lower at 0.5% annually from 2000 to 2010, and 0.13% annually from 2010 to 2013. From 2000 to 2010, the incorporated area of Iowa had the largest increase in population rate at 12.5%, followed by the unincorporated areas of Calcasieu Parish at 11.8%. The incorporated area of Vinton had the largest decrease in population during this time period at -3.8%. From 2010 to 2013, Lake Charles experienced the largest growth in population at 1.2% followed by Iowa at 1.1%.

The unincorporated area of Calcasieu Parish experienced the largest increase in housing units from 2000 to 2010 at 14.9%, followed by the incorporated area of Iowa at 12.7%. The only area in Calcasieu Parish to experience a decline in housing units during this time period was DeQuincy at -2.3%. From 2010 to

2013, DeQuincy's decline in housing units continued at an annual rate of -2.1%. The incorporated areas of Sulphur and Vinton also began to decline at rates of -0.7% and -0.9% annually, and the unincorporated areas of Calcasieu Parish declined at a rate of -0.2% annually. Housing growth rates from 2010 to 2013 increased for both incorporated areas of Iowa (2.3%) and Lake Charles (1.2%).

### Future Hazard Impacts

Hazard impacts were estimated for five years and ten years in the future (2019 and 2024). Yearly population and housing growth rates were applied to parish inventory assets for composite flood and tropical cyclones. Based on a review of available information, it is assumed that population and housing units will continue to grow slightly within Calcasieu Parish from the present until 2024. A summary of estimated future impacts is shown in the table below. Dollar values are expressed in future costs and assume an annual rate of inflation of 1.02%.

*Table 2-7: Estimated Future Impacts, 2019-2024*

*(Source: Hazus, US Census Bureau)*

Hazard / Impact	Total in Parish (2014)	Hazard Area (2014)	Hazard Area (2019)	Hazard Area (2024)
Flood Damage				
Structures	83,315	43,243	44,075	45,095
Value of Structures	\$18,873,357,192	\$9,795,899,771	\$10,504,055,187	\$11,421,737,877
# of People	193,782	100,579	101,242	102,043
Tropical Cyclone				
Structures	83,315	83,315	84,918	86,882
Value of Structures	\$18,873,357,192	\$18,873,357,192	\$20,237,731,105	\$22,005,792,601
# of People	193,782	193,782	195,059	196,602

### Land Use

The Calcasieu Parish Land Use table is provided on the following page. Residential, commercial, and industrial areas account for only 15% of the parish's land use. Agricultural land is the largest category at 220,462 acres, accounting for 31% of parish land. At 195,187 acres, wetlands account for 28% of parish lands, while 154,215 acres of forested areas account for 22% of parish lands. The parish also consists of 27,292 acres of water areas, accounting for 4% of all parish lands.

Table 2-8: Calcasieu Parish Land Use  
(Source: USGS Land Use Map)

Land Use	Acres	Percentage
Agricultural Land, Cropland, and Pasture	220,462	31%
Wetlands	195,187	28%
Forest Land (not including forested wetlands)	154,215	22%
Urban/Development	103,115	15%
Water	27,292	4%

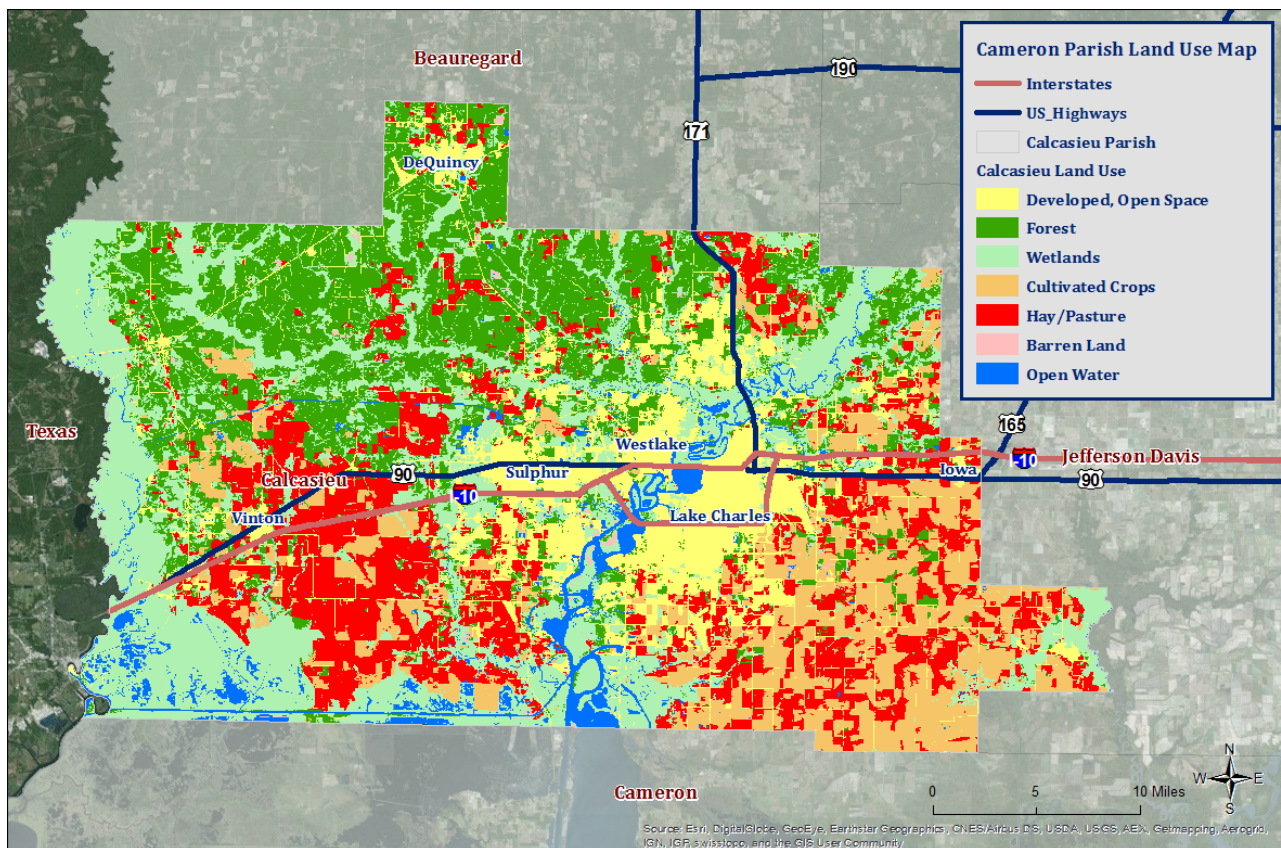


Figure 2-10: Calcasieu Parish Land Use Map  
(Source: USGS Land Use Map)

## Hazard Identification

### Drought

A drought is a deficiency in water availability over an extended period of time, caused by precipitation totals and soil water storages that do not satisfy the environmental demand for water, either by evaporation or transpiration through plant leaves. It is important to note that the lack of precipitation alone does not constitute drought; the season during which the precipitation is lacking has a major impact on whether drought occurs. For example, a week of no precipitation in July, when the solar energy to evaporate water and vegetation's need for water to carry on photosynthesis are both high, may trigger a drought, while a week of no precipitation in January may not initiate a drought.

Drought is a unique and insidious hazard. Unlike other natural hazards, no specific threshold of "dryness" exists for declaring a drought. In addition, the definition of drought depends on stakeholder needs. For instance, the onset (and demise) of agricultural drought is quick, as crops need water every few days; once they get rainfall, they improve. But hydrologic drought sets in (and is alleviated) only over longer time periods. A few dry days will not drain a reservoir, but a few rain showers cannot replenish it either. Moreover, different geographical regions define drought differently based on the deviation from local, normal precipitation. And drought can occur anywhere, triggered by changes in the local-to-regional-scale atmospheric circulation over an area, or by broader-scale circulation variations such as the expansion of semi-permanent oceanic high-pressure systems or the stalling of an upper-level atmospheric ridge in place over a region. The severity of a drought depends upon the degree and duration of moisture deficiency, as well as the size of the affected area. Periods of drought also tend to be associated with other hazards, such as wildfires and/or heat waves. Lastly, drought is a slow onset event, causing less direct—but tremendous indirect—damage. Depletion of aquifers, crop loss, and livestock and wildlife mortality rates are examples of direct impacts. Since the groundwater found in aquifers is the source of about 38% of all county and city water supplied to households (and comprises 97% of the water for all rural populations that are not already supplied by cities and counties), droughts can potentially have direct, disastrous effects on human populations. The indirect consequences of drought, such as unemployment, reduced tax revenues, increased food prices, reduced outdoor recreation opportunities, higher energy costs as water levels in reservoirs decrease and consumption increases, and water rationing, are not often fully known. This complex web of impacts causes drought to affect people and economies well beyond the area physically experiencing the drought.

This hazard is often measured using the Palmer Drought Severity Index (PDSI, also known operationally as the Palmer Drought Index). The PDSI, first developed by Wayne Palmer in a 1965 paper for the U.S. Weather Bureau, measures drought through recent precipitation and temperature data with regard to a basic supply-and-demand model of soil moisture. It is most effective in long-term calculations. Three other indices used to measure drought are the Palmer Hydrologic Drought Index (PHDI), the Crop Moisture Index (CMI), which is derived from the PDSI, and the Keetch-Byram Drought Index (KBDI), created by John Keetch and George Byram in 1968 for the U.S. Forest Service. The KBDI is used mainly for predicting the likelihood of wildfire outbreaks. As a compromise, the PDSI is used most often for droughts since it is a medium-response drought indicator. The objective of the PDSI is to provide measurements of moisture conditions that are standardized so that comparisons using the index can be made between locations and between months. [Table 2-9](#) displays the range and Palmer classifications of the PDSI index. [Figure 2-11](#) displays the current drought monitor for the state of Louisiana and its parishes.

*Table 2-9: Palmer Drought Severity Index Classification and Range*

Range	Palmer Classifications
4.0 or more	Extremely Wet
3.0 to 3.9	Very Wet
2.0 to 2.9	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2.0 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

The PDSI best measures the duration and intensity of drought-inducing circulation patterns at a somewhat long-term time scale, although not as long-term as the PHDI. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns in addition to the effects of cumulative patterns of previous months. Although weather patterns can change almost overnight from a long-term drought pattern to a long-term wet pattern, as a medium-response indicator, the PDSI responds relatively rapidly. Data compiled by the National Drought Mitigation Center indicates normal conditions exist in Calcasieu Parish at the time this plan went to publication ([Figure 2-11](#)).

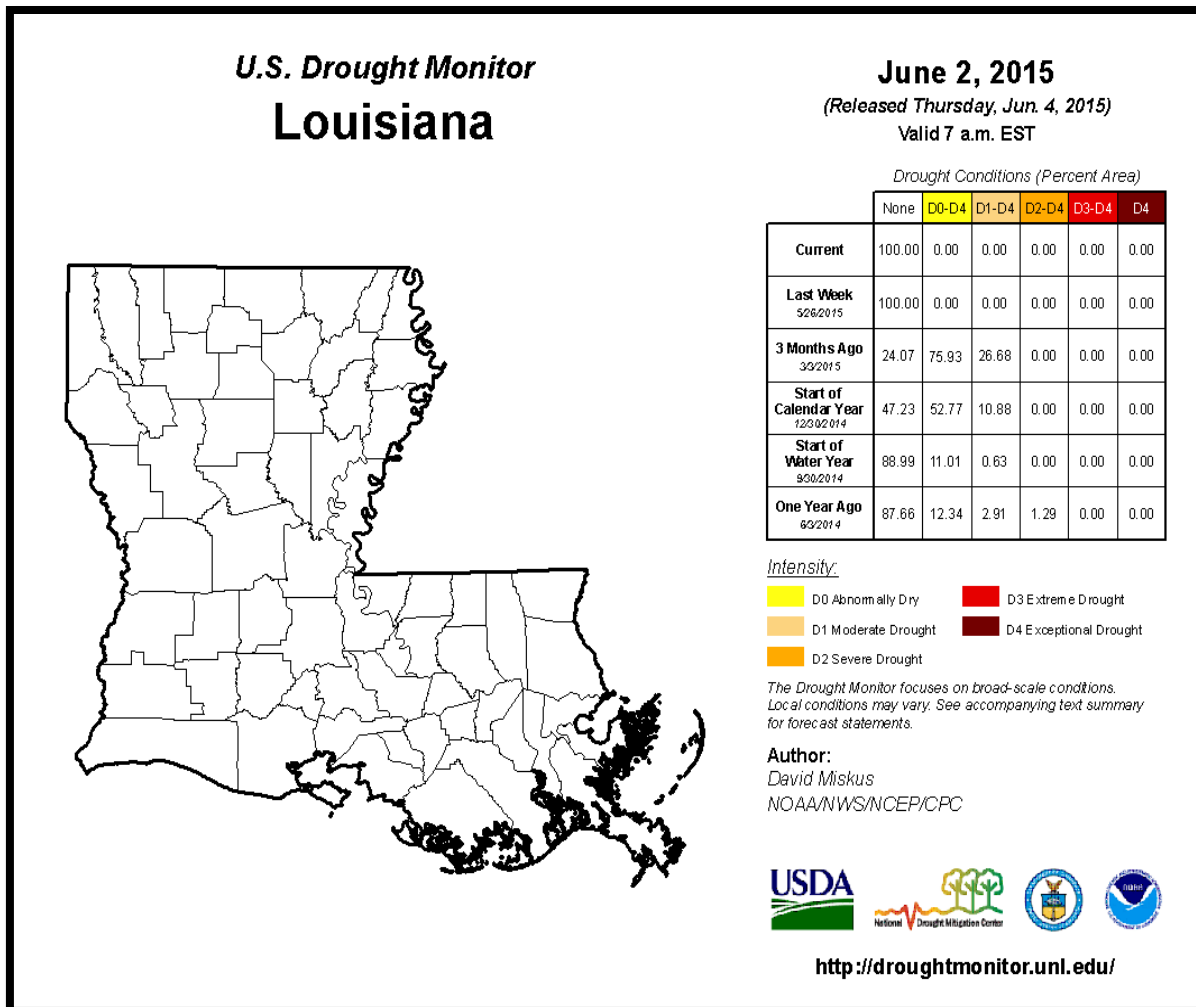


Figure 2-11: United States Drought Monitor for the State of Louisiana and its Parishes  
(Source: The National Drought Mitigation Center)

#### Location

Drought typically impacts a region and not one specific parish or jurisdiction. While the entire planning area can experience drought, the major impact of a drought event in Calcasieu Parish is on the agricultural community.

#### Previous Occurrences / Extents

The SHELDUS database reports a total of three drought events occurring within the boundaries of Calcasieu Parish between the years of 1989 to 2014. Table 2-10 identifies the date of occurrence, estimated crop damage, and severity of the events that have occurred in Calcasieu Parish. Based on previous occurrences, and in accordance with the Palmer Drought Index, the worst case scenario for drought in Calcasieu Parish would be a severe drought event.



*Table 2-10: Drought Events with Crop Damage Totals for Calcasieu Parish  
(Source: SHEL DUS)*

Date	Crop Damage	Palmer Classification
May 1996	\$92,797	Moderate Drought
August 1998	\$15,160,345	Severe Drought
December 2000	\$14,339,978	Severe Drought

#### *Frequency / Probability*

Based on previous occurrences of three drought events in 25 years, the probability of drought occurrence in the planning area in any given year is 12%.

#### *Estimated Potential Losses*

According to the SHEL DUS database, there have been three drought events that have caused some level of crop damage. The total agricultural damage from these events is \$29,593,120, with an average cost of \$9,864,373 per drought event. When annualizing the total cost over the 25-year record, total annual losses based on drought is estimated to be \$1,183,725. [Table 2-11](#) presents an analysis of agricultural exposure that is susceptible to drought by major crop type for Calcasieu Parish.

*Table 2-11: Agricultural Exposure by Crop Type for Droughts in Calcasieu Parish  
(Source: LSU Ag Center 2014 Parish Totals)*

Agricultural Exposure by Type for Drought						
Rice	Soybeans	Sugarcane	Pecans	Forestry	Wheat	Total
\$9,347,963	\$3,526,038	\$394,588	\$143,044	\$11,135,000	\$85,566	\$24,632,199

There have been no reported injuries or deaths as a direct result to drought in Calcasieu Parish.



### Expansive Soils

Soils and soft rock that tend to swell or shrink due to changes in moisture content are commonly known as expansive soils. Changes in soil volume present a hazard primarily to structures built on top of expansive soils. The most extensive damage occurs to highways and streets.

“Clay” is defined as a natural, earthy, fine-grained material that develops plasticity when mixed with a limited amount of water. Swelling clay is clay that is capable of absorbing large quantities of water, thus increasing greatly in volume.

Variations in moisture content and volume changes are greatest in clays found in regions of moderate to high precipitation, where prolonged periods of drought are followed by long periods of rainfall. It is in these regions, which include many of the Southern, Central, and Western States, that swelling of clays resulting from climatic fluctuations cause the most severe engineering problems.

### Location

The availability of data on expansive soils varies greatly. In or near metropolitan centers and at dam sites, abundant information on the amount of clay generally is available. However, for large areas of the United States, little information is reported other than field observations of the physical characteristics of clay of a particular stratigraphic unit. Therefore, fixed criteria for determining the swelling potential have not been devised. However, one method that was devised in 1989 was based mostly on numerous published descriptions of the physical and mineralogical properties of clays. Using this classification system, it is evident that the southeastern portion of Louisiana, primarily along the Mississippi River from around East Baton Rouge Parish to the mouth of the Mississippi River, is abundant with high swelling potential clays. Clays in the Quaternary Alluvium of the lower Mississippi River valley in Louisiana are reported to be of the “montmorillonite type”. Clayey soils of the alluvial valley have high “shrink-swell capacity”, and foundation problems in the area are associated with changing water levels and the instability of clayey soils. Foundation failures in alluvial deposits of the Mississippi River valley are common. [Figure 2-12](#) shows the primary locations of swelling clays in Louisiana and [Figure 2-13](#) shows the areas within the planning area that are at risk to expansive soils.

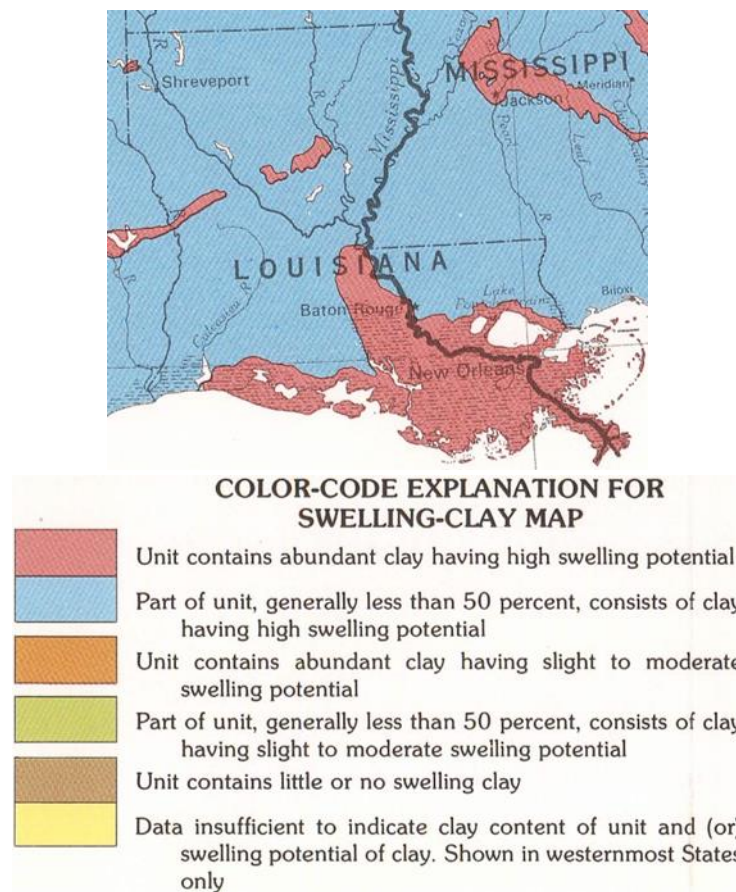


Figure 2-12: Location of Swelling Clays in Louisiana

(Source: "Swelling Clays Map of the Conterminous United States", W.W. Olive, A.F. Chleborad, C.W. Frahme, J. Schlocker, R.R. Schneider, and R.L. Shuster; 1989)

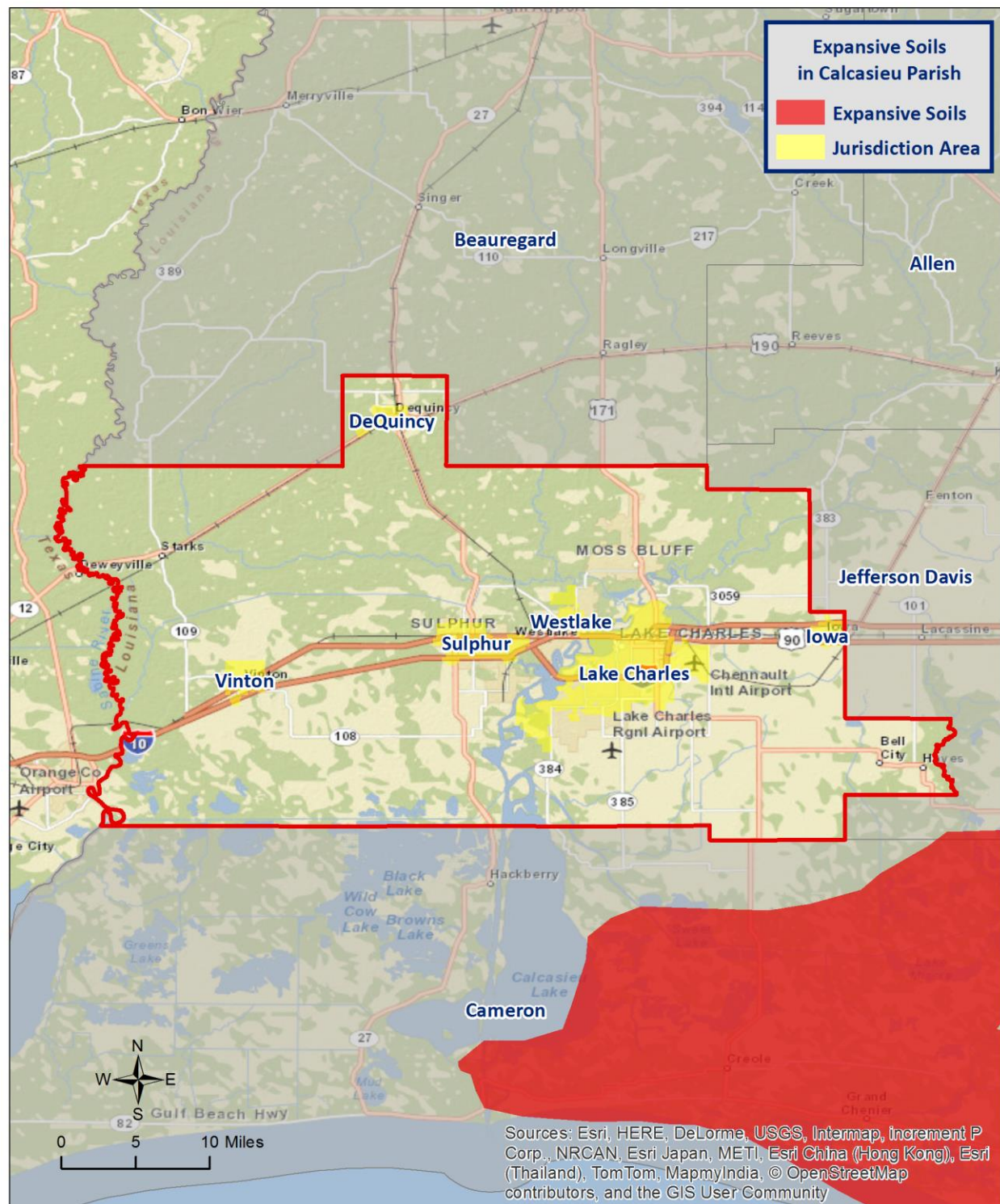


Figure 2-13: Location of Swelling Clays in Calcasieu Parish  
 (Source: "Swelling Clays Map of the Conterminous United States", W.W. Olive, A.F. Chleborad, C.W. Frahme, J. Schlocker, R.R. Schneider, and R.L. Shuster; 1989)

Based on the map in [Figure 2-13](#), there is no risk of expansive soils within Calcasieu Parish.

*Previous Occurrences / Extents*

There have been no previous occurrences in the planning area.

*Frequency / Probability*

Based on [Figure 2-13](#), expansive soils are located outside of the planning area of Calcasieu Parish and are considered a very low impact hazard.

*Estimated Potential Losses*

Because of the low impact of expansive soils in the planning area, expansive soils are not carried forward into risk assessment.

### Extreme Heat

There is no operational definition for defining heat or a heat wave. Heat waves are the consequence of the same weather pattern as drought, and therefore both hazards often occur concurrently. A heat wave is an extended period of oppressive and above normal temperatures over a given period of time. The World Meteorological Organization recommends the declaration of a heat wave when the daily maximum temperature exceeds the average maximum temperatures by 9 °F and lasts for a period of at least five days.

However, temperature alone is insufficient to describe the stress placed on humans (as well as flora and fauna) in hot weather. It is crucial to consider the effect of relative humidity since it is essential to the body's ability to perspire and cool. Once air temperature reaches 95 °F, perspiration becomes a very significant biophysical mechanism to ensure heat loss. Perspiration is ineffective as a cooling mechanism if the water cannot evaporate (i.e., sweating in high relative humidity is reduced as compared to during dry conditions). To communicate this relationship between temperature and humidity, the National Weather Service (NWS) developed the Heat Index (HI), which provides a warning system based on a combination of air temperature and relative humidity. The HI is presented in [Table 2-12](#), and [Table 2-13](#) summarizes the HI risk levels and protective measures. The NWS devised the index for shady, light wind conditions, and thus advises that the HI value can be increased by as much as 15 °F if a person is in direct sunlight with strong, hot winds present.

Most heat disorders (e.g., sunburn, heat cramps, heat exhaustion, and heat stroke) occur because the victim has been overexposed to heat, or has over-exercised in relation to their age and physical condition. Other circumstances that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Seniors and children are most at risk from adverse heat effects. Extreme heat can also damage roads, bridges, pipelines, utilities, and railroads. High temperatures can be partially responsible for deflection of rails and related railroad accidents.

According to NOAA, extreme heat is the leading weather-related cause of death in the United States. And while heat-related deaths in Louisiana are not common, due in part to the consistency and predictability of high seasonal temperatures, they do occur and are still very intense and dangerous. Such deaths happen in a variety of circumstances, often in ways that are not easily categorized due to their unexpectedness. For instance, although exposure to heat is higher at the beach than usual, NOAA does not track heat-related deaths there because such deaths happen infrequently.



Table 2-12: Heat Index Advisor based on Air Temperature (°F) and Relative Humidity  
(Source: National Weather Service)

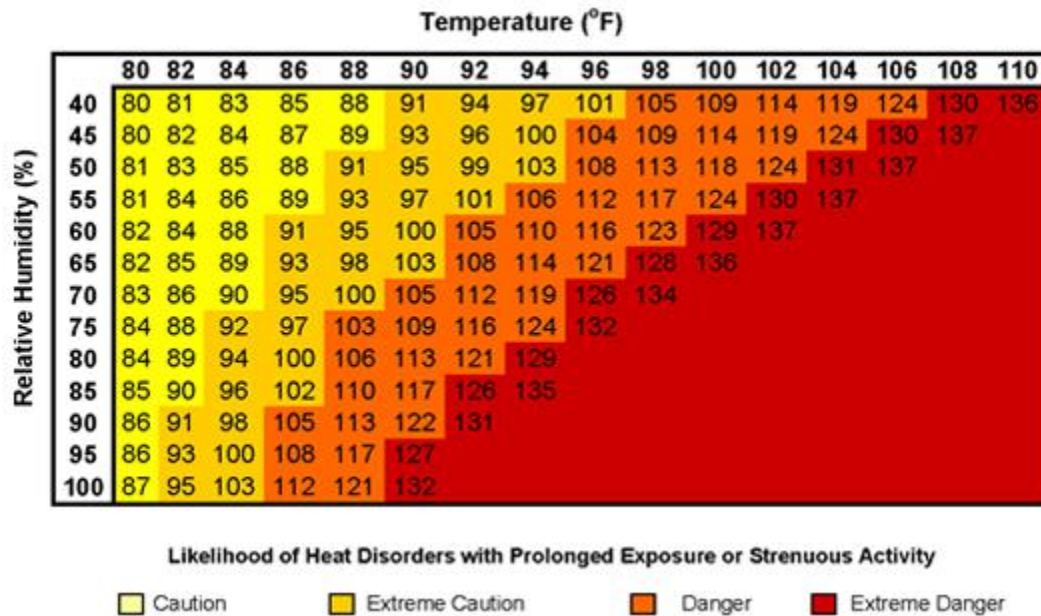


Table 2-13: Summary of Heat Index Risk Levels with Protective Measures  
(Source: National Weather Service)

Heat Index	Risk Level	Protective Measures
Less than 91°F	Lower (Caution)	Basic heat safety and planning.
91°F to 103°F	Moderate	Implement precautions and heighten awareness.
103°F to 115°F	High	Additional precautions to protect workers.
Greater than 115°F	Very High to Extreme	Triggers even more aggressive protective measures.

#### Location

Extreme heat typically impacts a region and not one specific parish or jurisdiction. Because extreme heat is a climatological based hazard and has the same probability of occurring in Calcasieu Parish as all of the adjacent parishes, the entire planning area for Calcasieu Parish is equally at risk for extreme heat.

#### Previous Occurrences / Extents

The SHELATUS database reports a total of two significant extreme heat events occurring within the boundaries of Calcasieu Parish between the years of 1960 to 2014. Table 2-14 provides an overview of extreme heat events that have impacted the Calcasieu Parish planning area since 1960. Based on historical data, the worst case scenario for Calcasieu Parish involving extreme heat would be a high risk level event on the HI scale with temperatures ranging from 103°F to 115°F.

*Table 2-14: Previous Occurrences of Extreme Heat in Calcasieu Parish  
(Source: SHEL DUS)*

Date	Crop Damage	Risk Level
May 1963	\$594,764	Moderate
July 1980	\$22,087	High

#### *Frequency / Probability*

Based on the geographical location of the State of Louisiana, and Calcasieu Parish in particular, extreme heat events occur frequently. However, extreme heat events that meet the definition used by SHEL DUS (those that actually result in damages to property or crops and injury or death to people) are less likely to occur. Based on a review of significant extreme heat data that has caused damages in the last 54 years, in which Calcasieu Parish has had two recorded events, the probability of occurrence is estimated at approximately 4%.

#### *Estimated Potential Losses*

According to the SHEL DUS database, crop damage due to extreme heat in Calcasieu Parish has totaled approximately \$616,851 since 1960. To estimate the potential losses of an extreme heat event on an annual basis, the total damages recorded for an extreme event is divided by the total number of years of available extreme heat data in SHEL DUS (1960 – 2014). This provides an annual estimated potential loss of \$11,423. The following table, based on the 2010 Census data, provides an estimate of potential crop losses for Calcasieu Parish:

*Table 2-15: Estimated Annual Crop Losses in Calcasieu Parish for Extreme Heat*

Estimated Annual Potential Losses from Extreme Heat for Calcasieu Parish						
Unincorporated Calcasieu Parish (44.8% of Population)	DeQuincy (1.7% of Population)	Iowa (1.6% of Population)	Lake Charles (37.3% of Population)	Sulphur (10.6% of Population)	Vinton (1.7% of Population)	Westlake (2.4% of Population)
\$5,117	\$192	\$178	\$4,266	\$1,209	\$190	\$271

There have been no reported injuries or deaths as a direct result of extreme heat in Calcasieu Parish.

#### *Vulnerability*

See Appendix C for parish and municipality agricultural exposure to extreme heat hazards.

## Flooding

A flood is the overflow of water onto land that is usually not inundated. The National Flood Insurance Program defines a flood as:

A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from overflow of inland or tidal waves, unusual and rapid accumulation or runoff of surface waters from any source, mudflow, or collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Factors influencing the type and severity of flooding include natural variables such as precipitation, topography, vegetation, soil texture, and seasonality, as well as anthropogenic factors such as urbanization (extent of impervious surfaces), land use (agricultural and forestry tend to remove native vegetation and accelerate soil erosion), and the presence of flood-control structures such as levees and dams.

Excess precipitation, produced from thunderstorms or hurricanes, is often the major initiating condition for flooding, and Louisiana can have high rainfall totals at any time of day or year. During the cooler months, slow-moving frontal weather systems produce heavy rainfalls, while the summer and autumn seasons produce major precipitation in isolated thunderstorm events (often on warm afternoons) that may lead to localized flooding. During these warmer seasons, floods are overwhelmingly of the flash flood variety, as opposed to the slower-developing river floods caused by heavy stream flow during the cooler months.

In cooler months, particularly in the spring, Louisiana is in peak season for severe thunderstorms. The fronts that cause these thunderstorms often stall while passing over the state, occasionally producing rainfall totals exceeding ten inches within a period of a few days. Since soil tends to be nearly saturated at this time (due to relatively low overall evaporation rates), spring typically becomes the period of maximum stream flow across the state. Together, these characteristics increase the potential for high water, with low-lying, poorly drained areas being particularly susceptible to flooding during these months.

In Louisiana, six specific types of flooding are of main concern: riverine, flash, ponding, backwater, urban, and coastal.

- **Riverine flooding** occurs along a river or smaller stream. It is the result of runoff from heavy rainfall or intensive snow or ice melt. The speed with which riverine flood levels rise and fall depends not only on the amount of rainfall, but even more on the capacity of the river itself, as well as the shape and land cover of its drainage basin. The smaller the river, the faster that water levels rise and fall. Thus, the Mississippi River levels rise and fall slowly due to its large capacity. Generally, elongated and intensely-developed drainage basins will reach faster peak discharges and faster falls than circular-shaped and forested basins of the same area.
- **Flash flooding** occurs when locally intense precipitation inundates an area in a short amount of time, resulting in local stream flow and drainage capacity being overwhelmed.
- **Ponding** occurs when concave areas (e.g., parking lots, roads, and clay-lined natural low areas) collect water and are unable to drain.



- **Backwater flooding** occurs when water slowly rises from a normally unexpected direction where protection has not been provided. A model example is the flooding that occurred in LaPlace during Hurricane Isaac in 2012. Although the town was protected by a levee on the side facing the Mississippi River, floodwaters from Lake Maurepas and Lake Pontchartrain crept into the community on the side of town opposite the Mississippi River.
- **Urban flooding** is similar to flash flooding but is specific to urbanized areas. It takes place when storm water drainage systems cannot keep pace with heavy precipitation, and water accumulates on the surface. Most urban flooding is caused by slow-moving thunderstorms or torrential rainfall.
- **Coastal flooding** can appear similar to any of the other flood types, depending on its cause. It occurs when normally dry coastal land is flooded by seawater, but may be caused by direct inundation (when the sea level exceeds the elevation of the land), overtopping of a natural or artificial barrier, or the breaching of a natural or artificial barrier (i.e., when the barrier is broken down by the sea water). Coastal flooding is typically caused by storm surge, tsunamis, or gradual sea level rise.

Historically, in Calcasieu Parish, all six types of flooding have historically been observed. For purposes of this assessment, ponding, flash flood, and urban flooding are considered to be flooding as a result of storm water from heavy precipitation thunderstorms

Based on stream gauge levels and precipitation forecasts, the National Weather Service (NWS) posts flood statements, watches, and warnings. The NWS issues the following weather statements with regard to flooding:

- **Flood Categories**
  - Minor Flooding: Minimal or no property damage, but possibly some public threat.
  - Moderate Flooding: Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.
  - Major Flooding: Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.
  - Record Flooding: Flooding which equals or exceeds the highest stage or discharge at a given site during the period of record keeping.
- **Flood Warning**
  - Issued along larger streams when there is a serious threat to life or property.
- **Flood Watch**
  - Issued when current and developing hydrometeorological conditions are such that there is a threat of flooding, but the occurrence is neither certain nor imminent.

Floods are measured mainly by probability of occurrence. A 10-year flood event, for example, is an event of small magnitude (in terms of stream flow or precipitation) but with a relatively high annual probability of recurrence (10%). A 100-year flood event is larger in magnitude, but it has a smaller chance of recurrence (1%). A 500-year flood is significantly larger than both a 100-year event and a 10-year event, but it has a lower probability than both to occur in any given year (0.2%). It is important to understand that an X-year flood event does not mean an event of that magnitude occurs only once in X years. Instead,

it means that on average, we can expect a flood event of that magnitude to occur once every X years. Given that such statistical probability terms are inherently difficult for the general population to understand, the Association of State Floodplain Managers (ASFPM) promotes the use of more tangible expressions of flood probability. As such, the ASFPM also expresses the 100-year flood event as having a 25% chance of occurring over the life of a 30-year mortgage.

It is essential to understand that the magnitude of an X-year flood event for a particular area depends on the source of flooding and the area's location. The size of a specific flood event is defined through historic data of precipitation, flow, and discharge rates. Consequently, different 100-year flood events can have very different impacts. The 100-year flood event in two separate locations have the same likelihood to occur, but they do not necessarily have the same magnitude. For example, a 100-year event for the Mississippi River means something completely different in terms of discharge values ( $\text{ft}^3/\text{s}$ ) than for the Amite River. Not only are the magnitudes of 100-year events different between rivers, they can be different along any given river. A 100-year event upstream is different from one downstream due to the change of river characteristics (volume, discharge, and topography). As a result, the definition of what constitutes a 100-year flood event is specific to each location, river, and time, since floodplain and river characteristics change over time. Finally, it is important to note that each flood event is unique. Two hypothetical events at the same location, given the same magnitude of stream flow, may still produce substantially different impacts if there were different antecedent moisture characteristics, different times of day of occurrence (which indicates the population's probable activities at the flood's onset), or other characteristic differences.

The 100-year flood event is of particular significance since it is the regulatory standard that determines the obligation (or lack thereof) to purchase flood insurance. Flood insurance premiums are set depending on the flood zone, as modeled by National Flood Insurance Program (NFIP) Rate Maps. The NFIP and FEMA suggest insurance rates based on Special Flood Hazard Areas (SFHAs), as diagrammed in [Figure 2-14](#).

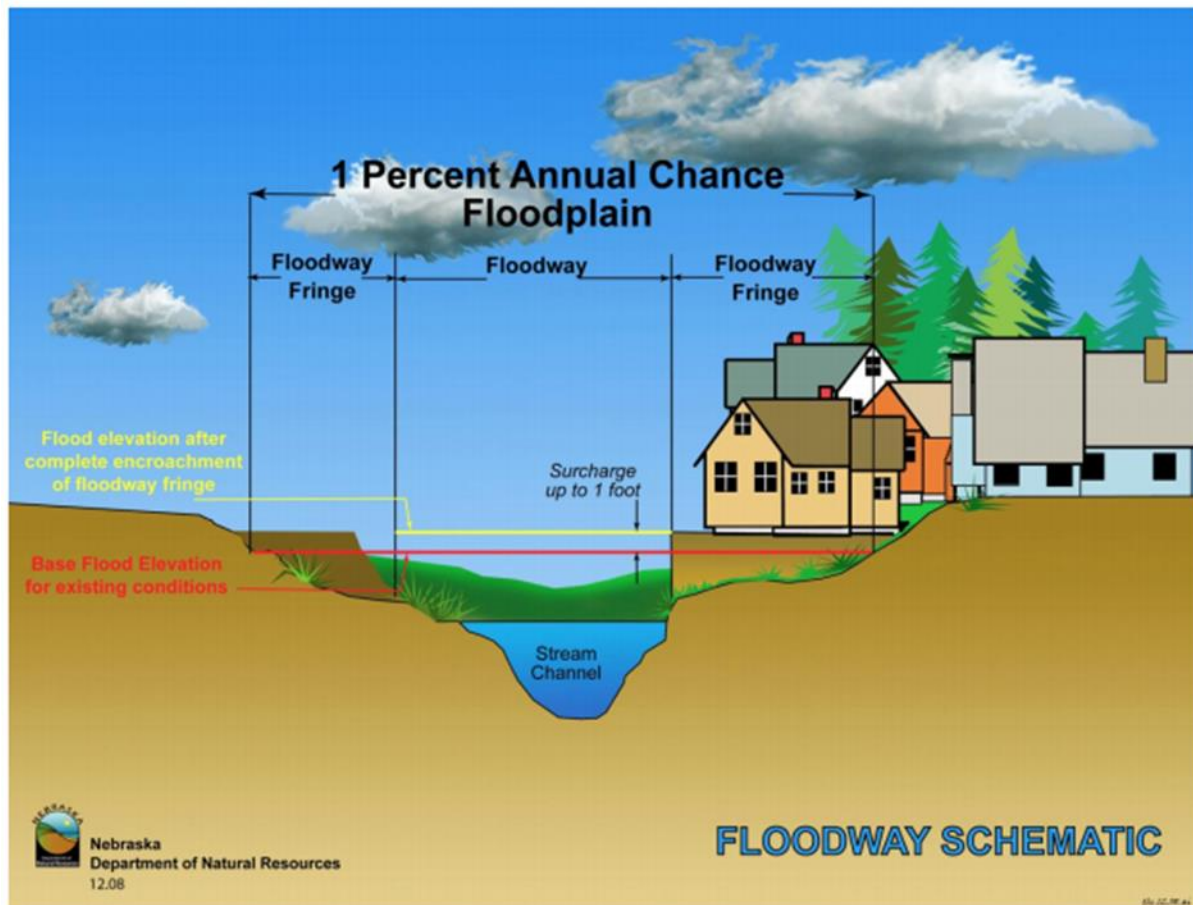


Figure 2-14: Schematic of 100-year Floodplain. The Special Flood Hazard Area (SFHA) extends to the end of the floodway fringe.

(Source: Nebraska Department of Natural Resources)

A SFHA is the land area covered by the floodwaters of the base flood (red line in Figure 2-14), where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.

#### Property Damage

The depth and velocity of flood waters are the major variables in determining property damage. Flood velocity is important because the faster water moves, the more pressure it puts on a structure and the more it will erode stream banks and scour the earth around a building's foundation. In some situations, deep and fast moving waters can push a building off its foundation. Structural damage can also be caused by the weight of standing water (hydrostatic pressure).

Another threat to property from a flood is called "soaking". When soaked, many materials change their composition or shape. Wet wood will swell, and if dried too quickly, will crack, split, or warp. Plywood can come apart and gypsum wallboard can deteriorate if it is bumped before it has time to completely dry. The longer these materials are saturated, the more moisture, sediment, and pollutants they absorb.

Soaking can also cause extensive damage to household goods. Wooden furniture may become warped, making it unusable, while other furnishings such as books, carpeting, mattresses, and upholstery usually are not salvageable. Electrical appliances and gasoline engines will flood, making them worthless until they are professionally dried and cleaned.

Many buildings that have succumbed to flood waters may look sound and unharmed after a flood, but water has the potential to cause severe property damage. Any structure that experiences a flood should be stripped, cleaned, and allowed to dry before being reconstructed. This can be an extremely expensive and time consuming effort.

#### *Repetitive Loss Properties*

Repetitive loss structures are structures covered by a contract for flood insurance made available under the NFIP that:

- a. Have incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and
- b. At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

Severe repetitive loss (SRL) is defined by the Flood Insurance Reform Act of 2004 and updated in the Biggert-Waters Flood Insurance Reform Act of 2012. For a property to be designated SRL, the following criteria must be met:

- a. It is covered under a contract for flood insurance made available under the NFIP; and
- b. It has incurred flood related damage –
  - 1) For which four or more separate claims payments have been made under flood insurance coverage with the amount of each claim exceeding \$5,000 and with the cumulative amount of such claims payments exceeding \$20,000; or
  - 2) For which at least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Figures regarding repetitive loss structures for Calcasieu Parish are provided in the table below:

*Table 2-16: Repetitive Loss Structures for Calcasieu Parish*

Jurisdiction	Number of Structures	Residential	Commercial	Government	Total Claims	Total Claims Paid	Average Claim Paid
Calcasieu Parish (Unincorporated)	395	389	6	0	1,164	32,159,448	\$27,628
DeQuincy	1	1	0	0	2	\$8,331	\$4,166
Iowa	7	7	0	0	17	\$248,283	\$14,605
Lake Charles	259	242	17	0	667	\$31,813,641	\$47,697
Sulphur	66	66	0	0	254	\$6,198,028	\$24,402
Vinton	1	1	0	0	2	\$16,874	\$8,437
Westlake	18	18	0	0	46	\$1,762,240	\$38,310
<b>Total</b>	<b>747</b>	<b>724</b>	<b>23</b>	<b>0</b>	<b>2,152</b>	<b>\$72,206,845</b>	<b>\$33,553</b>

All 747 repetitive loss structures were able to be geocoded in order to provide an overview of where the repetitive loss structures were located throughout the parish. [Figure 2-15](#) shows the approximate location of the 747 structures, while [Figure 2-16](#) shows where the highest concentration of repetitive loss structures are located. Through the repetitive loss map, it is clear that the primary concentrated area of repetitive loss structures is focused in and around the incorporated areas of Lake Charles, Sulphur, and Westlake.

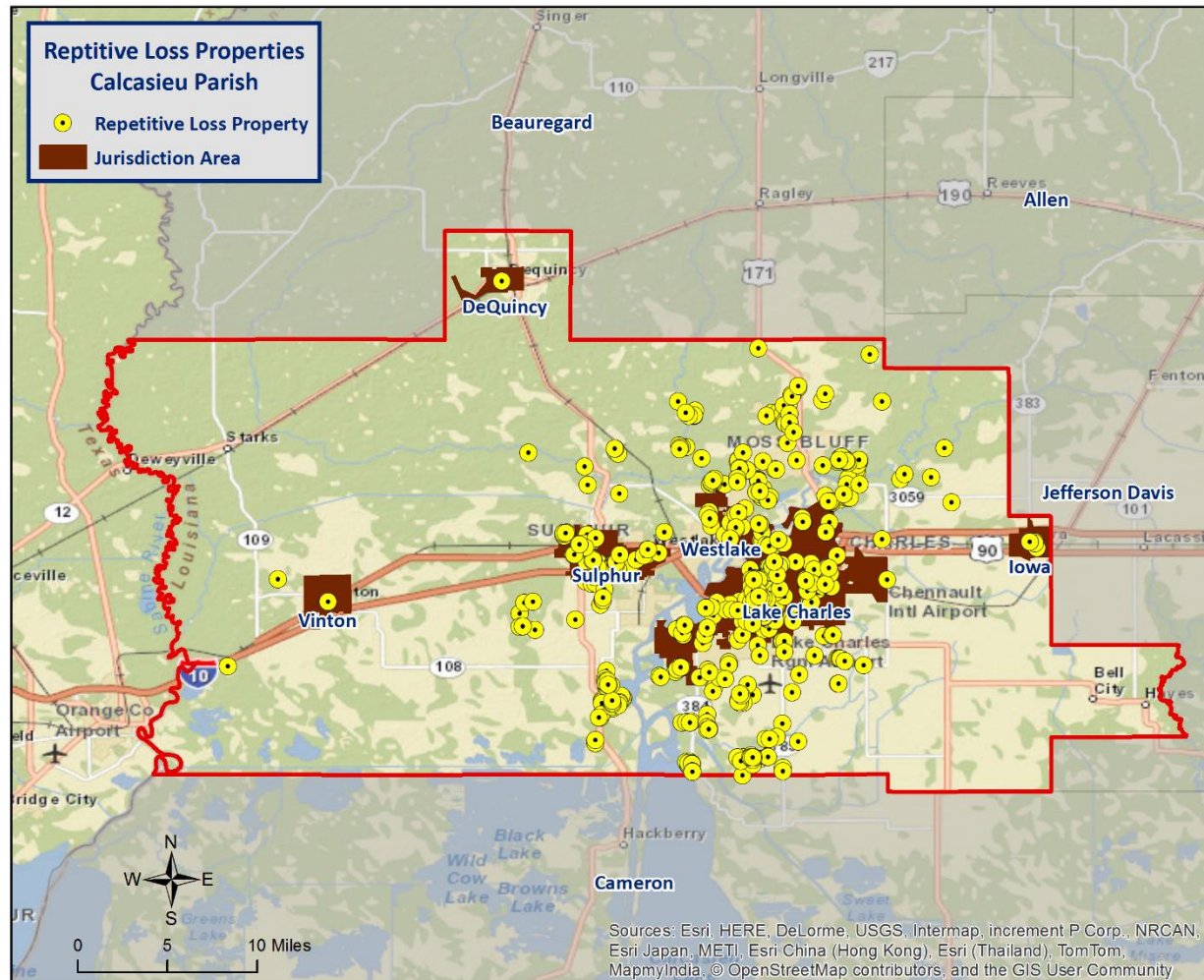


Figure 2-15: Repetitive Loss Properties in Calcasieu Parish



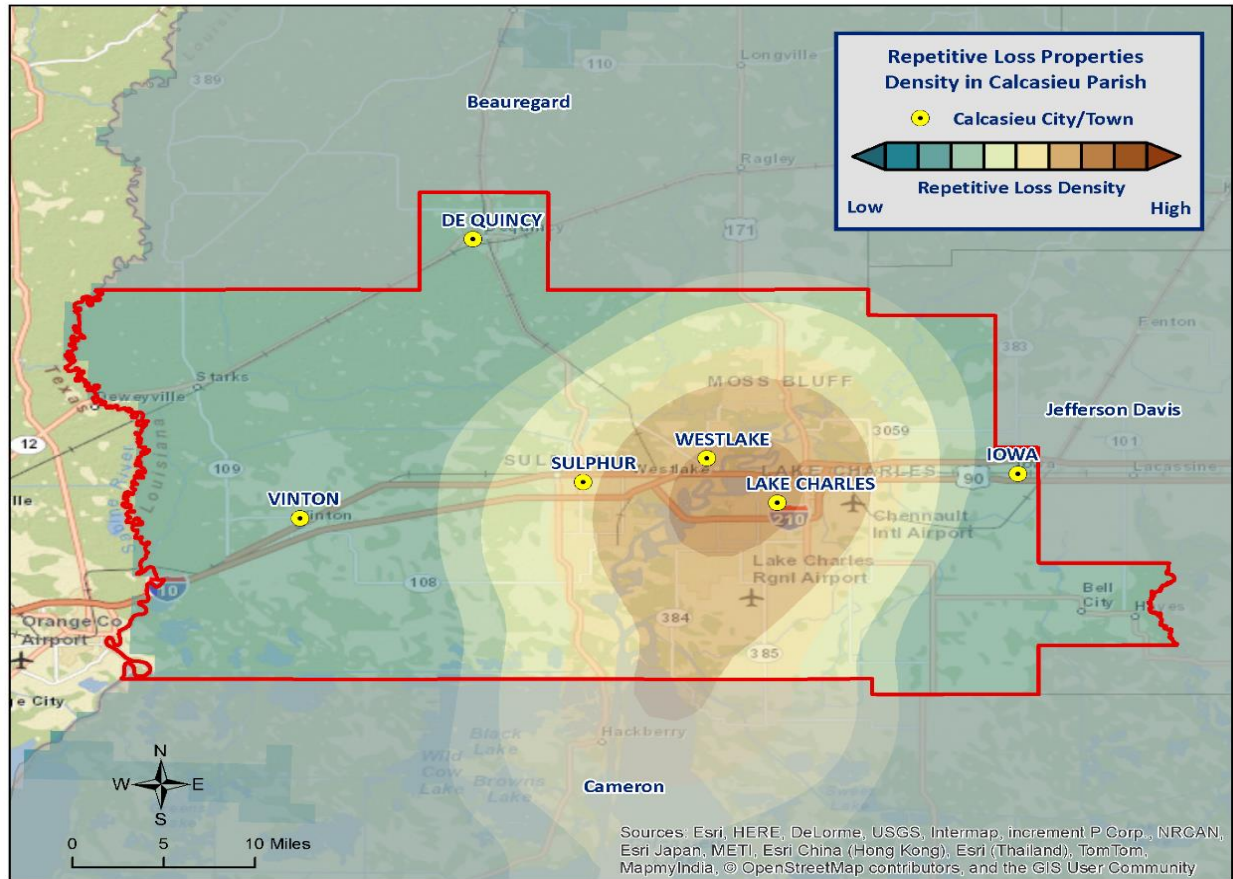


Figure 2-16: Repetitive Loss Property Densities in Calcasieu Parish

#### National Flood Insurance Program

Flood insurance statistics indicate that Calcasieu Parish has 13,707 flood insurance policies with the NFIP, with total annual premiums of \$8,751,754. Calcasieu Parish, the cities of DeQuincy, Lake Charles, Sulphur, and Westlake, and the towns of Iowa and Vinton are all participants in the NFIP. Calcasieu Parish and each of the incorporated jurisdictions will continue to adopt and enforce floodplain management requirements, including regulating new construction Special Flood Hazard Areas, and will continue to monitor activities including local requests for new map updates. Flood insurance statistics and additional NFIP participation details for Calcasieu Parish are provided in the tables to follow.



Table 2-17: Summary of Community Flood Maps for Calcasieu Parish

CID	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Date Joined the NFIP	Tribal
220037	Calcasieu (Unincorporated)	9/13/1974	9/29/1978	2/18/2011	9/29/1978	No
220038	DeQuincy, City of	1/16/1974	4/2/1979	2/18/2011	4/2/1979	No
220039	Iowa, Town of	5/24/1974	2/4/1988	2/18/2011	2/4/1988	No
220040	Lake Charles, City of	11/1/1974	10/16/1979	2/18/2011	10/16/1979	No
220041	Sulphur, City of	5/24/1976	8/16/1988	2/18/2011	8/16/1988	No
220042	Vinton, Town of	5/24/1974	7/16/1981	2/18/2011	7/16/1981	No
220043	Westlake, City of	5/17/1974	2/3/1982	2/18/2011	2/3/1982	No

Table 2-18: Summary of NFIP Policies for Calcasieu Parish

Location	No. of Insured Structures	Total Insurance Coverage Value	Annual Premiums Paid	No. of Insurance Claims Filed Since 1978	Total Loss Payments
Calcasieu Parish (Unincorporated)	6,881	\$1,610,990,900	\$4,304,424	2,885	\$68,278,525
DeQuincy	53	\$10,648,400	\$40,503	19	\$319,252
Iowa	169	\$30,468,300	\$81,786	58	\$763,632
Lake Charles	5,139	\$1,272,002,200	\$3,341,711	2,412	\$56,960,487
Sulphur	1,178	\$263,992,300	\$800,334	502	\$9,211,507
Vinton	61	\$15,701,200	\$55,350	7	\$34,488
Westlake	226	\$46,890,100	\$127,646	164	\$3,808,705
<b>Total</b>	<b>13,707</b>	<b>\$3,250,693,400</b>	<b>\$8,751,754</b>	<b>6,047</b>	<b>\$139,376,596</b>

According to the Community Rating System (CRS) list of eligible communities dated June 1, 2014, Calcasieu Parish and the city of Lake Charles participate in the CRS, while the cities of DeQuincy, Sulphur, and Westlake, and the towns of Iowa and Vinton, do not participate.

Table 2-19: List of Areas within Calcasieu Parish that Participate in the Community Rating System

Community Number	Name	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFHA	% Discount for Non-SFHA	Status
220037	Calcasieu Parish	10/1/1991	10/1/2007	8	10	5	C
220040	Lake Charles, City of	10/1/2004	5/1/2012	8	10	5	C

### *Threat to People*

Just as with property damage, depth and velocity are major factors in determining the threat posed to people by flooding. It takes very little depth or velocity for flood waters to become dangerous. A car will float in less than two feet of moving water, and can be swept downstream into deeper waters, trapping passengers within the vehicle. Victims of floods have often put themselves in perilous situations by entering flood waters that they believe to be safe, or by ignoring travel advisories.

Major health concerns are also associated with floods. Flood waters can transport materials such as dirt, oil, animal waste, and chemicals (e.g., farm, lawn, and industrial) that may cause illnesses of various degrees when coming in contact with humans. Flood waters can also infiltrate sewer lines and inundate wastewater treatment plants, causing sewage to backup and creating a breeding ground for dangerous bacteria. This infiltration may also cause water supplies to become contaminated and undrinkable.

### *Flooding in Calcasieu Parish*

By definition, flooding is caused when an area receives more water than the drainage system can convey. The following is a synopsis of the types of flooding that Calcasieu Parish experiences.

**Flash Floods:** Flash floods are characterized by a rapid rise in water level, high velocity, and large amounts of debris. They are capable of uprooting trees, undermining buildings and bridges, and scouring new channels. Major factors in flash flooding are the high intensity and short duration of rainfall, as well as the steepness of watershed and stream gradients.

**Local Drainage or High Groundwater Levels:** Locally heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable drainage channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems.

**Backwater Flooding:** Backwater flooding is normally associated with riverine flooding and connotes minimal velocity. All low lying areas are at risk. A heavy rainfall event coupled with a swollen river, canal, bayou, or marsh hinders drainage outflow, causing backwater flooding to the same areas susceptible to storm surge.

**Riverine Flooding:** Riverine flooding, by definition, is river-based. Most of the riverine flooding problems occur when the Sabine River crests at flood stage levels, causing extensive flooding in low-lying areas.

**Coastal Flooding:** Coastal flooding occurs when ocean water is pushed inland by hurricane winds and/or high tides. The severity of coastal flooding can be compounded by the riverine flooding that typically accompanies major tropical cyclone systems.

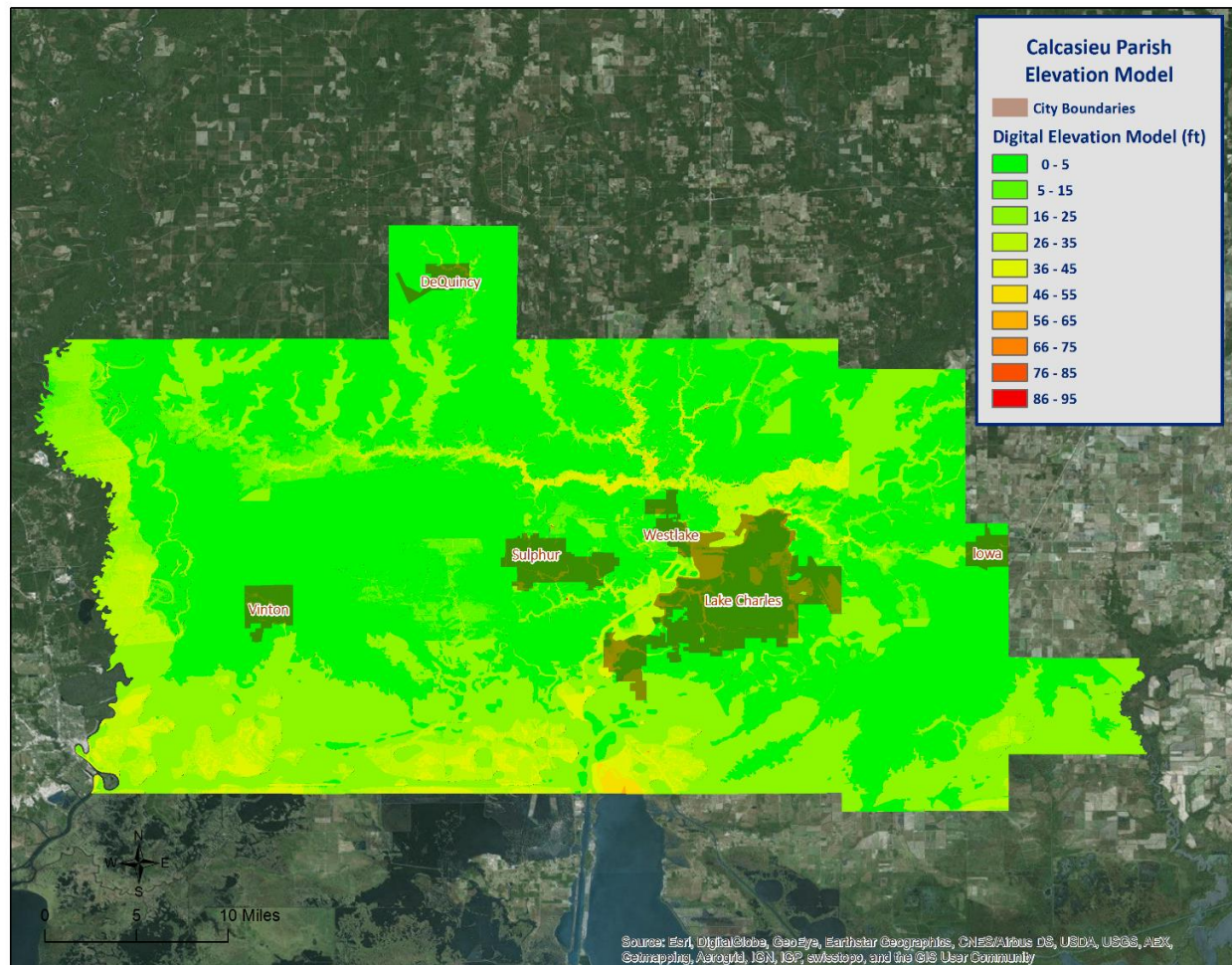


Figure 2-17: Elevation throughout Calcasieu Parish

Looking at the digital elevation model (DEM) in Figure 2-17 for Calcasieu Parish is instructive in visualizing where the low lying and high risk areas are for the parish. Elevations in the parish range from near sea level to 95 feet. The highest elevations in the parish are approximately 95 feet, located in the DeQuincy area. These higher elevations are sporadic throughout the parish and are not common for the majority of the area. The other incorporated areas ranged in elevation from 13 to 21 feet, with the town of Iowa averaging 21 feet, the city of Sulphur averaging 15 feet, the town of Vinton averaging 13 feet, and the city of Westlake averaging 16 feet. The lowest elevations of the parish average between one and five feet, and are located in the unincorporated areas of Calcasieu Parish.

#### Location

Calcasieu Parish has experienced significant flooding in its history and can expect more in the future. Many parts of the parish are located in the 100-year floodplain. Of the 1,094 square miles of land in the parish, 423 square miles are considered “special flood hazard areas”, constituting 38.7% of the total land area. In general, the southern half of the planning area has notable vulnerability to flooding, either due to riverine flooding or flooding related to hurricanes and Tropical Cyclones. Areas in the northern portion of the parish that are known to have special vulnerability to flooding include the unincorporated area of Moss Bluff and the incorporated city of Westlake.



Another area of increased vulnerability to riverine flooding in Calcasieu Parish is the Sabine River Basin. The Sabine River forms the western boundary of the parish. It flows for 555 miles and has a total drainage basin area of 9,756 square miles (2,330 square miles in Louisiana). The river's basin is characterized by flat slopes and wide, timbered floodplains, and the extreme southern portion of the river is subject to coastal flooding. High rainfall rates produce frequent flooding of low-lying areas and large floods occur on average every five years. During a flooding event, the lowest part of the basin usually remains inundated for many days and sometimes for several weeks. The unincorporated areas of Toomey, Starks, and Niblett's Bluff are communities in the western portion of the planning area with significant histories of impacts due to Sabine River flooding.

The following are enlarged maps of the incorporated areas showing the areas within each jurisdiction that are at risk of flooding:

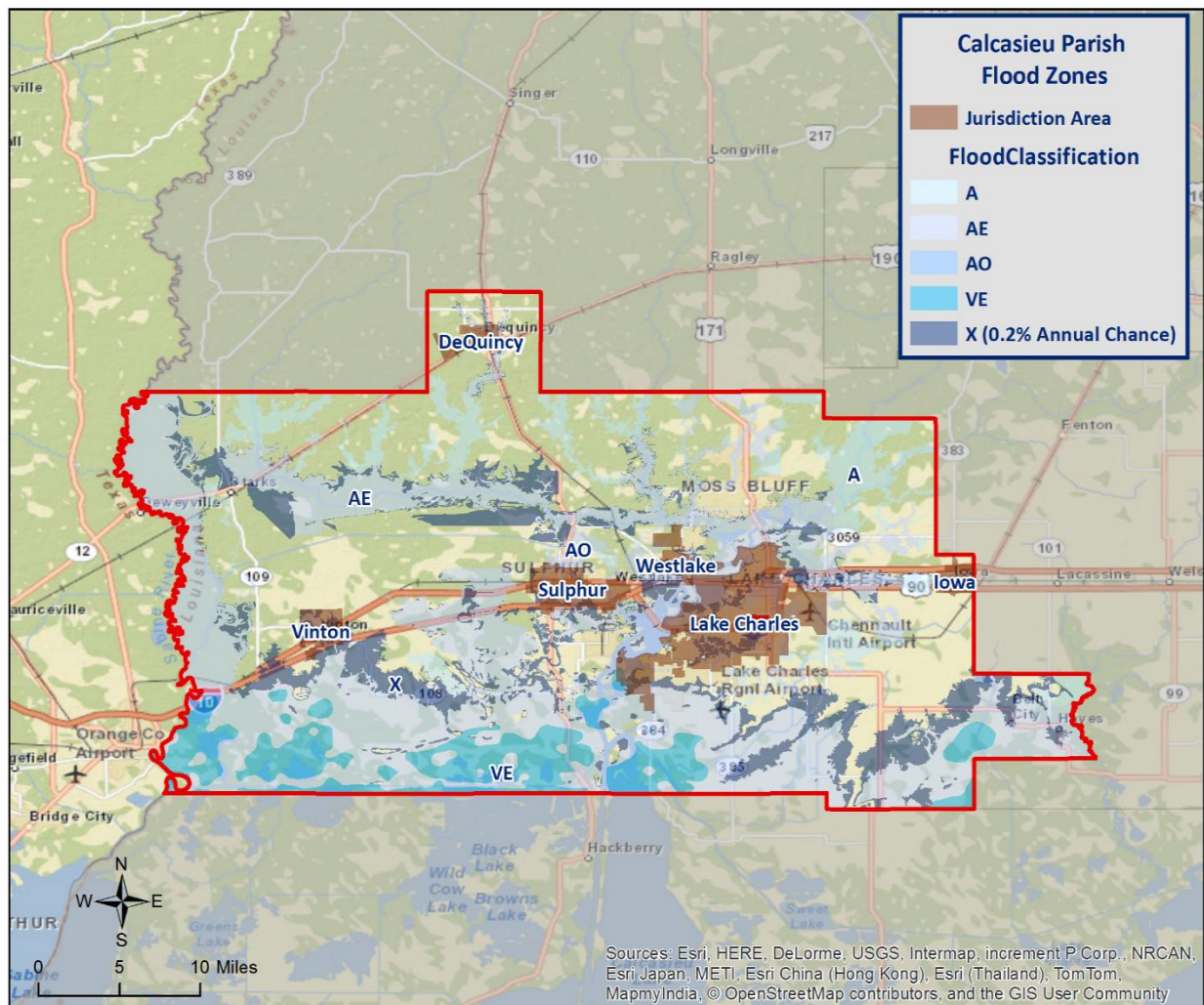


Figure 2-18: Calcasieu Parish Areas within the Flood Zones

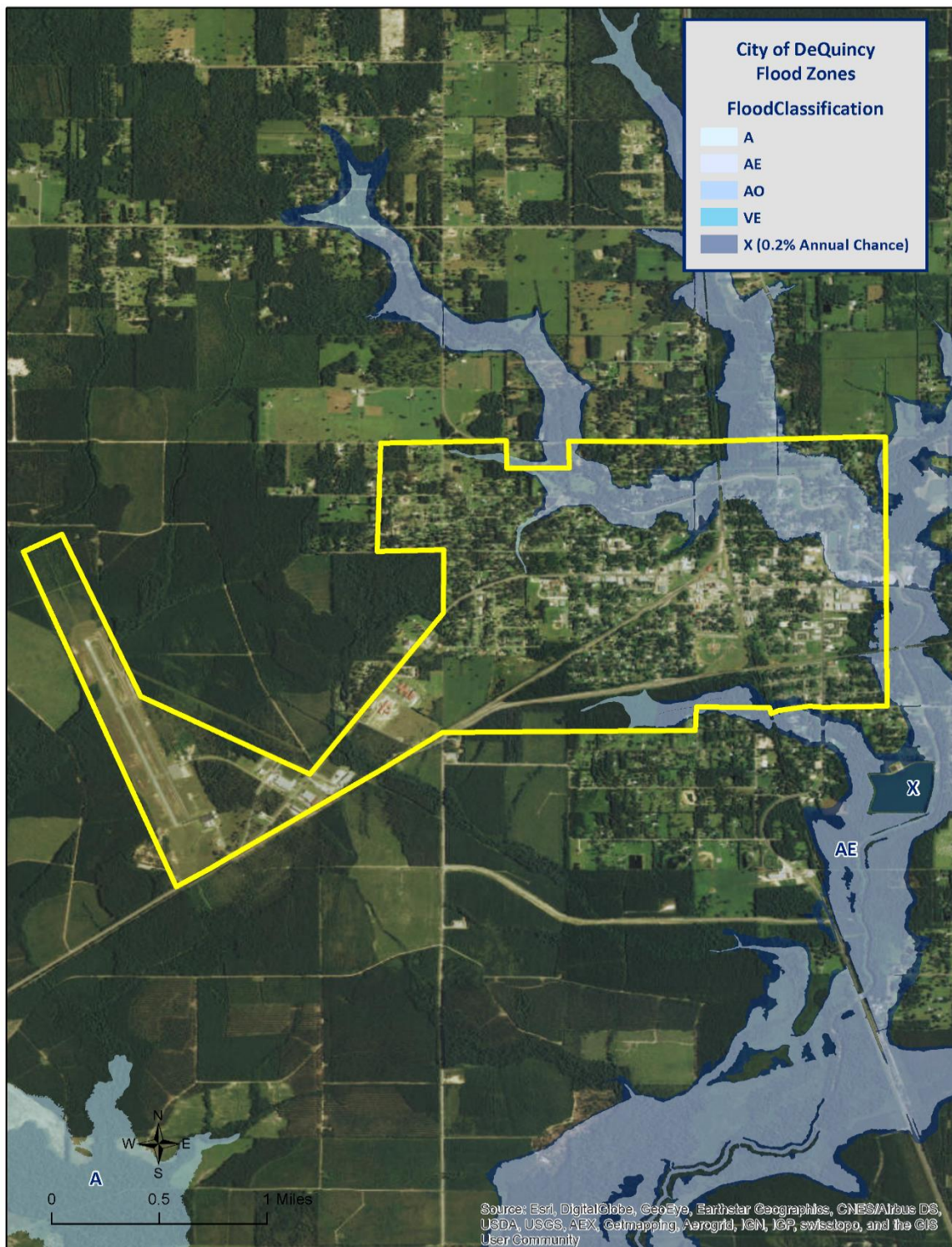


Figure 2-19: City of DeQuincy Areas within the Flood Zones



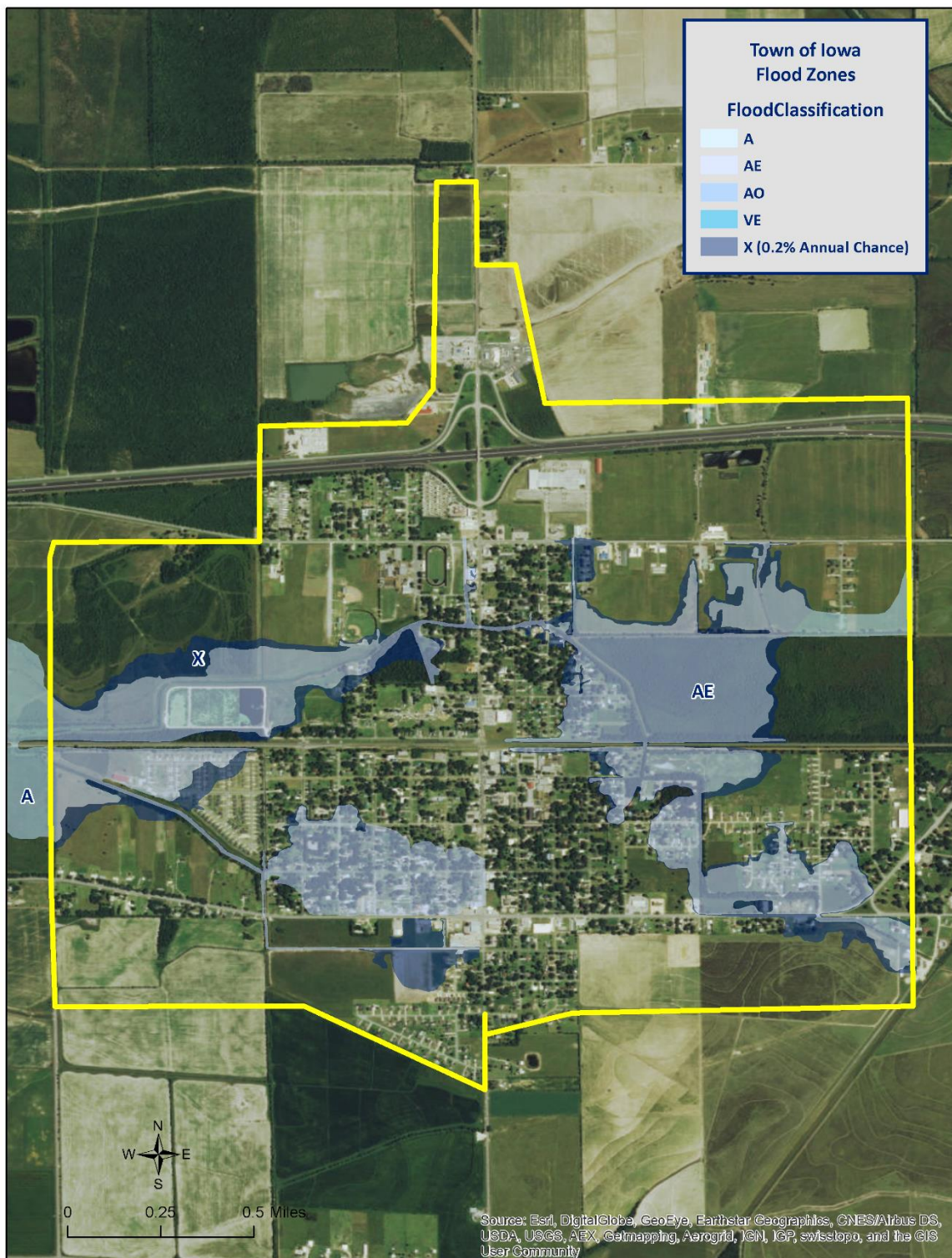


Figure 2-20: Town of Iowa Areas within the Flood Zones



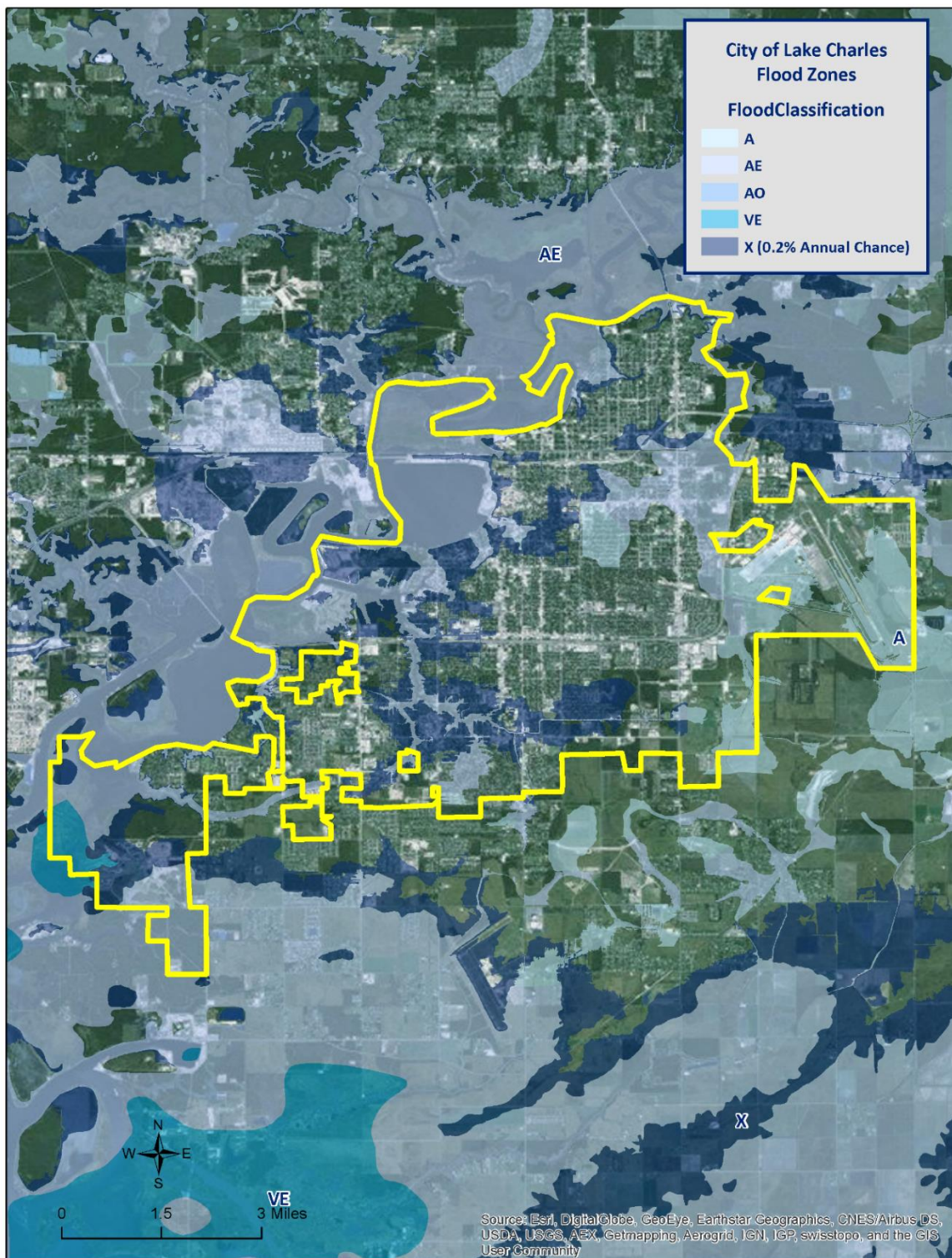


Figure 2-21: City of Lake Charles Areas within the Flood Zones



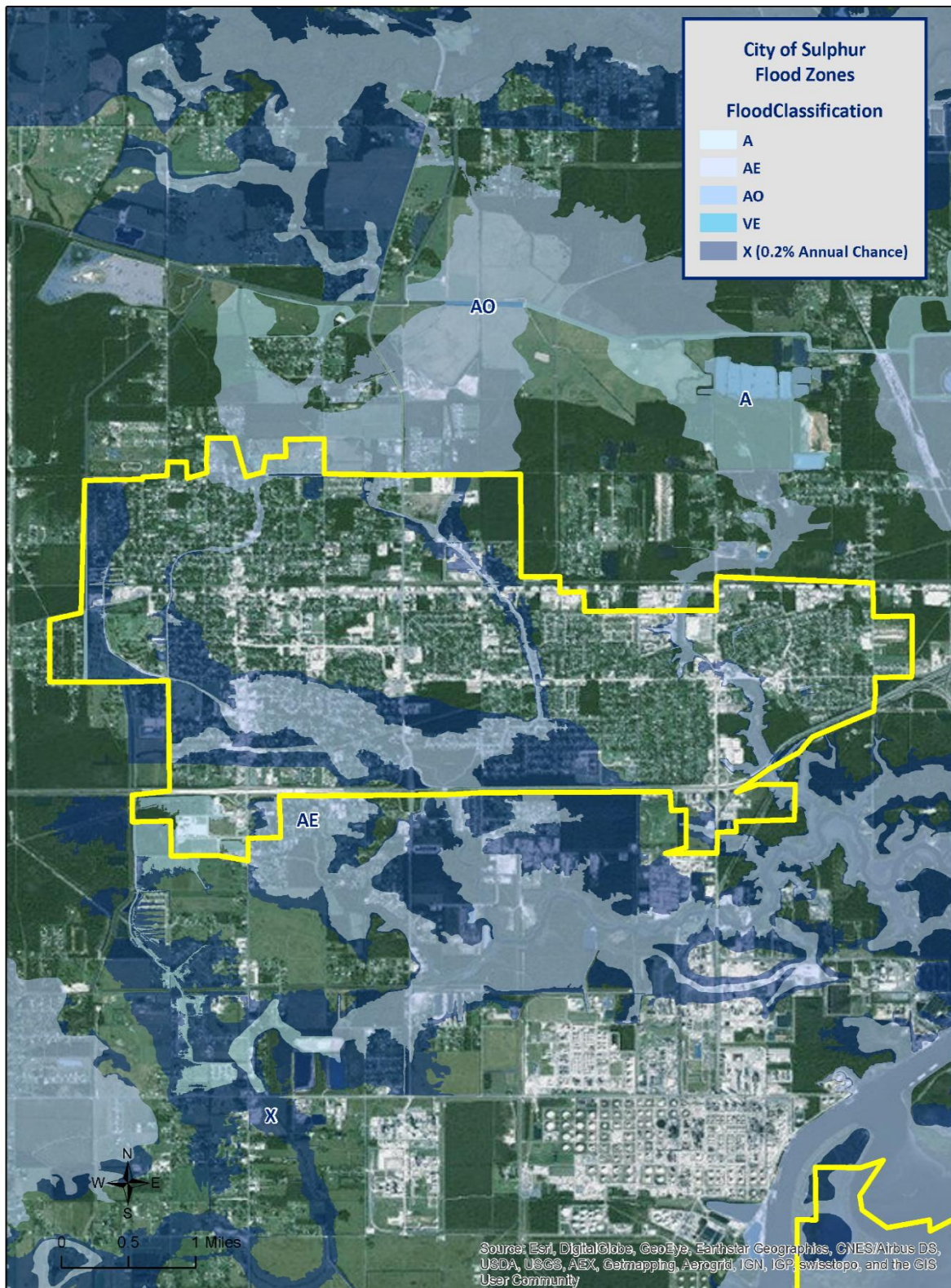


Figure 2-22: City of Sulphur Areas within the Flood Zones



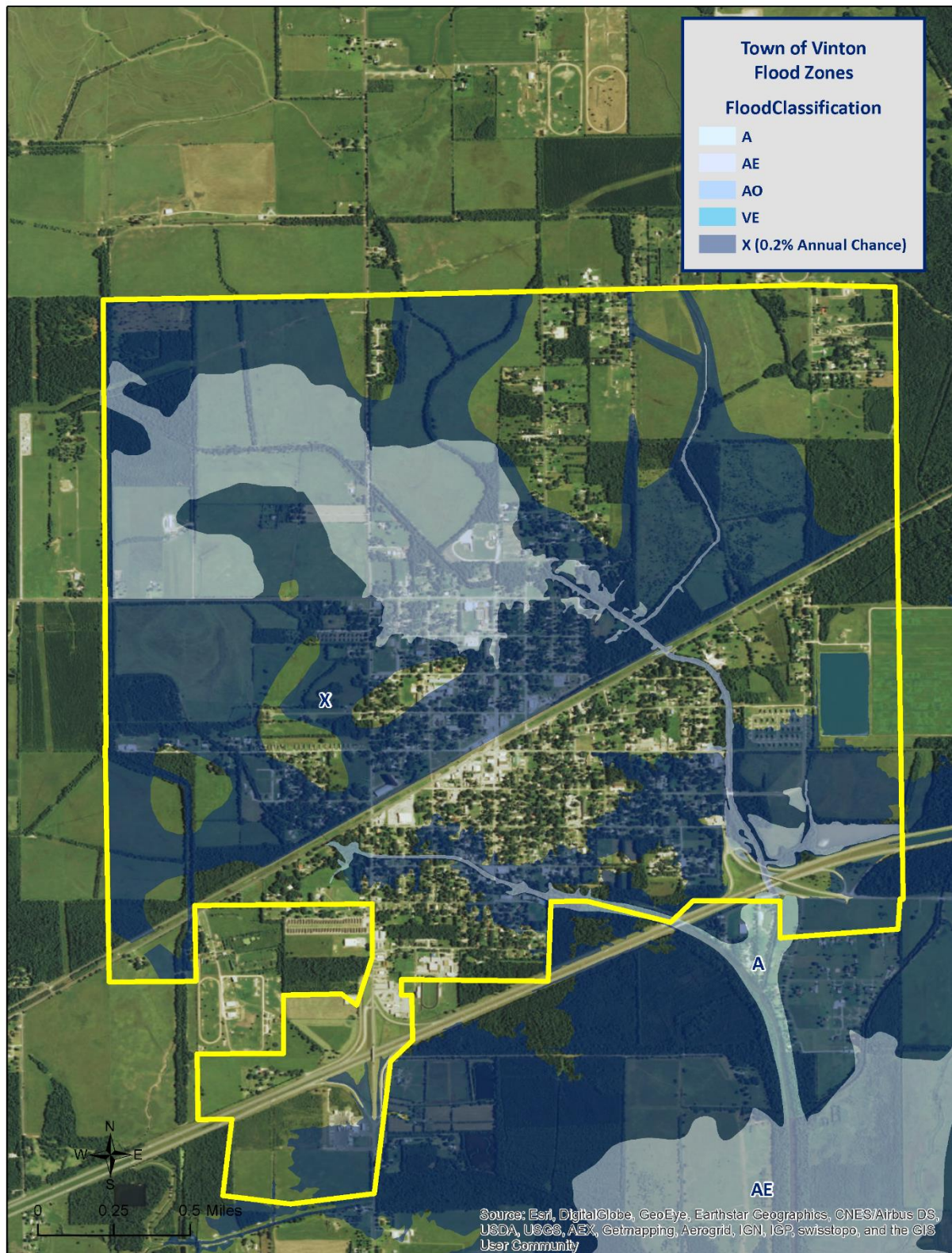


Figure 2-23: Town of Vinton Areas within the Flood Zones



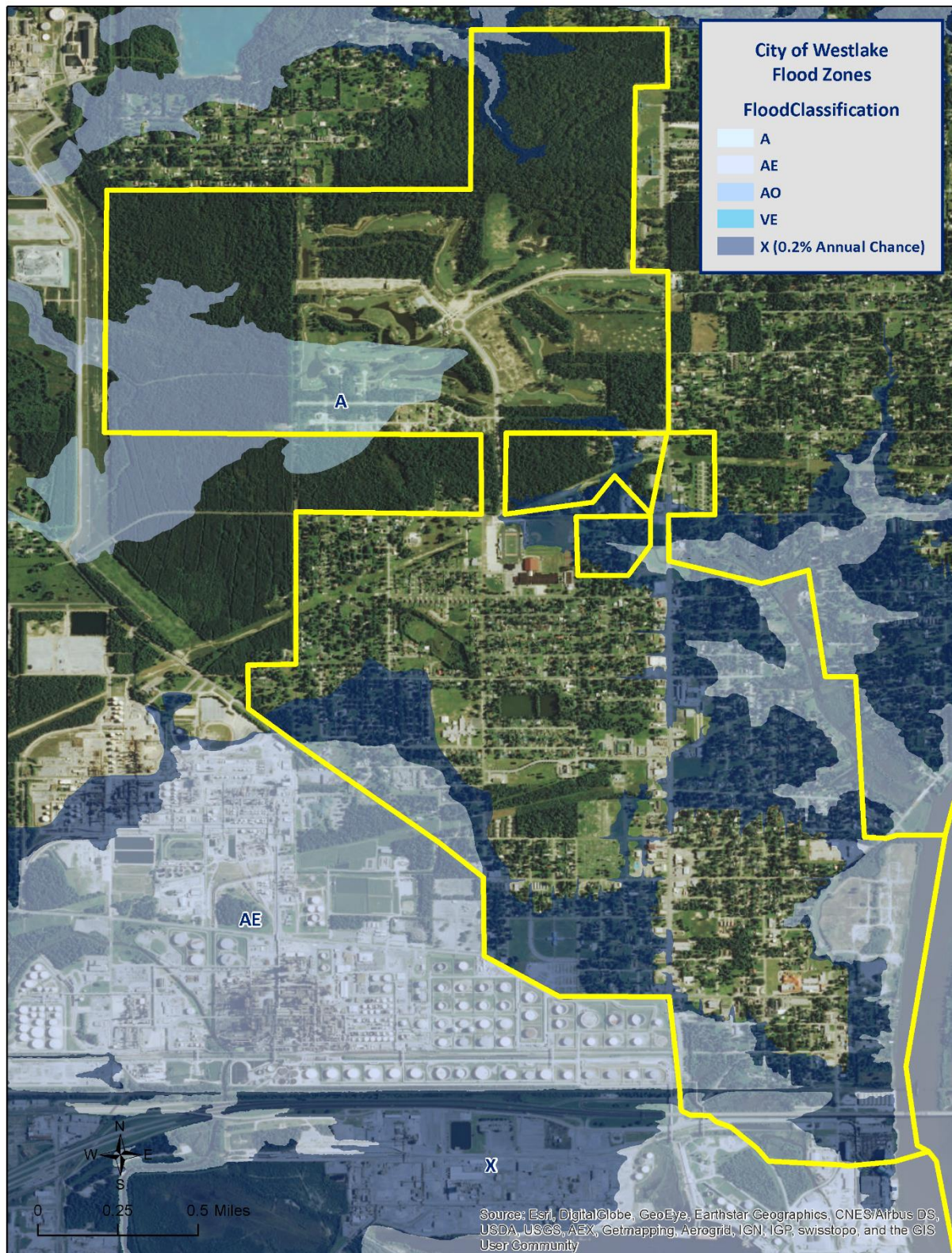


Figure 2-24: City of Westlake Areas within the Flood Zones

*Previous Occurrences / Extents*

Historically, there have been 59 flooding events that have created significant flooding in Calcasieu Parish between 1989 and 2014. Below is a brief synopsis of the 22 flooding events that have occurred since 2009, including flooding events that have occurred since the parish's last planning update.

*Table 2-20: Historical Floods in Calcasieu Parish with Locations from 2009 - 2014*

Date	Extents	Type of Flooding	Estimated Damages	Location
April 18, 2009	Heavy rainfall between 4 to 6 inches caused flash flooding in Lake Charles and Sulphur. Ryan Street and Common Street in Lake Charles were impassable due to flood waters, and numerous streets in Sulphur had to be closed due to flood waters.	Flash Flood	\$5,000	LAKE CHARLES AND SULPHUR
May 24, 2009	Scattered thunderstorms in the Lake Charles area caused minor street flooding in Lake Charles on Enterprise Boulevard, Creole Street, and Alamo Street. Lake Street was impassable due to flooding.	Flood	\$0	LAKE CHARLES
July 8, 2009	Scattered thunderstorms caused flooding in the Lake Charles area. Canal Street was flooded, with cars barely able to drive through the floodwaters.	Flood	\$0	LAKE CHARLES
September 28, 2009	Minor street flooding occurred in Lake Charles due to scattered thunderstorms.	Flood	\$0	LAKE CHARLES

Date	Extents	Type of Flooding	Estimated Damages	Location
	Minor street flooding occurred around the intersection of Lake Street and Country Club Road.			
October 22, 2009	Widespread street flooding occurred across the central and northern portions of Lake Charles. Several major roadways were flooded, including Ryan Street and Enterprise Boulevard.	Flash Flood	\$10,000	LAKE CHARLES
October 26, 2009	Major flash flooding occurred in the cities of Sulphur, Westlake, and Lake Charles, as well as the unincorporated areas of the parish, when a slow moving front produced heavy rainfall.	Flash Flood	\$500,000	SULPHUR, WESTLAKE, LAKE CHARLES, AND UNINCORPORATED AREAS
October 27, 2009	Heavy rains caused flooding in the Lake Charles area. Several roadways were closed, including Ward Line Road and Tom Hebert Road.	Flood	\$100,000	LAKE CHARLES
November 3, 2009	Due to heavy rainfall, the Sabine River Authority was forced to release water from a swollen Toledo Bend Reservoir, causing extensive flooding in Alligator Park and Niblett's Bluff.	Flood	\$500,000	UNINCORPORATED AREAS

Date	Extents	Type of Flooding	Estimated Damages	Location
	Damage to roads in the area was extensive.			
December 14, 2009	Rain showers and thunderstorms caused widespread street flooding. Numerous roadways were covered by 4 to 8 inches of water. In Sulphur, 2.67 inches of rain fell in a 3 hour period.	Flood	\$10,000	VINTON, SULPHUR, AND UNINCORPORATED AREAS
December 14, 2009	Flash floods occurred in the eastern section of the parish due to scattered showers and thunderstorms. Numerous roads were completely underwater across Lake Charles. Some vehicles were stranded in flood waters.	Flash Flood	\$10,000	LAKE CHARLES, IOWA, AND UNINCORPORATED AREAS
January 29, 2010	Minor street flooding occurred in the unincorporated area of Moss Bluff.	Flood	\$0	UNINCORPORATED AREAS
May 30, 2010	Widespread street flooding occurred across south Lake Charles. Most entrance and exit ramps to Interstate 210 were closed due to high water. One home along Ernest Street and another on Common Street were flooded.	Flash Flood	\$20,000	LAKE CHARLES
July 27, 2010	Rain from thunderstorms covered roadways	Flash Flood	\$2,000	LAKE CHARLES



Date	Extents	Type of Flooding	Estimated Damages	Location
	along Tom Hebert Road and in the Fairview Mobile Home Park.			
February 18, 2012	Flooding occurred in a trailer park, with a water depth of 1 to 2 feet.	Flash Flood	\$10,000	LAKE CHARLES
March 20, 2012	Over 10 inches of rain fell from Vinton to Starks, causing roadways to flood. Water also covered roadways in DeQuincy, making them nearly impassable or closed. Water entered multiple homes in the Starks and DeQuincy areas.	Flash Flood	\$1,750,000	VINTON, DEQUINCY, AND UNINCORPORATED AREAS
March 21, 2012	Water from the previously mentioned storm continued to drain throughout the Vinton and DeQuincy areas, causing flooding.	Flood	\$1,000	VINTON, DEQUINCY, AND UNINCORPORATED AREAS
January 9, 2013	Slow moving thunderstorms caused parish-wide flash flooding. Multiple homes flooded and numerous roadways had to be closed due to flood waters.	Flash Flood	\$8,000,000	PARISH-WIDE
September 20, 2013	Thunderstorms moved across Moss Bluff, Sulphur, and Westlake for several hours, causing flash flooding in the area. Cars stalled as they attempted to cross	Flash Flood	\$1,710,000	SULPHUR, WESTLAKE, AND UNINCORPORATED AREAS

Date	Extents	Type of Flooding	Estimated Damages	Location
	inundated roads. One elderly woman had to be rescued from her car when she attempted to cross an inundated roadway.			
May 28, 2014	Slow moving thunderstorms caused flash flooding in Lake Charles, Sulphur, and surrounding areas. Numerous vehicles were flooded, and one home was flooded.	Flash Flood	\$30,000	LAKE CHARLES, SULPHUR, AND UNINCORPORATED AREAS
June 27, 2014	Heavy rain in the parish caused extensive flooding throughout the area. People were reportedly kayaking in the streets near LaGrange High School due to the height of the flood waters. Water entered several homes and apartments.	Flash Flood	\$200,000	PARISH-WIDE
August 19, 2014	Heavy rains fell across portions of Lake Charles, causing flash floods. Two feet deep water was reported along Enterprise Boulevard and at the entrance of Highland Meadows subdivision. Lake Charles Regional Airport reported 2.77 inches of rain fell during the event.	Flash Flood	\$0	LAKE CHARLES

Date	Extents	Type of Flooding	Estimated Damages	Location
August 30, 2014	Heavy rain fell throughout the parish. Portions of Interstate 10 and 210 were temporarily closed due to high water. Five homes along Dogwood Avenue were flooded, and a few homes were flooded in the Hunters Grove subdivision in Iowa.	Flash Flood	\$100,000	PARISH-WIDE

Based on previous flood events, the worst-case scenarios are based on historical flooding events. Storm water excesses and riverine flooding primarily affect the low lying areas of the parish, and flood depths of up to six feet can be expected in the unincorporated areas of the parish. The incorporated areas of Lake Charles, Sulphur, and Westlake can expect flood depths from three to five feet, while the incorporated area of Iowa can expect flooding levels of approximately two to four feet. The incorporated areas of Vinton and DeQuincy can expect flood levels of approximately one to three feet.

#### *Frequency / Probability*

While other parts of this plan, along with the State's Hazard Mitigation Plan, have relied on the SHELUS database to provide the annual probability, due to Calcasieu Parish having multiple jurisdictions, it was necessary to assess the historical data found in the National Climatic Data Center's for Calcasieu Parish and its jurisdictions to properly determine probability for future flood events. The table below shows the probability and return frequency for each jurisdiction.

*Table 2-21: Annual Flood Probabilities for Calcasieu Parish*

Jurisdiction	Annual Probability	Return Frequency
Calcasieu Parish (Unincorporated)	100%	Less than once a year
DeQuincy	32%	3 – 4 years
Iowa	24%	4 – 5 years
Lake Charles	100%	Less than once a year
Sulphur	60%	1 – 2 years
Vinton	40%	2 – 3 years
Westlake	32%	3 - 4 years

Based on historical record, the overall flooding probability for the entire Calcasieu Parish Planning area is 100% with 59 events occurring over a 25-year period. Based on the State's Hazard Mitigation Plan and the amount of significant flooding events that have taken place throughout the parish, the Calcasieu Parish Planning area can anticipate having more than two flooding events each year.

### *Estimated Potential Losses*

Using the Hazus 2.2 Flood Model, the 100-year flood scenario, along with the Parish DFIRM, was analyzed to determine losses from this worst-case scenario. Table 2-22 shows the total economic losses that would result from this occurrence.

*Table 2-22: Estimated Losses in Calcasieu Parish from a 100-year Flood Event  
(Source: Hazus 2.2)*

<b>Jurisdiction</b>	<b>Estimated Total Losses from 100-Year Flood Event</b>
Calcasieu Parish (Unincorporated)	\$1,903,740,000
DeQuincy	\$22,631,000
Iowa	\$26,456,000
Lake Charles	\$916,875,000
Sulphur	\$128,807,000
Vinton	\$8,285,000
Westlake	\$38,769,000
<b>Total</b>	<b>\$3,045,563,000</b>

The Hazus 2.2 Flood model also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish. The losses for each jurisdiction by sector are listed in the following tables:

*Table 2-23: Estimated 100-year Flood Losses for Unincorporated Calcasieu Parish by Sector  
(Source: Hazus 2.2)*

<b>Calcasieu Parish (Unincorporated)</b>	<b>Estimated Total Losses from 100-Year Flood Event</b>
Agricultural	\$9,278,000
Commercial	\$275,031,000
Government	\$10,950,000
Industrial	\$200,227,000
Religious / Non-Profit	\$29,906,000
Residential	\$1,352,777,000
Schools	\$25,571,000
<b>Total</b>	<b>\$1,903,740,000</b>

*Table 2-24: Estimated 100-year Flood Losses for DeQuincy by Sector  
(Source: Hazus 2.2)*

<b>DeQuincy</b>	<b>Estimated Total Losses from 100-Year Flood Event</b>
Agricultural	\$0
Commercial	\$3,367,000
Government	\$19,000
Industrial	\$258,000
Religious / Non-Profit	\$831,000
Residential	\$16,268,000
Schools	\$1,888,000
<b>Total</b>	<b>\$22,631,000</b>

*Table 2-25: Estimated 100-year Flood Losses for Iowa by Sector  
(Source: Hazus 2.2)*

<b>Iowa</b>	<b>Estimated Total Losses from 100-Year Flood Event</b>
Agricultural	\$0
Commercial	\$2,921,000
Government	\$117,000
Industrial	\$178,000
Religious / Non-Profit	\$2,438,000
Residential	\$20,614,000
Schools	\$188,000
<b>Total</b>	<b>\$26,456,000</b>

*Table 2-26: Estimated 100-year Flood Losses for Lake Charles by Sector  
(Source: Hazus 2.2)*

<b>Lake Charles</b>	<b>Estimated Total Losses from 100-Year Flood Event</b>
Agricultural	\$2,760,000
Commercial	\$270,439,000
Government	\$9,141,000
Industrial	\$27,677,000
Religious / Non-Profit	\$26,976,000
Residential	\$571,575,000
Schools	\$8,307,000
<b>Total</b>	<b>\$916,875,000</b>

*Table 2-27: Estimated 100-year Flood Losses for Sulphur by Sector  
(Source: Hazus 2.2)*

<b>Sulphur</b>	<b>Estimated total Losses from 100-Year Flood Event</b>
Agricultural	\$127,000
Commercial	\$28,895,000
Government	\$156,000
Industrial	\$6,483,000
Religious / Non-Profit	\$939,000
Residential	\$91,004,000
Schools	\$1,203,000
<b>Total</b>	<b>\$128,807,000</b>

*Table 2-28: Estimated 100-year Flood Losses for Vinton by Sector  
(Source: Hazus 2.2)*

<b>Vinton</b>	<b>Estimated total Losses from 100-Year Flood Event</b>
Agricultural	\$0
Commercial	\$511,000
Government	\$0
Industrial	\$110,000
Religious / Non-Profit	\$381,000
Residential	\$6,652,000
Schools	\$631,000
<b>Total</b>	<b>\$8,285,000</b>

*Table 2-29: Estimated 100-year Flood Losses for Westlake by Sector  
(Source: Hazus 2.2)*

<b>Westlake</b>	<b>Estimated total Losses from 100-Year Flood Event</b>
Agricultural	\$100,000
Commercial	\$5,037,000
Government	\$485,000
Industrial	\$6,779,000
Religious / Non-Profit	\$524,000
Residential	\$25,699,000
Schools	\$145,000
<b>Total</b>	<b>\$38,769,000</b>



*Threat to People*

The total population within the parish that is susceptible to a flood hazard is shown in the table below:

*Table 2-30: Vulnerable Populations Susceptible to a 100-year Flood Event  
(Source: Hazus 2.2)*

Number of People Exposed to Flood Hazards			
Location	# in Community	# in Hazard Area	% in Hazard Area
Calcasieu Parish (Unincorporated)	86,354	59,634	69.1%
DeQuincy	3,235	1,070	33.1%
Iowa	2,996	2,032	67.8%
Lake Charles	71,993	27,025	37.5%
Sulphur	20,410	7,780	38.1%
Vinton	3,212	1,205	37.5%
Westlake	4,568	1,307	28.6%
Total	192,768	100,053	51.9%

The Hazus 2.2 flood model was also extrapolated to provide an overview of vulnerable populations throughout the jurisdictions in the following tables:

*Table 2-31: Vulnerable Populations Susceptible to a 100-year Flood Event in Unincorporated Calcasieu Parish  
(Source: Hazus 2.2)*

Calcasieu Parish (Unincorporated)		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	59,634	69.1%
Persons Under 5 Years	4,055	6.8%
Persons Under 18 Years	14,849	24.9%
Persons 65 Years and Over	8,051	13.5%
White	42,459	71.2%
Minority	17,175	28.8%

*Table 2-32: Vulnerable Populations Susceptible to a 100-year Flood Event in DeQuincy  
(Source: Hazus 2.2)*

DeQuincy		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	1,070	33.1%
Persons Under 5 Years	78	7.3%
Persons Under 18 Years	210	19.7%
Persons 65 Years and Over	184	17.2%
White	826	77.2%
Minority	244	22.8%

*Table 2-33: Vulnerable Populations Susceptible to a 100-year Flood Event in Iowa  
(Source: Hazus 2.2)*

Iowa		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	2,032	67.8%
Persons Under 5 Years	148	7.3%
Persons Under 18 Years	447	22.0%
Persons 65 Years and Over	227	11.2%
White	1,415	69.6%
Minority	617	30.4%

*Table 2-34: Vulnerable Populations Susceptible to a 100-year Flood Event in Lake Charles  
(Source: Hazus 2.2)*

Lake Charles		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	27,025	37.5%
Persons Under 5 Years	1,894	7.0%
Persons Under 18 Years	4,451	16.5%
Persons 65 Years and Over	3,765	13.9%
White	12,696	47.0%
Minority	14,329	53.0%

*Table 2-35: Vulnerable Populations Susceptible to a 100-year Flood Event in Sulphur  
(Source: Hazus 2.2)*

Sulphur		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	7,780	38.1%
Persons Under 5 Years	591	7.6%
Persons Under 18 Years	1,400	18.0%
Persons 65 Years and Over	1,109	14.3%
White	6,988	89.8%
Minority	792	10.2%

*Table 2-36: Vulnerable Populations Susceptible to a 100-year Flood Event in Vinton  
(Source: Hazus 2.2)*

Vinton		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	1,205	37.5%
Persons Under 5 Years	95	7.9%
Persons Under 18 Years	210	17.4%
Persons 65 Years and Over	181	15.0%
White	908	75.3%
Minority	297	24.7%

*Table 2-37: Vulnerable Populations Susceptible to a 100-year Flood Event in Westlake  
(Source: Hazus 2.2)*

Westlake		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	1,307	28.6%
Persons Under 5 Years	104	8.0%
Persons Under 18 Years	239	18.3%
Persons 65 Years and Over	187	14.3%
White	1,009	77.2%
Minority	298	22.8%

*Vulnerability*

See Appendix C for parish and municipality buildings that are susceptible to flooding due to proximity within the 100-year flood plain.

### Sinkholes

Sinkholes are areas of ground with no natural external surface drainage. They can vary in size from a few square feet to hundreds of acres, and can reach depths of more than 100 feet. Sinkholes are usually found in karst terrain—that is, areas where limestone, carbonate rock, salt beds, and other water-soluble rocks lie below the Earth’s surface. Karst terrain is marked by the presence of other uncommon geologic features, such as springs, caves, and dry streambeds that lose water into the ground. In general, sinkholes form gradually (in the case of cover subsidence sinkholes), but they can also occur suddenly (in the case of cover-collapse sinkholes).

Sinkhole formation is a very simple process. Whenever water is absorbed through soil, it encounters water-soluble bedrock. The water then begins to dissolve the bedrock, forming sinkholes. The karst rock dissolves along cracks; as the fissures grow, soil and other particles fill the gaps, loosening the soil above the bedrock. As the soil sinks from the surface, a depression forms, which draws in more water, funneling it down to the water-soluble rock. The increase of water and soil in the rock pushes open the cracks, again drawing more soil and water into it. This positive feedback loop continues, unless clay plugs into the cracks in the bedrock, at which time a pond may form. A sudden cover-collapse sinkhole occurs when the top soil above dissolving bedrock does not sink, but forms a bridge over the soil that is sinking beneath it. The underground soil continues to fill the bedrock fissures, until finally the soil bridge collapses and fills the void beneath it.

Both kinds of sinkholes can occur naturally or through human influence. While sinkholes tend to form naturally in karst areas, sinkholes can form in other geological areas that have been altered by humans, by processes such as mining, sewers, hydraulic fracture drilling, groundwater pumping, irrigation, or storage ponds. In all of these cases, and others, the cause for the sinkhole is that support for surface soil has been weakened or substantially removed.

In the United States, 20% of the land is susceptible to sinkholes. Most of this area lies in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. In Louisiana, most of the sinkholes are precipitated by the human-influenced collapse of salt dome caverns. The collapse of a salt dome is usually a slow process; however, it may occur suddenly and without any advance warning.

### Location

Currently, there are nine identifiable salt dome locations in Calcasieu Parish. In addition, there is one salt dome in which its two mile buffer extends into Calcasieu Parish. [Figure 2-25](#) displays the locations of these salt domes with their relative location to the nearest jurisdiction. As depicted in [Figure 2-25](#), the sink holes are dispersed throughout Calcasieu Parish. While the majority of sinkholes are located in unincorporated areas of the parish, a two mile buffer around each of the Sulphur Mines, Lockport, Calcasieu 1, and Iowa salt domes encompass parts of Sulphur, Westlake, and Iowa respectively.



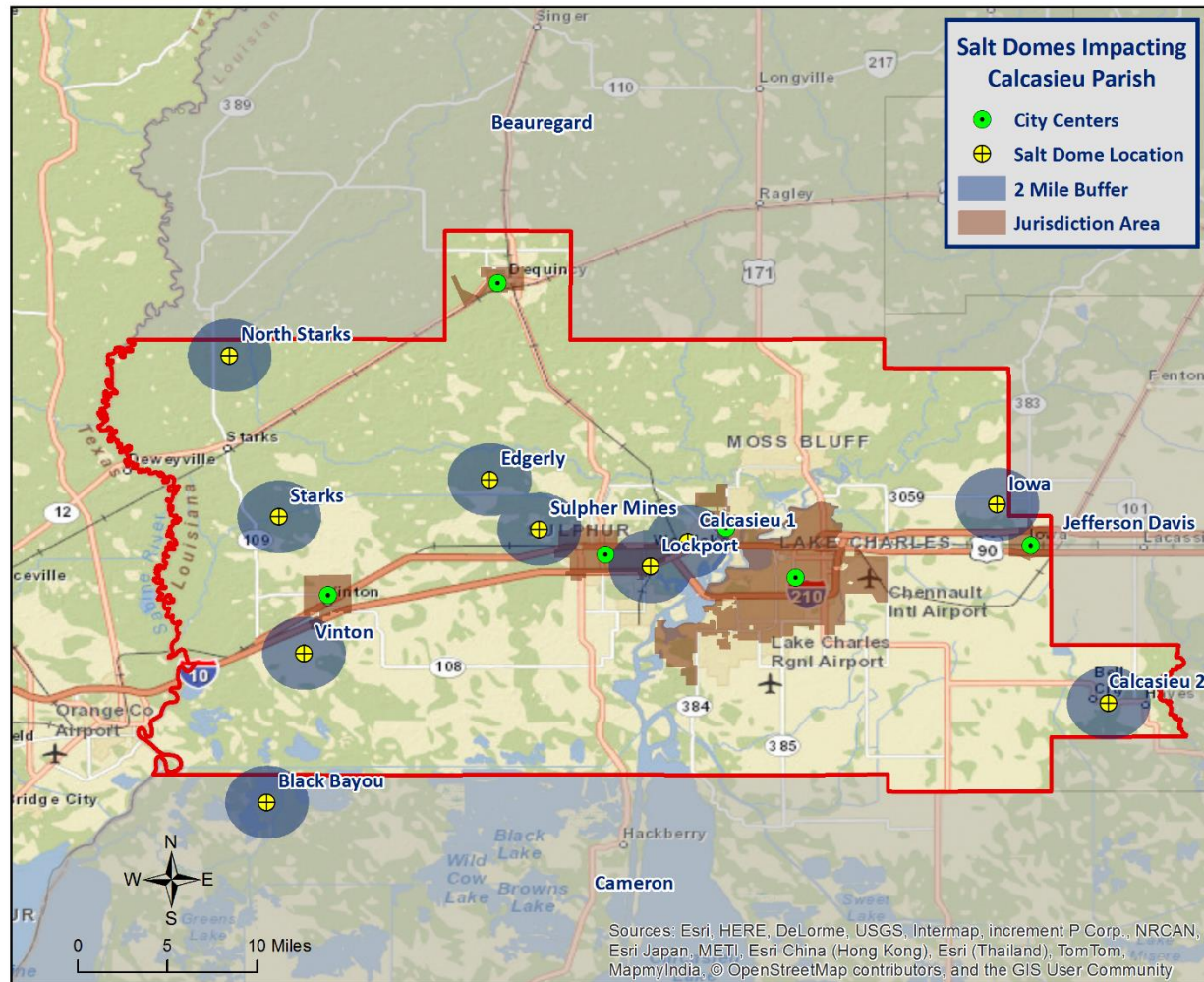


Figure 2-25: Salt Dome Locations in Calcasieu Parish Relative to Jurisdictions

#### Previous Occurrences / Extents

There have been no recorded incidents of sinkholes or salt dome collapses in Calcasieu Parish to date. While the exact length and depth of a sinkhole caused by a salt dome collapse is unknown, based on the average size of salt domes and past collapses of salt domes in the state of Louisiana, one could expect to see a sinkhole approximately 35 acres in size and approximately 750 feet deep.

#### Frequency / Probability

Since there has been no recorded incidents of sinkhole or salt dome collapse in Calcasieu Parish, the annual chance of occurrence is calculated at less than 1%.

#### Estimated Potential Losses

Of the ten salt domes that influence Calcasieu Parish, nine were analyzed to determine the number of people and houses that are potentially susceptible to losses from a sink hole materializing from one of the salt domes. The remainder was discounted due to it not being located near any populated areas of the parish. The following tables are based on conducting a two mile buffer around the center of the salt dome. The values were determined by querying the 2010 U.S. Census block data to determine the number of houses and people located within two miles of each salt dome. Critical facilities were also analyzed to

determine if they fell within the two mile buffer of a salt dome. Total value for all occupancy groups from Hazus 2.2 was used to estimate a total loss of all facilities that were within two miles of a salt dome.

The salt dome that poses the greatest risk to Calcasieu Parish is the Lockport Salt Dome. The Lockport Salt Dome contains a total of 3,879 homes and 9,467 people within its two mile buffer.

*Table 2-38: Estimated Potential Losses from a Sinkhole Formation  
(Source: U.S. 2010 Census Data and Hazus 2.2)*

Salt Dome Name	Total Building Exposure	Critical Infrastructure Exposure	Number of People Exposed	Number of Houses Exposed
Calcasieu 1	\$604,784,000	7	5,217	2,153
Calcasieu 2	\$82,997,000	3	1,031	430
Edgerly	\$20,333,000	0	363	137
Iowa	\$67,171,000	0	918	393
Lockport	\$1,195,816,000	7	9,467	3,879
North Starks	\$2,724,000	0	185	83
Starks	\$5,520,000	0	123	46
Sulphur Mines	\$251,574,000	3	4,105	1,846
Vinton	\$29,248,000	0	367	144

Due to the isolated locations of the sinkholes, there is little to no risk to people, with the exception being the residents within two miles of the Calcasieu 1, Calcasieu 2, Lockport, and Sulphur Mines Salt Domes. The remaining five salt domes that were analyzed also pose some risk, but not nearly to the same degree as the Lockport Salt Dome.

#### *Vulnerability*

See Appendix C for parish and municipality building exposure to a sinkhole hazard.

### Thunderstorms

The term “thunderstorm” is usually used as a catch-all term for several kinds of storms. Here, “thunderstorm” is defined to include any precipitation event in which thunder is heard or lightning is seen. Thunderstorms are often accompanied by heavy rain and strong winds, and depending on conditions, occasionally by hail or snow. Thunderstorms form when humid air masses are heated, which causes them to become convectively unstable. Consequently, the air masses rise. Upon rising, the air masses’ water vapor condenses into liquid water and/or deposits directly into ice when they rise sufficiently to cool to the dew-point temperature.

Thunderstorms are classified into four main types (single-cell, multi-cell, squall line, and supercell), depending on the degree of atmospheric instability, the change in wind speed with height (called wind shear), and the degree to which the storm’s internal dynamics are coordinated with those of adjacent storms. There is no such interaction for single-cell thunderstorms, but there is significant interaction with clusters of adjacent thunderstorms in multi-cell thunderstorms, and with a linear “chain” of adjacent storms in squall line thunderstorms. Though supercell storms have no significant interactions with other storms, they have very well-organized and self-sustaining internal dynamics, which allows them to be the longest-lived and most severe of all thunderstorms.

The life of a thunderstorm proceeds through three stages: the developing (or cumulus) stage, the mature stage, and the dissipation stage. During the developing stage, the unstable air mass is lifted as an updraft into the atmosphere. This sudden lift rapidly cools the moisture in the air mass, releasing latent heat as condensation and/or deposition occurs, which warms the surrounding environment, thus making it less dense than the surrounding air. This process intensifies the updraft and creates a localized lateral rush of air from all directions into the area beneath the thunderstorm to feed continued updrafts. At the mature stage, the rising air is accompanied by downdrafts caused by the shear of falling rain (if melted completely), or hail, freezing rain, sleet, or snow (if not melted completely). The dissipation stage is characterized by the dominating presence of the downdraft as the hot surface that gave the updrafts their buoyancy is cooled by precipitation. During the dissipation stage, the moisture in the air mass largely empties out.

The Storm Prediction Center, in conjunction with the National Weather Service (NWS), has the ability to issue advisory messages based on forecasts and observations. The following are the advisory messages that may be issued, along with definitions of each:

- *Severe Thunderstorm Watch:* Issued to alert people to the possibility of a severe thunderstorm developing in the area. Expected time frame for these storms is three to six hours.
- *Severe Thunderstorm Warning:* Issued when severe thunderstorms are imminent. This warning is highly localized and covers parts of one to several parishes (counties).

A variety of hazards might be produced by thunderstorms, including lightning, hail, tornadoes or waterspouts, flash flooding, and high-speed winds called downbursts. Nevertheless, given the criteria, the National Oceanic and Atmospheric Administration (NOAA) characterizes a thunderstorm as severe when it produces one or more of the following:

- Hail of one inch in diameter or larger
- Wind gusts to 58 mph or greater
- One or more tornadoes

Tornadoes and flooding hazards have been profiled within this report; therefore, for the purpose of thunderstorms, the sub-hazards of hail, high winds, and lightning will be profiled.

Thunderstorms occur throughout Louisiana at all times of the year, although the types and severity of those storms vary greatly depending on a wide variety of atmospheric conditions. Thunderstorms generally occur more frequently during the late spring and early summer when extreme variations exist between ground surface temperatures and upper atmospheric temperatures.

#### *Hazard Description*

##### *Hailstorms*

Hailstorms are severe thunderstorms in which balls or chunks of ice fall along with rain. Hail initially develops in the upper atmosphere as ice crystals that are bounced about by high-velocity updraft winds. The ice crystals grow through deposition of water vapor onto their surface. They then fall partially to a level in the cloud where the temperature exceeds the freezing point, melt partially, and then get caught in another updraft whereupon re-freezing and deposition grows another concentric layer of ice. After several trips up and down the cloud, they develop enough weight to fall. The size of hailstones varies depending on the severity and size of the thunderstorm. Higher surface temperatures generally mean stronger updrafts, which allow more massive hailstones to be supported by updrafts, leaving them suspended longer. This longer suspension time means larger hailstone sizes. [Table 2-39](#) displays a spectrum of hailstone diameters and their everyday equivalents.

*Table 2-39: Spectrum of hailstone diameters and their everyday description  
(Source: National Weather Service)*

Spectrum of Hailstone Diameters	
Hail Diameter Size	Description
1/4"	Pea
1/2"	Plain M&M
3/4"	Penny
7/8"	Nickle
1" (severe)	Quarter
1 1/4"	Half Dollar
1 1/2"	Ping Pong Ball / Walnut

Spectrum of Hailstone Diameters	
Hail Diameter Size	Description
1 3/4"	Golf Ball
2"	Hen Egg / Lime
2 1/2"	Tennis Ball
2 3/4"	Baseball
3"	Teacup / Large Apple
4"	Softball
4 1/2"	Grapefruit
4 3/4" – 5"	Computer CD-DVD

Hailstorms can cause widespread damage to structures, automobiles, and crops. While the damage to individual structures or vehicles is often minor, the cumulative cost to communities, especially across large metropolitan areas, can be quite significant. Hailstorms can also be devastating to crops. Thus, the severity of hailstorms depends on the size of the hailstones, the length of time the storm lasts, and where it occurs.

Hail rarely causes loss of life, although large hailstones can cause bodily injury.

#### High Winds

In general, high winds can occur in a number of different ways, within and without thunderstorms. The Federal Emergency Management Agency (FEMA) distinguishes these as shown in Table 2-40.

*Table 2-40: High winds categorized by source, frequency, and duration  
(Source: Making Critical Facilities Safe from High Wind, FEMA)*

High Winds Categories			
High Wind Type	Description	Relative Frequency in Louisiana	Relative Maximum Duration in Louisiana
Straight-line Winds	Wind blowing in straight line; usually associated with intense low-pressure area	High	Few minutes – 1 day
Downslope Winds	Wind blowing down the slope of a mountain; associated with temperature and pressure gradients	N/A	N/A
Thunderstorm Winds	Wind blowing due to thunderstorms, and thus associated with temperature and pressure gradients	High (especially in the spring and summer)	Few minutes – several hours
Downbursts	Sudden wind blowing down due to downdraft in a thunderstorm; spreads out horizontally at the ground, possibly forming horizontal vortex rings around the downdraft	Medium-to-High (~5% of all thunderstorms)	~15 – 20 minutes



High Winds Categories			
High Wind Type	Description	Relative Frequency in Louisiana	Relative Maximum Duration in Louisiana
Northeaster (nor'easter) Winds	Wind blowing due to cyclonic storm off the east coast of North America; associated with temperature and pressure gradients between the Atlantic and land	N/A	N/A
Hurricane Winds	Wind blowing in spirals, converging with increasing speed toward eye; associated with temperature and pressure gradients between the Atlantic and Gulf and land	Low-to-Medium	Several days
Tornado Winds	Violently rotating column of air from base of a thunderstorm to the ground with rapidly decreasing winds at greater distances from center; associated with extreme temperature gradient	Low-to-Medium	Few minutes – few hours

The only high winds of present concern are thunderstorm winds and downbursts. Straight-line winds are common but are a relatively insignificant hazard (on land) compared to other high winds. Downslope winds are common but relatively insignificant in the mountainous areas of Louisiana where they occur. Nor'easters are cyclonic events that have at most a peripheral effect on Louisiana, and none associated with high winds. Winds associated with hurricanes and tornadoes will be considered in their respective sections.

Table 2-41 presents the Beaufort Wind Scale, first developed in 1805 by Sir Francis Beaufort, which aids in determining relative force and wind speed based on the appearance of wind effects.

*Table 2-41: Beaufort Wind Scale  
(Source: NOAA's SPC)*

Beaufort Wind Scale			
Force	Wind (MPH)	WMO Classification	Appearance of Wind Effects on Land
			Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway

Beaufort Wind Scale			
Force	Wind (MPH)	WMO Classification	Appearance of Wind Effects on Land
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Twigs breaking off trees, generally impedes progress
9	47-54	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	54-73	Violent Storm	N/A
12	74+	Hurricane	N/A

Major damage directly caused by thunderstorm winds is relatively rare, while minor damage is common and pervasive, and most noticeable when it contributes to power outages. These power outages can have major negative impacts such as increased tendency for traffic accidents, loss of revenue for businesses, increased vulnerability to fire, food spoilage, and other losses that might be sustained by a loss of power. Power outages may pose a health risk for those requiring electric medical equipment and/or air conditioning.

#### Lightning

Lightning is a natural electrical discharge in the atmosphere that is a by-product of thunderstorms. Every thunderstorm produces lightning. There are three primary types of lightning: intra-cloud, cloud-to-ground, and cloud-to-cloud. Cloud-to-ground lightning has the potential to cause the most damage to property and crops, while also posing as a health risk to the populace in the area of the strike.

Damage caused by lightning is usually to homes or businesses. These strikes have the ability to damage electrical equipment inside the home or business, and can also ignite a fire that could destroy homes or crops.

Lightning continues to be one of the top three storm-related killers in the United States per FEMA, but it also has the ability to cause negative long-term health effects to the individual that is struck.

#### Hazard Profile

##### Hailstorms

##### Location

Because hailstorms are a climatological based hazard, the entire planning area for Calcasieu Parish is equally at risk for hailstorms.

##### Previous Occurrences / Extents

The SHELDUS database reports eight significant hailstorm events occurring within the boundaries of Calcasieu Parish between the years of 1989-2014. According to the National Climatic Data Center, hailstorm diameters experienced in Calcasieu Parish have ranged from 0.75 inches to 2.75 inches since

1989. The most frequently recorded hail size has been 0.75 inch diameters. Figure 2-26 displays the density of hailstorms in Calcasieu Parish and adjacent parishes. Based on the National Climatic Data Center dataset, Table 2-42 provides an overview of hailstorms that have impacted the Calcasieu Parish Planning area since 2009. Calcasieu Parish can expect to experience hail up to 2.75 inches in diameter for future events.

*Table 2-42: Previous Occurrences of Hailstorms in Calcasieu Parish  
(Source: NCDC)*

Date	Recorded Hail Size (inches)	Location
March 25, 2009	1	SULPHUR
March 25, 2009	1	VINCENT
March 26, 2009	0.75	LAKE CHARLES
March 27, 2009	1	VINTON
March 27, 2009	0.75	BUHLER
March 31, 2009	0.75	(LCH)LK CHARLES MUNI
March 31, 2009	0.88	(LCH)LK CHARLES MUNI
April 12, 2009	0.75	BUHLER
April 12, 2009	1	LAKE CHARLES
April 12, 2009	0.88	VINCENT LNDG
April 12, 2009	1	LAKE CHARLES LAKE
April 12, 2009	0.75	LAKE CHARLES MUNI AR
April 12, 2009	0.88	DEQUINCY
July 8, 2009	0.88	CHENNAULT INDUS AIRP
July 25, 2009	1.75	BUHLER
August 26, 2009	0.75	VINTON
August 26, 2009	0.88	VINTON
August 26, 2009	0.88	VINTON
December 15, 2009	0.88	VINTON
December 15, 2009	0.75	SULPHUR
March 25, 2010	1	CHENNAULT INDUS AIRP
March 25, 2010	0.88	(LCH)LK CHARLES MUNI
March 25, 2010	1	(LCH)LK CHARLES MUNI
May 17, 2010	1	MOSS BLUFF
May 26, 2010	1	GILLIS
May 30, 2010	1	LAKE CHARLES LAKE
March 29, 2011	1	(LCH)LK CHARLES MUNI
March 29, 2011	1	LAKE CHARLES
March 29, 2011	0.75	(LCH)LK CHARLES MUNI
March 30, 2011	1	(LCH)LK CHARLES MUNI
March 30, 2011	0.88	(LCH)LK CHARLES MUNI
March 30, 2011	0.88	VINCENT
March 30, 2011	1.75	VINCENT LNDG
March 30, 2011	1.5	(LCH)LK CHARLES MUNI

Date	Recorded Hail Size (inches)	Location
March 30, 2011	1.25	LAKE CHARLES
June 6, 2011	0.88	(LCH)LK CHARLES MUNI
June 6, 2011	0.75	VINTON
June 6, 2011	0.88	VINTON
June 6, 2011	1	TOOMEY
August 14, 2011	0.88	IOWA
April 4, 2012	1	DEQUINCY
November 5, 2012	1	BUHLER
November 5, 2012	1.25	WESTLAKE
February 25, 2013	1.75	NIBLETTS BLUFF
February 25, 2013	1	VINTON
February 25, 2013	1.75	VINTON
May 9, 2013	0.88	VINTON
May 9, 2013	1	VINCENT
May 10, 2013	1.25	(LCH)LK CHARLES MUNI
June 8, 2013	0.88	SULPHUR
June 8, 2013	0.88	VINCENT
June 14, 2013	0.75	SULPHUR



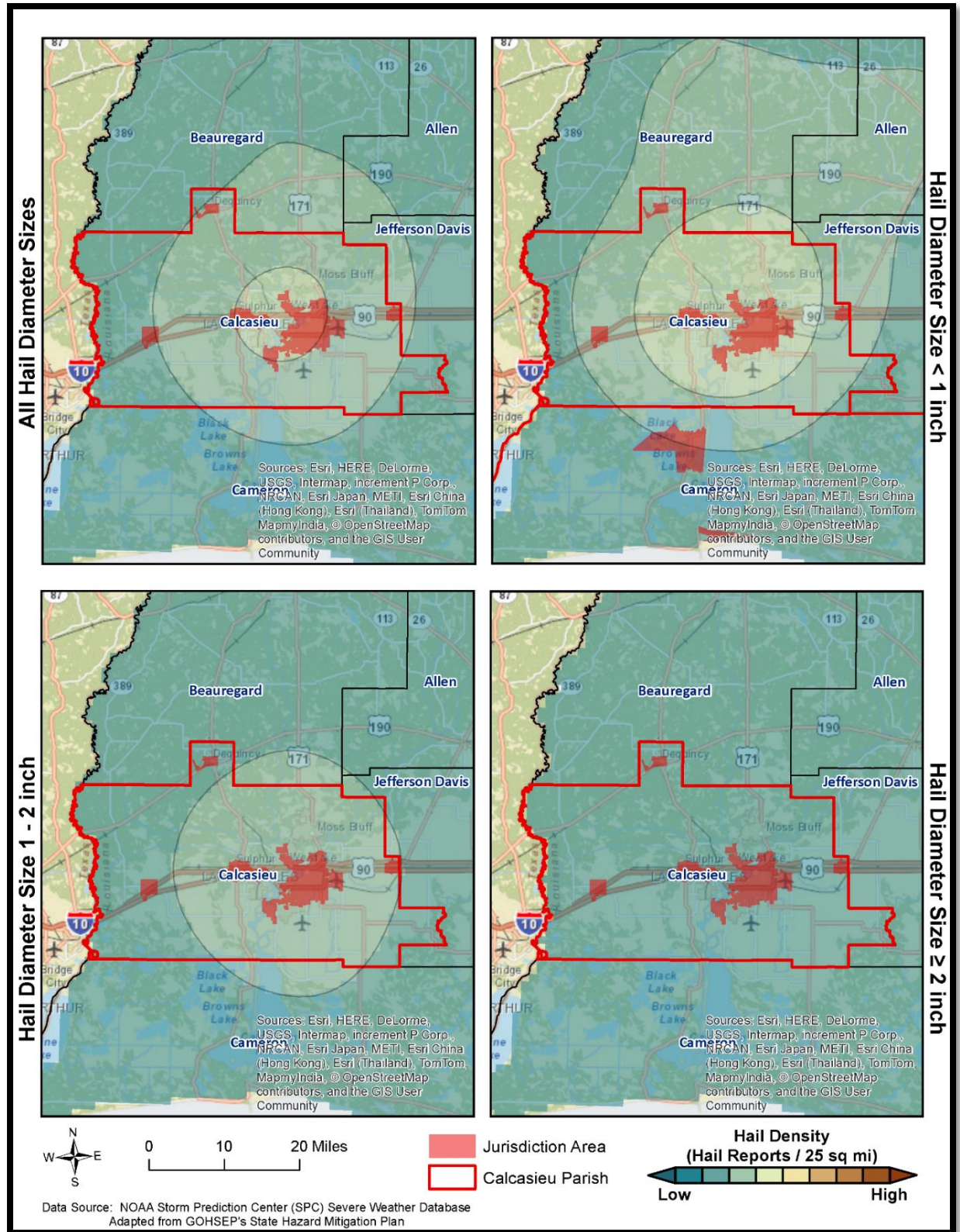


Figure 2-26: Density of Hailstorms by Diameter from 1950-2012  
(Source: State of Louisiana Hazard Mitigation Plan 2014)

### *Frequency*

Based on historical data from SHELDUS for the past 25 years, it is estimated the probability of occurrence for a significant hailstorm event is approximately 32%, with a return frequency of less than once every two to four years. The probability was determined based on a review of significant hail data that has caused damages in the last 25 years, in which Calcasieu Parish has had eight recorded events.

### *Estimated Potential Losses*

According to the SHELDUS database, property damage due to hailstorms in Calcasieu Parish have totaled approximately \$81,350 since 1989. A list of total damages by event can be found in [Table 2-43](#). To estimate the potential losses of a hail event on an annual basis, the total damages recorded for wind events was divided by the total number of years of available wind data in SHELDUS (1989 – 2014). This provides an annual estimated potential loss of \$3,254. [Table 2-44](#) provides an estimate of potential property losses for Calcasieu Parish.

*Table 2-43: Property Damage Caused by Hailstorms in Calcasieu Parish  
(Source: SHELDUS)*

Date	Property Damage
April 1991	\$100
May 1991	\$2,750
June 1991	\$2,500
January 1999	\$50,000
June 2007	\$5,000
April 2009	\$1,000
May 2013	\$20,000

*Table 2-44: Estimated Annual Property Losses in Calcasieu Parish from Hailstorms*

Estimated Annual Potential Losses from Hailstorms for Calcasieu Parish						
Unincorporated Calcasieu Parish (44.8% of Population)	DeQuincy (1.7% of Population)	Iowa (1.6% of Population)	Lake Charles (37.3% of Population)	Sulphur (3.1% of Population)	Vinton (1.7% of Population)	Westlake (2.4% of Population)
\$1,458	\$55	\$51	\$1,215	\$345	\$54	\$77

There have been no deaths or injuries due to hailstorms from 1989 – 2014 in Calcasieu Parish.

### *Vulnerability*

See Appendix C for parish and municipality buildings that are susceptible to hailstorms.

## High Winds

### Location

Because high winds are a climatological based hazard, the entire planning area for Calcasieu Parish is equally at risk for high winds.

### Previous Occurrences / Extents

The SHELATUS database reports a total of 185 thunderstorm wind events occurring within the boundaries of Calcasieu Parish between the years of 1989 to 2014. The significant thunderstorm wind events experienced in Calcasieu Parish have ranged in wind speed from 50 mph to 87 mph. Calcasieu Parish can expect to receive thunderstorm winds up to 87 mph for future high wind events.

*Table 2-45: Previous Occurrences for Thunderstorm High Wind Events*

Location	Date	Recorded Wind Speeds (mph)	Property Damage	Crop Damage
DEQUINCY ARPT	March 25, 2009	81	\$100,000	\$0
BUHLER	March 25, 2009	70	\$25,000	\$0
GILLIS	March 25, 2009	58	\$1,000	\$0
MOSS BLUFF	March 25, 2009	58	\$3,000	\$0
(LCH)LK CHARLES MUNI	March 25, 2009	60	\$2,000	\$0
(LCH)LK CHARLES MUNI	March 25, 2009	60	\$0	\$0
VINCENT LNDG	March 26, 2009	60	\$0	\$0
STARKS	May 26, 2009	60	\$5,000	\$0
DEQUINCY	May 26, 2009	60	\$3,000	\$0
EDGERLY	May 26, 2009	60	\$3,000	\$0
LAKE CHARLES	May 26, 2009	60	\$2,000	\$0
LAKE CHARLES LAKE	May 26, 2009	60	\$0	\$0
(LCH)LK CHARLES MUNI	June 29, 2009	58	\$0	\$0
IOWA	July 8, 2009	60	\$5,000	\$0
LAKE CHARLES LAKE	July 8, 2009	60	\$1,000	\$0
IOWA	July 8, 2009	60	\$2,000	\$0
MOSS BLUFF	July 18, 2009	60	\$1,000	\$0
LAKE CHARLES	July 18, 2009	60	\$1,000	\$0
VINTON	July 18, 2009	70	\$0	\$0
CHENNAULT INDUS AIRP	July 18, 2009	60	\$3,000	\$0

Location	Date	Recorded Wind Speeds (mph)	Property Damage	Crop Damage
(LCH)LK CHARLES MUNI	March 25, 2010	70	\$20,000	\$0
MOSS BLUFF	May 17, 2010	60	\$3,000	\$0
LAKE CHARLES LAKE	May 17, 2010	60	\$0	\$0
LAKE CHARLES MUNI AR	May 17, 2010	63	\$0	\$0
HOUSTON RIVER	May 26, 2010	100	\$5,000,000	\$0
WESTLAKE	May 26, 2010	60	\$5,000	\$0
LAKE CHARLES LAKE	May 26, 2010	60	\$1,000	\$0
HOLMWOOD	May 26, 2010	60	\$3,000	\$0
PERKINS	May 30, 2010	60	\$15,000	\$0
LAKE CHARLES	May 30, 2010	60	\$25,000	\$0
VINTON	June 3, 2010	60	\$3,000	\$0
STARKS	February 1, 2011	60	\$3,000	\$0
VINCENT LNDG	March 30, 2011	70	\$20,000	\$0
(LCH)LK CHARLES MUNI	March 30, 2011	70	\$5,000	\$0
VINCENT LNDG	March 30, 2011	96	\$0	\$0
STARKS	April 26, 2011	60	\$3,000	\$0
MOSS BLUFF	April 26, 2011	60	\$30,000	\$0
MALLARD	April 26, 2011	60	\$5,000	\$0
VINCENT	April 26, 2011	60	\$2,000	\$0
HOLMWOOD	June 5, 2011	70	\$40,000	\$0
NIBLETTTS BLUFF	June 6, 2011	58	\$10,000	\$0
CHENNAULT INDUS AIRP	July 5, 2011	67	\$0	\$0
LAKE CHARLES LAKE	August 18, 2011	58	\$5,000	\$0
DEQUINCY	December 22, 2011	58	\$5,000	\$0
SULPHUR	December 22, 2011	58	\$10,000	\$0
LAKE CHARLES	December 22, 2011	58	\$20,000	\$0
SULPHUR	February 18, 2012	58	\$5,000	\$0
CHENNAULT INDUS AIRP	April 2, 2012	58	\$50,000	\$0
DEQUINCY	May 31, 2012	58	\$5,000	\$0
BELL CITY	June 7, 2012	58	\$1,000	\$0
HOLMWOOD	July 20, 2012	63	\$5,000	\$0



Location	Date	Recorded Wind Speeds (mph)	Property Damage	Crop Damage
LAKE CHARLES LAKE	July 20, 2012	58	\$0	\$0
LAKE CHARLES LAKE	July 20, 2012	69	\$900,000	\$0
LAKE CHARLES LAKE	July 20, 2012	58	\$0	\$0
LAKE CHARLES	July 20, 2012	72	\$0	\$0
LAKE CHARLES MUNI AR	July 20, 2012	58	\$0	\$0
LAKE CHARLES	July 21, 2012	58	\$1,000	\$0
LAKE CHARLES MUNI AR	July 21, 2012	62	\$0	\$0
DEQUINCY	August 10, 2012	58	\$1,000	\$0
BUHLER	November 5, 2012	58	\$1,000	\$0
(LCH)LK CHARLES MUNI	November 5, 2012	69	\$1,000	\$0
DEQUINCY	December 25, 2012	58	\$2,000	\$0
WESTLAKE	March 31, 2013	58	\$5,000	\$0
MAPLEWOOD	May 9, 2013	58	\$0	\$0
(LCH)LK CHARLES MUNI	May 10, 2013	75	\$100,000	\$0
ARARET	June 6, 2013	58	\$2,000	\$0
DEQUINCY	June 6, 2013	58	\$2,000	\$0
VINTON	June 6, 2013	58	\$0	\$0
SULPHUR	June 6, 2013	58	\$4,000	\$0
LAKE CHARLES	June 6, 2013	90	\$15,000	\$0
LAKE CHARLES MUNI AR	October 31, 2013	70	\$5,000	\$0
DEQUINCY	April 4, 2014	59	\$15,000	\$0
HOLLYWOOD	June 27, 2014	58	\$1,000	\$0

### *Frequency*

High winds are a fairly common occurrence within Calcasieu Parish, with an annual chance of occurrence calculated at 100%. According to the State Hazard Mitigation Plan, Calcasieu Parish has a future probability of experiencing two to four wind events annually.

### *Estimated Potential Losses*

Since 1989, there have been 185 significant wind events that have resulted in property damages according to the SHEL DUS database. The total property damages associated with those storms have totaled \$5,840,091. To estimate the potential losses of a wind event on an annual basis, the total damages

recorded for wind events was divided by the total number of years of available wind data in SHELDUS (1989 – 2014). This provides an annual estimated potential loss of \$233,604. The following table provides an estimate of potential property losses for Calcasieu Parish:

*Table 2-46: Estimated Annual Property Losses in Calcasieu Parish Resulting from Wind Damage*

Estimated Annual Potential Losses from Thunderstorm Winds for Calcasieu Parish						
Unincorporated Calcasieu Parish (44.8% of Population)	DeQuincy (1.7% of Population)	Iowa (1.6% of Population)	Lake Charles (37.3% of Population)	Sulphur (3.1% of Population)	Vinton (1.7% of Population)	Westlake (2.4% of Population)
\$104,647	\$3,920	\$3,631	\$87,244	\$24,734	\$3,892	\$5,536

There have been no reported injuries or fatalities as a result of a thunderstorm wind event over the 25-year record.

#### *Vulnerability*

See appendix C-1 to C-2 for parish and municipality buildings that are susceptible to high winds.

#### *Lightning*

##### *Location*

Like hail and high winds, lightning is a climatological based hazard and has the same probability of occurring throughout the entire planning area for Calcasieu Parish.

##### *Previous Occurrences / Extents*

The SHELDUS database reports a total of 15 lightning events occurring within the boundaries of Calcasieu Parish between the years of 1989-2014. The SHELDUS database only records lightning events that cause death, injuries, crop damage, and/or property damage, so these numbers do not accurately reflect the number of lightning events in Calcasieu Parish, which occur on a nearly monthly basis. The planning area can expect to have a lightning density of 11-12 flash/sq mile/year. The table below provides an overview of significant lightning strikes over the last five years:

*Table 2-47: Previous Occurrences of Significant Lightning Strikes in Calcasieu Parish from 2009 – 2014*  
(Source: NCDC and SHELDUS)

Location	Date	Summary	Property Damage
LAKE CHARLES	September 5, 2009	Lightning struck two boaters fishing on Black Bayou at the Intracoastal Waterway, killing one and injuring the other.	\$5,429
MOSS BLUFF	May 2, 2011	Lightning struck a house on Suburban Street, causing it to catch fire.	\$103,565

Location	Date	Summary	Property Damage
GILLIS	June 8, 2012	A lightning strike downed a tree onto Joe Miller Road.	\$1,014
LAKE CHARLES LAKE	August 7, 2012	Lightning struck Veterans Memorial Park in Lake Charles, blasting apart brick work near a flag pole.	\$507
STARKS	August 11, 2014	A lightning strike started a forest fire in the Starks area. The fire was suppressed after a few hours.	\$1,000

Since 2009, there have been no lightning events that have caused property damage or loss of life in the incorporated areas of DeQuincy, Sulphur, Westlake, Iowa, and Vinton.

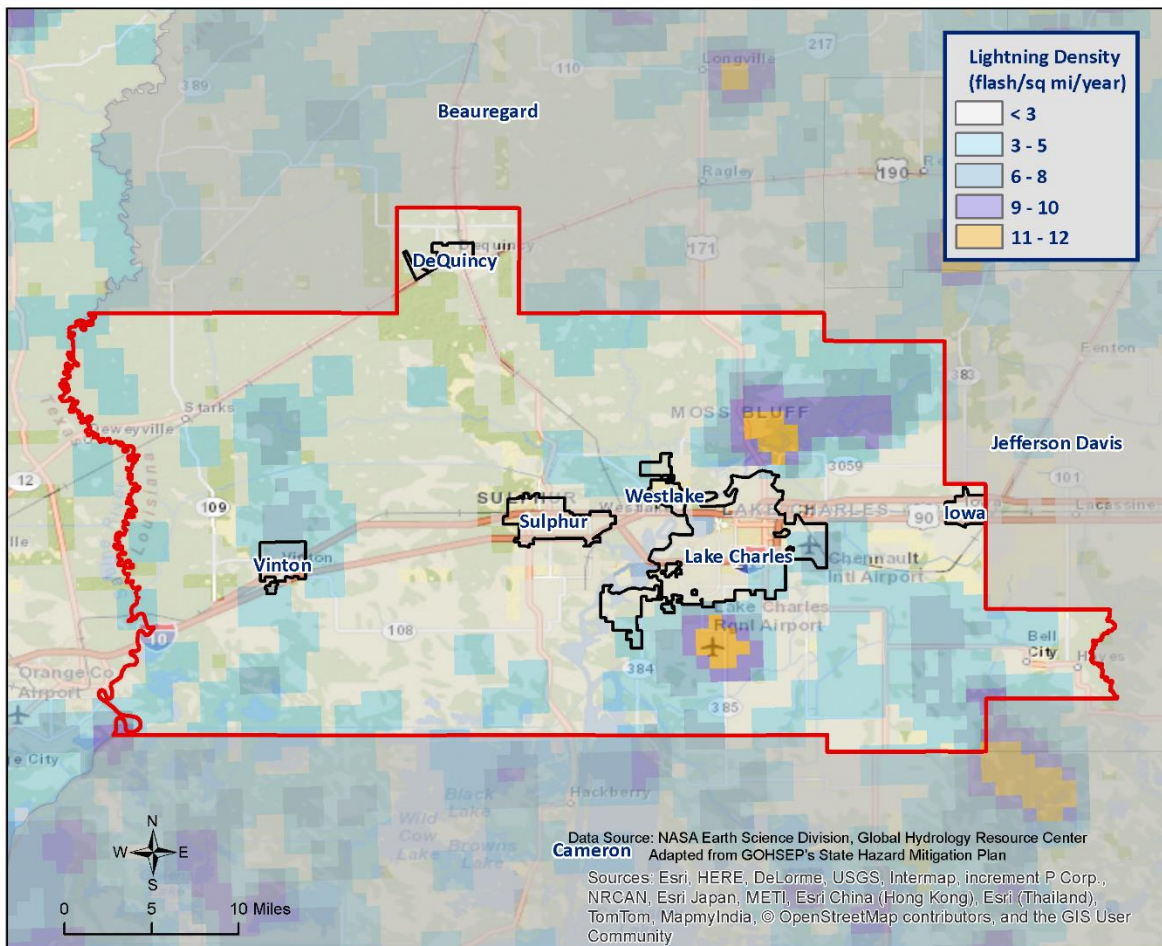


Figure 2-27: Lightning Density Reports for Calcasieu Parish

### *Frequency*

Lightning can strike anywhere and is produced by every thunderstorm, so the chance of lightning occurring in Calcasieu Parish is high. However, lightning that meets the definition that is used by SHEL DUS and the NCDC that actually results in damages to property and injury or death is a less likely event. According to the State Hazard Mitigation Plan, a major lightning strike in Calcasieu Parish is likely to occur every one to four years. This is consistent with SHEL DUS, which has 15 lightning events that have caused property damages or injuries over the last 25 years, establishing an annual probability of 60%.

### *Estimated Potential Losses*

Since 1989, there have been 15 significant lightning events that have resulted in property damages according to the SHEL DUS database. The total property damages associated with lightning events totaled \$496,948. To estimate the potential losses of a lightning event on an annual basis, the total damages recorded for lightning events was divided by the total number of years of available major lightning strike data in SHEL DUS (1989 – 2014). This provides an annual estimated potential loss of \$19,878. The following table provides an estimate of potential property losses for Calcasieu Parish:

*Table 2-48: Estimated Annual Property Losses in Calcasieu Parish from Lightning*

Estimated Annual Potential Losses from Thunderstorm Winds for Calcasieu Parish						
Unincorporated Calcasieu Parish (44.8% of Population)	DeQuincy (1.7% of Population)	Iowa (1.6% of Population)	Lake Charles (37.3% of Population)	Sulphur (3.1% of Population)	Vinton (1.7% of Population)	Westlake (2.4% of Population)
\$8,905	\$334	\$309	\$7,424	\$2,105	\$331	\$471

There have been seven reported injuries and three fatalities in Calcasieu Parish as a result of a lightning strikes over the 25-year record.

### *Vulnerability*

See Appendix C for parish and municipality building exposure to lightning hazards.



## Tornadoes

Tornadoes (also called twisters or cyclones) are rapidly rotating funnels of wind extending between storm clouds and the ground. For their size, tornadoes are the most severe storms, and 70% of the world's reported tornadoes occur within the continental United States, making them one of the most significant hazards Americans face. Tornadoes and waterspouts form during severe weather events, such as thunderstorms and hurricanes, when cold air overrides a layer of warm air, causing the warm air to rise rapidly. This usually results in a counterclockwise rotation in the northern hemisphere. The updraft of air in tornadoes always rotates because of wind shear (differing speeds of moving air at various heights), and it can rotate in either a clockwise or counterclockwise direction; clockwise rotations (in the northern hemisphere) will sustain the system, at least until other forces cause it to die seconds to minutes later.

Since February 1, 2007, the Enhanced Fujita (EF) Scale has been used to classify tornado intensity. The EF Scale classifies tornadoes based on their damage pattern rather than wind speed; wind speed is then derived and estimated. This contrasts with the Saffir-Simpson scale used for hurricane classification, which is based on measured wind speed. [Table 2-49](#) shows the EF scale in comparison with the old Fujita (F) Scale, which was used prior to February 1, 2007. When discussing past tornadoes, the scale used at the time of the hazard is used.

*Table 2-49: Comparison of the Enhanced Fujita (EF) Scale to the Fujita (F) Scale*

Wind speed (mph)	Enhanced Fujita Scale					
	EF0	EF1	EF2	EF3	EF4	EF5
	65-85	86-110	111-135	136-165	166-200	>200
	Fujita Scale					
	F0	F1	F2	F3	F4	F5
	<73	73-112	113-157	158-206	207-260	>261

The National Weather Service (NWS) has the ability to issue advisory messages based on forecasts and observations. The following are the advisory messages that may be issued, along with definitions of each:

- Tornado Watch:** Issued to alert people to the possibility of a tornado developing in the area. A tornado has not been spotted but the conditions are favorable for tornadoes to occur.
- Tornado Warning:** Issued when a tornado has been spotted or when radar identifies a distinctive “hook-shaped” area within a thunderstorm line.

Structures within the direct path of a tornado vortex are often reduced to rubble. Structures adjacent to the tornado's path are often severely damaged by high winds flowing into the tornado vortex, known as inflow winds. It is here, adjacent to the tornado's path, that the building type and construction techniques are critical to the structure's survival. Although tornadoes strike at random, making all buildings

vulnerable, mobile homes, homes with crawlspaces, and buildings with large spans are more likely to suffer damage.

The major health hazard from tornadoes is physical injury from flying debris, or being in a collapsed building or mobile home. Within a building, flying debris or projectiles are generally stopped by interior walls. However, if a building has no partitions, any glass, brick, or other debris blown into the interior is life threatening. Following a tornado, damaged buildings are a potential health hazard due to instability, electrical system damage, and gas leaks. Sewage and water lines may also be damaged.

Peak tornado activity in Louisiana occurs during the spring, as it does in the rest of the United States. Nearly one-third of observed tornadoes in the United States occur during April. About half of those in Louisiana, including many of the strongest, occur between March and June. Fall and winter tornadoes are less frequent, but the distribution of tornadoes throughout the year is more uniform in Louisiana than in locations farther north.

#### *Location*

While there is a significant tornado record in Calcasieu Parish with actual locations, tornadoes in general are a climatological based hazard and have the same approximate probability of occurring in Calcasieu Parish as all of its jurisdictions. Because a tornado has a similar probability of striking anywhere within the planning area for Calcasieu Parish, all jurisdictions are equally at risk for tornadoes.

#### *Previous Occurrences / Extents*

SHELDUS reports a total of 22 tornadoes or waterspouts occurring within the boundaries of Calcasieu Parish between the years of 1989-2014. The tornadoes experienced in Calcasieu Parish have from ranged EF0 to EF1 on the EF scale, and ranged from F0 to F2 on the F scale. The worst case scenario Calcasieu Parish can expect in the future is an EF1 tornado.

The tornado that caused the most damage to property occurred on December 30, 2002. The F1 tornado was responsible for over \$9 million in damage. The tornado touched down on the west side of the incorporated area of Iowa, destroying two homes and heavily damaging a small mall. The tornado responsible for the most injuries occurred on April 3, 2000. The tornado destroyed a mobile home, trapping five people inside who sustained minor injuries. There have been no fatalities in Calcasieu Parish as a result of tornadoes.

*Table 2-50: Historical Tornadoes in Calcasieu Parish with Locations from 1989-2014*

Date	Impacts	Property Damage	Location	Magnitude
December 21, 1990	1 mile path with a width of 200 yards. Destroyed one mobile home, a second story of a home, and caused minor damage to 20 other homes.	\$89,119	UNINCORPORATED AREA	F1
May 5, 1991	0.2 mile path with a width of 17 yards. A small tornado was reported by a pilot near Stark.	\$855	UNINCORPORATED AREA	F0
June 5, 1991	0.5 mile path with a width of 13 yards. Destroyed a mobile home and blew over a building that was currently under construction.	\$4,276	UNINCORPORATED AREA	F0
June 26, 1992	0.2 mile path with a width of 20 yards. Damaged the roof of four hangars at the old Chennault Air Force Base.	\$8,310	UNINCORPORATED AREA	F1
June 30, 1992	0.5 mile path with a width of 20 yards. Destroyed the canopy at a gas station and overturned some portable business signs.	\$822	UNINCORPORATED AREA	F1
April 7, 1993	5 mile path with a width of 30 yards. Destroyed a few barns in its path.	\$8,061	STARKS	F0
January 12, 1998	0.5 mile path with a width of 10 yards. One barn was destroyed, and a race horse was killed by flying debris.	\$71,459	SULPHUR	F0
October 6, 1998	0.5 mile path with a width of 10 yards. Ripped the roof off of a camper, which landed on the neighbor's truck and trailer.	\$71,459	LAKE CHARLES	F0
January 2, 1999	2.5 mile path with a width of 100 yards. Downed several trees and power lines.	\$34,258	SULPHUR	F0

Date	Impacts	Property Damage	Location	Magnitude
January 2, 1999	2.5 mile path with a width of 50 yards. Damaged several buildings at a local gas plant, as well as numerous homes and businesses.	\$102,775	SULPHUR	F1
January 2, 1999	4 mile path with a width of 400 yards. Destroyed several homes and one farm. Lifted a home in the air and moved it 75 yards from its original location.	\$352,372	HAYES	F2
March 2, 1999	4 mile path with a width of 75 yards. Destroyed one home and downed several trees.	\$104,873	SULPHUR	F2
April 3, 2000	5 mile path with a width of 20 yards. Destroyed one mobile home and trapped five people inside. Two businesses and five other homes received minor damage.	\$135,283	LAKE CHARLES	F1
November 28, 2001	1 mile path with a width of 10 yards. Tops of trees were removed by the tornado.	\$658	VINTON	F0
October 29, 2002	1 mile path with a width of 20 yards. Downed several trees and power lines.	\$12,949	DEQUINCY	F0
December 30, 2002	3 mile path with a width of 20 yards. Destroyed two homes, one business, and heavily damaged a small mall.	\$9,064,475	IOWA	F1
November 22, 2004	1 mile path with a width of 20 yards. Destroyed a brick dugout at a high school and damaged a shed and porch at nearby homes.	\$30,831	IOWA	F0
January 25, 2012	5.8 mile path with a width of 25 yards. Damaged the roofs of several homes and blew down several trees.	\$101,465	LOCKMOOR	EF1

Date	Impacts	Property Damage	Location	Magnitude
July 20, 2012	8.23 mile path with a width of 150 yards. Multiple mobile homes were damaged and several trees were downed. Multiple homes received roof damage.	\$101,454	CHENNAULT INDUS AIRP	EF1
July 20, 2012	1.49 mile path with a width of 100 yards. Patio furniture was damaged and superficial tree damage was sustained.	\$1,025	HOLMWOOD	EF0
October 31, 2013	7.12 mile path with a width of 150 yards. Caused minor roof and fence damage. Downed several trees.	\$30,000	PERKINS	EF1
October 31, 2013	1.39 mile path with a width of 30 yards. One home sustained minor damage and two sheds were destroyed.	\$10,000	VINCENT LNDG	EF0
April 4, 2014	1.84 mile path with a width of 100 yards. Snapped or uprooted numerous trees, which resulted in several road closures.	\$5,000	GILLIS	EF1

The incorporated areas of Lake Charles, DeQuincy, Iowa, Sulphur, Westlake, and Vinton have not experienced a tornado event from 2009 to the present. Since 2010, the year in which the last update to this hazard mitigation plan was written, Calcasieu Parish has had six tornadoes touchdown in the unincorporated areas of the parish. The following is a brief synopsis of these events:

#### January 25, 2012 – EF1 Tornado in Lockmoor

A tornado touched down on Evergreen Road west of Westlake, blowing down trees and damaging the roofs of several homes. Most of the damage was due to trees falling onto homes. The tornado traveled towards Moss Bluff, snapping several trees near North Perkins Ferry Road. The tornado also blew a fence down and peeled shingles off of several roofs.

#### July 20, 2012 – EF1 Tornado near Chennault Industrial Airport

A tornado touched down just south of Chennault Airport and traveled southwest to west for approximately eight miles. The tornado crossed Highway 14 near Carlo Henry Road, Common Street near Murbelle, and ended south of Gauthier near Elliot Road. Multiple mobile homes were damaged in the Sugarloaf neighborhood and several power poles were downed along Highway



14. Several trees were downed along Carlo Henry, Murbelle, Arabie, and Beaugh Roads. Portions of roofs were damaged or removed along Murbelle Road, with one home being shifted one to two feet from its foundation.

#### July 20, 2012 – EF0 Tornado in Holmwood

A weak tornado developed along the leading edge of a slow moving front near Holmwood. The tornado did mostly superficial damage to trees, although one pine tree with a width of six to eight inches was snapped. Patio furniture was also damaged along Nick Marone Road, and one agricultural structure was damaged.

#### October 31, 2013 – EF1 Tornado in Perkins

A tornado touched down southwest of the corner of Sandy Lane and Butler Lane, south of DeQuincy. The tornado moved west to northwest, and it became its strongest along Wanda Lane. Here, EF1 damage was produced. The path continued across Highway 27, across Holbrook Park Road, and finally dissipated before reaching Beckwith Creek. Mostly tree damage was noted along the path. However, on Edith and Wanda Lanes, fence damage was noted along with three large trees downed and roofing removed from an outbuilding.

#### October 31, 2013 – EF0 Tornado in Vincent Landing

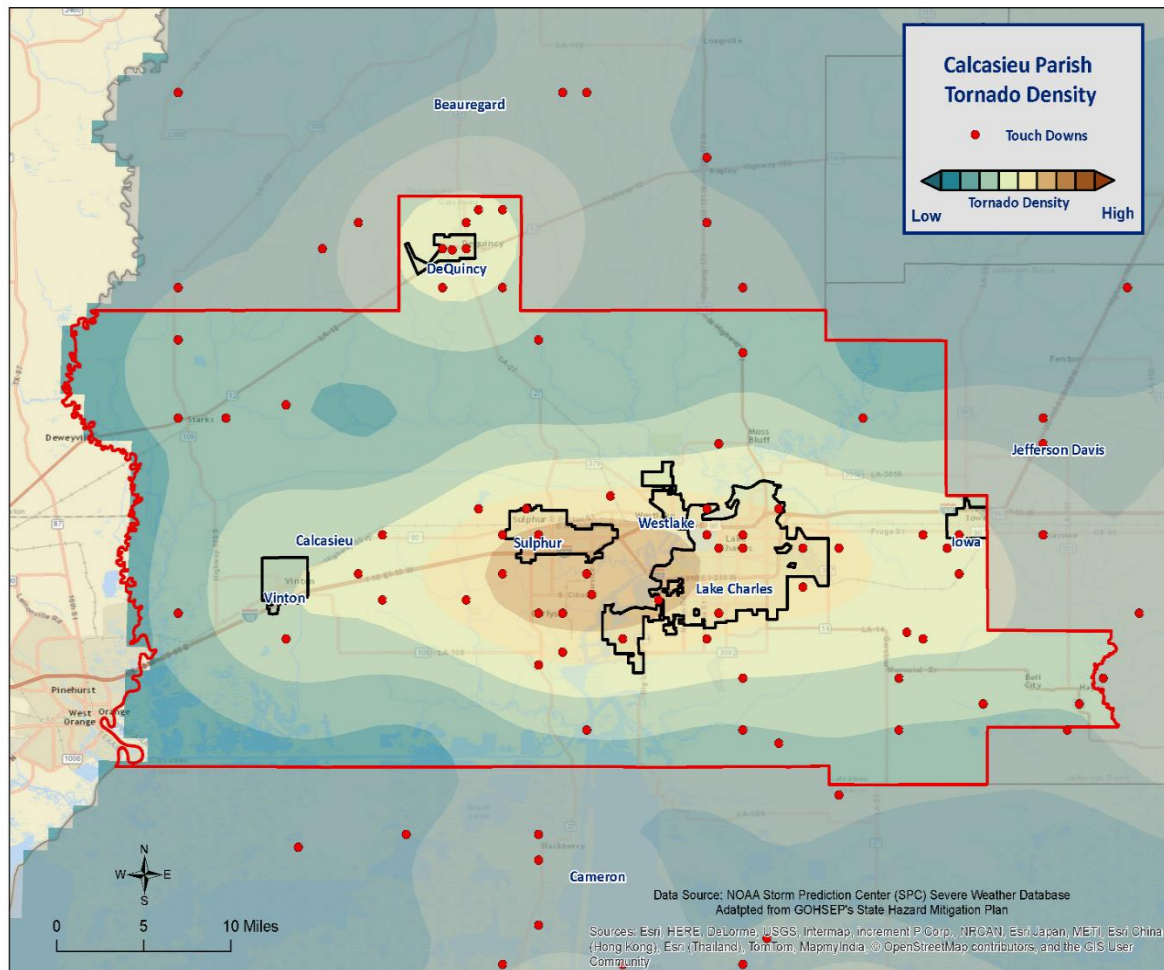
A weak tornado touched down in the marsh and woods north of Graywood Parkway and traveled west across Big Lake Road. The tornado continued down L. Ogea Road and Sances Road before dissipating. One home had minor damage and two sheds were destroyed.

#### April 4, 2014 – EF1 Tornado in Gillis

A tornado developed from severe storms in the Gillis area, downing ten to fifteen trees on Kingery, Mattie Reeves, and Topsy Roads. Some of the trees blocked roads and driveways.

#### *Frequency / Probability*

Tornadoes are a sporadic occurrence within Calcasieu Parish with an annual chance of occurrence calculated at 88% based on the records for the past 25 years (1989-2014). [Figure 2-28](#) displays the density of tornado touch downs in Calcasieu Parish and neighboring parishes. Based on the State Hazard Mitigation Plan, the overall probability of a tornado touching down in Calcasieu Parish is once every one to two years.



*Figure 2-28: Location and Density of Tornadoes to Touch Down in Calcasieu Parish  
(Source: NOAA/SPC Severe Weather Database)*

### *Estimated Potential Losses*

According to the SHELUDS database, there have been 22 tornadoes that have caused some level of property damage. The total damage from the actual claims for property is \$10,336,779, with an average cost of \$469,854 per tornado strike. When annualizing the total cost over the 25-year record, total annual losses based on tornadoes are estimated to be \$413,371. To provide an estimated annual estimated potential loss per jurisdiction, the 2010 Census population was used to assign the estimated potential losses proportionally across the jurisdictions. Based on the 2010 Census data, [Table 2-51](#) provides an annual estimate of potential losses for Calcasieu Parish.

*Table 2-51: Estimated Annual Losses for Tornadoes in Calcasieu Parish*

Estimated Annual Potential Losses from Tornadoes for Calcasieu Parish						
Unincorporated Calcasieu Parish (44.8% of Population)	DeQuincy (1.7% of Population)	Iowa (1.6% of Population)	Lake Charles (37.3% of Population)	Sulphur (3.1% of Population)	Vinton (1.7% of Population)	Westlake (2.4% of Population)
\$185,222	\$6,939	\$6,426	\$154,419	\$43,778	\$6,889	\$9,798

Table 2-52 presents an analysis of building exposure that is susceptible to tornadoes by general occupancy type for Calcasieu Parish, along with the percentage of building stock that are mobile homes.

*Table 2-52: Building Exposure by General Occupancy Type for Tornadoes in Calcasieu Parish*  
 (Source: FEMA's Hazus 2.2)

Building Exposure by General Occupancy Type for Tornadoes Exposure Types (\$1,000)							
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Mobile Homes (%)
14,769,798	2,613,894	562,260	34,779	375,372	91,657	163,965	18.9%

The parish has suffered through a total of three days in which tornadoes or waterspouts have accounted for eight injuries and no fatalities during this 25-year period (Table 2-53). The average number of injuries per event for Calcasieu Parish is 0.36 per tornado, with an average of 0.32 per year for the 25-year period.

*Table 2-53: Tornadoes in Calcasieu Parish by Magnitude that Caused Injuries or Deaths*

Date	Magnitude	Deaths	Injuries
January 2, 1992	F2	0	2
April 3, 2000	F1	0	5
December 30, 2002	F1	0	1

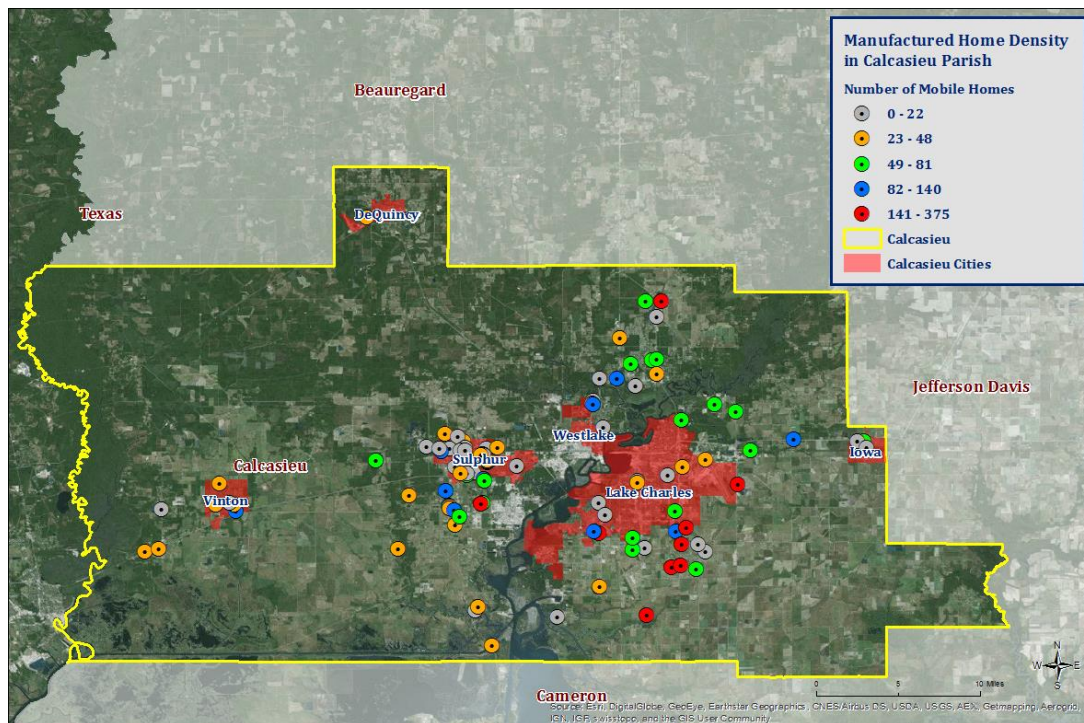
In assessing the overall risk to population, the most vulnerable population throughout the parish are those residing in manufacturing housing. Approximately 18.9% of all housing in Calcasieu Parish consists of manufactured housing. Based on location data collected in a previous hazard mitigation project, there are 72 known locations where manufactured housing is concentrated. Each of those 72 locations have an overall number of manufactured houses ranging from one to 375. The location and density of manufactured houses can be seen in Figure 2-29.

Manufactured housing is more likely to sustain damage from a tornado than any other residential structure. The highest concentration of manufactured home parks is located in the unincorporated area of Calcasieu Parish (Table 2-54). However, this does not influence the risk associated with a tornado event

since they strike at random, making all structures and population within the planning area equally vulnerable.

*Table 2-54: Manufactured Home Distribution throughout Calcasieu Parish*

Location	Number of Manufactured Home Parks	% of Manufactured Home Parks
Unincorporated Area	44	61.1%
DeQuincy	1	1.4%
Iowa	3	4.2%
Lake Charles	16	22.2%
Sulphur	1	1.4%
Vinton	5	6.9%
Westlake	2	2.8%



*Figure 2-29: Location and Approximate Number of Units in Manufactured Housing Locations throughout Calcasieu Parish*

### *Vulnerability*

See Appendix C for parish and municipality building exposure to tornado hazards.

### Tropical Cyclones

Tropical cyclones are among the worst hazards Louisiana faces. These spinning, low-pressure air masses draw surface air into their centers and attain strength ranging from weak tropical waves to the most intense hurricanes. Usually, these storms begin as clusters of oceanic thunderstorms off the western coast of Africa, moving westward in the trade wind flow. The spinning of these thunderstorm clusters begins because of the formation of low pressure in a perturbation in the westerly motion of the storms associated with differential impacts of the Earth's rotation. The west-moving, counterclockwise-spinning collection of storms, now called a tropical disturbance, may then gather strength as it draws humid air toward its low-pressure center. This results in the formation of a tropical depression (defined when the maximum sustained surface wind speed is 38 mph or less), then a Tropical Cyclone (when the maximum sustained surface wind ranges from 39 mph to 73 mph), and finally a hurricane (when the maximum sustained surface wind speeds exceed 73 mph). On the next page, [Table 2-55](#) presents the Saffir-Simpson Hurricane Wind Scale, which categorizes tropical cyclones based on sustained winds.



Table 2-55: Saffir-Simpson Hurricane Wind Scale

SAFFIR-SIMPSON HURRICANE WIND SCALE			
Category	Sustained Winds	Pressure	Types of Damage Due to Winds
Tropical Depression	<39 mph	N/A	N/A
Tropical Cyclone	39-73 mph	N/A	N/A
1	74-95 mph	>14.2 psi	Very dangerous winds will produce some damage. Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallow-rooted trees may be toppled, especially after the soil becomes waterlogged. Extensive damage to power lines and poles will likely result in power outages that could last several days.
2	96-110 mph	14-14.2 psi	Extremely dangerous winds will cause extensive damage. Well-constructed frame homes could sustain major roof and siding damage. Many shallow-rooted trees will be snapped or uprooted, especially after the soil becomes waterlogged, and block numerous roads. Near total power loss is expected, with outages that could last from several days to weeks.
3	111-129 mph	13.7 -14 psi	Devastating damage will occur. Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, especially after the soil becomes waterlogged, blocking numerous roads. Electricity and water may be unavailable for several days to weeks after the storm passes.
4	130-156 mph	13.3-13.7 psi	Catastrophic damage will occur. Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, especially after the soil becomes waterlogged, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	157 mph or higher	<13.7 psi	Catastrophic damage will occur. A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks to months.

Many associated hazards can occur during a hurricane, including heavy rains, flooding, high winds, and tornadoes. A general rule of thumb in coastal Louisiana is that the number of inches of rainfall to be expected from a tropical cyclone is approximately 100 divided by the forward velocity of the storm in

mph; so a fast-moving storm (20 mph) might be expected to drop five inches of rain while a slow-moving (5 mph) storm could produce totals of around 20 inches. However, no two storms are alike, and such generalizations have limited utility for planning purposes. Hurricane Beulah, which struck Texas in 1967, spawned 115 confirmed tornadoes. In recent years, extensive coastal development has increased the storm surge resulting from these storms so much that this has become the greatest natural hazard threat to property and loss of life in the state. Storm surge is a temporary rise in sea level generally caused by reduced air pressure and strong onshore winds associated with a storm system near the coast. Although storm surge can technically occur at any time of the year in Louisiana, surges caused by hurricanes can be particularly deadly and destructive. Such storm surge events are often accompanied by large, destructive waves (exceeding ten meters in some places) that can inflict a high number of fatalities and economic losses. In 2005, Hurricane Katrina clearly demonstrated the destructive potential of this hazard, as it produced the highest modern-day storm surge levels in the state of Louisiana, reaching up to 18.7 feet near Alluvial City in St. Bernard Parish.

Property can be damaged by the various forces that accompany a tropical cyclone. High winds can directly impact structures in three ways: wind forces, flying debris, and pressure. By itself, the force of the wind can knock over trees, break tree limbs, and destroy loose items, such as television antennas and power lines. Many things can be moved by high winds. As winds increase, so does the pressure against stationary objects. Pressure against a wall rises with the square of the wind speed. For some structures, this force is enough to cause failure. The potential for damage to structures is increased when debris breaks the building “envelope” and allows the wind pressure to impact all surfaces (the building envelope includes all surfaces that make up the barrier between the indoors and the outdoors, such as the walls, foundation, doors, windows, and roof). Mobile homes and buildings in need of maintenance are most subject to wind damage. High winds mean bigger waves. Extended pounding by waves can demolish any poorly or improperly designed structures. The waves also erode sand beaches, roads, and foundations. When foundations are compromised, the building will collapse.

Nine out of ten deaths during hurricanes are caused by storm surge flooding. Falling tree limbs and flying debris caused by high winds have the ability to cause injury or death. Downed trees and damaged buildings are a potential health hazard due to instability, electrical system damage, broken pipelines, chemical releases, and gas leaks. Sewage and water lines may also be damaged. Salt water and fresh water intrusions from storm surge send animals, such as snakes, into areas occupied by humans.

#### *Location*

Hurricanes are the single biggest threat to all of south Louisiana. With any single hurricane having the potential to devastate multiple parishes at once, the risk of a tropical cyclone has the probability of impacting anywhere within the planning area for Calcasieu Parish. As such, all jurisdictions are equally at risk for tropical cyclones.

#### *Previous Occurrences / Extents*

The central Gulf of Mexico coastline is among the most hurricane-prone locations in the United States, and hurricanes can affect every part of the state. The SHELDS database reports a total of seven tropical cyclone events occurring within the boundaries of Calcasieu Parish between the years 2002 and 2014 (Table 2-56). The tropical cyclone events experienced in Calcasieu Parish include depressions, storms, and hurricanes. As a worst case scenario, Calcasieu Parish can expect to experience hurricanes at the category 4 level in the future.

*Table 2-56: Historical Tropical Cyclone Events in Calcasieu Parish from 2002- 2014*  
(Source: SHEL DUS)

Date	Name	Storm Type At Time of Impact
October 3, 2002	Lili	Hurricane –Category 1
September 23, 2005	Rita	Hurricane – Category 3
September 13, 2007	Humberto	Hurricane – Category 1
August 5, 2008	Edouard	Tropical Storm
September 1, 2008	Gustav	Tropical Storm
September 12, 2008	Ike	Tropical Storm
September 3, 2011	Lee	Tropical Storm

#### [Hurricane Audrey \(1957\)](#)

Hurricane Audrey made landfall on June 27, 1957 near the Texas/Louisiana border, causing a disastrous storm surge. The highest storm surge measured was 12.4 feet in Cameron Parish. Waves associated with the storm were monstrous. In the Gulf of Mexico, seas of 45 to 50 feet were reported, and waves in Cameron Parish reached as high as 20 feet above mean sea level. Approximately 526 people died due to Hurricane Audrey, and damages in Louisiana totaled approximately \$120 million.

In Calcasieu Parish, Hurricane Audrey dropped 7.57 inches of rain, and produced 75 mph sustained winds and gusts up to 97 mph. Storm surge associated with Audrey registered seven feet above mean sea level around Lake Charles and 6.5 feet around the Moss Bluff area.

#### [Tropical Storm Allison \(2001\)](#)

Tropical Storm Allison ravaged U.S. coastal areas with torrential rain and flooding for nearly two weeks in June of 2001. Fifty fatalities are attributed to Tropical Storm Allison. Insured losses totaled \$2.5 billion, with total damages exceeded \$6 billion. The heavy rain from Tropical Storm Allison initially hit southeastern Texas and eventually moved into Calcasieu Parish, resulting in widespread street flooding on June 6.

#### [Hurricane Lili \(2002\)](#)

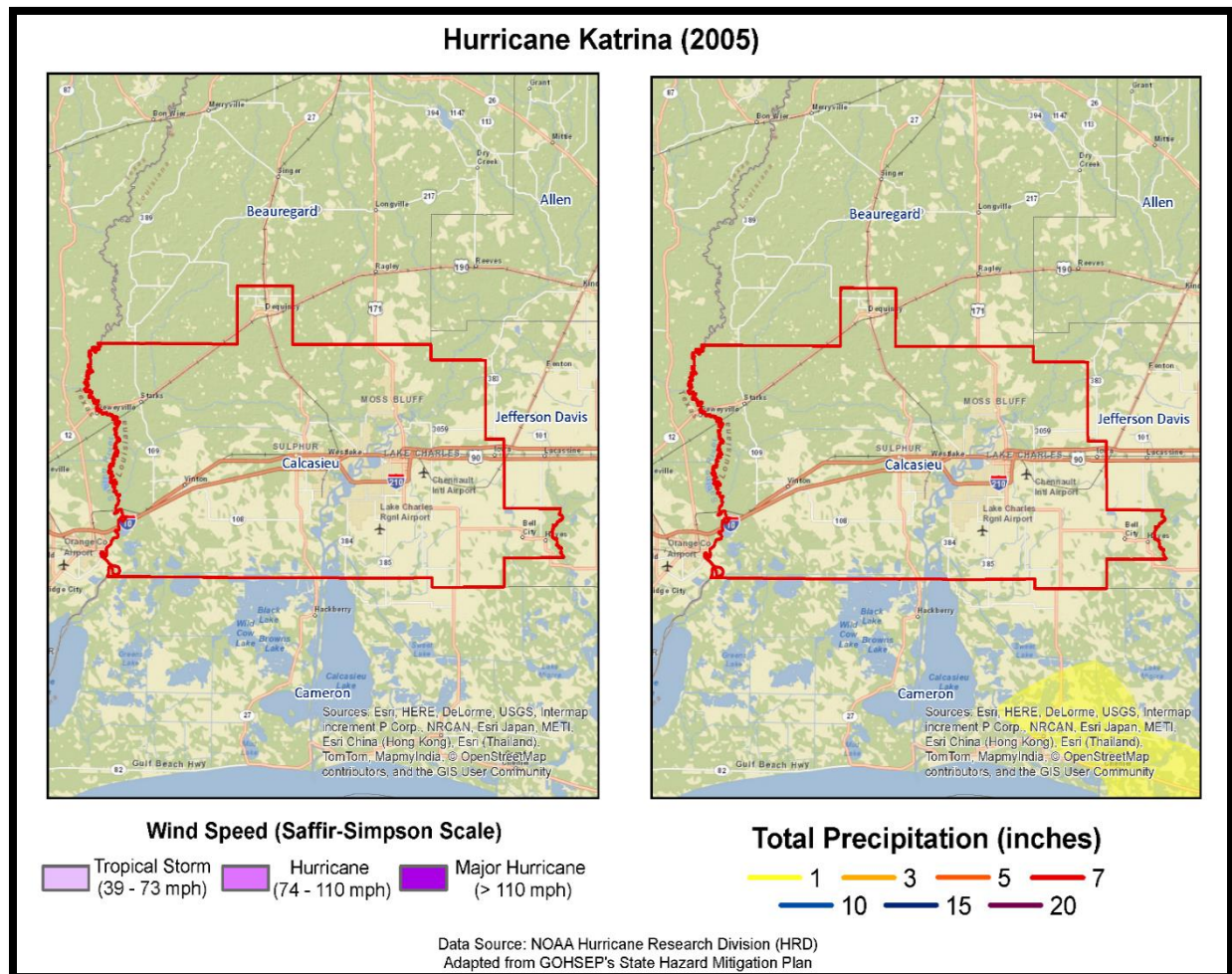
Hurricane Lili made landfall on the Louisiana coast on October 3, 2002 with an estimated intensity of 80 knots. Although Lili weakened considerably before making landfall on the central Louisiana coast, it caused significant wind and flood damage in the area. Strong winds toppled trees onto houses and into roadways, stripped shingles from roofs, and blew out windows. The wind and driving rain flattened sugar cane fields throughout southern Louisiana. A combination of storm surge and rain caused levees to fail in Montegut and Franklin, Louisiana. Lili also temporarily curtailed oil production in the Gulf of Mexico.

The primary impact in Calcasieu Parish was flooding, with evacuations being required for residents in low-lying areas. Major power interruptions occurred along with downed trees and wind damage to structures. Three injuries were reported in Calcasieu Parish as a result of Hurricane Lili.

#### [Hurricane Katrina \(2005\)](#)

Hurricane Katrina was one of the strongest and most destructive hurricanes on record to impact the coast of the United States. The National Hurricane Center ranked Katrina as the costliest storm (both before

and after adjusting for inflation) and the third deadliest in the U.S. since 1851. The hurricane initially made landfall in Plaquemines Parish on August 29, 2005, as a Category 3 storm and continued on a north-northeast track with a second landfall occurring near the Louisiana-Mississippi border. Hurricane Katrina caused widespread devastation along the central Gulf Coast states. Following the passage of Katrina, the flooding of New Orleans was catastrophic, resulting in the displacement of more than 250,000 people.



*Figure 2-30: Wind Speed and Precipitation Totals in Calcasieu Parish for Hurricane Katrina*

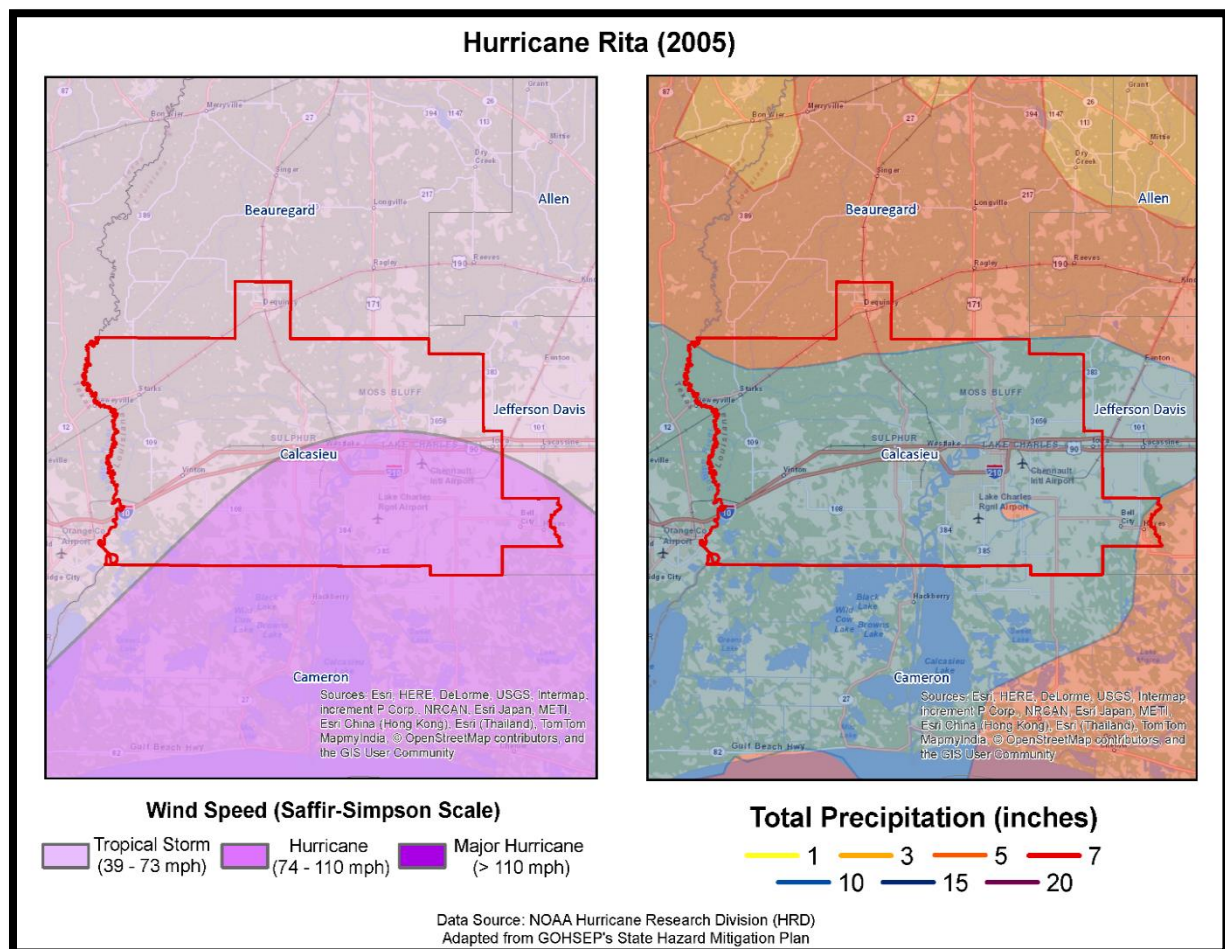
The most significant impact of Hurricane Katrina on Calcasieu Parish was the large number of evacuees leaving New Orleans and surrounding areas in southeastern Louisiana. Nearly 2,000 evacuees were housed at the Lake Charles Civic Center, and 4,730 hotel rooms in Calcasieu Parish were filled with people fleeing Hurricane Katrina. Disaster response costs in Calcasieu Parish were related to providing emergency sheltering to evacuees.

#### Hurricane Rita (2005)

While Hurricane Katrina and resulting levee failures captured headlines worldwide, lesser known (but just as destructive) Hurricane Rita wreaked havoc on southwestern Louisiana less than a month



later. The storm made landfall as a Category 3 hurricane in Cameron Parish. Across southeast Louisiana, the main effect from Hurricane Rita was the substantial storm surge flooding that occurred in low lying communities across coastal areas of southern Terrebonne, southern Lafourche, and southern Jefferson Parishes, where numerous homes and businesses were flooded. Some of the most substantial damage occurred in southern Terrebonne Parish, where storm surge of five to seven feet above normal overtopped or breached local drainage levees, inundating many small communities. Newspaper accounts indicated that approximately 10,000 structures were flooded in Terrebonne Parish. Lafitte and other communities in lower Jefferson Parish also suffered extensive storm surge flooding. Storm surge flooding also occurred in areas adjacent to Lake Pontchartrain and Lake Maurepas, affecting homes and businesses from Slidell to Mandeville and Madisonville. Approximately 1,500 structures were reported as flooded in Livingston Parish near Lake Maurepas. Repaired levees damaged by Hurricane Katrina in late August were overtopped or breached along the Industrial Canal in New Orleans, resulting in renewed flooding in adjacent portions of New Orleans and St. Bernard Parish. However, the flooding was much more limited in scope than during Hurricane Katrina.



*Figure 2-31: Wind Speed and Precipitation Totals in Calcasieu Parish for Hurricane Rita*

Hurricane Rita was the most powerful hurricane to impact southwestern Louisiana since Hurricane Audrey in 1957. Estimated damages in southwest Louisiana totaled near \$4 billion, with the majority of those



losses occurring in Cameron and Calcasieu Parishes. Entire towns were destroyed in Cameron Parish, including downtown Cameron, Creole, Holly Beach, and Grand Chenier. An estimated 90 to 95 percent of the homes in the parish were severely damaged or destroyed. Storm surge values were estimated around 15 feet in parts of Cameron Parish. The storm surge also moved up the Calcasieu ship channel, flooding portions of Calcasieu Parish, including portions of downtown Lake Charles near the civic center. This storm surge was estimated to be between six to eight feet. Disaster response costs in Calcasieu Parish were significant, totaling over \$11 million.

#### [Hurricane Humberto \(2007\)](#)

In 2007, southeastern Texas and southwestern Louisiana were impacted by Hurricane Humberto, which was a rapidly developing storm that made landfall on September 13th as a Category 1 hurricane. Hurricane Humberto tracked into a northeasterly direction along the Texas coastline between High Island, Texas and Sea Rim State Park, then onward into the state of Louisiana. The most significant damages occurred in Jefferson, Orange, and Newton counties in Texas, with moderate wind and flooding damage in Calcasieu Parish.

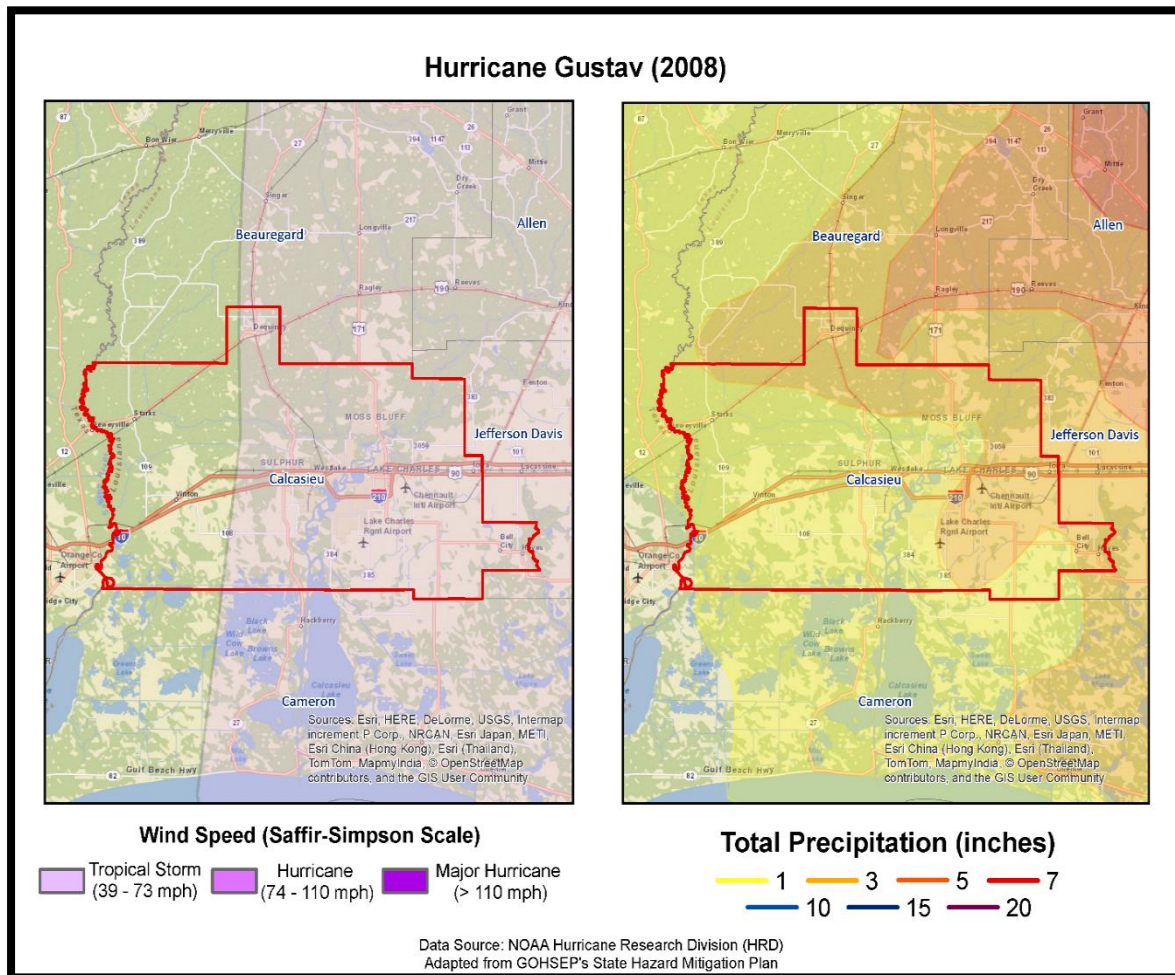
#### [Hurricane Gustav \(2008\)](#)

Hurricane Gustav entered the southeast Gulf of Mexico as a major category 3 hurricane on August 31, 2008, after developing in the Caribbean Sea and moving across western Cuba. Gustav tracked northwestward across the Gulf toward Louisiana and made landfall as a Category 2 hurricane near Cocodrie, Louisiana during the morning of September 1st. Gustav continued to move northwest across south Louisiana and weakened to a Category 1 storm over south central Louisiana later that day. The storm diminished to a tropical depression over northwestern Louisiana on September 2nd.

The highest wind gust recorded was 117 mph (102 kts) at a USGS site at the Houma Navigational Canal and at the Pilot Station East C-MAN near the Southwest Pass of the Mississippi River. The highest sustained wind of 91 mph was recorded at the Pilot's Station East C-MAN site. However, due to the failure of equipment at some observation sites during the storm, higher winds may have occurred. The minimum sea level pressure measured was 951.6 millibars at a USGS site at Caillou Lake, southwest of Dulac, and 954.5 millibars at the LUMCON facility near Dulac. Rainfall varied considerably across southeast Louisiana, ranging from around four inches to just over 11 inches.

Gustav produced widespread wind damage across southeast Louisiana, especially in the area from Houma and Thibodaux through the greater Baton Rouge area. Hurricane force wind gusts occurred also across the inland areas, including the Baton Rouge area and surrounding parishes. A peak wind gust of 91 mph was recorded at the Baton Rouge (Ryan Field) Airport at 1:12 PM CST. This was only one mph less than the highest wind gust recorded during Hurricane Betsy in 1965. After the storm, the electric utility serving most of southeast Louisiana reported 75 to 100 percent of utility customers were without power, in areas ranging from Lafourche and Terrebonne Parishes northwest through the Baton Rouge area to southwest Mississippi and central Louisiana. Considerable damage occurred to many houses and structures as large tree limbs and trees were toppled by the hurricane force winds. Preliminary estimates from the American Red Cross indicated that around 13,000 single family dwellings were damaged by the hurricane in southeast Louisiana, and several thousand more apartments and mobile homes were also damaged. Early estimates from Louisiana Economic Development indicated that Gustav caused at least \$4.5 billion in property damage in Louisiana, including insured and uninsured losses.

In Calcasieu Parish, Hurricane Gustav had a much smaller impact than Hurricane Ike, which came a few days later, though there were two fatalities associated with the hurricane. Hurricane Gustav caused a 3.2 foot peak storm surge in Calcasieu Parish, and the Moss Bluff area received 3.26 inches of rain.

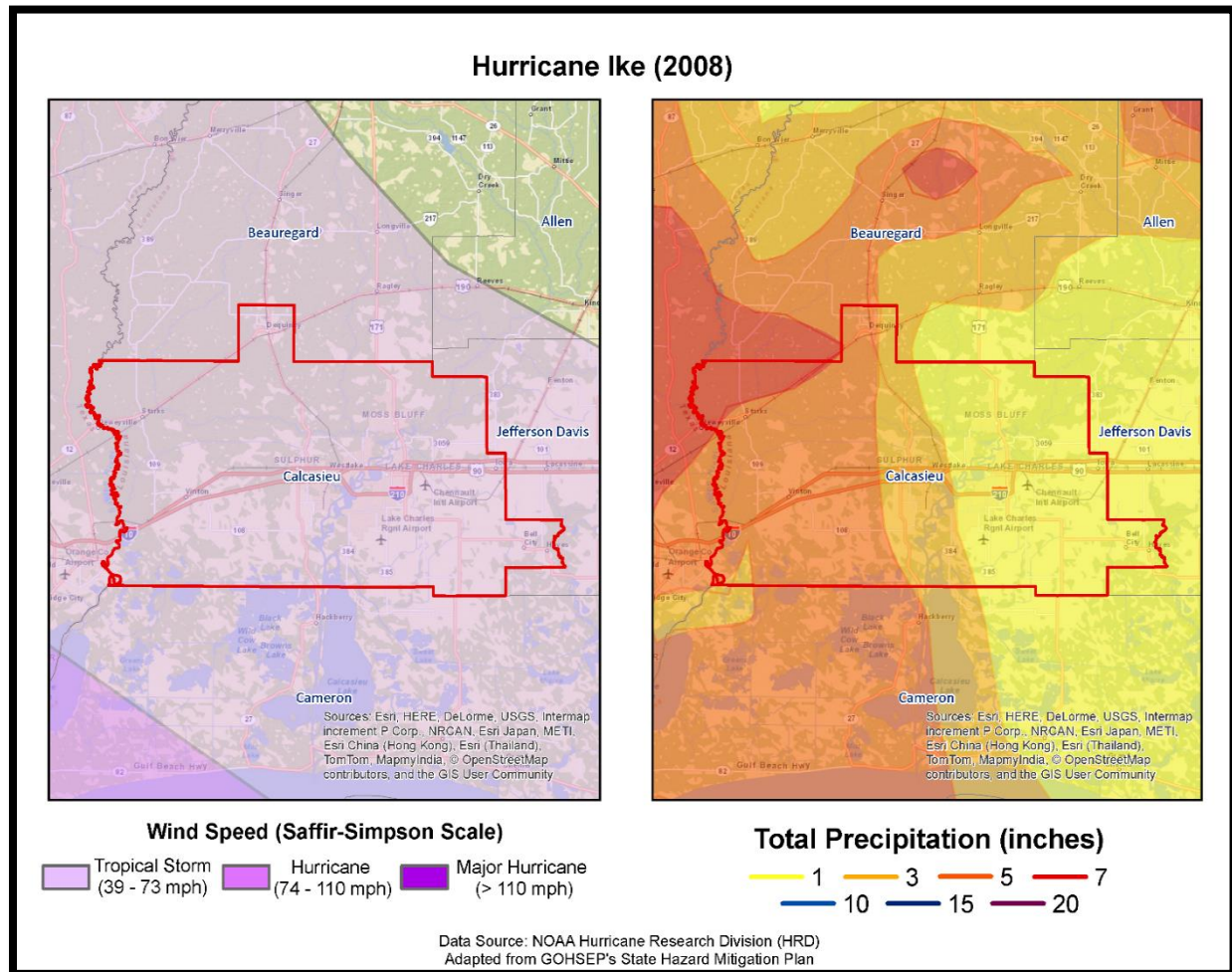


*Figure 2-32: Wind Speed and Precipitation Totals in Calcasieu Parish for Hurricane Gustav*

#### Hurricane Ike (2008)

Hurricane Ike caused wind damage, storm surge flooding, and tornadoes across southwest Louisiana. Ike made landfall near Galveston, TX early in the morning on September 13th as a strong category 2 hurricane. Sustained hurricane force winds were confined to extreme western Cameron Parish. The highest recorded winds in southwest Louisiana were experienced at Lake Charles Regional Airport, with sustained winds of 53 mph (46 kts) and gusts of 77 mph (67 kts). The lowest pressure reading occurred at Southland Field near Sulphur, LA, with a low of 994.6 millibars. Several tornadoes were reported across southwest Louisiana. The most significant one was near Mamou, where ten to fifteen homes were damaged, including one that lost its roof. Storm surge was a significant event. Water levels ranged from 14 feet in western Cameron Parish, to eight feet in St. Mary Parish. This resulted in widespread flooding of the same areas that flooded during Hurricane Rita in 2005. Most of Cameron Parish was under water. Over 3,000 homes were flooded. This extended north into Calcasieu Parish, where another 1,000 homes flooded in Lake Charles, Westlake, and Sulphur. In Vermilion Parish, at least 1,000 homes flooded in Pecan Island, Forked Island, Intracoastal City, and Henry. This extended east into Iberia Parish, where another 1,000

homes flooded south of Highway 14 and Highway 90. In St. Mary Parish, some of the worst flooding occurred in Franklin, where a man-made levee failed, flooding over 450 homes. Maximum storm total rainfall ranged from six to eight inches across Cameron, Calcasieu, and Beauregard Parishes. No fatalities were reported in southwest Louisiana. Total property damages, however, were high. Losses were estimated to be almost \$420 million across southwest Louisiana. Agricultural losses were over \$225 million.



*Figure 2-33: Wind Speed and Precipitation Totals for Hurricane Ike in Calcasieu Parish*

In Calcasieu Parish, the storm surge reached north of Interstate 10 in Lake Charles. High water elevation near downtown Lake Charles crested at over ten feet. Near the southwest corner of Moss Bluff and Sam Houston Jones State Park, the high water elevations reached 9.5 feet. High water elevations in southwestern Calcasieu Parish along the Sabine River crested between 7.7 and 8.3 feet, while north of Interstate 10 crested at 8.7 feet, and between 9.3 and 10.5 feet south of Interstate 10.

#### Tropical Storm Lee (2011)

Tropical Storm Lee initially developed as Tropical Depression Thirteen in the middle of the Gulf of Mexico on the evening of Thursday, September 1, 2011. The depression moved slowly north and gradually strengthened, eventually reaching Tropical Storm strength just south of the Louisiana coast on Friday afternoon September 2, 2011. Tropical Storm Lee made only slow and haltingly northward progress over



the next 24 hours, eventually moving onshore at the Louisiana coast Saturday night, September 3, 2011, with a maximum sustained wind estimated around 60 mph. Lee moved slowly inland to the north of Baton Rouge late Sunday September 4, 2011, and eventually weakened to a tropical depression Sunday evening. Tropical Depression Lee then moved steadily northeast throughout Monday, September 5, 2011, taking on extra-tropical characteristics over the next 24 hours as it interacted with an upper level disturbance moving through the region. The maximum winds observed in Louisiana were a southerly wind of 46 mph (40 kts) sustained, with a 58 mph (50 kts) gust at New Orleans Lakefront Airport on September 4, 2012 at 0528CST. The lowest minimum central pressure was 993.2 millibars, recorded at Baton Rouge Ryan Field on September 4, 2012 at 0959CST. As Tropical Depression Lee was moving northeast and taking on mid-latitude characteristics, strong northerly winds were experienced across the region, occasionally gusting to higher levels than experienced when Lee was characterized as a tropical cyclone. No fatalities or injuries were associated with any Tropical Storm Lee hazards.

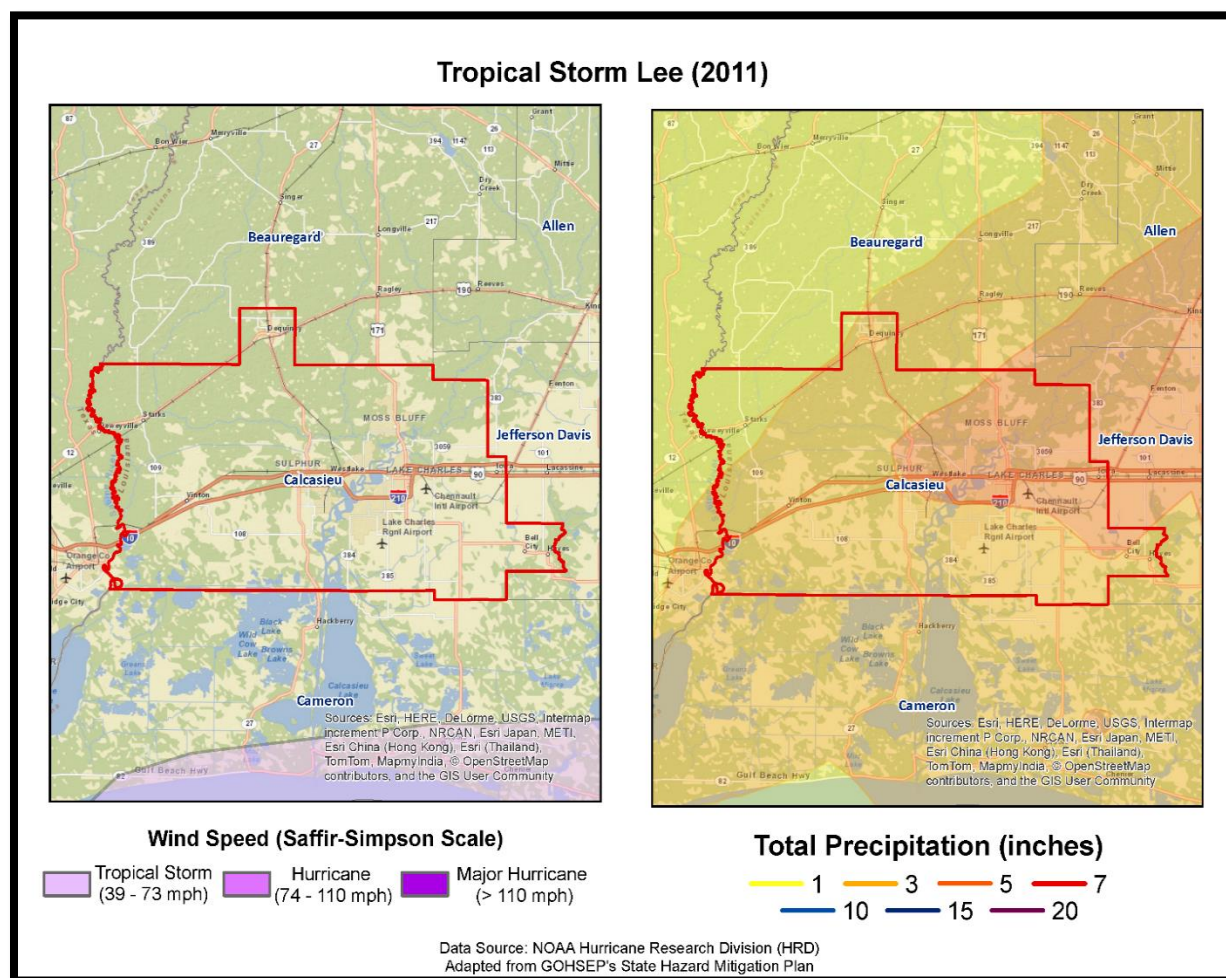


Figure 2-34: Wind Speed and Precipitation Totals in Calcasieu Parish for Tropical Storm Lee

The main impacts associated with Tropical Storm Lee were storm surge and rainfall. Both of these impacts were related to its slow speed as it crossed the region, which allowed the circulation to linger over the area for several days. Storm surge associated with Lee caused storm tides three to five feet above normal,

resulting in lowland flooding. Additional detailed information about Tropical Storm Lee's storm surge is contained in the separate storm surge report. Four day rainfall totals ranged from seven to 15 inches across the area. A maximum of 15.48 inches was recorded near Holden in Livingston Parish. Due to dry antecedent conditions, river flooding was minimal for the amount of rainfall that occurred. Wind impacts were generally minimal due to only tropical cyclone strength winds being recorded, resulting in tree limbs being blown down and weak trees toppling, causing power outages.

Overall, there were minimal reports of damage to residences or infrastructure in Calcasieu Parish. Localized flooding was experienced in low-lying areas of the parish, but flood damage was minimal. Isolated power outages due to a few downed trees were also reported across the parish.

Figure 2-35 displays the wind zones that affect Calcasieu Parish in relation to critical facilities throughout the parish.

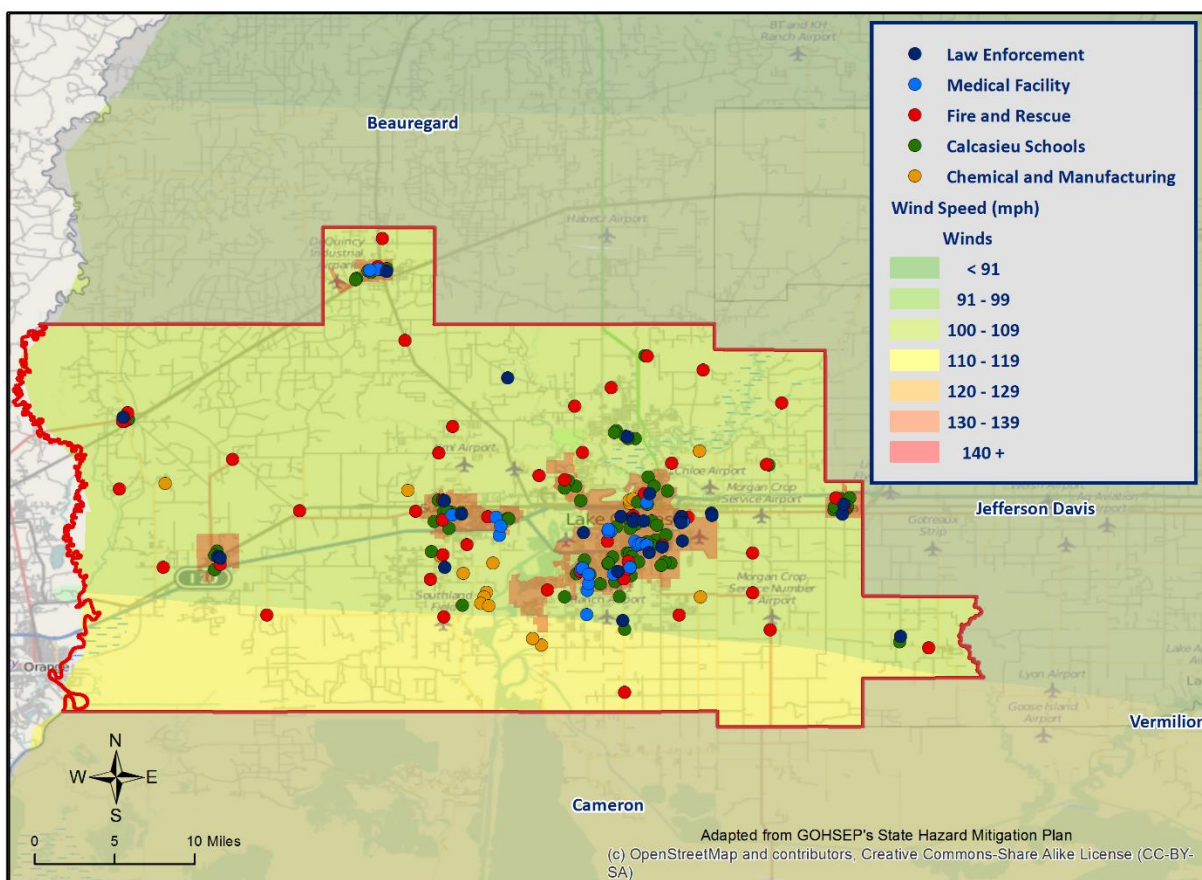


Figure 2-35: Winds Zones for Calcasieu Parish in Relation to Critical Facilities

#### Frequency / Probability

Tropical cyclones are large natural hazard events that regularly impact Calcasieu Parish. The annual chance of occurrence for a tropical cyclone is estimated at 36% for Calcasieu Parish and its municipalities, with nine events occurring within 25 years. The tropical cyclone season for the Atlantic Basin is from June 1st through November 30<sup>th</sup>, with most of the major hurricanes (Saffir-Simpson Categories 3, 4, & 5) occurring between the months of August and October. Based on geographical location alone, Calcasieu



Parish is highly vulnerable to tropical cyclones. This area has experienced several tropical cyclone events in the past and can expect more in the future. Based on a 25-year historical record, the probability of future occurrence of tropical cyclones in Calcasieu Parish is approximately once every two to three years.

#### *Estimated Potential Losses*

Using Hazus 2.2 100-Year Hurricane model, the 100-Year Hurricane scenario was analyzed to determine losses from this worst-case scenario. Table 2-57 shows the total economic losses that would result from this occurrence.

*Table 2-57: Total Estimated Losses for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Jurisdiction	Estimated total Losses from 100-Year Hurricane Event
Calcasieu Parish (Unincorporated)	\$146,827,028
DeQuincy	\$5,500,445
Iowa	\$5,094,075
Lake Charles	\$122,409,133
Sulphur	\$34,702,963
Vinton	\$5,461,338
Westlake	\$7,766,935
<b>Total</b>	<b>\$327,761,917</b>

Total losses from a 100-Year Hurricane event for each jurisdiction were compared with the total value of assets to determine the ratio of potential damage to total inventory in the table below.

*Table 2-58: Ratio of Total Losses to Total Estimated Value of Assets for each Jurisdiction in Calcasieu Parish (Source: Hazus 2.2)*

Jurisdiction	Estimated Total Losses from 100-Year Hurricane Event	Total Estimated Value of Assets	Ratio of Estimated Losses to Total Value
Unincorporated	\$146,827,028	\$7,095,197,000	2.1%
DeQuincy	\$5,500,445	\$343,471,000	1.6%
Iowa	\$5,094,075	\$281,566,000	1.8%
Lake Charles	\$122,409,133	\$8,097,337,000	1.5%
Sulphur	\$34,702,963	\$2,046,321,000	1.7%
Vinton	\$5,461,338	\$268,289,000	2.0%
Westlake	\$7,766,935	\$479,544,000	1.6%

Based on the Hazus 2.2 hurricane model, estimated total losses range from 1.5% to 2.1% of the total estimated value of all assets for the unincorporated area of Calcasieu Parish and the incorporated areas of DeQuincy, Iowa, Lake Charles, Sulphur, Vinton, and Westlake.

The Hazus 2.2 hurricane model also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish. The losses for each jurisdiction by sector are listed in the tables on the following pages.

*Table 2-59: Estimated Losses in Unincorporated Calcasieu Parish for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

<b>Calcasieu Parish (Unincorporated)</b>	<b>Estimated Total Losses from 100-Year Hurricane Event</b>
Agricultural	\$575,808
Commercial	\$20,027,124
Government	\$1,148,984
Industrial	\$3,056,907
Religious / Non-Profit	\$2,135,502
Residential	\$166,826,389
Schools	\$987,550
<b>Total</b>	<b>\$194,758,264</b>

*Table 2-60: Estimated Losses in DeQuincy for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

<b>DeQuincy</b>	<b>Estimated Total Losses from 100-Year Hurricane Event</b>
Agricultural	\$16,262
Commercial	\$565,614
Government	\$32,450
Industrial	\$86,334
Religious / Non-Profit	\$60,312
Residential	\$4,711,581
Schools	\$27,891
<b>Total</b>	<b>\$5,500,445</b>

*Table 2-61: Estimated Losses in Iowa for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

<b>Iowa</b>	<b>Estimated Total Losses from 100-Year Hurricane Event</b>
Agricultural	\$15,061
Commercial	\$523,827
Government	\$30,053
Industrial	\$79,956
Religious / Non-Profit	\$55,856
Residential	\$4,363,492
Schools	\$25,830
<b>Total</b>	<b>\$5,094,075</b>

*Table 2-62: Estimated Losses in Lake Charles for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Lake Charles	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	\$361,906
Commercial	\$12,587,414
Government	\$722,158
Industrial	\$1,921,322
Religious / Non-Profit	\$1,342,202
Residential	\$104,853,438
Schools	\$620,693
<b>Total</b>	<b>\$122,409,133</b>

*Table 2-63: Estimated Losses in Sulphur for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Sulphur	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	\$102,600
Commercial	\$3,568,529
Government	\$204,732
Industrial	\$544,694
Religious / Non-Profit	\$380,514
Residential	\$29,725,927
Schools	\$175,966
<b>Total</b>	<b>\$34,702,963</b>

*Table 2-64: Estimated Losses in Vinton for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Vinton	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	\$16,147
Commercial	\$561,593
Government	\$32,219
Industrial	\$85,721
Religious / Non-Profit	\$59,883
Residential	\$4,678,083
Schools	\$27,693
<b>Total</b>	<b>\$5,461,338</b>

*Table 2-65: Estimated Losses in Westlake for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Westlake	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	\$22,963
Commercial	\$798,679
Government	\$45,821
Industrial	\$121,909
Religious / Non-Profit	\$85,164
Residential	\$6,653,015
Schools	\$39,383
<b>Total</b>	<b>\$7,766,935</b>

#### *Threat to People*

The total population within the parish that is susceptible to a hurricane hazard is shown in the table below:

*Table 2-66: Number of People Susceptible to a 100-Year Hurricane Event in Calcasieu Parish  
(Source: Hazus 2.2)*

Number of People Exposed to Hurricane Hazards			
Location	# in Community	# in Hazard Area	% in Hazard Area
Parish (Unincorporated)	86,354	86,354	100.0%
DeQuincy	3,235	3,235	100.0%
Iowa	2,996	2,996	100.0%
Lake Charles	71,993	71,993	100.0%
Sulphur	20,410	20,410	100.0%
Vinton	3,212	3,212	100.0%
Westlake	4,568	4,568	100.0%
<b>Total</b>	<b>192,768</b>	<b>192,768</b>	<b>100.0%</b>

The HAZUS-MH hurricane model was also extrapolated to provide an overview of vulnerable populations throughout the jurisdictions. These populations are illustrated in the following tables:

*Table 2-67: Vulnerable Populations in Unincorporated Calcasieu Parish for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Calcasieu Parish (Unincorporated)		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	86,354	100.0%
Persons Under 5 Years	5,872	6.8%
Persons Under 18 Years	21,502	24.9%
Persons 65 Years and Over	11,658	13.5%
White	61,484	71.2%
Minority	24,870	28.8%



*Table 2-68: Vulnerable Populations in DeQuincy for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

DeQuincy		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	3,235	100.0%
Persons Under 5 Years	235	7.3%
Persons Under 18 Years	636	19.7%
Persons 65 Years and Over	556	17.2%
White	2,498	77.2%
Minority	737	22.8%

*Table 2-69: Vulnerable Populations in Iowa for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Iowa		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	2,996	100.0%
Persons Under 5 Years	218	7.3%
Persons Under 18 Years	659	22.0%
Persons 65 Years and Over	335	11.2%
White	2,086	69.6%
Minority	910	30.4%

*Table 2-70: Vulnerable Populations in Lake Charles for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Lake Charles		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	71,993	100.0%
Persons Under 5 Years	5,047	7.0%
Persons Under 18 Years	11,857	16.5%
Persons 65 Years and Over	10,029	13.9%
White	33,822	47.0%
Minority	38,171	53.0%

*Table 2-71: Vulnerable Populations in Sulphur for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Sulphur		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	20,410	100.0%
Persons Under 5 Years	1,551	7.6%
Persons Under 18 Years	3,674	18.0%
Persons 65 Years and Over	2,910	14.3%
White	18,332	89.8%
Minority	2,078	10.2%

*Table 2-72: Vulnerable Populations in Vinton for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Vinton		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	3,212	100.0%
Persons Under 5 Years	254	7.9%
Persons Under 18 Years	559	17.4%
Persons 65 Years and Over	481	15.0%
White	2,420	75.3%
Minority	792	24.7%

*Table 2-73: Vulnerable Populations in Westlake for a 100-Year Hurricane Event  
(Source: Hazus 2.2)*

Westlake		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	4,568	100.0%
Persons Under 5 Years	365	8.0%
Persons Under 18 Years	836	18.3%
Persons 65 Years and Over	655	14.3%
White	3,525	77.2%
Minority	1,043	22.8%

#### *Vulnerability*

See Appendix C for parish and municipality buildings that are susceptible to hurricanes.

### Tsunamis

The National Oceanic and Atmospheric Administration (NOAA) describes a tsunami as a series of ocean waves generated by sudden displacements in the sea floor, landslides, volcanic activity, or other large, abrupt disturbances of the sea-surface. Only as a tsunami approaches land does it become a hazard. In shallow water, it gains height as its waves slow and compress. Tsunamis can resemble a series of quickly rising tides, and they can withdraw with currents much like those of a river. They can also form breaking waves, but these are less common occurrences. Swift currents commonly cause most of the damage associated with a tsunami.

Tsunamis typically cause the most severe damage and casualties near their source. There, waves are highest because the energy of the tsunami has not started to dissipate. Nearby coastal populations may have little to no warning of the approaching tsunami. Persons caught in the path of a tsunami often have little chance to survive. Children and the elderly are particularly at risk since they lack the mobility, strength, and endurance to fight the strong currents of a tsunami.

Tsunamis are fast moving forces of nature that have the ability to cross the ocean at speeds close to 600 miles per hour. The 1964 tsunami that occurred along Alaska's Aleutian Islands took less than five hours to reach the islands of Hawaii, where it killed 159 people. These waves can also continue for hours. Later waves can be larger, more deadly, and more damaging. An example of this is the tsunami that struck Crescent City, California following the 1964 Alaskan earthquake. The first wave to strike the city was eight feet above the tide level. The second wave was six feet above tide level, and the third wave was 11 feet above tide level. The fourth, and most damaging, wave was 16 feet above tide level. The third and fourth waves combined to cause eleven fatalities.

### Location

Approximately 85% of all tsunamis are triggered by earthquakes. According to the National Weather Service, there is no credible risk of an earthquake source located in the Gulf of Mexico unless associated with a submarine landslide occurrence. Submarine landslides occur when deposited material is displaced in one of the three distinct geologic provinces or zones (East-Breaks, Mississippi Canyon, and West Florida) located in the Gulf of Mexico (Figure 2-36). These submarine landslides have the potential to cause a seismic event that could result in a tsunami.

A tsunami event typically impacts a region and not one specific parish or jurisdiction. Because a tsunami is a geophysical based hazard that has the same approximate probability of occurring in Calcasieu Parish as all of the adjacent parishes, the entire planning area for Calcasieu Parish is equally at risk.

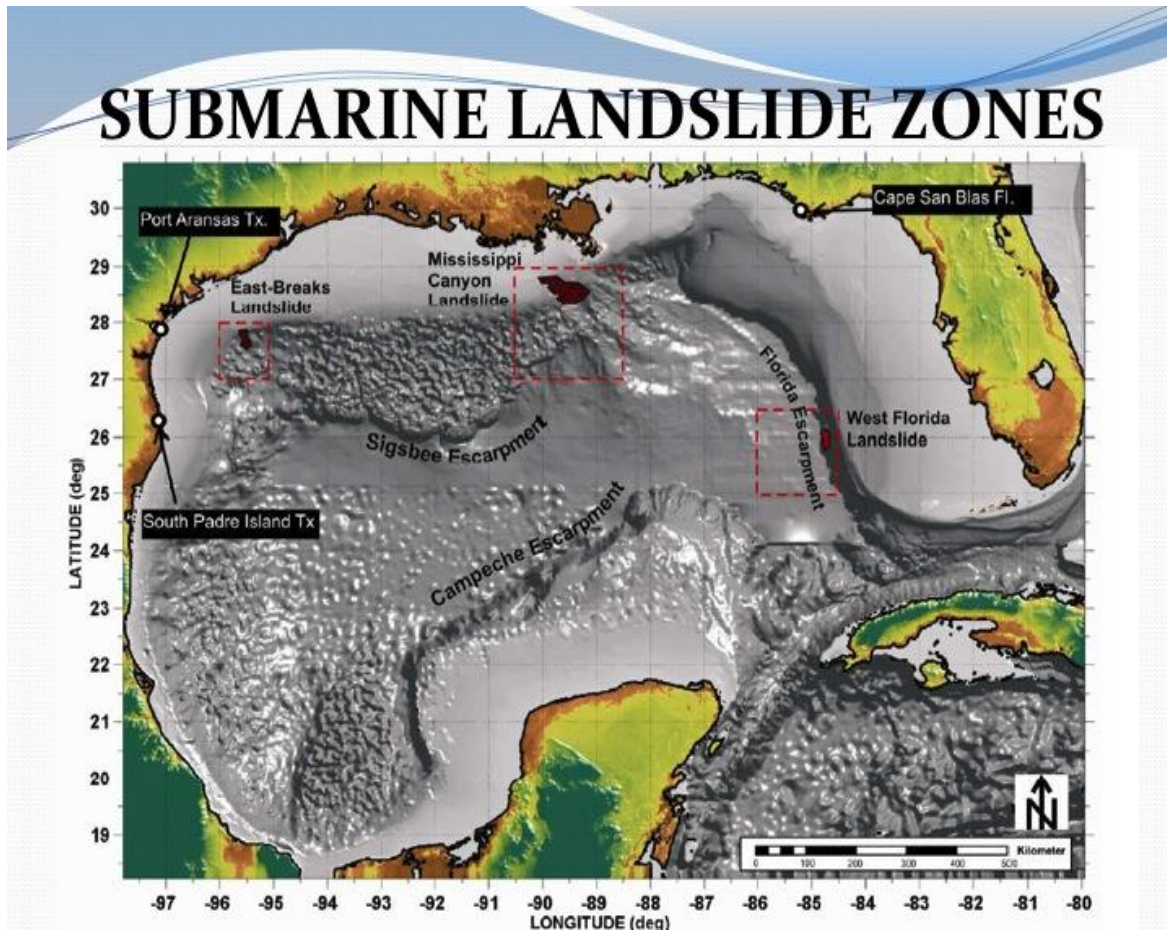


Figure 2-36: Submarine Landslide Zones in the Gulf of Mexico  
(Source: National Weather Service)

#### *Previous Occurrences / Extents*

Per NOAA's National Geophysical Data Center/World Data Service's Global Historical Tsunami Database, there has been one occurrence of a tsunami event in the Gulf of Mexico since the year of 1900. This database tracks the validity of each tsunami event reported and assigns a numerical figure to each event ranging from -1 (erroneous entry) to 4 (definite tsunami). The one event reported received a value of 2 (questionable tsunami). The event occurred on May 5, 1922 around the Galveston, Texas area. Wave height was less than one meter above tide level. The database reports no tsunami events impacting Calcasieu Parish or the coast of Louisiana from the year 1900 to the time this plan was published. In general, based on assessments of general topography across the planning area, locations in the southern portion of the parish and the vicinity of the Calcasieu River and neighboring water bodies could expect inundation levels of approximately 1 to 3 feet.

#### *Frequency / Probability*

The National Weather Service estimates the probability of a tsunami event in the Gulf of Mexico as once every 1,000 years. Based on historical data and the National Weather Service's return rate, a tsunami event is considered to be an extremely rare event for the entire planning area in Calcasieu Parish.

### *Estimated Potential Losses*

Because a tsunami event is considered to be an extremely rare event in the planning area, tsunamis are not carried forward into risk assessment.

### *Wildfires*

A wildfire is combustion in a natural setting, marked by flames or intense heat. Most frequently, wildfires are ignited by lightning or unintentionally by humans. Fires set purposefully (but lawfully) are referred to as controlled fires or burns. There are three different types of wildfires: (1) **Ground fires** burn primarily in the thick layers of organic matter directly on the forest floor and even within the soil. Ground fires destroy root networks, peat, and compact litter. These fires spread extremely slowly and can smolder for months. (2) **Surface fires** burn litter and vegetative matter in the underbrush of a forest. (3) **Crown fires** spread rapidly by wind and move quickly by jumping along the tops of trees. There are two types of crown fires: (a) *passive (or dependent)* crown fires rely on heat transfer from surface fire, whereas (b) *active (or independent)* crown fires do not require any heat transfer from below. Active crown fires tend to occur with greater tree density and drier conditions. A firestorm is a mass, crown fire (also called a running crown fire, area fire, or conflagration). They are large, continuous, intense fires that lead to violent convection. They are characterized by destructively violent surface in-drafts near and beyond their perimeter. Crown fires are the most damaging and most difficult to contain. The intensity of crown fires enables the fire to produce its own wind gusts. These so-called *fire whirls* can move embers ahead of the fire front and ignite new fires. Fire whirls are spinning vortex columns of ascending hot air and gases rising from the fire. Large fire whirls have the intensity of a small tornado.

The conditions conducive to the occurrence of wildfires are not distributed equally across the United States. Wildfires have a much greater likelihood of occurring in the western part of the country. Although less frequent than in other areas, wildfires do occur in Louisiana. Wildfire danger can vary greatly season to season, and is exacerbated by dry weather conditions. Factors that increase susceptibility to wildfires are the availability of fuel (e.g., litter and debris), topography (i.e., slope and elevation affect various factors like precipitation, fuel amount, and wind exposure), and specific meteorological conditions (e.g., low rainfall, high temperatures, low relative humidity, and winds). The potential for wildfire is often measured by the Keetch–Byram Drought Index (KBDI), which represents the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in the soil. The KBDI tries to measure the amount of precipitation needed to return soil to its full field capacity, with KBDI values ranging from 0 (moist soil) to 800 (severe drought).

According to the State of Louisiana Forestry Division, most forest fires in Louisiana are caused by intentional acts (arson) or carelessness and negligence committed by people, exacerbated by human confrontation with nature. The wildland–urban interface is the area in which development meets wildland vegetation, where both vegetation and the built environment provide fuel for fires. As development near wildland settings continues, more people and property are exposed to wildfire danger. [Figure 2-37](#) displays the areas of wildland-urban interaction in Calcasieu Parish.

The Southern Group of State Foresters developed the Southern Wildfire Risk Assessment Portal to create awareness among the public and government sectors about the threat of wildfires in their areas. The Southern Wildfire Assessment Portal allows users to identify areas that are most prone to wildfires. The table on the next page summarizes the intensity levels assigned to areas in the Southern Wildfire Assessment Portal.



*Table 2-74: Southern Group of State Foresters Wildfire Risk Assessment Fire Intensity Scale  
(Source: Southern Wildfire Assessment Portal)*

Fire Intensity Scale	
Level	Definition
1	Lowest Intensity: Minimal direct wildfire impacts. Location has a minimal chance of being directly impacted by a wildfire.
2	Low Intensity: Small flames usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress.
3	Moderate Intensity: Flames up to eight feet in length; short-range spotting is possible.
4	High Intensity: Large flames up to 30 feet in length; short-range spotting common; medium range spotting possible.
5	Highest Intensity: Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire induced winds.

#### *Location*

Wildfires impact areas that are populated with forests and grasslands. Because every jurisdictional area in Calcasieu Parish has some form of wildland-urban interface or wildland-urban intermix, the entire planning area is equally at risk for wildfires. The following figure displays the areas of wildland-urban interface and intermix in Calcasieu Parish and its jurisdictions.

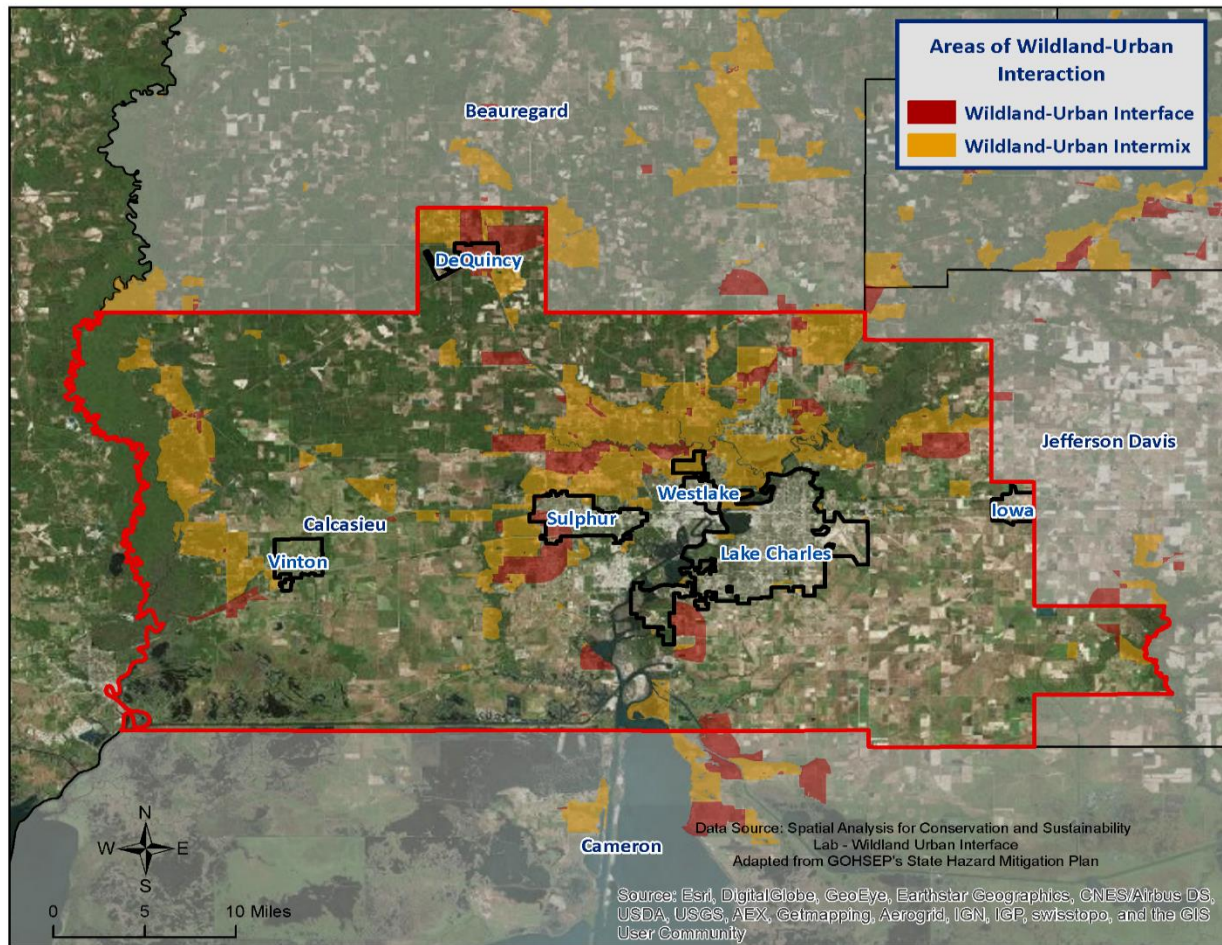


Figure 2-37: Wildland-Urban Interaction in Calcasieu Parish

#### Previous Occurrences / Extents

According to SHELUDS, there have been two reported wildfire events that have occurred within the boundaries of Calcasieu Parish between the years of 1989 and 2014. Table 2-75 provides a brief synopsis of each event.

Table 2-75: Previous Occurrences for Wildfire Events

Date	Synopsis	Property Damage	Crop Damage
April 17, 2011	A wildfire burned approximately 300 acres near Holbrook Road, approximately 5 miles southeast of DeQuincy. Several homes were threatened and evacuated as a precaution.	\$0	\$31,069
June 12, 2011	Extreme drought conditions contributed to a wildfire in the unincorporated northern portion of Calcasieu Parish. Nearly 700 acres burned, resulting in lost timber.	\$0	\$258,911

Since 2009, there have been no reported wildfire events in the incorporated areas of DeQuincy, Iowa, Lake Charles, Sulphur, Vinton, and Westlake.

Based on the Southern Group of State Foresters Risk Assessment Portal, [Table 2-76](#) outlines the intensity that each jurisdictional area within Calcasieu Parish could potential experience due to a wildfire event.

*Table 2-76: Potential Wildfire Intensity Levels for Calcasieu Parish  
(Source: Southern Wildfire Assessment Portal)*

Potential Wildfire Intensity	
Calcasieu Parish (Unincorporated)	Highest Intensity Level 5
DeQuincy	Lowest Intensity Level 1
Iowa	Lowest Intensity Level 1
Lake Charles	Moderate to High Intensity Level 3.5
Sulphur	Low Intensity Level 2
Vinton	Moderate Intensity Level 3
Westlake	Low Intensity Level 2

#### *Frequency / Probability*

With two recorded events in 25 years, wildfire events within the boundaries of Calcasieu Parish have an annual chance of occurrence calculated at 8% based on the SHELUDS dataset.

#### *Estimated Potential Losses*

According to the SHELUDS database, there have been two wildfire events that have caused property damage, crop damage, injuries, or fatalities in Calcasieu Parish. In assessing the overall risk to population, the most vulnerable population throughout the parish consists of those residing in areas of wildland-urban interaction. [Figure 2-37](#) displays the areas of wildland-urban interaction in Calcasieu Parish.

Using Hazus 2.2, along with wildland-urban interaction areas, [Table 2-77](#) presents an analysis of total building exposure that is located within the wildland-urban interaction areas.

*Table 2-77: Total Building Exposure by Wildland-Urban Interaction Areas  
(Source: Hazus 2.2)*

Jurisdiction	Estimated Total Building Exposure
Calcasieu Parish (Unincorporated)	\$4,760,599,000
DeQuincy	\$279,224,000
Iowa	\$680,000
Lake Charles	\$459,565,000
Sulphur	\$568,109,000
Vinton	\$3,938,000
Westlake	\$24,748,000
<b>Total</b>	<b>\$6,096,863,000</b>

Hazus 2.2 also provides a breakdown by jurisdiction for seven primary sectors (Hazus occupancy) throughout the parish. Utilizing this information with the wildland-urban interaction areas allows for

identifying the total exposure by jurisdiction. The total exposure for each jurisdiction by sector is listed in the following tables:

*Table 2-78: Estimated Exposure for Unincorporated Calcasieu Parish by Sector  
(Source: Hazus 2.2)*

<b>Calcasieu Parish (Unincorporated)</b>	<b>Estimated Total Building Exposure by Sector</b>
Agricultural	\$9,415,000
Commercial	\$409,321,000
Government	\$20,296,000
Industrial	\$122,131,000
Religious / Non-Profit	\$72,679,000
Residential	\$4,109,192,000
Schools	\$17,565,000
<b>Total</b>	<b>\$4,760,599,000</b>

*Table 2-79: Estimated Exposure for DeQuincy by Sector  
(Source: Hazus 2.2)*

<b>DeQuincy</b>	<b>Estimated Total Building Exposure by Sector</b>
Agricultural	\$339,000
Commercial	\$13,050,000
Government	\$1,443,000
Industrial	\$13,084,000
Religious / Non-Profit	\$12,321,000
Residential	\$232,548,000
Schools	\$6,439,000
<b>Total</b>	<b>\$279,224,000</b>

*Table 2-80: Estimated Exposure for Iowa by Sector  
(Source: Hazus 2.2)*

<b>Iowa</b>	<b>Estimated Total Building Exposure by Sector</b>
Agricultural	\$0
Commercial	\$0
Government	\$0
Industrial	\$0
Religious / Non-Profit	\$0
Residential	\$680,000
Schools	\$0
<b>Total</b>	<b>\$680,000</b>

*Table 2-81: Estimated Exposure for Lake Charles by Sector  
(Source: Hazus 2.2)*

Lake Charles	Estimated Total Building Exposure by Sector
Agricultural	\$1,697,000
Commercial	\$53,722,000
Government	\$6,723,000
Industrial	\$11,740,000
Religious / Non-Profit	\$3,953,000
Residential	\$381,730,000
Schools	\$0
<b>Total</b>	<b>\$459,565,000</b>

*Table 2-82: Estimated Exposure for Sulphur by Sector  
(Source: Hazus 2.2)*

Sulphur	Estimated Total Building Exposure by Sector
Agricultural	\$382,000
Commercial	\$91,643,000
Government	\$1,012,000
Industrial	\$9,650,000
Religious / Non-Profit	\$5,680,000
Residential	\$457,773,000
Schools	\$1,969,000
<b>Total</b>	<b>\$568,109,000</b>

*Table 2-83: Estimated Exposure for Vinton by Sector  
(Source: Hazus 2.2)*

Vinton	Estimated Total Building Exposure by Sector
Agricultural	\$0
Commercial	\$0
Government	\$0
Industrial	\$0
Religious / Non-Profit	\$0
Residential	\$3,938,000
Schools	\$0
<b>Total</b>	<b>\$3,938,000</b>



*Table 2-84: Estimated Exposure for Westlake by Sector  
(Source: Hazus 2.2)*

Westlake	Estimated Total Building Exposure by Sector
Agricultural	\$62,000
Commercial	\$4,157,000
Government	\$1,156,000
Industrial	\$17,000
Religious / Non-Profit	\$365,000
Residential	\$17,053,000
Schools	\$1,938,000
<b>Total</b>	<b>\$24,748,000</b>

#### *Threat to People*

The total population within the parish that is located within a wildland-urban interaction area is shown in the table below:

*Table 2-85: Populations Located within a Wildland-Urban Interaction Area  
(Source: 2010 U.S. Census Data)*

Number of People Located in Wildland-Urban Interaction Areas.			
Location	# in Community	# in Area	% in Area
Calcasieu (Unincorporated)	86,354	34,717	40.2%
DeQuincy	3,235	3,164	97.8%
Iowa	2,996	18	0.6%
Lake Charles	71,993	298	0.4%
Sulphur	20,410	4,101	20.1%
Vinton	3,212	24	0.7%
Westlake	4,568	14	0.3%
<b>Total</b>	<b>192,768</b>	<b>10,129</b>	<b>28.4%</b>

The 2010 U.S. Census data was also extrapolated to provide an overview of populations located within wildland-urban interaction areas throughout the jurisdictions. That data is illustrated in the following tables:

*Table 2-86: Population in Unincorporated Calcasieu Parish Located within a Wildland-Urban Interaction Area*

*(Source: 2010 U.S. Census Data)*

Calcasieu Parish (Unincorporated)		
Category	Total Numbers	Percentage of People in Wildland-Urban Interaction Area
Number in Hazard Area	34,717	40.2%
Persons Under 5 Years	2,361	6.8%
Persons Under 18 Years	8,645	24.9%
Persons 65 Years and Over	4,687	13.5%
White	24,719	71.2%
Minority	9,998	28.8%

*Table 2-87: Population in DeQuincy Located within a Wildland-Urban Interaction Area*

*(Source: 2010 U.S. Census Data)*

DeQuincy		
Category	Total Numbers	Percentage of People in Wildland-Urban Interaction Area
Number in Hazard Area	3,164	97.8%
Persons Under 5 Years	230	7.3%
Persons Under 18 Years	622	19.7%
Persons 65 Years and Over	544	17.2%
White	2,443	77.2%
Minority	721	22.8%

*Table 2-88: Population in Iowa Located within a Wildland-Urban Interaction Area  
(Source: 2010 U.S. Census Data)*

Iowa		
Category	Total Numbers	Percentage of People in Wildland-Urban Interaction Area
Number in Hazard Area	18	0.6%
Persons Under 5 Years	1	7.3%
Persons Under 18 Years	4	22.0%
Persons 65 Years and Over	2	11.2%
White	13	69.6%
Minority	5	30.4%

*Table 2-89: Population in Lake Charles Located within a Wildland-Urban Interaction Area  
(Source: 2010 U.S. Census Data)*

Lake Charles		
Category	Total Numbers	Percentage of People in Wildland-Urban Interaction Area
Number in Hazard Area	298	0.4%
Persons Under 5 Years	21	7.0%
Persons Under 18 Years	49	16.5%
Persons 65 Years and Over	42	13.9%
White	140	47.0%
Minority	158	53.0%

*Table 2-90: Population in Sulphur Located within a Wildland-Urban Interaction Area  
(Source: 2010 U.S. Census Data)*

Sulphur		
Category	Total Numbers	Percentage of People in Wildland-Urban Interaction Area
Number in Hazard Area	4,101	20.1%
Persons Under 5 Years	312	7.6%
Persons Under 18 Years	738	18.0%
Persons 65 Years and Over	585	14.3%
White	3,684	89.8%
Minority	417	10.2%

*Table 2-91: Population in Vinton Located within a Wildland-Urban Interaction Area  
(Source: 2010 U.S. Census Data)*

Vinton		
Category	Total Numbers	Percentage of People in Wildland-Urban Interaction Area
Number in Hazard Area	24	0.7%
Persons Under 5 Years	2	7.9%
Persons Under 18 Years	4	17.4%
Persons 65 Years and Over	4	15.0%
White	18	75.3%
Minority	6	24.7%

*Table 2-92: Population in Westlake Located within a Wildland-Urban Interaction Area  
(Source: 2010 U.S. Census Data)*

Westlake		
Category	Total Numbers	Percentage of People in Wildland-Urban Interaction Area
Number in Hazard Area	14	0.3%
Persons Under 5 Years	1	8.0%
Persons Under 18 Years	3	18.3%
Persons 65 Years and Over	2	14.3%
White	11	77.2%
Minority	3	22.8%

### *Vulnerability*

See Appendix C for parish and municipality facilities that could potentially be exposed to a wildfire hazard. Buildings were determined based on whether or not they fall within the wildfire-urban interface and/or intermix.

### Winter Storms

For Louisiana and other parts of the southeastern United States, a severe winter storm occurs when humid air from the Gulf of Mexico meets a cold air mass from the north. Once the cold air mass crosses Louisiana, and the temperature drops, precipitation may fall in the form of snow or sleet. If the ground temperature is cold enough but air temperature is above freezing, rain can freeze instantly on contact with the surface, causing massive ice storms.

The winter storm events that affect the state of Louisiana are ice storms, freezes, and snow events. Of the winter storm types listed above, ice storms are the most dangerous. Ice storms occur during a precipitation event when warm air aloft exceeds 32 °F, while the surface remains below the freezing point. Ice will form on all surfaces when precipitation originating as rain or drizzle contacts physical structures. These ice storms are usually accompanied by freezing temperatures and occasionally snow.

Winter storms can be accompanied by strong winds, creating blizzard conditions with blinding, wind driven snow, severe drifting, and dangerous wind chill. These types of conditions are very rare in Louisiana, even in north Louisiana, but ice storms are more common. The climatic line between snow and rain often stalls over north Louisiana, creating ideal conditions for ice accumulation.

In a typical winter storm event, homes and buildings are damaged by ice accumulation, either directly by the weight of the ice on the roofs or by trees and/or limbs falling on buildings. While it is not very prevalent, this type of damage can occur in Louisiana, particularly in north Louisiana. Effects of winter weather more likely to occur in Louisiana, especially south Louisiana, include extreme temperatures which can cause waterlines to freeze and sewer lines to rupture. This is especially true with mobile homes, since cold air is able to access more of the building's infrastructure. Winter storms can also have a devastating effect on agriculture, particularly on crops (like citrus) that are dependent on warm weather. Long exposures to low temperatures can kill many kinds of crops, and ice storms can weigh down branches and fruit.

Winter storms are not only a direct threat to human health through conditions like frostbite and hypothermia, but they are also an indirect threat to human health due to vehicle accidents and loss of power and heat, which can be disrupted for days. However, these impacts are rarely seen in Louisiana. As people use space heaters and fireplaces to stay warm, the risk of household fires and carbon monoxide poisoning increases.

Winter storm events occur throughout Louisiana usually during the colder calendar months of December, January, and February. Severe weather events do not occur with the same frequency across all parts of Louisiana. The northern quarter of Louisiana has historically experienced the most severe winter events between 1987 and 2012. The central, and to an even greater extent the southern parts of the state, such as Ascension Parish, have experienced the fewest severe winter events.

### Location

Because a winter storm is a climatological based hazard and has the same probability of occurring in Calcasieu Parish as all of the adjacent parishes, the entire planning area for Calcasieu Parish is equally at risk for winter storms.



*Previous Occurrences / Extents*

According to SHELATUS, there have been four reported winter storm events that have occurred within the boundaries of Calcasieu Parish between the years of 1989 and 2014. [Table 2-93](#) provides a brief synopsis of each event. Worst-case

*Table 2-93: Previous Occurrences for Winter Storm Events*

Date	Synopsis	Property Damage	Crop Damage
January 12, 1997	A record ice storm hit southwest Louisiana and southeast Texas. The hardest hit area was Calcasieu Parish. Over 40,000 electric customers were without power for up to six days due to the number of downed trees and power lines. Numerous traffic accidents were attributed to icy roadways. Millions of tons of debris was removed, which took over two months to pick up in some areas. Hundreds of homes received minor roof damage due to trees and tree limbs falling on them.	\$1,966,667	\$2,854,509
December 11, 2008	A rare snow event occurred that produced snowflakes the size of half dollars in some areas. The event lasted 5 to 7 hours and produced snow accumulation totals of 1.5 inches in Vinton, 0.4 inches in Lake Charles, and 1.2 inches in Moss Bluff. For Lake Charles, this was the earliest measurable snowfall on record for the fall/winter season.	\$3,571	\$3,864
January 8, 2010	Several record low temperatures were set when a cold Arctic air mass moved through the area. Calcasieu Parish Coroner's Office reported that a Mossville man died of exposure to freezing temperatures. All Calcasieu Parish schools were closed due to the cold temperatures and low wind chill readings. Sporadic power outages affected much of the parish throughout the event.	\$25,000	\$26,708
February 3, 2011	A mix of freezing rain, sleet, and snow fell across the area. Calcasieu Parish received around one tenth to nearly one quarter of an inch of ice accumulation. Scattered power outages occurred and dozens of car accidents were reported around the parish. Several major roadways, including Interstate 10, had to be closed.	\$10,000	\$10,356

While winter storms are climatological events that impact an entire region, there have been no report of damages or loss of life due to winter storms in the incorporated areas of DeQuincy, Sulphur, Westlake, Iowa, and Vinton since 2009. Based on previous winter storm events, the worst-case scenario for the unincorporated area of Calcasieu Parish and the incorporated area of Vinton is approximately one to two inches of snow accumulation and approximately one tenth to one quarter inch of ice accumulation. The incorporated areas of Lakes Charles, DeQuincy, Westlake, Iowa, and Sulphur can expect snow accumulation up to approximately one inch and ice accumulation from approximately one tenth to one quarter inch.

*Frequency / Probability*

With four recorded events in 25 years, winter storm events within the boundaries of Calcasieu Parish have an annual chance of occurrence calculated at 16% based on the SHELDUS dataset.

*Estimated Potential Losses*

Since 1989, there have been four reported winter weather events that have resulted in property and/or crop damages according to the SHELDUS database. The total property damages associated with these storms have totaled \$2,895,439. To estimate the potential losses of a winter weather event on an annual basis, the total damage recorded for winter weather events was divided by the total number of years of available winter weather data in SHELDUS (1989 – 2014). This provides an annual estimated potential loss of \$115,818. To assess potential losses to the participating jurisdictions, the 2010 Census population was used to assign the estimated potential losses proportionally across the jurisdictions. The following table provides an estimate of potential property losses for Calcasieu Parish based on the 2010 Census data:

*Table 2-94: Estimated Annual Losses for Winter Weather Events in Calcasieu Parish*

Estimated Annual Potential Losses from Tornadoes for Calcasieu Parish						
Unincorporated Calcasieu Parish (44.8% of Population)	DeQuincy (1.7% of Population)	Iowa (1.6% of Population)	Lake Charles (37.3% of Population)	Sulphur (3.1% of Population)	Vinton (1.7% of Population)	Westlake (2.4% of Population)
\$51,883	\$1,944	\$1,800	\$43,254	\$12,263	\$1,930	\$2,745

From 1989 - 2014, there have been three injuries and one fatality as a result of winter weather in Calcasieu Parish.

*Vulnerability*

See Appendix C for parish and municipality building exposure to winter weather hazards.

### Subsidence/Coastal Land Loss

Coastal land loss is the loss of land (especially beach, shoreline, or dune material) by natural and/or human influences. Coastal land loss occurs through various means, including erosion, subsidence (the sinking of land over time as a result of natural and/or human-caused actions), saltwater intrusion, coastal storms, littoral drift, changing currents, manmade canals, rates of accretion, and sea level rise. The effects of these processes are difficult to differentiate because of their complexity and because they often occur simultaneously, with one influencing each of the others.

Some of the worst recent contributors to coastal land loss in the state are the tropical cyclones of the past decade. Two storms that stand out in this regard are Hurricanes Katrina and Rita. These powerful cyclones completely covered large tracts of land in a very brief period, permanently altering the landscape. The disastrous legacy of these storms concentrated already ongoing efforts to combat coastal land loss. Consistent with the 2014 State Hazard Mitigation Plan Update, coastal land loss is considered in terms of two of the most dominant factors: sea level rise and subsidence.

Sea level rise and subsidence impact Louisiana in a similar manner—again making it difficult to separate impacts. Together, rising sea level and subsidence—known together as relative sea level rise—can accelerate coastal erosion and wetland loss, exacerbate flooding, and increase the extent and frequency of storm impacts. According to NOAA, global sea level rise refers to the upward trend currently observed in the average global sea level. Local sea level rise is the level that the sea rises relative to a specific location (or, benchmark) at the coastline. The most prominent causes of sea level rise are thermal expansion, tectonic actions (such as sea floor spreading), and the melting of the Earth's glacial ice caps. The current U.S. Environmental Protection Agency (EPA) estimate of global sea level rise is 10–12 in. per century, while future sea level rise could be within the range of 1–4 ft. by 2100. According to the U.S. Geological Survey (USGS), the Mississippi Delta plain is subject to the highest rate of relative sea level rise of any region in the nation largely due to rapid geologic subsidence.

Subsidence results from a number of factors including:

- Compaction/consolidation of shallow strata caused by the weight of sediment deposits, soil oxidation, and aquifer draw-down (shallow component)
- Gas/oil/resource extraction (shallow & intermediate component)
- Consolidation of deeper strata (intermediate components)
- Tectonic effects (deep component)

For the most part, subsidence is a slow-acting process with effects that are not as evident as hazards associated with discrete events. Although the impacts of subsidence can be readily seen in coastal parishes over the course of decades, subsidence is a “creeping” hazard. The highest rate of subsidence is occurring at the Mississippi River Delta (estimated at greater than 3.5 ft./century). Subsidence rates tend to decrease inland, and they also vary across the coast.

Overall, subsidence creates three distinct problems in Louisiana:

- By lowering elevations in coastal Louisiana, subsidence accelerates the effects of saltwater intrusion and other factors that contribute to land loss .
- By lowering elevations, subsidence may make structures more vulnerable to flooding.

- By destabilizing elevations, subsidence undermines the accuracy of surveying benchmarks (including those affecting levee heights, coastal restoration programs, surge modeling, BFEs, and other engineering inputs), which can contribute to additional flooding problems if construction occurs at lower elevations than anticipated or planned.

#### *Location*

Historic areas of coastal land loss and gain (Figure 2-38) and subsidence rates (Figure 2-39) have been quantified for Calcasieu Parish using data from the U.S. Geologic Survey and Louisiana Coastal Protection and Restoration Authority (CPRA). Since 1932, the average annual land loss in Louisiana is 35 mi<sup>2</sup>, while the average annual land gain has been 3 mi<sup>2</sup> for a net loss of 32 mi<sup>2</sup> per year. Land loss is primarily currently occurring in the southern unincorporated areas and portions of the northern unincorporated areas of Calcasieu Parish and in some portions of Lake Charles, Vinton, Westlake, and Sulphur (Figure 2-38). Subsidence is occurring in the southern unincorporated areas of Calcasieu Parish and in the incorporated areas of Lake Charles, Westlake, and Sulphur (Figure 2-39).

#### *Previous Occurrences / Extent*

Coastal land loss is an ongoing process, including discrete (hurricanes) and continuous (subsidence, sea level rise) processes. While historic flood loss data undoubtedly include the effects of coastal land loss, specific previous occurrences have not been identified as a source of direct disaster damage in Louisiana. Rather, the effects of the underlying flood or hurricane storm surge hazard are recorded. Land loss is a significant hazard, however, and assessment of the added flood impacts caused by land loss is quantified in the following sections. The unincorporated area of Calcasieu Parish can expect to experience subsidence rates of approximately 25mm annually while the incorporated areas of Westlake, Vinton, Lake Charles, and Sulphur can expect subsidence rates of approximately 6mm annually. The incorporated areas of DeQuincy and Iowa are currently not susceptible to land loss and subsidence.

For the most part, subsidence is a slow-acting process with effects that are not as evident as hazards associated with discrete events. Although the impacts of subsidence can be readily seen in coastal parishes over the course of decades, subsidence is a “creeping” hazard.

#### *Frequency / Probability*

Subsidence, sea level rise, and coastal land loss are ongoing hazards. Based on historical subsidence rates and land loss/gain trends, the probability of future land loss in Louisiana is 100% certain, but actual rates of subsidence and land loss/gain vary along the coast based on various meteorological, geological, and human-influenced dynamics (e.g., water/resource extraction, canal dredging, saltwater intrusion, marsh restoration projects, etc.).

*Table 2-95: Annual Probability of Coastal Land Loss in Calcasieu Parish.*

Coastal Land Loss Probability Calcasieu Parish						
Unincorporated Calcasieu Parish	DeQuincy	Iowa	Lake Charles	Sulphur	Vinton	Westlake
100%	<1%	<1%	100%	100%	100%	100%



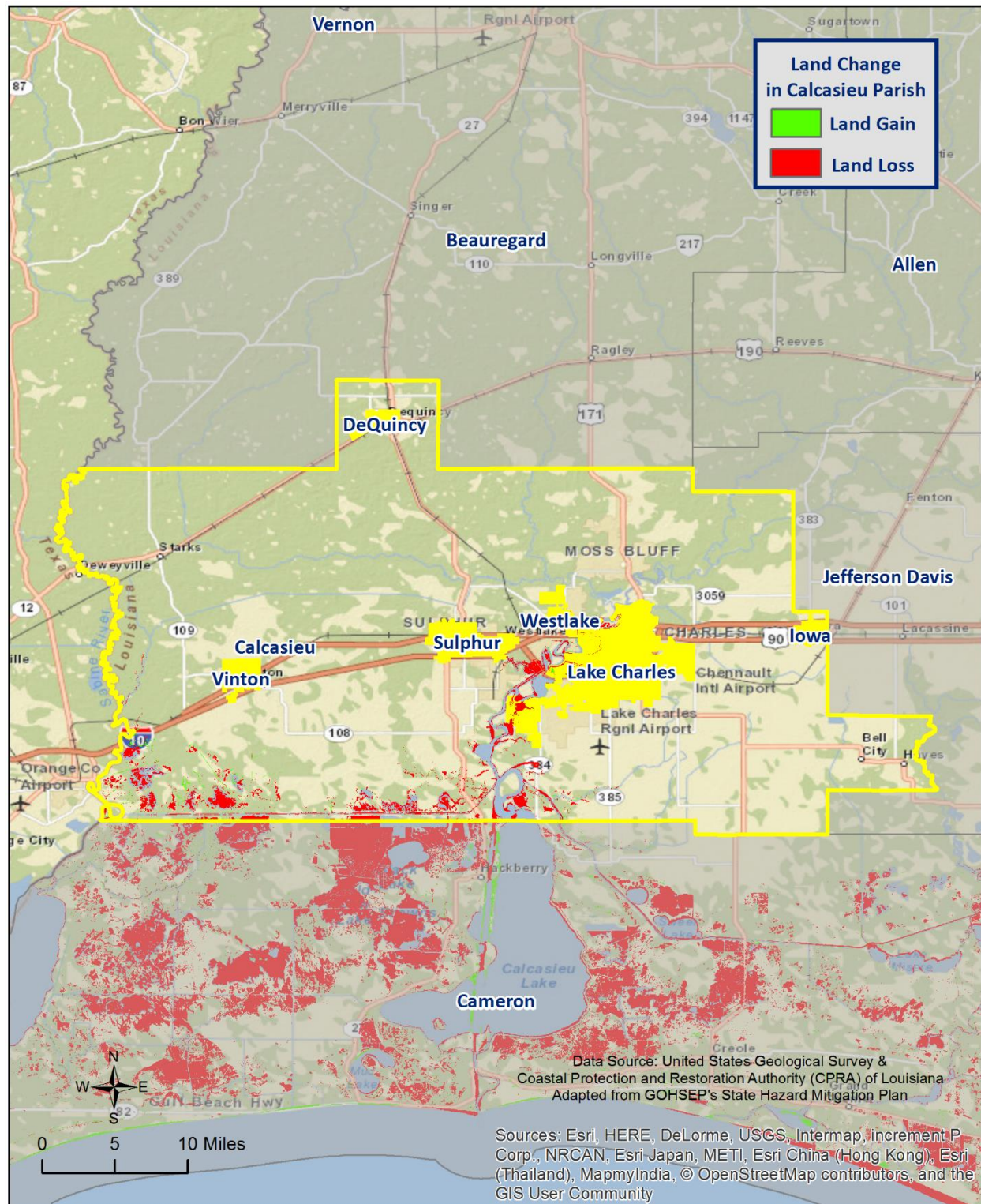


Figure 2-38: Historical Areas of Land Loss and Gain between 1932 and 2010  
(Source: State of Louisiana Hazard Mitigation Plan)



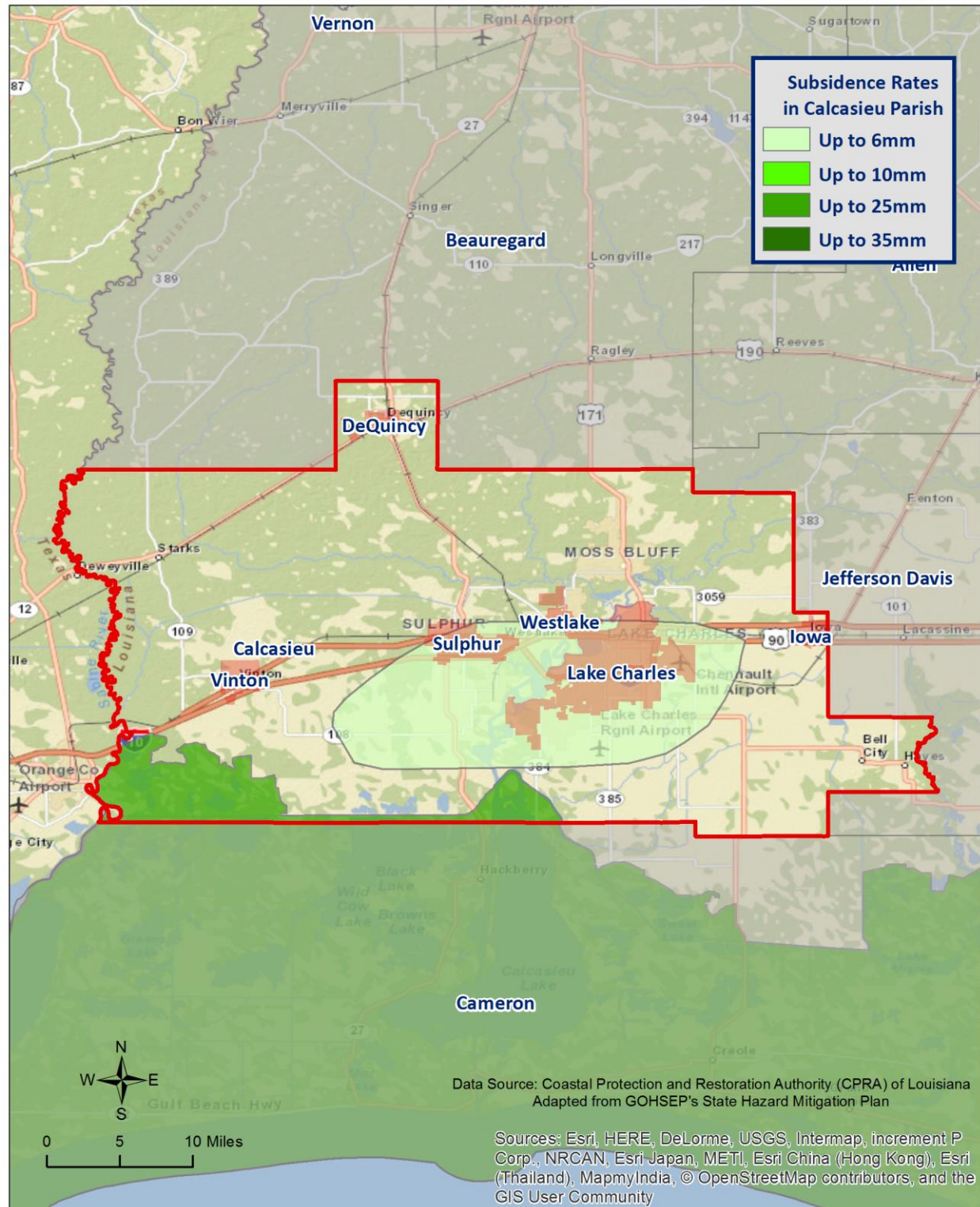


Figure 2-39: Maximum Annual Subsidence Rates Based on Subsidence Zones in Coastal Louisiana.  
(Source: State of Louisiana Hazard Mitigation Plan)

### *Estimated Potential Losses*

To determine the estimated potential losses, the methodology implemented in the 2014 Louisiana State Plan Update was used. In the state plan, two parameters were considered to estimate the projected increase in coastal flood losses from storm surge scenarios – global sea level rise and subsidence. A timeframe of 10 years was used for evaluation of future effects of sea level rise and subsidence for comparison with current conditions. The NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) model was used to estimate the maximum of maximum (MOM) storm surge elevations for a Category 1 hurricane at mean tide along the coast of Louisiana. The MOM scenario is not designed to describe the storm surge that would result from a particular event, but rather evaluates the impacts of multiple hurricane scenarios with varying forward speeds and storm track trajectories to create the maximum storm surge elevation surface that would occur given the simultaneous occurrence of all hurricane events for a given category.

There are many global sea level rise scenarios from which to select; however, within a 10-year timeframe, methods that predict accelerating sea level rise rates do not deviate significantly from straight line methods. Therefore, a linear sea level rise projection for the sea level rise occurring in 10 years (SLR<sub>2024</sub>) using a linear global sea level rise rate of 3.1 mm/year was used (IPCC, 2007), which is also in accordance with the CPRA Coastal Master Plan. This resulted in an increase of 0.1 feet, which was applied to the NOAA MOM storm surge elevation results over the model output domain.

$$SLR_{2024} = 0.0031 \frac{m}{year} \times 10 \text{ years}$$

$$SLR_{2024} = 0.031 \text{ meters} = 0.10 \text{ ft in 2024}$$

To estimate the effects of subsidence, the elevation profile for southern Louisiana was separated into sections based on subsidence zones. The 20th percentile values for subsidence were used, in accordance with the CPRA Master Plan, and subtracted from the digital elevation model (DEM) for each zone and re-joined to create a final subsided ground elevation layer.

To perform the economic loss assessment, depth grids were created for current conditions (SLOSH MOM Results – Current Land Elevation) and for projected 2024 conditions ([SLOSH MOM Results + 0.1 ft sea level rise] – [Current Land Elevation – Subsidence]). HAZUS-MH was used to calculate economic loss for the current and future depth grids.

Figure 2-40 shows the projected increase in total flood loss resulting from a SLOSH Category 1 MOM in the year 2014, with many areas, primarily in unincorporated Calcasieu Parish, expecting increase in losses. Some areas that would be currently unaffected by a SLOSH Category 1 MOM would be impacted in ten years based on subsidence and sea level rise projections (Figure 2-41).

To determine annual potential loss estimates for coastal land loss, increased exposure estimates over the next 10 years calculated using HAZUS-MH were annualized at the parish level (Figure 2-42). To provide an annual estimated potential loss per jurisdiction, the total loss for the census block groups within each jurisdiction were calculated. Based on hazard exposure, Table 2-14 provides an estimate of annual potential losses for Calcasieu Parish.



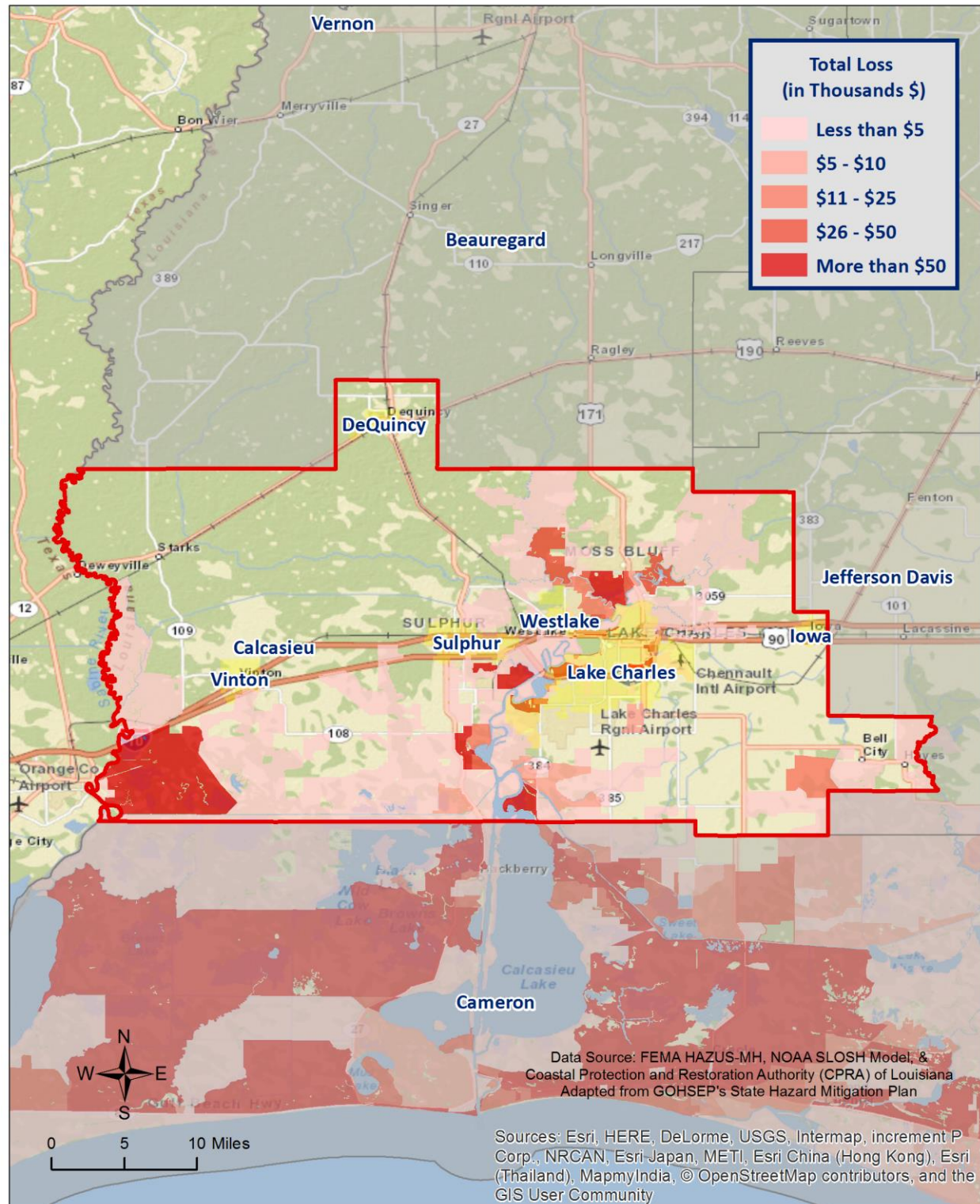


Figure 2-40: Increase in Total Loss Estimates in 2024 by Census Block Group Based on the HAZUS-MH Flood Model and NOAA SLOSH model.  
(Source: State of Louisiana Hazard Mitigation Plan)

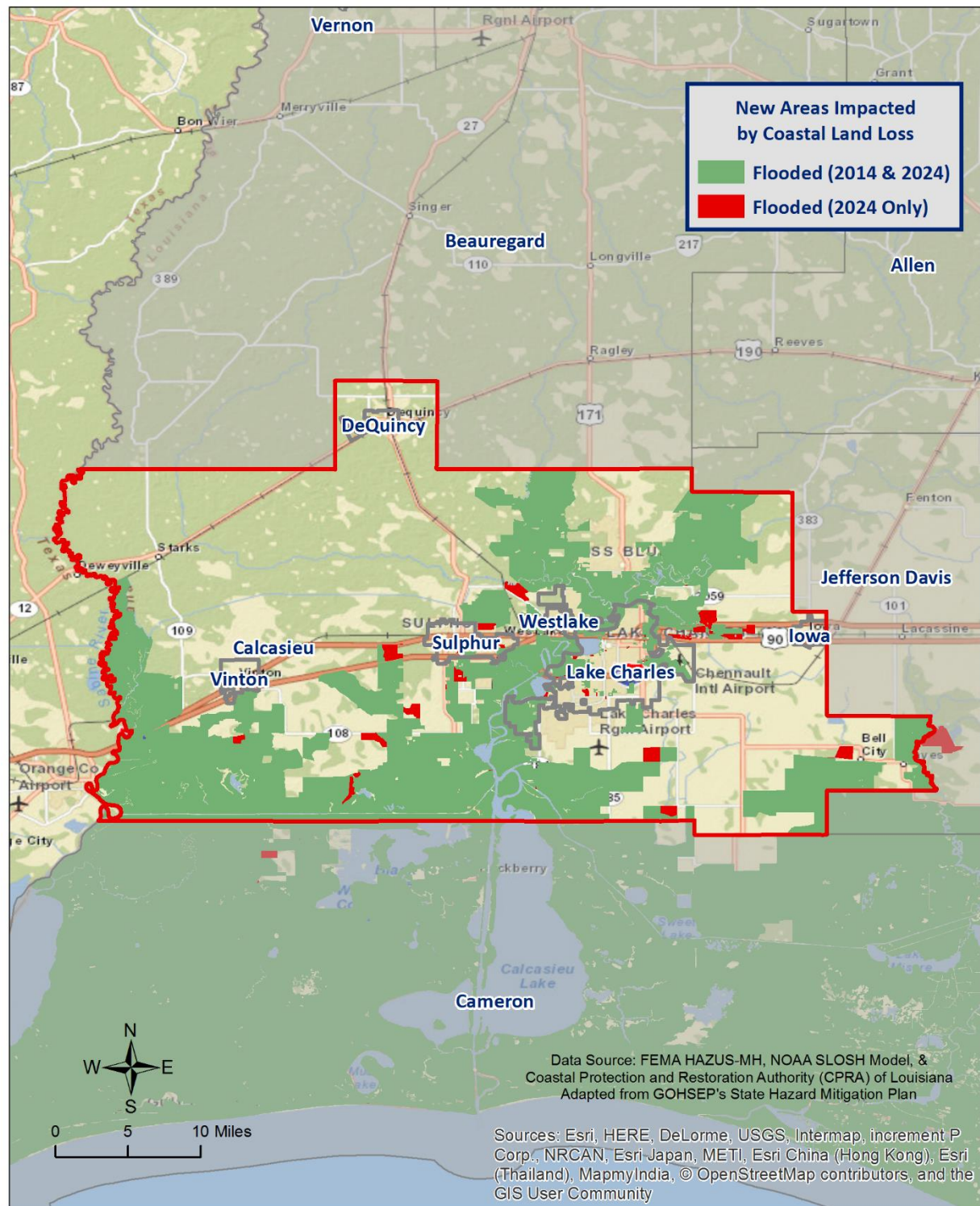


Figure 2-41: Census Block Groups not Currently Impacted by Category 1 Hurricane Storm Surge but Expected to be Impacted in 2024 are Shown in Red.  
(Source: State of Louisiana Hazard Mitigation Plan)



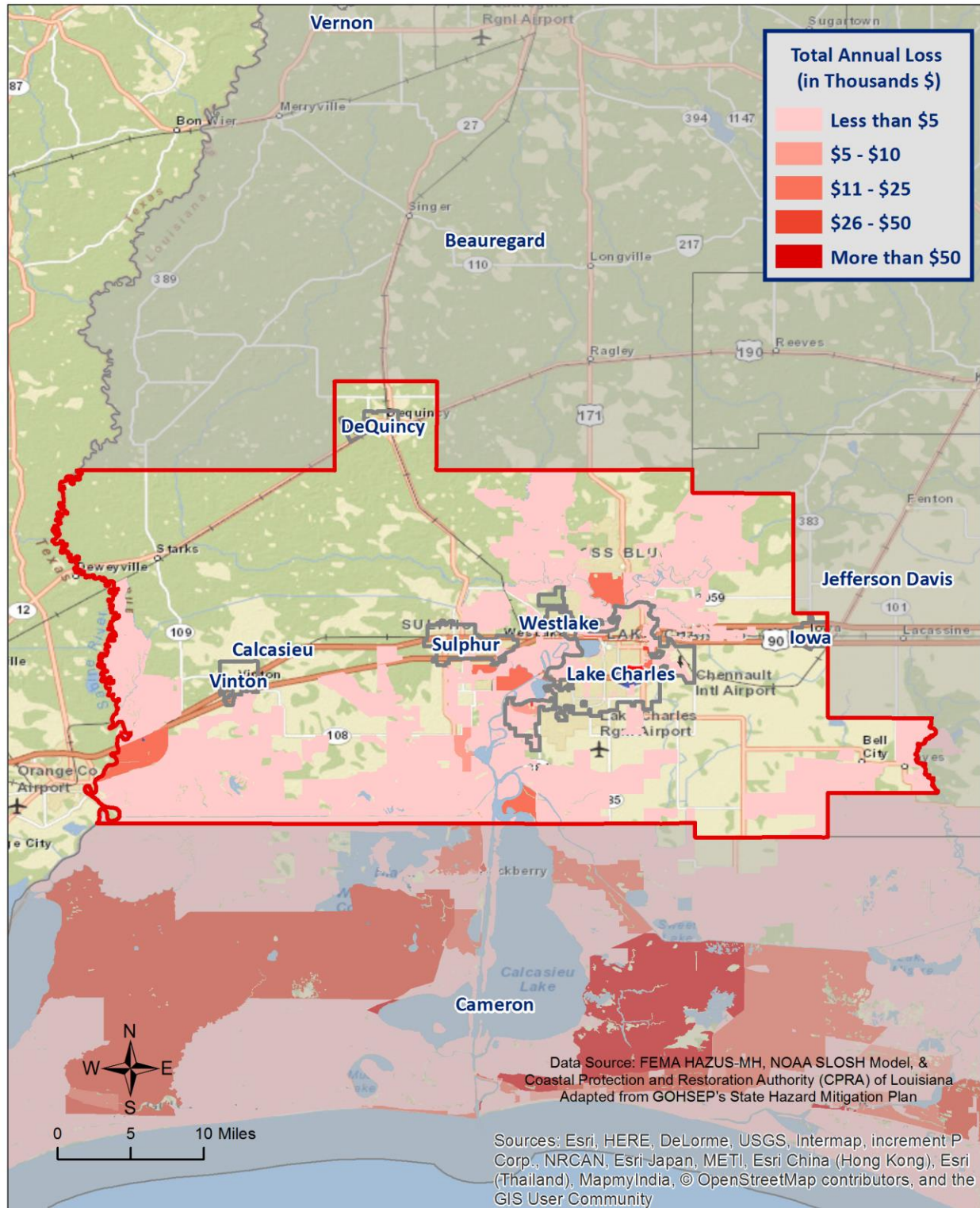


Figure 2-42: Estimated Annual Losses for Coastal Land Loss by Census Block Group.



The following table shows the current and future exposure potential based on the HAZUS-MH 2.2 inventory database.

*Table 2-96: Estimated Annual Losses for Coastal Land Loss in Calcasieu Parish.  
(Source: HAZUS-MH)*

Coastal Land Loss Estimated Annual Potential Losses for Calcasieu Parish						
Unincorporated Calcasieu Parish	DeQuincy	Iowa	Lake Charles	Sulphur	Vinton	Westlake
\$122,800	\$0	\$0	\$107,000	\$1,000	\$200	\$60,000

### Threat to People

Coastal land loss can impact all demographics and age groups. Buildings located within highly vulnerable coastal land loss areas could be eventually permanently shut down and forced to re-locate. Long-term sheltering and permanent relocation could be a concern for communities that are at the highest risk for future coastal land loss. The total population within the parish that is susceptible to the effects of coastal land loss are shown in Table 2-97.

*Figure 2-97: Number of People Susceptible to Coastal Land Loss in Calcasieu Parish.  
(Source: Census 2010)*

Number of People Exposed to Hurricane Hazards			
Location	# in Community	# in Hazard Area	% in Hazard Area
Parish (Unincorporated)	86,354	17,482	20.2%
DeQuincy	3,235	0	0%
Iowa	2,996	0	0%
Lake Charles	71,993	8,445	11.7%
Sulphur	20,410	0	0%
Vinton	3,212	0	0%
Westlake	4,568	412	9%
<b>Total</b>	<b>192,768</b>	<b>26,339</b>	<b>13.7%</b>

The HAZUS-MH hurricane model was used to identify populations vulnerable to coastal land loss throughout the jurisdictions in the tables below:

*Table 2-98: Population Vulnerable to Coastal Land Loss in Unincorporated Calcasieu Parish.*

Calcasieu Parish (Unincorporated)		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	17,482	20.2%
Persons Under 5 years	1,189	6.8%
Persons Under 18 years	4,353	24.9%
Persons 65 Years and Over	2,360	13.5%
White	12,447	71.2%
Minority	5,035	28.8%

*Table 2-99: Population Vulnerable to Coastal Land Loss in Lake Charles.  
(Source: HAZUS-MH)*

Lake Charles		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	33	100%
Persons Under 5 years	2	6.1%
Persons Under 18 years	9	27.3%
Persons 65 Years and Over	4	12.1%
White	21	63.6%
Minority	12	36.4%

*Table 2-100: Population Vulnerable to Coastal Land Loss in Lake Charles.  
(Source: HAZUS-MH)*

Lake Charles		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	8,445	11.7%
Persons Under 5 years	592	7.0%
Persons Under 18 years	1,391	16.5%
Persons 65 Years and Over	1,176	13.9%
White	3,967	47.0%
Minority	4,478	53.0%

*Table 2-101: Population Vulnerable to Coastal Land Loss in Westlake.  
(Source: HAZUS-MH)*

Westlake		
Category	Total Numbers	Percentage of People in Hazard Area
Number in Hazard Area	412	9.0%
Persons Under 5 years	33	8.0%
Persons Under 18 years	75	18.3%
Persons 65 Years and Over	59	14.3%
White	318	77.2%
Minority	94	22.8%

#### *Vulnerability*

See Appendix C for parish and municipality buildings that are susceptible to coastal land loss and subsidence.

\*\*\*This Page Left Intentionally Blank\*\*\*

### 3 Capability Assessment

This section summarizes the results of the Calcasieu Parishes jurisdictions and other agency efforts to develop policies, programs, and activities that directly or indirectly support hazard mitigation. It also provides information on resources and gaps in the parish's infrastructure, as well as relevant changes in its law since the last Plan Update, in order to suggest a mitigation strategy.

Through this assessment, Calcasieu Parish and the participating jurisdictions are able to identify strengths that could be used to reduce losses and reduce risk throughout the community. It also identifies areas where mitigation actions might be used to supplement current capabilities and create a more resilient community before, during, and after a hazard event.

#### Policies, Plans and Programs

Calcasieu Parish capabilities are unique to the parish, including planning, regulatory, administrative, technical, financial, and education and outreach resources. There are a number of mitigation-specific acts, plans, executive orders, and policies that lay out specific goals, objectives, and policy statements which already support or could support pre- and post-disaster hazard mitigation. Many of the ongoing plans and policies hold significant promise for hazard mitigation. They take an integrated and strategic look holistically at hazard mitigation in Calcasieu Parish to propose ways to continually improve it. These tools are valuable instruments in pre- and post-disaster mitigation as they facilitate the implementation of mitigation activities through the current legal and regulatory framework. Examples of existing documents in Calcasieu Parish and its jurisdictions include the following:

**Planning and Regulatory**

Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.

	Calcasieu Parish	DeQuincy	Lake Charles	Sulphur	Westlake	Vinton	Iowa
<b>Plans</b>	<b>Yes / No</b>						
Comprehensive / Master Plan	No	Yes	yes	Yes	No	No	No
Capital Improvements Plan	Yes	Yes	yes	Yes	yes	Yes	No
Economic Development Plan	Yes	Yes	yes	No	no	Yes	No
Local Emergency Operations Plan	Yes	Yes	yes	Yes	yes	Yes	Yes
Continuity of Operations Plan	Yes	Yes	yes	Yes	yes	No	No
Transportation Plan	Yes	No	yes	No	no	No	No
Stormwater Management Plan	Yes	Yes	yes	Yes	yes	No	No
Community Wildfire Protection Plan	No	Yes	No	No	yes	No	No
Other plans (redevelopment, recovery, coastal zone management)	Yes	No	No	Yes	no	No	No
<b>Building Code, Permitting and Inspections</b>	<b>Yes / No</b>						
Building Code	Yes	Yes	yes	Yes	yes	Yes	Yes
Building Code Effectiveness Grading Schedule (BCEGS) Score	Yes	Yes	no	No	no	No	No
Fire Department ISO/PIAL rating	Yes	Yes	yes	Yes	yes	Yes	Yes
Site plan review requirements	Yes	Yes	yes	Yes	yes	Yes	No
<b>Land Use Planning and Ordinances</b>	<b>Yes / No</b>						
Zoning Ordinance	Yes	Yes	yes	Yes	yes	No	NO
Subdivision Ordinance	Yes	Yes	yes	Yes	yes	No	Yes
Floodplain Ordinance	Yes	Yes	yes	Yes	yes	Yes	Yes
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	No	Yes	yes	Yes	yes	No	No
Flood Insurance Rate Maps	yes	Yes	yes	Yes	yes	No	Yes
Acquisition of land for open space and public recreation uses	Yes	Yes	yes	Yes	no	No	No
Other	No	No	No	No	no	No	No

**Building Codes, Permitting, Land Use Planning and Ordinances**

The Calcasieu Office of Planning and Development provides oversight for building permits and codes, land use planning, and all parish ordinances.

As of the 2015 Update, Calcasieu Parish and its jurisdictions ensure that all adopted building codes are enforced and in compliance relating to the construction of any structure within the boundaries of the parish. Building permits are required prior to beginning any type of construction or renovation projects, installation of electrical wiring, plumbing, or gas piping, moving manufactured/modular or portable buildings, and reroofing or demolitions.

The Calcasieu Parish Code Enforcement for Property Standards is responsible for enforcing the Parish Ordinances relating to health and safety, property maintenance standards, condemnation of unsafe structures, and zoning compliance.

The Planning and Zoning Board meet regularly to consider any proposed ordinance changes, and to take final actions on these changes at scheduled Police Jury Meetings.

While local capabilities for mitigation can vary from community to community, Calcasieu Parish as a whole has a system in place to coordinate and share these capabilities through Calcasieu Parish Government and through this Parish Hazard Mitigation Plan.



Some programs and policies, such as the above described, might use complementary tools to achieve a common end, but fail to coordinate with or support each other. Thus, coordination among local mitigation policies and programs is essential to hazard mitigation.

### Administration, Technical, and Financial

As a community, Calcasieu Parish has administrative and technical capabilities in place that may be utilized in reducing hazard impacts or implementing hazard mitigation activities. Such capabilities include staff, skillset, and tools available in the community that may be accessed to implement mitigation activities and to effectively coordinate resources. The ability to access and coordinate these resources is also important. On the following page are examples of resources in place in Calcasieu Parish and its jurisdictions.

Administration and Technical							
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.							
	Calcasieu Parish	DeQuincy	Lake Charles	Sulphur	Westlake	Vinton	Iowa
<b>Administration</b>	Yes / No						
Planning Commission	Yes	Yes	yes	Yes	no	No	No
Mitigation Planning Committee	Yes	Yes	yes	No	no	No	No
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Yes	Yes	yes	Yes	yes	Yes	Yes
<b>Staff</b>	Yes / No; FT/PT; % Hazard Mitigation						
Chief Building Official	Yes	Yes	yes	Yes	no	Yes	No
Floodplain Administrator	Yes	Yes	yes	Yes	yes	Yes	Yes
Emergency Manager	Yes	Yes	yes	Yes	yes	Yes	No
Community Planner	Yes	No	no	No	no	No	No
Civil Engineer	Yes	No	no	Yes	yes	No	No
GIS Coordinator	Yes	No	yes/parish	Yes	yes	No	No
Grant Writer	Yes	Yes	yes	No	yes	Yes	Yes
Other	Yes	No	No	No	no	No	no
<b>Technical</b>	Yes / No						
Warning Systems / Service (Reverse 911, outdoor warning signals)	Yes	Yes	yes	Yes	no	Yes	No
Hazard Data & Information	Yes	Yes	yes	No	no	No	No
Grant Writing	Yes	Yes	yes	No	yes	Yes	No
Hazus Analysis	No	No	No	No	no	No	No
Other	No	No	no	No	no	No	No

Financial capabilities are the resources that Calcasieu Parish and its incorporated jurisdictions have access to or are eligible to use in order to fund mitigation actions. Costs associated with implementing the actions identified by the jurisdictions may vary from little/no cost actions, such as outreach efforts, to substantial action costs such acquisition of flood prone properties.

The following resources are available to fund mitigation actions in Calcasieu Parish and its jurisdictions:

Financial							
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.							
	Calcasieu Parish	DeQuincy	Lake Charles	Sulphur	Westlake	Vinton	Iowa
Funding Resource	Yes / No						
Capital Improvements project funding	Yes	Yes	yes	Yes	yes	Yes	Yes
Authority to levy taxes for specific purposes	Yes	Yes	yes	Yes	yes	No	Yes
Fees for water, sewer, gas, or electric services	Yes	Yes	yes	Yes	yes	Yes	Yes
Impact fees for new development	Yes	No	no	No	no	Yes	No
Stormwater Utility Fee	Yes	No	no	No	no	No	No
Community Development Block Grant (CDBG)	Yes	Yes	yes	No	yes	Yes	Yes
Other Funding Programs	Yes	No	no	No	yes	No	Yes

### Education and Outreach

A key element in hazard mitigation is promoting a safer, more disaster resilient community through education and outreach activities and/or programs. Successful outreach programs provide data and information that improves overall quality and accuracy of important information for citizens to feel better prepared and educated with mitigation activities. These programs enable the individual jurisdictions and parish as a whole to maximize opportunities for implementation of activities through greater acceptance and consensus of the community.

Calcasieu Parish and its jurisdictions have existing education and outreach programs to implement mitigation activities, as well as to communicate risk and hazard related information to its communities. Specifically focusing on advising repetitive loss property owners of ways they can reduce their exposure to damage by repetitive flooding remains a priority for the entire parish. The existing programs are as follows:

Education and Outreach							
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.							
	Calcasieu Parish	DeQuincy	Lake Charles	Sulphur	Westlake	Vinton	Iowa
Program / Organization	Yes / No						
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	No	Yes	Yes	no	Yes	Yes
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Yes	Yes	yes	Yes	no	Yes	Yes
Natural Disaster or safety related school program	Yes	Yes	yes	Yes	no	No	No
Storm Ready certification	Yes	Yes	no	No	no	No	No
Firewise Communities certification	No	Yes	no	No	no	No	no
Public/Private partnership initiatives addressing disaster-related issues	Yes	Yes	Yes	No	yes	No	No

In some cases, the jurisdictions rely on Calcasieu Parish OHSEP and/or Calcasieu Parish Government Agencies for the above listed planning and regulatory, administrative and technical, financial, and education and outreach capabilities. Comments regarding the jurisdictions utilization or intentions to utilize and leverage the capabilities of the parish government can be found in Appendix E in the jurisdictional specific worksheets.

As reflected in the aforementioned existing regulatory mechanisms, programs, and resources within each jurisdiction, Calcasieu Parish and each jurisdiction remains committed to expanding and improving on the existing capabilities within the parish. Each participating jurisdiction will work toward increased participation in funding opportunities and available mitigation programs. Should funding become available, the hiring of additional personnel to dedicate to hazard mitigation initiatives and programs, as well as increasing ordinances within the jurisdictions, will help to enhance and expand risk reduction measures within the parish.

With the sharing of these capabilities, the following municipalities and entities are recognized by the Parish of Calcasieu under the Hazard Mitigation Plan, allowing them to apply for available hazard mitigation funding for as long as these municipalities and entities notify the parish of their intentions and the parish concurs:

- Calcasieu Parish
- City of DeQuincy
- City of Lake Charles
- City of Sulphur
- City of Westlake
- Town of Vinton
- Town of Iowa

### Flood Insurance and Community Rating System

Calcasieu Parish is a participant in the Community Rating System (CRS). Maintaining and improving the CRS rating for the parish and participating jurisdictions is recognized as a high priority by the Hazard Mitigation Steering Committee, with the addition of a new goal directly relating to CRS. Participation in the CRS strengthens local capabilities by lowering flood insurance premiums for jurisdictions that exceed NFIP minimum requirements.

Under the Federal Emergency Management Agency (FEMA), the National Flood Insurance Program (NFIP) administers the Community Rating System. Under the CRS, flood insurance premiums for properties in participating communities are reduced to reflect the flood protection activities that are being implemented. This program can have a major influence on the design and implementation of flood mitigation activities, so a brief summary is provided here.

A community receives a CRS classification based upon the credit points it receives for its activities. It can undertake any mix of activities that reduce flood losses through better mapping, regulations, public information, flood damage reduction and/or flood warning and preparedness programs.

There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction (see Figure 3-1). A community that does not apply for the CRS or that does not obtain the minimum number of credit points is a class 10 community.

During the last update, 38 Louisiana communities participated, including Lake Charles (class 8) and Calcasieu Parish (class 8). Mandeville, Shreveport, and Jefferson and East Baton Rouge Parishes had the best classifications in the state, class 7. As of the 2015 update, Jefferson, East Baton Rouge, and Terrebonne Parishes all lead the state with best classifications, class 6.

CLASS	DISCOUNT	CLASS	DISCOUNT
1	45%	6	20%
2	40%	7	15%
3	35%	8	10%
4	30%	9	5%
5	25%	10	—
SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class. SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.* Non-SFHA (Zones B, C, X, D): 10% discount for Classes 1-6; 5% discount for Classes 7-9.			

\* In determining CRS Premium Discounts, all AR and A99 Zones are treated as non-SFHAs.

*Figure 3-1: CRS Discounts by Class  
(Source: FEMA)*

As of May 2012, 310 communities in the State of Louisiana participate in the Federal Emergency Management Agency's NFIP. Of these communities, 41 (or 13%) participate in the Community Rating System (CRS). Of the top fifty Louisiana communities, in terms of total flood insurance policies held by residents, 27 participate in the CRS. The remaining 23 communities present an outreach opportunity for encouraging participation in the CRS. In Calcasieu Parish, the following communities participate; Lake Charles (Class 8) and Calcasieu Parish (class 8).

The CRS provides an incentive not just to start new mitigation programs, but to keep them going. There are two requirements that "encourage" a community to implement flood mitigation activities.

First, the Parish will receive CRS credit for this plan when it is adopted. To retain that credit, though, the parish must submit an evaluation report on progress toward implementing this plan to FEMA by October 1st of each year. That report must be made available to the media and the public.

Second, the parish must annually recertify to FEMA that it is continuing to implement its CRS credited activities. Failure to maintain the same level of involvement in flood protection can result in a loss of CRS credit points and a resulting increase in flood insurance rates to residents.

In 2011<sup>2</sup>, the National Flood Insurance Program (NFIP) completed a comprehensive review of the Community Rating System that will result in the release of a new CRS Coordinator's Manual.

The changes to the 2013 CRS Coordinator's Manual are the result of a multi-year program evaluation that included input from a broad group of contributors in order to evaluate the CRS and refine the program to meet its stated goals.

The upcoming changes will drive new achievements in the following six core flood loss reduction areas important to the NFIP: (1) reduce liabilities to the NFIP Fund; (2) improve disaster resiliency and

<sup>2</sup> <https://www.fema.gov/national-flood-insurance-program-community-rating-system>

sustainability of communities; (3) integrate a whole community approach to addressing emergency management; (4) promote natural and beneficial functions of floodplains; (5) increase understanding of risk, and; (6) strengthen adoption and enforcement of disaster-resistant building codes.

The 2013 CRS Coordinator's Manual changes will impact each CRS community differently. Some communities will see an increase in the points they receive since points for certain activities have increased (e.g., Activity 420 Open Space Preservation). Other communities will receive fewer points for certain activities (e.g., Activity 320 Map Information Service). It is likely that some communities with marginal CRS Class 9 programs will have to identify new CRS credits in order to remain in the CRS.

Typically, CRS communities do not request credit for all the activities they are currently implementing unless it would earn enough credit to advance the community to a higher CRS Class. A community that finds itself losing CRS credit with the 2013 Manual could likely identify activities deserving credit they had not previously received.

Due to the changes in both activities and CRS points, community CRS coordinators should speak with their ISO/CRS Specialist to understand how and when the 2013 Manual will impact their community.



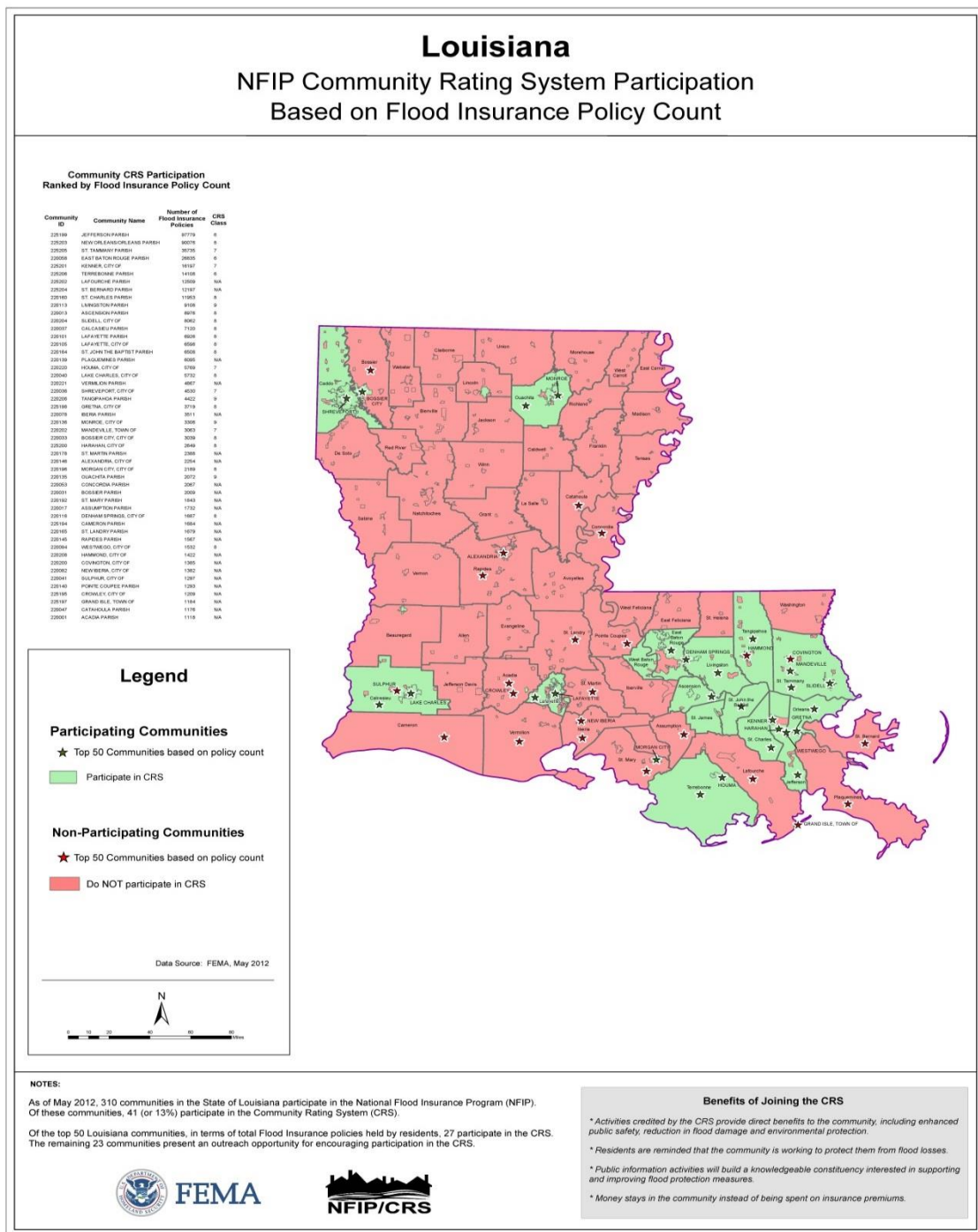


Figure 3-2: Louisiana CRS NFIP Participation  
(Source: FEMA<sup>3</sup>)

<sup>3</sup> [http://www.fema.gov/media-library-data/20130726-2128-31471-9581/ks\\_ky\\_la\\_crs\\_may\\_2012\\_508.zip](http://www.fema.gov/media-library-data/20130726-2128-31471-9581/ks_ky_la_crs_may_2012_508.zip)

In addition to the direct financial reward for participating in the Community Rating System, there are many other reasons to participate in the CRS. As FEMA staff often say, “If you are only interested in saving premium dollars, you’re in the CRS for the wrong reason.” The other benefits that are more difficult to measure in dollars include:

1. The activities credited by the CRS provide direct benefits to residents, including:

- Enhanced public safety
- A reduction in damage to property and public infrastructure
- Avoidance of economic disruption and losses
- Reduction of human suffering
- Protection of the environment

2. A community’s flood programs will be better organized and more formal. Ad hoc activities, such as responding to drainage complaints rather than an inspection program, will be conducted on a sounder, more equitable basis.

3. A community can evaluate the effectiveness of its flood programs against a nationally recognized benchmark.

4. Technical assistance in designing and implementing a number of activities is available at no charge from the Insurance Services Office.

5. The public information activities will build a knowledgeable constituency interested in supporting and improving flood protection measures.

6. A community would have an added incentive to maintain its flood programs over the years. The fact that its CRS status could be affected by the elimination of a flood related activity or a weakening of the regulatory requirements for new developments would be taken into account by the governing board when considering such actions.

7. Every time residents pay their insurance premiums, they are reminded that the community is working to protect them from flood losses, even during dry years.

**\*\*More information on the Community Rating System can be found at [www.fema.gov/nfip/crs.shtm](http://www.fema.gov/nfip/crs.shtm)\*\***

### NFIP Worksheets

Parish and Participating Jurisdiction NFIP worksheets can be found in Appendix E: State Required Worksheets

\*\*\*This Page Left Intentionally Blank\*\*\*

## 4 Mitigation Strategy

### Introduction

Calcasieu Parish's Hazard Mitigation Strategy has a common guiding principle and is the demonstration of the parish's and participating jurisdictions' commitment to reduce risks from hazards. The strategy also serves as a guide for parish and local decision makers as they commit resources to reducing the effects of hazards.

An online public opinion survey was conducted of Calcasieu Parish residents between June and October 2014. The 25 question survey was completed by parish residents over the age of 18.

The survey was designed to capture public perceptions and opinions regarding natural hazards in Calcasieu Parish. In addition, the survey collected information regarding the methods and techniques preferred by the respondents for reducing the risks and losses associated with local hazards.

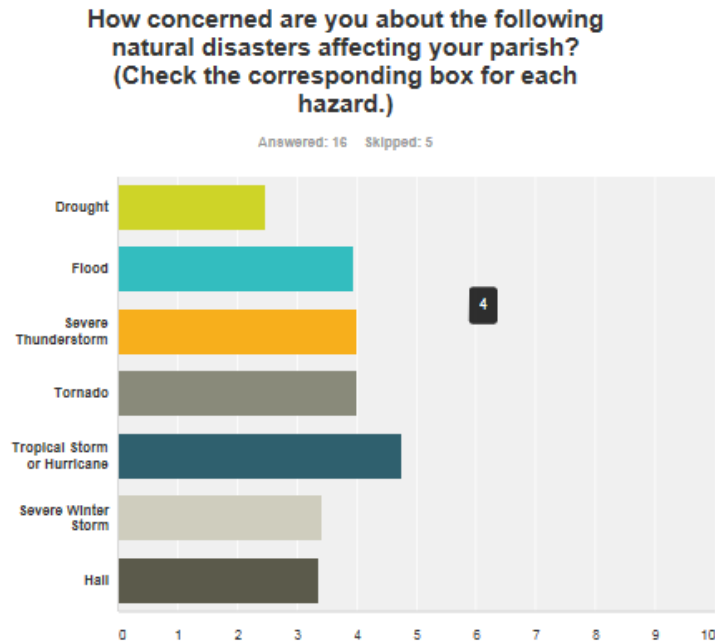
When asked to gauge from a list which categories were more susceptible to impacts caused by natural hazards, the top three categories selected were:

1. Human (Loss of life and/or injuries)
2. Infrastructure (Damage or loss of bridges, utilities, schools, etc.)
3. Governance (Ability to maintain order and and/or provide public amenities and services)

	1	2	3	4	5	6	Total	Score
Human (Loss of life and/or injuries)	58.33% 7	0.00% 0	33.33% 4	8.33% 1	0.00% 0	0.00% 0	12	5.08
Economic (Business closures and/or job losses)	0.00% 0	33.33% 4	16.67% 2	16.67% 2	25.00% 3	8.33% 1	12	3.42
Infrastructure (Damage or loss of bridges, utilities, schools, etc.)	16.18% 2	27.27% 3	27.27% 3	18.18% 2	0.00% 0	9.09% 1	11	4.18
Cultural/Historic (Damage or loss of libraries, museums, historic sites)	0.00% 0	0.00% 0	7.69% 1	30.77% 4	7.69% 1	53.85% 7	13	1.92
Environmental (Damage or loss of forests, pastureland, waterways, etc.)	15.38% 2	0.00% 0	15.38% 2	15.38% 2	46.15% 6	7.69% 1	13	3.00
Governance (Ability to maintain order and/or provide public amenities and services)	7.14% 1	35.71% 5	7.14% 1	14.29% 2	14.29% 2	21.43% 3	14	3.43

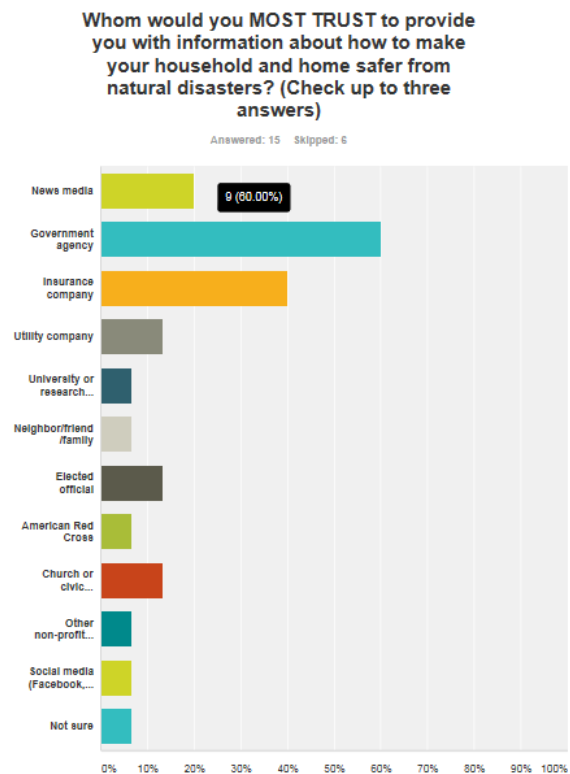
The survey results also indicated which natural disasters citizens were *most concerned* with being affected by in Calcasieu Parish. The top three natural disasters selected were:

1. Hurricanes
2. Severe Thunderstorms and Tornadoes
3. Flooding



The online survey also showed a level of trust in the parish government for disaster related issues, further highlighting the collaborative relationship between citizen and government agencies. This indicated that the strategies and actions being implemented within the communities is trusted and important to citizens.

Calcasieu Parish reviewed and confirmed the goals, objectives, actions, and projects over the period of the hazard mitigation plan update process. The mitigation actions and projects in this 2015 Hazard Mitigation Plan Update are a product of analysis and review of the Calcasieu Parish Hazard Mitigation Plan Steering Committee under the coordination of the Calcasieu Parish Office of Homeland Security and Emergency Preparedness. The committee was presented a list of projects and actions, both new and from the 2009 plan, for review from June 2015 to August 2015.





During the public meeting in July, the committee and participating jurisdictions provided a status of the projects from 2009 and the proposed actions for the 2015 update. Breakout forums were provided for citizens to discuss each project with subject matter experts from the parish.

Committee members then submitted jurisdiction-specific projects based on feasibility for funding, ease of completion, and other community-specific factors. The actions were later prioritized.

This activity confirms that the goals and action items developed by the Calcasieu Parish Hazard Mitigation Plan Steering Committee are representative of the outlook of the community at large. Full survey results can be found here:

<https://www.surveymonkey.com/r/CalcasieuParish>

The goals represent the guidelines that the parish and its communities want to achieve with this plan update. To help implement the strategy and adhere to the mission of the Hazard Mitigation Plan, the preceding section of the Plan Update focused on identifying and quantifying the risks faced by the residents and property owners in Calcasieu Parish from natural and manmade hazards. By articulating goals and objectives based on the previous plans, the risk assessment results, and the intent to address those results, this section sets the stage for identifying, evaluating, and prioritizing feasible, cost effective, and environmentally sound actions to be promoted at the parish and municipal level – and to be undertaken by the state for its own property and assets. By doing so, Calcasieu Parish and its jurisdictions can make progress toward reducing identified risks.

For the purposes of this Plan Update, goals and action items are defined as follows:

- **Goals** are general guidelines that explain what the parish wants to achieve. Goals are expressed as broad policy statements representing desired long-term results.
- **Action Items** are the specific steps (projects, policies, and programs) that advance a given Goal. They are highly focused, specific, and measurable.

## Goals

The current goals of the Calcasieu Parish Hazard Mitigation Plan Update Steering Committee represent long-term commitments by the parish and its jurisdictions. After assessing these goals, the committee decided that the current seven goals remain valid and priorities within the parish remain unchanged.

The goals are as follows:

1. Reduce or prevent injury and loss of life
2. Reduce or prevent damage to property and material assets
3. Reduce or prevent future damage to critical facilities (fire, rescue, law enforcement, communications, command and control) essential for protection and public safety
4. Reduce or prevent future damage to special facilities, including schools, nursing homes, health care facilities, prisons, and historical and cultural resources
5. Reduce or prevent future damage to infrastructure, including stormwater conveyance structures, utility systems, pipelines, railroads, highways, bridges, and navigable waterways
6. Reduce or prevent future damage to commercial facilities
7. Reduce or prevent future damage to higher risk facilities that, if damaged, may result in significant loss of human life, damage to the environment, or significant harm to the local

Economy. These facilities include hazardous material handling facilities, dams, flood control facilities, and other high security facilities

The Mitigation Action Plan focuses on actions to be taken by Calcasieu Parish and its jurisdictions. All of the activities in the Mitigation Action Plan will be focused on helping the parish and its municipalities in developing and funding projects that are not only cost effective, but also meet the other DMA 2000 criteria of environmental compatibility and technical feasibility.

The Hazard Mitigation Plan Steering Committee and each jurisdiction reviewed and evaluated the potential action and project lists in which consideration was given to a variety of factors. Such factors include determining a project's eligibility for federal mitigation grants, as well as its ability to be funded. This process required evaluation of each project's engineering feasibility, cost effectiveness, and environmental and cultural factors.

### 2015 Mitigation Actions and Update on Previous Plan Actions

The Calcasieu Parish Hazard Mitigation Plan Steering Committee and participating jurisdictions each identified actions that would reduce and/or prevent future damage within Calcasieu Parish and their respective communities. In that effort, each jurisdiction focused on a comprehensive range of specific mitigation actions. These actions were identified in thorough fashion by the consultant team, the committee, and the individual jurisdictions, by way of frequent and open communications and meetings held throughout the planning process.

As outlined in the Local Mitigation Planning Handbook, the following are eligible types of mitigation actions:

- **Local Plans and Regulations** – These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
- **Structure and Infrastructure Projects** – These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area, and also includes projects to construct manmade structures to reduce the impact of hazards.
- **Natural System Protection** – These actions minimize the damage and losses and also preserve or restore the functions of natural systems.
- **Education and Awareness Programs** – These actions inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.

In addition to the established and agreed upon parish and jurisdiction actions relative to the parish-wide goals, the action updates from the previous plan updates can be found in the table on the following page. The jurisdictions of DeQuincy, Sulphur, Iowa and Vinton did not implement any mitigation actions prior to this update from the previous plan. The Parish and participating jurisdictions agreed to remove or delete actions which funding was unavailable for, or actions that were low priorities and were not deemed necessary by the steering committee and jurisdictions to carry over.

## Calcasieu 2010 Hazard Mitigation Actions Update

Calcasieu Mitigation Action Update						
Calcasieu HM Action Item #	Action	Action Description	Funding Source	Responsible Party, Agency, or Department	Hazard	Status
1	Indian and Little Bayou Drainage	The drainage improvements within Indian Bayou and Little Indian Bayou involve widening and deepening the channels to increase functionality and capacity of the bayous to mitigate future flooding impacts.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Flooding, Wind, Tropical Cyclone	Carried Over
2	Belfield Ditch Retention Ponds	Propose to reduce flood levels in and around Belfield Ditch by constructing a detention pond that will receive water (via an intake pipe) from the ditch when water levels rise above a certain level. Floodwaters will be held in the detention pond until it can be safely released without negatively impacting structures or infrastructure.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Flooding, Wind, Tropical Cyclone	Developed into "Belfield Ditch Drainage Improvement Project", currently awaiting FEMA approval
3	901 Lakeshore Bldg - Retrofit	A retrofit will address the necessary upgrades the facility will need to effectively function as an Emergency Operations Center and be able to provide continuous operations in the event of a disaster. The retrofit will provide protection to the building envelope that exceeds the International Building Code (IBC) standard.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Wind, Tropical Cyclone, Tornado	Ongoing - In construction phase as of August 2015
4	Westlake Waste Water Treatment Facility	A berm at the Westlake Sewer Plant will assure continued operations of vital community infrastructure in the event of a hazard event. The city engineer estimates that a berm at least 3 feet in height is required to mitigate negative impacts from future flooding occurrences.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Wind, Tropical Cyclone, Tornado	Carried Over
5	911 Hodges - Storm Hardening	A retrofit to the facility will address the necessary upgrades the facility will need to work effectively as an Emergency Operations Center and be able to provide continuous operations in the event of a disaster. The retrofit will provide protection to the building envelope that exceeds	FEMA HMGP, Local	Calcasieu Parish OHSEP	Wind, Tropical Cyclone, Tornado	Deleted

Calcasieu Mitigation Action Update						
Calcasieu HM Action Item #	Action	Action Description	Funding Source	Responsible Party, Agency, or Department	Hazard	Status
		the International Building Code (IBC) standard. FEMA 361, or other relevant FEMA standards, will be consulted for procedures in completing a retrofit project.				
6	City of Westlake - Rep loss Acquisition	This project would involve purchasing repetitive loss and severe repetitive loss homes through a voluntary acquisition process. The total number of homes that might be acquired would be 18. A final number of potential homes that might be able to be acquired may change during research undertaken during the actual project scoping phase. An alternative mitigation measure is that the first finished floor of the homes could be elevated to a minimum of 1 foot above base flood elevation in lieu of acquisition. Based on preliminary investigations, it is estimated that up to 6 of the total 18 properties might opt for elevation rather than acquisition. Through either voluntary acquisition or elevation, future flooding damages will be mitigated and money will be saved not having to pay flood insurance claims.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Flooding	2 acquisition and 2 elevation projects have been completed. Also, 1 elevation and 1 acquisition project are currently awaiting FEMA approval
7	City of Westlake City Hall - Storm Hardening	A retrofit to the facility will address the necessary upgrades the facility will need to work effectively during a hurricane storm event, be able to provide continuous operations in the event of a disaster, and serve as a location for first-responders. The retrofit will provide protection to the building envelope that exceeds the International Building Code (IBC) standard. FEMA 361, or other relevant FEMA standards, will be consulted for procedures in completing a retrofit project.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Wind, Tropical Cyclone, Tornado	No Action/Carried Over

Calcasieu Mitigation Action Update						
Calcasieu HM Action Item #	Action	Action Description	Funding Source	Responsible Party, Agency, or Department	Hazard	Status
8	City of Westlake Police Station - Storm Hardening	A retrofit to the facility will address the necessary upgrades the facility will need to work effectively during a hurricane, be able to provide continuous operations in the event of a disaster, and serve as a potential dispatch location for first-responders. The retrofit will provide protection to the building envelope that exceeds the International Building Code (IBC) standard. FEMA 361, or other relevant FEMA standards, will be consulted for procedures in completing a retrofit project.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Wind, Tropical Cyclone, Tornado	No Action/Carried Over
9	North Perkins Ferry - Drainage	Project 9 proposes to reduce flood levels in and around North Perkins Ferry Road by constructing a culvert crossing and an open ditch alongside the road that will provide a destination for the stormwater runoff. Floodwater will be collected in the open ditch rather than flooding adjacent properties. Land and/or easement acquisition for this project is already completed.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Flooding, Wind, Tropical Cyclone	No Action/Carried Over
10	Marsh Bayou - Drainage	The drainage improvements within Marsh Bayou will be limited to widening and deepening the channel to increase functionality and capacity of the bayou for handling water without flooding. The project will not include ongoing maintenance.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Flooding, Wind, Tropical Cyclone	No Action/Carried Over
11	Goldsmith Canal - Drainage	The drainage improvements within Goldsmith Canal will be limited to widening and deepening the channel by re-grading it to increase functionality and capacity of the canal for handling water without flooding. The project will not include ongoing maintenance.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Flooding, Wind, Tropical Cyclone	No Action/Carried Over



Calcasieu Mitigation Action Update						
Calcasieu HM Action Item #	Action	Action Description	Funding Source	Responsible Party, Agency, or Department	Hazard	Status
12	Goos Road - Storm Hardening	A retrofit to the facility will address the necessary upgrades the facility will need to work effectively during a hurricane, be able to provide continuous operations in the event of a disaster, and serve as a potential dispatch location for first-respond that will deal with drainage issues in the area. The retrofit will provide protection to the building envelope that exceeds the International Building Code (IBC) standard.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Wind, Tropical Cyclone, Tornado	No Action/Carried Over
13	Houston River - Drainage	The drainage improvements within Houston River will be limited to widening and deepening the channel to increase functionality and capacity of the river for handling water without flooding. The project will not include ongoing maintenance.	FEMA HMGP, Local	Calcasieu Parish OHSEP	Flooding, Wind, Tropical Cyclone	No Action/Carried Over

## City of Lake Charles 2010 Mitigation Action Update

City of Lake Charles Mitigation Action Update					
Lake Charles HM Action #	Action	Action Description	Funding Source	Responsible Party, Agency, or Department	Status
1	Transfer Switch Installation	Installation of automatic transfer switches at 3 fire stations, Lake Charles Parish Public Works. Mounting of six customer owned generators on trailers	FEMA HMGP, Local	Lake Charles Public Works	Completed
2	Retrofit of Critical Facilities	Retrofitting of critical facilities in Lake Charles	FEMA HMGP, Local	Lake Charles Engineering Department	Ongoing
3	Installation of Lightning Rods	Installation of lightning rods on Lake Charles Hospital	FEMA HMGP, Local	Lake Charles Engineering Department	Carried Over
4	Construction of Safe Room	Construction of safe room for first responders	FEMA HMGP	Lake Charles Engineering Department	Deleted
5	City Hall Hardening Project- Windows, Roof, Doors and Tie Downs	Harden City Hall Windows, Doors and roof/ Tie Downs	HMGP, DOE, ARRA, CDBG, City	PW, Engineering	Completed New windows were installed Roof and tie Downs were completed
6	Lake Charles Civic Center Hardening	Civic Center Hardening , Coliseum, Kitchen and meeting room levels; Theater and back of House; roof and exterior weather-proofing	HMGP, CDBG, CITY	Engineering, Civic Center	Completed multi phased hardening of the Civic Center 2015
7	Road Usability through Drainage Retrofits	Ongoing investigations, Annual CEA for debris removal , drainage study ongoing, Priority basins and work plans being implemented	City CIP	PW , Planning	Ongoing - Drainage plan on file and updated
8	Flood Damage Acquisitions, Elevations, Relocations	Ongoing annual NFIP, SRL,	Ongoing annual NFIP, SRL,PPGP, CRS, RFC, PDM, FMA, etc.	Planning and development	Ongoing - Annual plans based on Named storm allocation of funding
9	Generators and Communications	Ongoing, replacement consoles, and alert systems.	OEP partnerships and other Grant funds, City.	Departmental-Fire, police and PW	completed
10	Water Emergencies and Rationing for Drought	Ongoing seasonal	City funds	IT, PIO, PW, Water division	Ongoing, completed

City of Lake Charles Mitigation Action Update					
Lake Charles HM Action #	Action	Action Description	Funding Source	Responsible Party, Agency, or Department	Status
11	At Risk Properties and Citizen Alerts, Warning Systems	Ongoing started NIXLE and CAER others coordinate with Calcasieu, SNAP and First Call	PIO, IT, LCPD, OEP	PIO, IT, LCPD, OEP, LCFD	Completed Purchased consoles and radio systems

## Unincorporated Calcasieu New Mitigation Actions

Unincorporated Calcasieu New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
CP1 Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA, Local	2-5 years	Calcasieu Parish/ Planning & Development	High Wind, Tropical Cyclone, Tornado, Hail	1,2, 3,4	New
CP2 Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA, Local	1-10 years	Calcasieu Parish/ Planning & Development	Flooding, Tropical Cyclone, Subsidence	1,2, 5	New
CP3 Flood Mitigation of Severe Repetitive Loss and Repetitive Loss Properties and Other Hazard Prone Structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss and severe repetitive loss or other hazard prone properties.	FEMA, Local	1-5 years	Calcasieu Parish/ Planning & Development	Flooding, Tropical Cyclone, Subsidence	1,2	New
CP4 Safe Room Projects	Construction of a safe room for first responders located in Calcasieu Parish. Other locations will be identified based on funding availability.	FEMA, Local	1-10 years	Calcasieu Parish/ Planning & Development	Tornado, High wind, tropical cyclone, hail	1,2	New
CP5 Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorms (lightning, high wind, hail), and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities. Also promoting the use of NOAA "All Hazards" radios for early warning and post event information.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP	Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorms (lightning, high wind, hail), winter storms, subsidence	1,2, 3,4, 5,6, 7	New
CP6 Properties at Risk	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizens of magnitude potential and provide mitigation suggestions	FEMA, Local, USACE	1-5 years	Calcasieu Parish OHSEP	Tropical Cyclone, high wind, hail, lightning, flooding, tornado, sinkhole,	1,2, 3,4, 5,6, 7	New

## Unincorporated Calcasieu New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
					wildfire, subsidence		
CP7 Continuity of Operations for Parish, Cooperative Agreements, Communications Equipment	Purchase of communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of residents	FEMA, Local	1-5 years	Calcasieu Parish OHSEP	Tropical Cyclone, high wind, tornado, sinkhole, wildfire, winter storms	1,2	New
CP8 Water Rationing Program	Implement a water rationing program with an emphasis on capabilities and enforcement.	FEMA, Local	1-5 years	CPPJ OHSEP, Planning & Dev't, Water Districts	Drought	1,2	New
CP9 Water Distribution Plan	Work with local businesses/water suppliers to develop and implement a water distribution plan for vulnerable populations in advance of periods of excessive heat.	FEMA, Local	1-5 years	CPPJ OHSEP	Excessive heat	1,2	New
CP10 Community Shelter Construction	Set up of community shelters for the public throughout the parish to shelter public during disasters.	FEMA, Local	1-5 years	CPPJ OHSEP, Public Works	Excessive heat, thunderstorm (lightning, high wind, hail), winter storms, sinkhole	1,2	New
CP11 NFIP Initiatives	Continue Calcasieu Parish's participation in the National Flood Insurance Program (NFIP). Identify and implement necessary actions and steps to further the participation of Calcasieu Parish in the NFIP and Community Rating System including but not limited to floodplain mapping, higher regulatory standards, protecting building utilities, stormwater management standards, drainage system maintenance, and flood warning programs.	FEMA, Local	5 years	CPPJ Planning & Development	Flooding, Tropical Cyclone	1,2	New
CP12 Flood Proofing of Critical Facilities	Flood-proof critical structures within the Parish to help promote continuation of critical services during a storm event	FEMA, Local	1-5 years	CPPJ Planning & Development	Flooding, Tropical Cyclone	1,2, 3,4, 5	New
CP13 Lightning Protection for Parish Facilities	Installation of lightning rods and surge protectors to facilities. Upgrade critical facilities database and communications systems including data back-up and surge protection to mitigate losses due to lightning strikes and electrical blackouts.	FEMA, Local	2-3 years	CPPJ OHSEP, Planning & Development	Lightning	1,2, 3,4	New
CP14 Wildfire Mitigation Plan	Develop and implement a regional interagency wildfire mitigation plan	FEMA, Local	1-3 years	CPPJ, Fire Districts	Wildfire	1,2	New



## Unincorporated Calcasieu New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
CP15 Emergency Warning System and Communications Equipment	Improve communication within the parish by purchasing, installing, and implementing outdoor warning systems and communications equipment to include Incident Management Information Sharing Software.	FEMA, Local	1-5 years	CPPJ OHSEP	High wind, hail, lightning, flooding, tornado, sinkhole, Tropical Cyclone	1,2,3,4,5,6	New
CP16 GIS Hazard Mitigation Planning	Develop a regional Geographic Information System (GIS) database to support future hazard mitigation planning.	HMGP and Parish	1-3 years	CPPJ, Participating cities, SRA-LA	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorms (lightning, high wind, hail), winter storms	1,2,3,4,5,6,7	New
CP17 Interoperable Communications Plan	Develop an interoperability/communications plan identifying resources and equipment needed to establish a single, interagency, mobile incident and communications command post.	HMGP and Parish	1-5 Years	Calcasieu Parish OHSEP	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorms (lightning, high wind, hail), winter storms	1,2	New
CP18 Volunteer Training Program	Create a program that recruits and trains volunteers to provide support in safeguarding the parish before, during and after any disaster or in the event of a large scale emergency.	CTPGP, HMGP	1-2 Years	CPPJ OHSEP	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorms (lightning, high wind, hail), winter storms	1	New
CP19 Vehicle Location System	Install automatic vehicle locator systems in all public school buses and other critical transportation vehicles to ensure continuity of operations and situational awareness during and following disasters.	HMGP	2-3 years	CPPJ OHSEP	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorms (lightning, high	1	New

### Unincorporated Calcasieu New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
					wind, hail), winter storms		
CP20 Generator Installation	Purchase generators and install at critical facilities to continue essential operations parishwide during events.	HMGP	1-2 Years	CPPJ OHSEP	Flooding, tropical cyclones, wildfire, winter storms	1,2, 3,4	New
CP21 Parish Evacuation Initiatives	Produce a map of evacuation routes and improve evacuation route signing.	HMGP, PDM	1-10 years	CPPJ OHSEP, Public Works	Tropical Cyclone	1	New
CP22 Tornado Mitigation Initiatives	Provide community facilities and government buildings with a tornado preparation checklist. Require each facility to update their existing tornado response plan in accordance with the list and associated recommendations.	HMGP, 5 percent initiative	1-2 Years	CPPJ OHSEP	Tornado	1,2	New
CP23 Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinance.	PDM, General funds, HMGP	1-5 Years	CPPJ, Fire Districts	Wildfire	1,2	New

## City of DeQuincy New Mitigation Actions

City of DeQuincy New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
D1 Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA, Local	2-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	High Wind, Tropical Cyclone, Tornado, Hail	1,2,3, 4	New
D2 Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, Tropical Cyclone	1,2,5	New
D3 Flood mitigation of severe repetitive loss and repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss and severe repetitive loss or other hazard prone properties.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, Tropical Cyclone	1,2	New
D4 Safe Room Projects	Construction of a safe room for first responders located in the Parish. Other locations will be identified based on funding availability.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ City of DeQuincy	Tornado, High Wind, Tropical Cyclone, Hail	1,2	New
D5 Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorms (lightning, high wind, hail), and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities. Also promoting the use of NOAA "All Hazards" radios for early warning and post event information.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, Tropical Cyclone, Tornadoes, Wildfire, Drought, Excessive Heat, Sinkholes, thunderstorm (lightning, High wind, hail), winter storms	1,2,3, 4,5,6, 7	New
D6 Properties at Risk	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizens of magnitude potential and provide mitigation suggestions	FEMA, Local, USACE	1-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	Tropical Cyclone, High Wind, hail, lightning, flooding, tornado, sinkhole, wildfire	1,2,3, 4,5,6, 7	New

City of DeQuincy New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
D7 Continuity of Operations for Parish, Cooperative Agreements, Communications Equipment	Purchase of communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of residents	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	Tropical Cyclone, high wind, tornado, sinkhole, wildfire, winter storms, hail	1,2	New
D8 Water Rationing Program	Implement a water rationing program with an emphasis on capabilities and enforcement.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	Drought	1,2	New
D9 Community Shelter Construction	Set up of community shelters for the public throughout the parish to shelter public during disasters.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	Excessive heat, thunderstorm (lightning, high wind, hail), winter storms, sinkhole	1,2	New
D10 NFIP Initiatives	Continue the Parish's and its jurisdictions participation in the National Flood Insurance Program (NFIP). Identify and implement necessary actions and steps to further the participation of Calcasieu Parish in the NFIP and Community Rating System including but not limited to floodplain mapping, higher regulatory standards, protecting building utilities, stormwater management standards, drainage system maintenance, and flood warning programs.	FEMA, Local	5 years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, Tropical Cyclone	1,2	New
D11 Lightning Protection for Parish Facilities	Installation of lightning rods and surge protectors to facilities. Upgrade critical facilities database and communications systems including data back-up and surge protection to mitigate losses due to lightning strikes and electrical blackouts.	FEMA, Local	2-3 years	Calcasieu Parish OHSEP/ City of DeQuincy	Lightning	1,2,3, 4	New
D12 Wildfire Mitigation Plan	Develop and implement a regional interagency wildfire mitigation plan	FEMA, Local	1-3 years	Calcasieu Parish OHSEP/ City of DeQuincy	Wildfire	1,2	New
D13 Emergency Warning System and Communications Equipment	Improve communication within the parish by purchasing, installing, and implementing outdoor warning systems and communications equipment to include Incident Management Information Sharing Software.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of DeQuincy	High wind, hail, lightning, flooding, tornado, sinkhole, Tropical Cyclone	1,2,3, 4,5,6	New

## City of DeQuincy New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
D14 GIS Hazard Mitigation Planning	Develop a regional Geographic Information System (GIS) database to support future hazard mitigation planning.	HMGP and Parish	1-3 years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2,3, 4,5,6, 7	New
D15 Interoperable Communications Plan	Develop an interoperability/communications plan identifying resources and equipment needed to establish a single, interagency, mobile incident and communications command post.	HMPG and Parish	1-5 Years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2	New
D16 Vehicle Location System	Install automatic vehicle locator systems in all public school buses and other critical transportation vehicles to ensure continuity of operations and situational awareness during and following disasters.	HMGP	2-3 years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1	New
D17 Generator Installation	Purchase generators and install at critical facilities to continue essential operations parishwide during events.	HMGP	1-2 Years	Calcasieu Parish OHSEP/ City of DeQuincy	Flooding, tropical cyclones, wildfire, winter storms	1,2,3, 4	New
D18 Parish Evacuation Initiatives	Produce a map of evacuation routes and improve evacuation route signing.	HMGP, PDM	1-10 years	Calcasieu Parish OHSEP/ City of DeQuincy	Tropical Cyclone	1	New



City of DeQuincy New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
D19 Tornado Mitigation Initiatives	Provide community facilities and government buildings with a tornado preparation checklist. Require each facility to update their existing tornado response plan in accordance with the list and associated recommendations.	HMGP, 5 percent initiative	1-2 Years	Calcasieu Parish OHSEP/ City of DeQuincy	Tornado	1,2	New
D20 Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinance.	PDM, General funds, HMGP	1-5 Years	Calcasieu Parish OHSEP/ City of DeQuincy	Wildfire	1,2	New

## City of Sulphur New Mitigation Actions

City of Sulphur New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
S1 Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA, Local	2-5 years	Calcasieu Parish OHSEP/ City of Sulphur	High Wind, Tropical Cyclone, Tornado, hail	1,2,3, 4	New
S2 Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, Tropical Cyclone, Subsidence	1,2,5	New
S3 Flood mitigation of severe repetitive loss and repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss and severe repetitive loss or other hazard prone properties.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, Tropical Cyclone, Subsidence	1,2	New
S4 Safe Room Projects	Construction of a safe room for first responders located in the Parish. Other locations will be identified based on funding availability.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ City of Sulphur	Tornado, high wind, tropical cyclone, hail	1,2	New
S5 Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities. Also promoting the use of NOAA "All Hazards" radios for early warning and post event information.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms, subsidence	1,2,3, 4,5,6, 7	New
S6 Properties at Risk	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizens of magnitude potential and provide mitigation suggestions	FEMA, Local, USACE	1-5 years	Calcasieu Parish OHSEP/ City of Sulphur	Tropical Cyclone, high wind, hail, lightning, flooding, tornado, sinkhole,	1,2,3, 4,5,6, 7	New

## City of Sulphur New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
					wildfire, subsidence		
S7 Continuity of Operations for Parish, Cooperative Agreements, Communications Equipment	Purchase of communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of residents	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Sulphur	Tropical Cyclone, high wind, tornado, sinkhole, wildfire, winter storms, hail	1,2	New
S8 Water Rationing Program	Implement a water rationing program with an emphasis on capabilities and enforcement.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Sulphur	Drought	1,2	New
S9 Community Shelter Construction	Set up of community shelters for the public throughout the parish to shelter public during disasters.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Sulphur	Excessive heat, thunderstorm (lightning, high wind, hail), winter storms, sinkhole	1,2	New
S10 NFIP Initiatives	Continue the Parish's and its jurisdictions participation in the National Flood Insurance Program (NFIP). Identify and implement necessary actions and steps to further the participation of Calcasieu Parish in the NFIP and Community Rating System including but not limited to floodplain mapping, higher regulatory standards, protecting building utilities, stormwater management standards, drainage system maintenance, and flood warning programs.	FEMA, Local	5 years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, Tropical Cyclone	1,2	New
S11 Lightning Protection for Parish Facilities	Installation of lightning rods and surge protectors to facilities. Upgrade critical facilities database and communications systems including data back-up and surge protection to mitigate losses due to lightning strikes and electrical blackouts.	FEMA, Local	2-3 years	Calcasieu Parish OHSEP/ City of Sulphur	Lightning	1,2,3, 4	New
S12 Wildfire Mitigation Plan	Develop and implement a regional interagency wildfire mitigation plan	FEMA, Local	1-3 years	Calcasieu Parish OHSEP/ City of Sulphur	Wildfire	1,2	New
S13 Emergency Warning System and Communications Equipment	Improve communication within the parish by purchasing, installing, and implementing outdoor warning systems and communications equipment to include Incident Management Information Sharing Software.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Sulphur	High wind, hail, lightning, flooding, tornado, sinkhole, Tropical Cyclone	1,2,3, 4,5,6	New

## City of Sulphur New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
S14 GIS Hazard Mitigation Planning	Develop a regional Geographic Information System (GIS) database to support future hazard mitigation planning.	HMGP and Parish	1-3 years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, Tropical Cyclone, tornados, wildfire, , drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2,3, 4,5,6, 7	New
S15 Interoperable Communications Plan	Develop an interoperability/communications plan identifying resources and equipment needed to establish a single, interagency, mobile incident and communications command post.	HMPG and Parish	1-5 Years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2	New
S16 Vehicle Location System	Install automatic vehicle locator systems in all public school buses and other critical transportation vehicles to ensure continuity of operations and situational awareness during and following disasters.	HMGP	2-3 years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1	New
S17 Generator Installation	Purchase generators and install at critical facilities to continue essential operations parishwide during events.	HMGP	1-2 Years	Calcasieu Parish OHSEP/ City of Sulphur	Flooding, tropical cyclones, wildfire, winter storms	1,2,3, 4	New
S18 Parish Evacuation Initiatives	Produce a map of evacuation routes and improve evacuation route signing.	HMGP, PDM	1-10 years	Calcasieu Parish OHSEP/ City of Sulphur	Tropical Cyclone	1	New
S19 Tornado Mitigation Initiatives	Provide community facilities and government buildings with a tornado preparation checklist. Require each facility to update their existing tornado response plan in accordance with the list and associated recommendations.	HMGP, 5 percent initiative	1-2 Years	Calcasieu Parish OHSEP/ City of Sulphur	Tornado	1,2	New

## City of Sulphur New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
S20 Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinance.	PDM, General funds, HMGP	1-5 Years	Calcasieu Parish OHSEP/ City of Sulphur	Wildfire	1,2	New



## Town of Vinton New Mitigation Actions

Town of Vinton New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
V1 Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA, Local	2-5 years	Calcasieu Parish OHSEP/ Town of Vinton	High Wind, Tropical Cyclone, Tornado, Hail	1,2,3,4	New
V2 Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, Tropical Cyclone, Subsidence	1,2,5	New
V3 Flood mitigation of severe repetitive loss and repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss and severe repetitive loss or other hazard prone properties.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, Tropical Cyclone, Subsidence	1,2	New
V4 Safe Room Projects	Construction of a safe room for first responders located in the Parish. Other locations will be identified based on funding availability.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ Town of Vinton	Tornado, high wind, tropical cyclone, hail	1,2	New
V5 Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities. Also promoting the use of NOAA "All Hazards" radios for early warning and post event information.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms, subsidence	1,2,3,4,5,6,7	New
V6 Properties at Risk	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizens of magnitude potential and provide mitigation suggestions	FEMA, Local, USACE	1-5 years	Calcasieu Parish OHSEP/ Town of Vinton	Tropical Cyclone, high wind, hail, lightning, flooding, tornado, sinkhole,	1,2,3,4,5,6,7	New

Town of Vinton New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
					wildfire, subsidence		
V7 Continuity of Operations for Parish, Cooperative Agreements, Communications Equipment	Purchase of communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of residents	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Vinton	Tropical Cyclone, high wind, tornado, sinkhole, wildfire, winter storms	1,2	New
V8 Water Rationing Program	Implement a water rationing program with an emphasis on capabilities and enforcement.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Vinton	Drought	1,2	New
V9 Community Shelter Construction	Set up of community shelters for the public throughout the parish to shelter public during disasters.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Vinton	Excessive heat, thunderstorm (lightning, high wind, hail), winter storms, sinkhole	1,2	New
V10 NFIP Initiatives	Continue the Parish's and its jurisdictions participation in the National Flood Insurance Program (NFIP). Identify and implement necessary actions and steps to further the participation of Calcasieu Parish in the NFIP and Community Rating System including but not limited to floodplain mapping, higher regulatory standards, protecting building utilities, stormwater management standards, drainage system maintenance, and flood warning programs.	FEMA, Local	5 years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, Tropical Cyclone	1,2	New
V11 Lightning Protection for Parish Facilities	Installation of lightning rods and surge protectors to facilities. Upgrade critical facilities database and communications systems including data back-up and surge protection to mitigate losses due to lightning strikes and electrical blackouts.	FEMA, Local	2-3 years	Calcasieu Parish OHSEP/ Town of Vinton	Lightning	1,2,3,4	New
V12 Wildfire Mitigation Plan	Develop and implement a regional interagency wildfire mitigation plan	FEMA, Local	1-3 years	Calcasieu Parish OHSEP/ Town of Vinton	Wildfire	1,2	New
V13 Emergency Warning System and Communications Equipment	Improve communication within the parish by purchasing, installing, and implementing outdoor warning systems and communications equipment to include Incident Management Information Sharing Software.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Vinton	High wind, hail, lightning, flooding, tornado, sinkhole, Tropical Cyclone	1,2,3,4,5,6	New

Town of Vinton New Mitigation Actions							
Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
V14 GIS Hazard Mitigation Planning	Develop a regional Geographic Information System (GIS) database to support future hazard mitigation planning.	HMGP and Parish	1-3 years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2,3, 4,5,6, 7	New
V15 Interoperable Communications Plan	Develop an interoperability/communications plan identifying resources and equipment needed to establish a single, interagency, mobile incident and communications command post.	HMPG and Parish	1-5 Years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2	New
V16 Vehicle Location System	Install automatic vehicle locator systems in all public school buses and other critical transportation vehicles to ensure continuity of operations and situational awareness during and following disasters.	HMGP	2-3 years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1	New
V17 Generator Installation	Purchase generators and install at critical facilities to continue essential operations parishwide during events.	HMGP	1-2 Years	Calcasieu Parish OHSEP/ Town of Vinton	Flooding, tropical cyclones, wildfire, winter storms	1,2,3, 4	New
V18 Parish Evacuation Initiatives	Produce a map of evacuation routes and improve evacuation route signing.	HMGP, PDM	1-10 years	Calcasieu Parish OHSEP/ Town of Vinton	Tropical Cyclone	1	New
V19 Tornado Mitigation Initiatives	Provide community facilities and government buildings with a tornado preparation checklist. Require each facility to update their existing tornado response plan in accordance with the list and associated recommendations.	HMGP, 5 percent initiative	1-2 Years	Calcasieu Parish OHSEP/ Town of Vinton	Tornado	1,2	New

## Town of Vinton New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
V20 Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinance.	PDM, General funds, HMGP	1-5 Years	Calcasieu Parish OHSEP/ Town of Vinton	Wildfire	1,2	New

## City of Westlake New Mitigation Actions

## City of Westlake New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
W1 Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA, Local	2-5 years	Calcasieu Parish OHSEP/ City of Westlake	High Wind, Tropical Cyclone, Tornado, Hail	1,2, 3,4	New
W2 Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, Tropical Cyclone, Subsidence	1,2, 5	New
W3 Flood mitigation of severe repetitive loss and repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss and severe repetitive loss or other hazard prone properties.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, Tropical Cyclone, Subsidence	1,2	New
W4 Safe Room Projects	Construction of a safe room for first responders located in the Parish. Other locations will be identified based on funding availability.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ City of Westlake	Tornado, high wind, tropical cyclone, hail	1,2	New
W5 Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high	1,2, 3,4, 5,6, 7	New

## City of Westlake New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
	resiliency within the parish and its communities. Also promoting the use of NOAA "All Hazards" radios for early warning and post event information.				wind, hail), winter storms, subsidence		
W6 Properties at Risk	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizens of magnitude potential and provide mitigation suggestions	FEMA, Local, USACE	1-5 years	Calcasieu Parish OHSEP/ City of Westlake	Tropical Cyclone, wind, hail, lightning, flooding, tornado, sinkhole, wildfire, hail, subsidence	1,2, 3,4, 5,6, 7	New
W7 Continuity of Operations for Parish, Cooperative Agreements, Communications Equipment	Purchase of communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of residents	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Westlake	Tropical Cyclone, high wind, tornado, sinkhole, wildfire, winter storms	1,2	New
W8 Water Rationing Program	Implement a water rationing program with an emphasis on capabilities and enforcement.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Westlake	Drought	1,2	New
W9 Community Shelter Construction	Set up of community shelters for the public throughout the parish to shelter public during disasters.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Westlake	Excessive heat, thunderstorm (lightning, high wind, hail), winter storms, sinkhole	1,2	New
W10 NFIP Initiatives	Continue the Parish's and its jurisdictions participation in the National Flood Insurance Program (NFIP). Identify and implement necessary actions and steps to further the participation of Calcasieu Parish in the NFIP and Community Rating System including but not limited to floodplain mapping, higher regulatory standards, protecting building utilities, stormwater management standards, drainage system maintenance, and flood warning programs.	FEMA, Local	5 years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, Tropical Cyclone	1,2	New
W11 Lightning Protection for Parish Facilities	Installation of lightning rods and surge protectors to facilities. Upgrade critical facilities database and communications systems including data back-up and surge protection to mitigate losses due to lightning strikes and electrical blackouts.	FEMA, Local	2-3 years	Calcasieu Parish OHSEP/ City of Westlake	Lightning	1,2, 3,4	New
W12 Wildfire Mitigation Plan	Develop and implement a regional interagency wildfire mitigation plan	FEMA, Local	1-3 years	Calcasieu Parish OHSEP/ City of Westlake	Wildfire	1,2	New



## City of Westlake New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
W13 Emergency Warning System and Communications Equipment	Improve communication within the parish by purchasing, installing, and implementing outdoor warning systems and communications equipment to include Incident Management Information Sharing Software.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Westlake	High wind, hail, lightning, flooding, tornado, sinkhole, Tropical Cyclone	1,2, 3,4, 5,6	New
W14 GIS Hazard Mitigation Planning	Develop a regional Geographic Information System (GIS) database to support future hazard mitigation planning.	HMGP and Parish	1-3 years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2, 3,4, 5,6, 7	New
W15 Interoperable Communications Plan	Develop an interoperability/communications plan identifying resources and equipment needed to establish a single, interagency, mobile incident and communications command post.	HMPG and Parish	1-5 Years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2	New
W16 Vehicle Location System	Install automatic vehicle locator systems in all public school buses and other critical transportation vehicles to ensure continuity of operations and situational awareness during and following disasters.	HMGP	2-3 years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1	New
W17 Generator Installation	Purchase generators and install at critical facilities to continue essential operations parishwide during events.	HMGP	1-2 Years	Calcasieu Parish OHSEP/ City of Westlake	Flooding, tropical cyclones, wildfire, winter storms	1,2, 3,4	New
W18 Parish Evacuation Initiatives	Produce a map of evacuation routes and improve evacuation route signing.	HMGP, PDM	1-10 years	Calcasieu Parish OHSEP/ City of Westlake	Tropical Cyclone	1	New

## City of Westlake New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
W19 Tornado Mitigation Initiatives	Provide community facilities and government buildings with a tornado preparation checklist. Require each facility to update their existing tornado response plan in accordance with the list and associated recommendations.	HMGP, 5 percent initiative	1-2 Years	Calcasieu Parish OHSEP/ City of Westlake	Tornado	1,2	New
W20 Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinance.	PDM, General funds, HMGP	1-5 Years	Calcasieu Parish OHSEP/ City of Westlake	Wildfire	1,2	New

## Town of Iowa New Mitigation Actions

## Town of Iowa New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
W1 Building Retrofits	Retrofit public buildings exterior shell to maintain use during and after storm events. Benefits: Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA, Local	2-5 years	Calcasieu Parish OHSEP/ Town of Iowa	High Wind, Tropical Cyclone, Tornado, Hail	1,2, 3,4	New
W2 Drainage Improvement	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves Parish or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, Tropical Cyclone	1,2, 5	New
W3 Flood mitigation of severe repetitive loss and repetitive loss properties and other hazard prone structures	Elevation, acquisition-demolition, acquisition-relocations, and reconstruction of repetitive loss and severe repetitive loss or other hazard prone properties.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, Tropical Cyclone	1,2	New
W4 Safe Room Projects	Construction of a safe room for first responders located in the Parish. Other locations will be identified based on funding availability.	FEMA, Local	1-10 years	Calcasieu Parish OHSEP/ Town of Iowa	Tornado, high wind, tropical cyclone, hail	1,2	New

## Town of Iowa New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
W5 Education and Outreach	Enhance the public outreach programs for the parish and all communities by increasing awareness of risks and safety for Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), and winter storm hazards as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities. Also promoting the use of NOAA "All Hazards" radios for early warning and post event information.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, Tropical Cyclone, tornadoes, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2, 3,4, 5,6, 7	New
W6 Properties at Risk	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizens of magnitude potential and provide mitigation suggestions	FEMA, Local, USACE	1-5 years	Calcasieu Parish OHSEP/ Town of Iowa	Tropical Cyclone, wind, hail, lightning, flooding, tornado, sinkhole, wildfire, hail	1,2, 3,4, 5,6, 7	New
W7 Continuity of Operations for Parish, Cooperative Agreements, Communications Equipment	Purchase of communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of residents	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Iowa	Tropical Cyclone, high wind, tornado, sinkhole, wildfire, winter storms	1,2	New
W8 Water Rationing Program	Implement a water rationing program with an emphasis on capabilities and enforcement.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Iowa	Drought	1,2	New
W9 Community Shelter Construction	Set up of community shelters for the public throughout the parish to shelter public during disasters.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Iowa	Excessive heat, thunderstorm (lightning, high wind, hail), winter storms, sinkhole	1,2	New
W10 NFIP Initiatives	Continue the Parish's and its jurisdictions participation in the National Flood Insurance Program (NFIP). Identify and implement necessary actions and steps to further the participation of Calcasieu Parish in the NFIP and Community Rating System including but not limited to floodplain mapping, higher regulatory standards, protecting building utilities, stormwater management standards, drainage system maintenance, and flood warning programs.	FEMA, Local	5 years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, Tropical Cyclone	1,2	New

## Town of Iowa New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
W11 Lightning Protection for Parish Facilities	Installation of lightning rods and surge protectors to facilities. Upgrade critical facilities database and communications systems including data back-up and surge protection to mitigate losses due to lightning strikes and electrical blackouts.	FEMA, Local	2-3 years	Calcasieu Parish OHSEP/ Town of Iowa	Lightning	1,2, 3,4	New
W12 Wildfire Mitigation Plan	Develop and implement a regional interagency wildfire mitigation plan	FEMA, Local	1-3 years	Calcasieu Parish OHSEP/ Town of Iowa	Wildfire	1,2	New
W13 Emergency Warning System and Communications Equipment	Improve communication within the parish by purchasing, installing, and implementing outdoor warning systems and communications equipment to include Incident Management Information Sharing Software.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ Town of Iowa	High wind, hail, lightning, flooding, tornado, sinkhole, Tropical Cyclone	1,2, 3,4, 5,6	New
W14 GIS Hazard Mitigation Planning	Develop a regional Geographic Information System (GIS) database to support future hazard mitigation planning.	HMGP and Parish	1-3 years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2, 3,4, 5,6, 7	New
W15 Interoperable Communications Plan	Develop an interoperability/communications plan identifying resources and equipment needed to establish a single, interagency, mobile incident and communications command post.	HMPG and Parish	1-5 Years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1,2	New
W16 Vehicle Location System	Install automatic vehicle locator systems in all public school buses and other critical transportation vehicles to ensure continuity of operations and situational awareness during and following disasters.	HMGP	2-3 years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, Tropical Cyclone, tornados, wildfire, drought, excessive heat, sinkholes, thunderstorm (lightning, high wind, hail), winter storms	1	New

## Town of Iowa New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
W17 Generator Installation	Purchase generators and install at critical facilities to continue essential operations parishwide during events.	HMGP	1-2 Years	Calcasieu Parish OHSEP/ Town of Iowa	Flooding, tropical cyclones, wildfire, winter storms	1,2,3,4	New
W18 Parish Evacuation Initiatives	Produce a map of evacuation routes and improve evacuation route signing.	HMGP, PDM	1-10 years	Calcasieu Parish OHSEP/ Town of Iowa	Tropical Cyclone	1	New
W19 Tornado Mitigation Initiatives	Provide community facilities and government buildings with a tornado preparation checklist. Require each facility to update their existing tornado response plan in accordance with the list and associated recommendations.	HMGP, 5 percent initiative	1-2 Years	Calcasieu Parish OHSEP/ Town of Iowa	Tornado	1,2	New
W20 Wildfire Ordinance	Strengthen penalties and improve enforcement capabilities of burn ban ordinance.	PDM, General funds, HMGP	1-5 Years	Calcasieu Parish OHSEP/ Town of Iowa	Wildfire	1,2	New

## City of Lake Charles New Mitigation Actions

## City of Lake Charles New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
LC1 Public Building wind hardening	Retrofit public buildings exterior shells to maintain use during and after storm events. Benefits: Reduces damage from high winds and hail, and helps assure that the identified public buildings can be used, occupied and operable during or after natural hazard events.	HMGP and Parish funding	November 2015 through December, 2018	City of Lake Charles	High Wind, Tropical Cyclone, Tornado, hail	1,2,3,4	New
LC2 Drainage - flood relief projects	Will relieve flooding problems, reduce flood damage and costs of damage, overtopping of roads with drain water, while also keeping open roadways during periods of high precipitation. Benefits: Relieves city or local government and property owners of the continual flooding problems, with closed roadways (loss of function). Saves public funds for road repairs, drainage ditch repairs, sandbagging and blocking of roadways during storm periods.	HMGP and Parish funding	November 2015 through December, 2018	City of Lake Charles	Flooding, Tropical Cyclone, Subsidence	1,2,5	New



## City of Lake Charles New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
LC3 Lift Station Hardening and Upgrades	Lift Station elevation, hardening and retrofits of five (5) unit stations. Replace and raise controls, provide and install submersible pumps, coat wells. Ability to control and better monitor sewer pumps remotely to avoid sewer flooding and back ups during emergency events. Provide for reliable wastewater removal during hazardous weather events. Reduces loss of life or property by preventing hazardous backups into homes. Protects public facilities and thoroughfares from sanitary sewer overflows, protects natural resources from contamination from overflows.	HMGP, City and other funds	January 2016- January 2019	City of Lake Charles	Flooding, Tropical Cyclone, thunderstorm, lightning, high wind, hail	1,2,5	New
LC4 Residential elevations and acquisitions for repetitive loss properties and severe repetitive loss properties	Elevation or acquisition-demolition of repetitive loss or severe repetitive loss properties. Benefits: Relieves property owners of the continual flooding problems. Saves flood relief and damage repayment for each property.	HMGP	November 2015 through December, 2018	City of Lake Charles	Flooding, tropical cyclone, subsidence	1,2	New
LC5 Safe Room Projects	Construction of a safe room for first responders located in Lake Charles. Other locations will be identified based on funding availability.	HMGP and Parish	April 2016 - December 2018	City of Lake Charles	Tornado, high wind, tropical cyclone	1,2	New
LC6 Mitigation Public Outreach	Enhance the public outreach programs for the city and all communities by increasing awareness of risks and safety for flooding, tropical cyclone, tornadoes, excessive heat, sinkholes, wind, lightning, hail, winter storms and wildfire hazards, as well as providing information on high risk areas. Informing communities, business and citizens on proper mitigation efforts and activities will create resiliency within the parish and its communities.	HMPG and Parish	January 2016 through December, 2018	City of Lake Charles	Flooding, Tropical Cyclone, tornados, wildfire, excessive heat, sinkholes, high wind, lightning, hail, winter storms, subsidence	1,2,3, 4,5,6, 7	New
LC7 City Sewer mitigation project	Clean, camera and repair city mainlines for sewer to mitigate inflow and infiltration from flooding and storm related waters. Reduces loss of life or property by preventing hazardous backups into homes. Protects public facilities and thoroughfares from sanitary sewer overflows, protects natural resources from contamination from overflows.	HMGP and City	January 2016- January 2019	City of Lake Charles	Flooding, Tropical Cyclone, thunderstorm, high wind, winter storm, Drought	1,2,5	New

## City of Lake Charles New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
LC8 Plant A Final Clarifier Replacement/ City Wastewater Plant Mitigation	Replace undersized final clarification units at wastewater plant. Provides for fewer suspended solids released into environment during hazardous weather events. Protects public waterways from sanitary sewer treatment exceedences, protects natural resources from contamination. Allows for better plant operation and efficiency by returning solids to plant operations not environment	HMGP and City	January 2016- January 2019	City of Lake Charles	Flooding, Tropical Cyclone, thunderstorm, high wind, winter storm	1,2,5	New
LC9 Water Plant Retrofits	The City of Lake Charles proposes to harden the water plants of Chennault, Center East, Center West, and McNeese, with siding retrofits, storm shutters, and doors. This will allow the water plants to withstand and minimize damage during natural disaster weather events. The structural integrity of the sites will be improved, thereby lessening the chance of loss of critical services during pre and post disaster events. These facilities are critical to assuring that adequate potable water as well as fire protection is available during these natural disaster weather events.	HMGP and City	January 2016- January 2025	City of Lake Charles	Flooding, Tropical Cyclone, thunderstorm, high wind, hail	1,2,3, 4	New
LC10 Generator Retrofit	Retrofit existing emergency generator which supplies the wastewater plant with emergency power during power outages. Retrofit will allow generator to supply both facilities during power outages. Retrofit to include electrical lines, wiring, and control panels. Supplying emergency power generation to site will ensure the operation of the facility during natural disaster weather events. This facility is critical to assuring that adequate potable water as well as fire protection is available during hazardous events.	HMGP and City	January 2016- January 2026	City of Lake Charles	Flooding, Tropical Cyclone, thunderstorm , high wind, winter storm, wildfire, tornado, hail	1,2,3, 4	New
LC 11 Lightning Rod Installation	Purchase and Installation of lightning rods for public facilities and buildings to mitigate the loss of property and life from lightning events	HMGP and City	January 2016- January 2020	City of Lake Charles	Lightning	1,2,3, 4	New
LC12 Community Shelter Construction	Set up of community shelters for the public in the City Of Lake Charles to shelter public during disasters.	FEMA, Local	1-5 years	CPPJ OHSEP, City of Lake Charles	Excessive heat, winter storms, sinkhole	1,2	New
LC13 Wildfire Mitigation Initiative	Develop and implement a regional interagency wildfire mitigation plan	FEMA, Local	1-3 years	CPPJ OHSEP, Fire Districts, City of Lake Charles	Wildfire	1,2	New

## City of Lake Charles New Mitigation Actions

Action	Action Description	Funding Source	Target Completion Date	Responsible Party, Agency, or Department	Hazard	Goal	Status
LC15 Emergency Warning System and Communication Equipment	Improve communication within the parish by purchasing, installing, and implementing outdoor warning systems and communications equipment to include Incident Management Information Sharing Software.	FEMA, Local	1-5 years	CPPJ OHSEP, City of Lake Charles	High wind, hail, lightning, flooding, tornado, sinkhole, Tropical Cyclone	1,2,3,4,5,6	New
LC16 Lift Station Radio Upgrades	Replace communication radios to upgraded units to allow for pump controls during emergency and day to day operations. (38 Units). This provides ability to control and better monitor sewer pumps remotely to avoid backups during emergencies.	FEMA, Local	1 year	City of Lake Charles	Flooding, Tropical Cyclone, thunderstorm, high wind, winter storm, tornado, hail	1,2,3,4	New
LC17 Plant D Generator Replacement	Replace wastewater plant generator. This will reduce the loss of life and property by preventing hazardous backups into homes during events. It also protects public facilities and thoroughfares from sanitary sewer overflows and protects natural resources from contamination from overflows.	FEMA, Local	1 year	City of Lake Charles	Flooding, Tropical Cyclone, thunderstorm, high wind, winter storm, tornado, hail	1,2,3,4	New
LC18 Water Rationing Program	Implement a water rationing program with an emphasis on capabilities and enforcement.	FEMA, Local	1-5 years	Calcasieu Parish OHSEP/ City of Lake Charles	Drought	1,2	New

## Action Prioritization

During the prioritization process, each jurisdiction and the Steering Committee considered the costs and relative benefits of each new action. Costs can usually be listed in terms of dollars, although at times it involves staff time rather than the purchase of equipment or services that can be readily measured in dollars. In most cases, benefits, such as lives saved or future damage prevented, are hard to measure in dollars, many projects were prioritized with these factors in mind.

In all cases, the jurisdictions concluded that the benefits (in terms of reduced property damage, lives saved, health problems averted and/or economic harm prevented) outweighed the costs for the recommended action items.

The Steering Committee met internally for mitigation action meetings to review and approve Calcasieu Parish and each jurisdictions mitigation actions. On-going actions, as well as actions which can be undertaken by existing parish or local staff without need for additional funding, were given high priority. The actions with high benefit and low cost, political support, and public support but require additional funding from parish or external sources were given medium priority. The actions that require substantial funding from external sources with relatively longer completion time were given low priority.

Calcasieu Parish and the participating jurisdictions will implement and administer the identified actions based off of the proposed timeframes and priorities for each reflected in the portions of this section where actions are summarized. The inclusion of any specific action item in this document does not commit the parish to implementation. Each action item will be subject to availability of staff and funding. Certain items may require regulatory changes or other decisions that must be implemented through standard processes, such as changing regulations. This plan is intended to offer priorities based on an examination of hazards.

Calcasieu Parish and the jurisdictions will implement and administer the identified actions based off of the proposed timeframes and priorities for each action.

## Appendix A: Planning Process

### Purpose

The hazard mitigation plan update process prompts local jurisdictions to keep their hazard mitigation plan current and moving toward a more resilient community. The plan update builds on the research and planning efforts of previous plans while reviewing recent trends. The Steering Committee followed FEMA's hazard mitigation planning process per the FEMA Local Mitigation Planning Handbook. This planning process assured public involvement and the participation of interested agencies and private organizations. Documentation of the planning process for the updated plan is addressed in this section.

### The Calcasieu Parish Hazard Mitigation Plan Update

The Calcasieu Parish Hazard Mitigation Plan Update process began in February 2015 with a series of meetings and collaborations between the contractor (SDMI) and the participating jurisdictions. Update activities were intended to give each jurisdiction the opportunity to shape the plan to best fit their community's goals. Community stakeholders and the general public were invited to attend and contribute information to the planning process during specific time periods or meetings.

Calcasieu Parish includes six incorporated municipalities: the towns of Iowa and Vinton, and the cities of DeQuincy, Lake Charles, Sulphur, and Westlake. All six municipalities participated in the Plan Update process. Calcasieu Parish Office of Homeland Security and Emergency Preparedness (OHSEP) invited communities' representatives to meetings, where they supplied critical infrastructure data and reviewed work-in-progress for the Plan Update.

Similar to the development of the original hazard mitigation plan, the role of the Steering Committee members during the Plan Update was to attend the planning meetings and provide valuable information on the parish, develop parts of the Plan Update, and review the results of research conducted by SDMI. Tasks completed by the Steering Committee include:

- Reviewing and revising the list of potential hazards included in the Plan Update
- Assembling a list of critical facilities, such as hospitals, police stations, and shelters
- Updating mitigation goals and objectives
- Determining prudent mitigation measures
- Prioritization of identified mitigation measures



The table below details the meeting schedule and purpose for the planning process:

Date	Meeting or Outreach	Location	Public Invited	Purpose
2/27/2015	Initial Coordination	Telephone/ Email	No	Discuss with Parish HM coordinator and any Steering Committee members expectations and requirements of the project.
3/31/2015	Kick-Off Meeting	Calcasieu OHSEP, Lake Charles, LA	No	Discuss with the plan Steering Committee expectations and requirements of the project. Assign plan worksheets to jurisdictions.
7/25/2015	Risk Assessment Overview	Police Jury, Lake Charles, LA	No	Discuss and review the risk assessment with the Steering Committee discuss and review expectations for public meeting.
7/25/2015	Public Meeting	Police Jury, Lake Charles, LA	Yes	The public meeting allowed the public and community stakeholders to participate and provide input into the hazard mitigation planning process. Maps of the Calcasieu parish communities were provide for the meeting attendees to identify specific areas where localized hazards occur.
Ongoing	Public Survey Tool	Online	Yes	This survey asked participants about public perceptions and opinions regarding natural hazards in Calcasieu Parish. In addition, we asked about the methods and techniques preferred for reducing the risks and losses associated with these hazards. Survey Results: <a href="https://www.surveymonkey.com/r/CalcasieuHMPU">https://www.surveymonkey.com/r/CalcasieuHMPU</a>
2 Week Period	Public Plan Review (Digital)		Yes	Parish Website and Calcasieu Parish OHSEP

## Planning

The plan update process consisted of several phases

Phase	Month 1-2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
Plan Revision								
Data Collection								
Risk Assessment								
Public Input								
Mitigation Strategy and Actions								
Plan Review by GOHSEP and FEMA								
Plan Adoption								
Plan Approval								

## Coordination

The Calcasieu Parish OHSEP oversaw the coordination of the 2015 Hazard Mitigation Plan Update Steering Committee during the update process. The Calcasieu Parish OHSEP and participating jurisdictions were responsible for identifying members for the committee.

The Parish Director and SDMI were jointly responsible for inviting the Steering Committees and key stakeholders to planned meetings and activities. SDMI assisted the Parish Director with meeting notices, website and social media statements for notification to the media and general public for public meetings and public outreach activities.

SDMI was responsible for facilitating meetings and outreach efforts during the update process.

## Neighboring Community, Local and Regional Planning Process Involvement

From the outset of the planning process, the Hazard Mitigation Team encouraged participation from a broad range of jurisdictional entities. The involvement of representatives from the city, state, and regional agencies provided diverse perspectives and mitigation ideas.

Formal participation in this plan includes but is not limited to the following activities:

- Participation in Hazard Mitigation Team meetings at the local and parish level
- Sharing local data and information

- Local action item development
- Plan document draft review
- Formal adoption of the Hazard Mitigation Plan document by each jurisdiction following provisional approval by The State of Louisiana and FEMA

The 2015 Hazard Mitigation Plan Update Steering Committee consisted of representatives from the following parish, municipal or community stakeholders:

- Calcasieu Parish Government
- Calcasieu Office of Homeland Security and Emergency Preparedness
- City of Lake Charles
- City of DeQuincy
- City of Sulphur
- City of Westlake
- Town of Iowa
- Town of Vinton

The Parish of Cameron was invited by the Calcasieu Parish OHSEP to participate in all meetings and activities as well in an effort to collaborate with neighboring communities. With the addition of the sinkhole hazard, Beauregard Parish and Calcasieu Parish will collaborate in the future on any mitigation measures necessary to mitigate the area in which the buffer zone of a sinkhole in Calcasieu Parish overlaps the parish line with Beauregard Parish. The participation of the GOHSEP Region 9 Coordinator during the process also contributed to neighboring community representation.

As part of the coordination and planning process, each jurisdiction was provided the State Required Hazard Mitigation Plan Update Worksheet. Jurisdictions with the capability to complete and return these worksheets returned them to assist with the 2015 update. The completed worksheets can be found in Appendix E – State Required Plan Update Worksheets

*Below is a detailed list of the 2015 HAZARD MITIGATION PLAN UPDATE Steering Committee:*

Member/Title	Jurisdiction/Entity	Address	Phone/Email
Dick Gremillion Director	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:dgremillion@cpji.net">dgremillion@cpji.net</a>
Norman Bourdeau Operations Manager	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:nbourdeau@cpji.net">nbourdeau@cpji.net</a>
Marc Ferguson Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:mferguson@cpji.net">mferguson@cpji.net</a>
Rob Daughdril Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:rdaughdril@cpji.net">rdaughdril@cpji.net</a>
Cade McLemore Emergency Planner	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:jmclmore@cpji.net">jmclmore@cpji.net</a>
Emily Abshire Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:eabshire@cpji.net">eabshire@cpji.net</a>
Jennifer Cobian Senior Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jcobian@cpji.net">jcobian@cpji.net</a>
Mary Jo Bayles Planner	City of Dequincy	300 N. Holly St. DeQuincy, LA 70633	337-786-8211 <a href="mailto:mjbayles@cityofdequincy.com">mjbayles@cityofdequincy.com</a>
Louis Coats Police Chief	City of Sulphur	500 N. Huntington Sulphur, LA 70663	337-527-4550 <a href="mailto:lcoats@sulphur.org">lcoats@sulphur.org</a>
John Reon Superintendent	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:jreon@bellsouth.net">jreon@bellsouth.net</a>
Eddie Hebert Superintendent in Training	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:eddie@gdd8.net">eddie@gdd8.net</a>
Terri Hawes Permit Technician	City of Westlake	P.O. Box 700, Westlake, LA 70669	337-433-0691 <a href="mailto:terrihawes@hotmail.com">terrihawes@hotmail.com</a>
Sandra Turley Municipal Clerk	Town of Iowa	P.O. Box 1707 Iowa, LA 70647	337-582-3535 <a href="mailto:sandra@iowala.org">sandra@iowala.org</a>
Mary Vice Municipal Clerk	Town of Vinton	1200 Horridge St. Vinton, LA 70668	337-589-7453 <a href="mailto:cityclerk_@cityofvinton.com">cityclerk_@cityofvinton.com</a>

Member/Title	Jurisdiction/Entity	Address	Phone/Email
<b>Lori Marinovich</b> Executive Director	City of Lake Charles	326 Pujo Street Lake Charles, LA 70601	337-491-1429 <a href="mailto:lmarinovich@cityoflc.us">lmarinovich@cityoflc.us</a>
<b>Jennifer Wallace</b> Manager	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jwallace@cppl.net">jwallace@cppl.net</a>
<b>Carl Chance</b> IT Director	Sabine River Authority	15091 Texas Hwy., Many, LA 71449	318-256-4114 <a href="mailto:carl.chance@la.gov">carl.chance@la.gov</a>

### Program Integration

Local governments are required to describe how their mitigation planning process is integrated with other ongoing local and area planning efforts. This subsection describes Calcasieu Parish programs and planning.

A measure of integration and coordination is achieved through the Hazard Mitigation Plan participation of Steering Committee members and community stakeholders, who administer programs such as floodplain management under the National Flood Insurance Program (NFIP) and parish planning and zoning and building code enforcement.

Opportunities to integrate the requirements of this Hazard Mitigation Plan into other local planning mechanisms will continue to be identified through future meetings of the parish and jurisdictions, and through the five-year review process described in the Plan Maintenance Section. The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update, and implementation of each jurisdiction's individual city/town plans that require specific planning and administrative tasks (e.g. risk assessment, plan amendments, ordinance revisions, capital improvement projects, etc.).

The members of the Calcasieu Parish Hazard Mitigation Steering Committee will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability in the parish. Existing plans, studies, and technical information were incorporated in the planning process. Examples include flood data from FEMA, the U.S. Army Corps of Engineers (USACE or Corps), and the U.S. Geological Survey. Much of this data was incorporated into the risk assessment component of the plan relative to plotting historical events and the magnitude of damages that occurred. The parish's 2005 Hazard Mitigation Plan was also used in the planning process. Other existing parish and jurisdiction data and plans reviewed and/or incorporated into the planning process include those listed below:

- Floodplain Ordinances (Parish and Jurisdictions)
- Emergency Operations Plan (Parish and Jurisdictions)
- Envision Calcasieu 2020 Plan (previously the Comprehensive Plan)
- Debris Removal Plan
- Economic Plan (Parish and Jurisdictions)
- Stormwater Management Plan
- Flood Insurance Rate Maps



Further information on other plans and capabilities reviewed can be found in the Capabilities Assessment, Section 3.

### Meeting Documentation and Public Outreach Activities

The following pages contain information from the meetings and public outreach activities conducted during this Hazard Mitigation Plan Update for Calcasieu Parish.

#### Meeting #1: Coordination Conference Call

**Date:** February 27, 2015

**Location:** Teleconference

**Purpose:** Discuss with the hazard mitigation lead for the parish (OHSEP director) the expectations and requirements of the hazard mitigation plan update process and to establish an initial project timeline.

**Public Initiation:** All parish government meetings are open to the public

**Invitees included:**

**SDMI Staff** – Lauren Stevens, Project Lead

**Calcasieu OHSEP** – Norman Bourdeau

#### Meeting #2: Hazard Mitigation Plan Update Kick-Off

**Date:** March 31, 2015

**Location:** Lake Charles, Louisiana

**Purpose:** Discuss the expectations and requirements of the hazard mitigation plan update process and to establish an initial project timeline with the Parish's Hazard Mitigation Plan Steering Committee. Assign each individual jurisdiction and the parish data collection for the plan update.

**Public Initiation:** All parish government meetings are open to the public

## Invitees Included:

Member/Title	Jurisdiction/Entity	Address	Phone/Email
Dick Gremillion Director	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:dgremillion@cppj.net">dgremillion@cppj.net</a>
Norman Bourdeau Operations Manager	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:nbourdeau@cppj.net">nbourdeau@cppj.net</a>
Marc Ferguson Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:mferguson@cppj.net">mferguson@cppj.net</a>
Rob Daughdril Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:rdaughdril@cppj.net">rdaughdril@cppj.net</a>
Cade McLemore Emergency Planner	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:jmclemore@cppj.net">jmclemore@cppj.net</a>
Emily Abshire Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:eabshire@cppj.net">eabshire@cppj.net</a>
Jennifer Cobian Senior Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jcobian@cppj.net">jacobian@cppj.net</a>
Mary Jo Bayles Planner	City of Dequincy	300 N. Holly St. DeQuincy, LA 70633	337-786-8211 <a href="mailto:mjbayles@cityofdequincy.com">mjbayles@cityofdequincy.com</a>
Louis Coats Police Chief	City of Sulphur	500 N. Huntington Sulphur, LA 70663	337-527-4550 <a href="mailto:lcoats@sulphur.org">lcoats@sulphur.org</a>
John Reon Superintendant	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:jreon@bellsouth.net">jreon@bellsouth.net</a>
Eddie Hebert Superintendant in Training	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:eddie@gdd8.net">eddie@gdd8.net</a>
Terri Hawes Permit Technician	City of Westlake	P.O. Box 700, Westlake, LA 70669	337-433-0691 <a href="mailto:terrihawes@hotmail.com">terrihawes@hotmail.com</a>
Sandra Turley Municipal Clerk	Town of Iowa	P.O. Box 1707 Iowa, LA 70647	337-582-3535 <a href="mailto:sandra@iowala.org">sandra@iowala.org</a>
Mary Vice Municipal Clerk	Town of Vinton	1200 Horridge St. Vinton, LA 70668	337-589-7453 <a href="mailto:cityclerk@cityofvinton.com">cityclerk @cityofvinton.com</a>

Member/Title	Jurisdiction/Entity	Address	Phone/Email
Lori Marinovich Executive Director	City of Lake Charles	326 Pujo Street Lake Charles, LA 70601	337-491-1429 <a href="mailto:lmarinovich@cityoflc.us">lmarinovich@cityoflc.us</a>
Jennifer Wallace Manager	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jwallace@cppj.net">jwallace@cppj.net</a>
Carl Chance IT Director	Sabine River Authority	15091 Texas Hwy., Many, LA 71449	318-256-4114 <a href="mailto:carl.chance@la.gov">carl.chance@la.gov</a>
Danny Lavergne	Director, Cameron Parish	148 Smith Circle Cameron, LA 70631	Cameron_oep@camtel.net

### Meeting #3 Risk Assessment Overview

**Date:** July 28, 2015

**Location:** Lake Charles, LA

**Purpose:** Members of the Hazard Mitigation Plan Update Steering Committee were invited and were presented the results of the most recent risk assessment and an overview of the public meeting presentation during this overview. The assessment was conducted based on hazards identified during previous plans.

**Public Initiation:** All Parish Government Meetings are Open to the Public

### Invitees Included:

Member/Title	Jurisdiction/Entity	Address	Phone/Email
Lori Marinovich Executive Director	City of Lake Charles	326 Pujo Street Lake Charles, LA 70601	337-491-1429 <a href="mailto:lmarinovich@cityoflc.us">lmarinovich@cityoflc.us</a>
Jennifer Wallace Manager	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jwallace@cppj.net">jwallace@cppj.net</a>
Carl Chance IT Director	Sabine River Authority	15091 Texas Hwy., Many, LA 71449	318-256-4114 <a href="mailto:carl.chance@la.gov">carl.chance@la.gov</a>
Danny Lavergne	Director, Cameron Parish	148 Smith Circle Cameron, LA 70631	Cameron_oep@camtel.net

Member/Title	Jurisdiction/Entity	Address	Phone/Email
Dick Gremillion Director	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:dgregmillion@cppi.net">dgregmillion@cppi.net</a>
Norman Bourdeau Operations Manager	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:nbourdeau@cppi.net">nbourdeau@cppi.net</a>
Marc Ferguson Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:mferguson@cppi.net">mferguson@cppi.net</a>
Rob Daughdril Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:rdaughdril@cppi.net">rdaughdril@cppi.net</a>
Cade McLemore Emergency Planner	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:jmclmore@cppi.net">jmclmore@cppi.net</a>
Emily Abshire Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:eabshire@cppi.net">eabshire@cppi.net</a>
Jennifer Cobian Senior Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jcobian@cppi.net">jacobian@cppi.net</a>
Mary Jo Bayles Planner	City of Dequincy	300 N. Holly St. DeQuincy, LA 70633	337-786-8211 <a href="mailto:mjbayles@cityofdequincy.com">mjbayles@cityofdequincy.com</a>
Louis Coats Police Chief	City of Sulphur	500 N. Huntington Sulphur, LA 70663	337-527-4550 <a href="mailto:lcoats@sulphur.org">lcoats@sulphur.org</a>
John Reon Superintendent	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:jreon@bellsouth.net">jreon@bellsouth.net</a>
Eddie Hebert Superintendent in Training	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:eddie@gdd8.net">eddie@gdd8.net</a>
Terri Hawes Permit Technician	City of Westlake	P.O. Box 700, Westlake, LA 70669	337-433-0691 <a href="mailto:terrihawes@hotmail.com">terrihawes@hotmail.com</a>
Sandra Turley Municipal Clerk	Town of Iowa	P.O. Box 1707 Iowa, LA 70647	337-582-3535 <a href="mailto:sandra@iowala.org">sandra@iowala.org</a>
Mary Vice Municipal Clerk	Town of Vinton	1200 Horridge St. Vinton, LA 70668	337-589-7453 <a href="mailto:cityclerk_@cityofvinton.com">cityclerk_@cityofvinton.com</a>

## Meeting #3: Public Meeting

**Date:** July 28, 2015**Location:** Lake Charles, LA

**Purpose:** The public meeting allowed the public and community stakeholders to participate and provide input into the hazard mitigation planning process. Maps of the Calcasieu Parish communities were provided for the meeting attendees to identify specific areas where localized hazards occur.

**Public Initiation:** Yes**Invitees Included:**

Member/Title	Jurisdiction/Entity	Address	Phone/Email
Dick Gremillion Director	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:dgregmillion@cpji.net">dgregmillion@cpji.net</a>
Norman Bourdeau Operations Manager	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:nbourdeau@cpji.net">nbourdeau@cpji.net</a>
Marc Ferguson Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:mferguson@cpji.net">mferguson@cpji.net</a>
Rob Daughdril Emergency Response Coordinator	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:rdaughdril@cpji.net">rdaughdril@cpji.net</a>
Cade McLemore Emergency Planner	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:imclemore@cpji.net">imclemore@cpji.net</a>
Emily Abshire Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:eabshire@cpji.net">eabshire@cpji.net</a>
Jennifer Cobian Senior Finance Analyst	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jcobian@cpji.net">jcobian@cpji.net</a>
Mary Jo Bayles Planner	City of Dequincy	300 N. Holly St. DeQuincy, LA 70633	337-786-8211 <a href="mailto:mjbayles@cityofdequincy.com">mjbayles@cityofdequincy.com</a>
Louis Coats Police Chief	City of Sulphur	500 N. Huntington Sulphur, LA 70663	337-527-4550 <a href="mailto:lcoats@sulphur.org">lcoats@sulphur.org</a>
John Reon Superintendent	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:jreon@bellsouth.net">jreon@bellsouth.net</a>
Eddie Hebert Superintendent in Training	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:eddie@gdd8.net">eddie@gdd8.net</a>
Terri Hawes Permit Technician	City of Westlake	P.O. Box 700, Westlake, LA 70669	337-433-0691 <a href="mailto:terrihawes@hotmail.com">terrihawes@hotmail.com</a>
Sandra Turley Municipal Clerk	Town of Iowa	P.O. Box 1707 Iowa, LA 70647	337-582-3535 <a href="mailto:sandra@iowala.org">sandra@iowala.org</a>
Mary Vice Municipal Clerk	Town of Vinton	1200 Horridge St. Vinton, LA 70668	337-589-7453 <a href="mailto:cityclerk_@cityofvinton.com">cityclerk_@cityofvinton.com</a>



Member/Title	Jurisdiction/Entity	Address	Phone/Email
Lori Marinovich Executive Director	City of Lake Charles	326 Pujo Street Lake Charles, LA 70601	337-491-1429 <a href="mailto:lmarinovich@cityoflc.us">lmarinovich@cityoflc.us</a>
Jennifer Wallace Manager	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jwallace@cppj.net">jwallace@cppj.net</a>
Carl Chance IT Director	Sabine River Authority	15091 Texas Hwy., Many, LA 71449	318-256-4114 <a href="mailto:carl.chance@la.gov">carl.chance@la.gov</a>
Danny Lavergne	Director, Cameron Parish	148 Smith Circle Cameron, LA 70631	Cameron_oep@camtel.net

**\*\*Subject Matter Experts from parish government were present to answer specific questions about proposed projects from any citizens.\*\***

#### Meeting Public Notices:

The screenshot shows the Calcasieu Parish Police Jury website. The header includes the parish name and a navigation menu with links like Home, About Us, Calcasieu Now, I Want To..., Living, Doing Business, Visiting, and Departments & Services. The 'Visiting' link is highlighted. On the left, there is a sidebar with links to various services. The main content area features an 'EVENTS CALENDAR' section for the 'Hazard Mitigation Plan' meeting. The meeting details are as follows:

EVENTS CALENDAR	
<b>Date:</b>	7/28/2015 12:00 PM - 1:00 PM
<b>Location:</b>	Police Jury Meeting Room 1015 Pithon Street Lake Charles, Louisiana

Below the meeting details, there is a link to 'Add to my Calendar'. A paragraph explains that a hazard mitigation plan describes an area's vulnerability to natural hazards and outlines actions to reduce risks. At the bottom, a survey link is provided for residents to participate in a survey about public perceptions and opinions regarding natural hazards.

(Source: Calcasieu Parish Police Jury<sup>4</sup>)

<sup>4</sup> <http://www.cppj.net/index.aspx?page=264&recordid=1707>

## Outreach Activity #1: Public Opinion Survey

**Date:** Ongoing throughout planning process**Location:** Web Survey**Public Initiation:** Yes**Calcasieu Parish Hazard Mitigation Public Opinion Survey****SURVEY INFORMATION**

You have been asked to participate in this survey about public perceptions and opinions regarding natural hazards in Calcasieu Parish. In addition, we would like information regarding the methods and techniques you prefer for reducing the risks and losses associated with these hazards. The questionnaire should be completed by an adult, preferably the head of household. The information you provide will be used to help improve public/private coordination, mitigation, and risk reduction efforts in your parish. The survey should take less than 30 minutes to complete.

This is a public opinion survey, the results of which will inform local natural hazard mitigation planning in Louisiana.

This survey is being conducted by a division of Louisiana State University on behalf of Calcasieu Parish government.

**CONSENT INFORMATION**

This survey has 25 questions and should take about 30 minutes to complete.

Results of this study may be published, but no names or identifying information will be included in the publication. Subject identity will remain confidential unless disclosure is required by law.

This study has been approved by the LSU IRB. For questions concerning participants rights, please contact the LSU Institutional Review Board Chair, Dr. Dennis Landin at 225-578-8692 or [irb@lsu.edu](mailto:irb@lsu.edu). The Principal Investigator for this survey, Mr. Brant Mitchell, SDMI, can be reached at or [bmitch9@lsu.edu](mailto:bmitch9@lsu.edu)

I agree to participate in the study described above and do so by continuing to the survey by clicking the "Next" button below. I acknowledge that I may request from the investigators a hard copy of this consent form for my signature.

**Calcasieu Parish Hazard Mitigation Public Opinion Survey****1. Are you EIGHTEEN (18) years old or older?**☐ Yes☐ No

**Calcasieu Parish Hazard Mitigation Public Opinion Survey**

**2. Do you live in Calcasieu Parish?**

☐ Yes

☐ No

## Calcasieu Parish Hazard Mitigation Public Opinion Survey

## NATURAL HAZARD INFORMATION

First we would like to know about your experiences involving natural hazards and your exposure to preparedness information.

3. During the past five years in the parish you currently reside in, have you or someone in your household directly experienced a natural disaster such as a severe windstorm, flood, tropical storm or other type of natural disaster?

☐ Yes

☐ No

4. Which of these natural disasters have you or someone in your household experienced in the past five years? (Check all that apply)

☐ Drought

☐ Tropical Storm or Hurricane

☐ Flood

☐ Severe Winter Storm

☐ Severe Thunderstorm

☐ Hail

☐ Tornado

Other (please specify)

5. How concerned are you about the following natural disasters affecting your parish? (Check the corresponding box for each hazard.)

	Not Concerned	Not Very Concerned	Neutral	Somewhat Concerned	Very Concerned
Drought	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Severe Thunderstorm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tornado	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tropical Storm or Hurricane	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Severe Winter Storm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

6. Have you ever received information about how to make members of your household and your home safer from natural disasters?

☐ Yes

☐ No

**7. How recently?**

- ☐ Within the last 6 months
- ☐ Between 6 and 12 months
- ☐ Between 1 and 2 years
- ☐ Between 2 and 5 years
- ☐ 5 years or more

**8. From whom did you LAST receive information about how to make members of your household and your home safer from natural disasters? (Check only one)**

- |  |   |
|--|---|
| <input type="radio"/> News media                         | <input type="radio"/> Elected official              |
| <input type="radio"/> Government agency                  | <input type="radio"/> American Red Cross            |
| <input type="radio"/> Insurance company                  | <input type="radio"/> Church or civic association   |
| <input type="radio"/> Utility company                    | <input type="radio"/> Other non-profit organization |
| <input type="radio"/> University or research institution | <input type="radio"/> Social media (Facebook, etc.) |
| <input type="radio"/> Neighbor/friend/family             | <input type="radio"/> Not sure                      |

Other (please specify)

**9. Whom would you MOST TRUST to provide you with information about how to make your household and home safer from natural disasters? (Check up to three answers)**

- |   |  |
|---|--|
| <input type="checkbox"/> News media                         | <input type="checkbox"/> Elected official              |
| <input type="checkbox"/> Government agency                  | <input type="checkbox"/> American Red Cross            |
| <input type="checkbox"/> Insurance company                  | <input type="checkbox"/> Church or civic association   |
| <input type="checkbox"/> Utility company                    | <input type="checkbox"/> Other non-profit organization |
| <input type="checkbox"/> University or research institution | <input type="checkbox"/> Social media (Facebook, etc.) |
| <input type="checkbox"/> Neighbor/friend/family             | <input type="checkbox"/> Not sure                      |

Other (please specify)





**10. What is the MOST EFFECTIVE way for you to receive information about how to make your household and home safer from natural disasters? (Check up to three answers)**

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Newspaper stories | <input type="checkbox"/> Online news outlets           | <input type="checkbox"/> Fact sheet/brochure                             |
| <input type="checkbox"/> Newspaper ads     | <input type="checkbox"/> Social media (Facebook, etc.) | <input type="checkbox"/> Chamber of Commerce                             |
| <input type="checkbox"/> TV news           | <input type="checkbox"/> Schools                       | <input type="checkbox"/> Library   |
| <input type="checkbox"/> TV ads            | <input type="checkbox"/> Billboards                    | <input type="checkbox"/> Public workshops/meetings                       |
| <input type="checkbox"/> Radio news        | <input type="checkbox"/> Books                         | <input type="checkbox"/> Displays in public places (mall, grocery, etc.) |
| <input type="checkbox"/> Radio ads         | <input type="checkbox"/> Mail                          | <input type="checkbox"/> University or research institution              |
| <input type="checkbox"/> Email newsletters | <input type="checkbox"/> Fire department               |  |

Other (please specify)

**11. Prior to taking this survey, were you aware of your parish's Hazard Mitigation Plan (HMP)?**

- ☐ Yes  
☐ No

**12. Prior to taking this survey, were you aware that the Federal Emergency Management Agency (FEMA) requires your parish to update the hazard mitigation plan every five years in order for your parish to be eligible for federal pre- and post-disaster hazard mitigation funds?**

- ☐ Yes  
☐ No

### Calcasieu Parish Hazard Mitigation Public Opinion Survey

#### COMMUNITY VULNERABILITIES AND HAZARD MITIGATION STRATEGIES

In order to assess community risk, we need to understand which community assets may be vulnerable to natural hazards in the region. Vulnerable assets are those community features, characteristics, or resources that may be impacted by natural hazards (e.g. populations with functional or special needs, economic components, environmental resources, etc.). The next set of questions focuses on vulnerable assets in your community and your preferred strategies to mitigate risk to those assets.

**13. Community assets are features, characteristics, or resources that either make a community unique or allow the community to function. In your opinion, which of the following CATEGORIES are most susceptible to the impacts caused by natural hazards in your parish?**

(Rank the community assets in order of vulnerability, 1 being most vulnerable and 6 being least vulnerable)

<input type="text"/>	<input type="text"/>	Human (Loss of life and/or injuries)
<input type="text"/>	<input type="text"/>	Economic (Business closures and/or job losses)
<input type="text"/>	<input type="text"/>	Infrastructure (Damage or loss of bridges, utilities, schools, etc.)
<input type="text"/>	<input type="text"/>	Cultural/Historic (Damage or loss of libraries, museums, historic sites)
<input type="text"/>	<input type="text"/>	Environmental (Damage or loss of forests, pastureland, waterways, etc.)
<input type="text"/>	<input type="text"/>	Governance (Ability to maintain order and/or provide public amenities and services)

**14. Next we would like to know what specific types of COMMUNITY ASSETS are most important to you.**

(Check the corresponding box for each asset)

	Not Important	Not Very Important	Neutral	Somewhat Important	Very Important
Nursing homes/Assisted-living facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Schools (K-12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hospitals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Major bridges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fire/Police stations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Museums/Historic buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Major employers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Small businesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
College/Universities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Parish or City Buildings (City Hall, Courthouse, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)



16. Natural hazards can have a significant impact on a community, but planning for these events can help lessen the impacts. The following statements will help determine citizen priorities regarding planning for natural disasters in your parish.

(Tell us how important each on is to you.)

	Not Important	Not Very Important	Neutral	Somewhat Important	Very Important
Protecting private property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protecting critical facilities (transportation networks, hospitals, fire stations)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preventing development in hazard areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enhancing the function of natural features (bayous, rivers and wetlands)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protecting historical and cultural landmarks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protecting and reducing damage to utilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strengthening emergency services (police, fire, EMS)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disclosing natural hazard risks during real estate transactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promoting cooperation among public agencies, citizens, non-profits and businesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Calcasieu Parish Hazard Mitigation Public Opinion Survey

## MITIGATION AND PREPAREDNESS ACTIVITIES IN YOUR HOUSEHOLD

Households can mitigate and prepare for natural hazards in order to prevent damage to property, injuries, and loss of life. The precautions you take and training you receive can make a big difference in your ability to recover from a natural disaster or emergency. Access to basic services, such as electricity, gas, water, telephones and emergency care can be cut off temporarily, or you may have to evacuate at a moment's notice. The following questions focus on your household's preparedness for disaster events.

**17. In the following list, please check those activities that you HAVE DONE in your household, PLAN TO DO in the near future, HAVE NOT DONE, or are UNABLE TO DO.**

(Check one answer for each preparedness activity)

	Have Done	Plan to Do	Not Done	Unable to Do
Attended meetings or received written information on natural disasters or emergency preparedness?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Talked with members in your household about what to do in case of a natural disaster or emergency?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prepared a "Disaster Supply Kit" (stored extra food, water, batteries or other emergency supplies)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last year, has anyone in your household been trained in First Aid or Cardio-Pulmonary Resuscitation (CPR)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussed or created a utility shutoff procedure in the event of a natural disaster?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**Calcasieu Parish Hazard Mitigation Public Opinion Survey****GENERAL HOUSEHOLD INFORMATION**

Finally, we would appreciate any information you are willing to share with us about you and your household. This information will remain confidential and is for survey comparison purposes only.

**18. Gender**

☐ Female

☐ Male

Other (please specify)

**19. How much total combined money did all members of your HOUSEHOLD earn last year?**

☐ \$0 to \$9,999

☐ \$10,000 to \$24,999

☐ \$25,000 to \$49,999

☐ \$50,000 to \$74,999

☐ \$75,000 to \$99,999

☐ \$100,000 to \$124,999

☐ \$125,000 to \$149,999

☐ \$150,000 to \$174,999

☐ \$175,000 to \$199,999

☐ \$200,000 and up

☐ Prefer not to answer

**20. In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)****21. Do you rent or own the place where you live?**

☐ Own

☐ Rent

☐ Neither (please specify)

22. Which category below includes your age?

- ☐ 17 or younger
- ☐ 18-20
- ☐ 21-29
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60 or older

23. Does anyone in your household own a business or a farm?

- ☐ Yes
- ☐ No

24. Which race/ethnicity best describes you? (Please choose only one.)

- ☐ American Indian or Alaskan Native
- ☐ Asian / Pacific Islander
- ☐ Black or African American
- ☐ Hispanic American
- ☐ White / Caucasian
- ☐ Multiple ethnicity / Other (please specify)

25. Please feel free to provide any additional comments in the space provided:

Prev

Done

Outreach Activity #2: Incident Questionnaire

**Date:** Public Meeting Activity

**Location:** Public Meeting

**Public Initiation:** Yes

**Public Meeting  
Incident/Issue Questionnaire**

1. Hazard Type(s):
  - a. Flooding
    - i. Riverine
    - ii. Storm Surge
    - iii. Street
    - iv. Other (describe):
  - b. High winds (not tropical)
  - c. Coastal
    - i. Saltwater Intrusion
    - ii. Erosion
    - iii. Other (describe):
  - d. Tropical Systems
  - e. Winter Weather
  - f. Other: \_\_\_\_\_
2. Describe incident or issue:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Location:
  - a. City: \_\_\_\_\_
  - b. Address or Area: \_\_\_\_\_
  - c. Localized or dispersed: \_\_\_\_\_
4. Intensity:
  - a. Depth (flooding) or Size (hail, etc.) \_\_\_\_\_
  - b. Wind strength
5. Re-occurring or one-time
  - a. If re-occurring, how often? \_\_\_\_\_
6. What type of interruptions does/did the incident or issue cause? (business closure, damage, evacuation, etc.) \_\_\_\_\_  
\_\_\_\_\_
7. How long was the interruption (hours, days, weeks, etc.)? \_\_\_\_\_
8. How could this problem or impact be prevented, fixed or alleviated?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
9. Can we contact you if we have further questions about this incident? Yes/No
10. Contact Information (optional)
  - a. Name: \_\_\_\_\_
  - b. City: \_\_\_\_\_
  - c. Phone: (\_\_\_\_\_) \_\_\_\_\_
  - d. Email: \_\_\_\_\_

### Outreach Activity #3: Mapping Activities

Public meeting attendees were asked to identify areas on jurisdictional maps provided that were “problem areas”. They were also asked to indicate any areas of new development. This activity gave the public an opportunity to interact with SDMI’s GIS Mapping section, as well as provide valuable input on areas that

may flood repeatedly during rain events that may not get reported to local emergency managers as significant events.

#### Public Plan Review Documentation

The Calcasieu Hazard Mitigation Draft Plan was placed on the Parish website to collect comments and feedback from the public. This outreach provided the public an opportunity to comment on the plan during the drafting stage and prior to plan approval.



\*\*\*This page left intentionally blank\*\*\*

DRAFT



## Appendix B: Plan Maintenance

### Purpose

The section of the Code of Federal Regulations (CFR) pertaining to Local Mitigation Plans lists five required components for each plan: a description of the planning process; risk assessments; mitigation strategies; a method and system for plan maintenance; and documentation of plan adoption. This section details the method and system for plan maintenance, following the CFR's guidelines that the Plan Update must include (1) "a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle," (2) "a process by which local governments incorporated the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans", and (3) "discussion on how the community will continue public participation in the plan maintenance process."

### Monitoring, Evaluating, and Updating the Plan

By law, the plan must be updated every five years prior to re-submittal to the Federal Emergency Management Agency (FEMA) for re-approval. The first part of this subsection describes the whole update process, including the responsible parties, methods to be used, evaluation criteria to be applied, and, scheduling for monitoring and evaluating the plan. These descriptions are followed by an explanation of how and when the plan will be periodically updated. The Plan must be updated every five years prior to re-submittal to FEMA for re-approval. The first part of this subsection describes the whole update process, including sections on the following:

- Responsible parties
- Methods to be used
- Evaluation criteria to be applied
- Scheduling for monitoring and evaluating the plan

### Responsible Parties

Calcasieu Parish has developed a method to ensure that a regular review and update of the Hazard Mitigation Plan occurs. This will be the responsibility of the Steering Committee which consists of representatives from governmental organizations, local businesses, and private citizens, who will be involved in the process of monitoring, evaluating and updating the plan. All jurisdictions participating in this plan will remain active in the Steering Committee. Each of the jurisdictions are listed below:

- Unincorporated Calcasieu
- City of Lake Charles
- City of DeQuincy
- City of Sulphur
- City of Westlake
- Town of Iowa
- Town of Vinton

Although the people filling the positions may change from year to year, each jurisdiction will have a representative on the Steering Committee. The future Steering Committee will continue to be comprised of the same job functions as currently evident in the Steering Committee. However, the decision of specific job duties will be left to the Parish Emergency Manager to be assigned as deemed appropriate.

### Methods for Monitoring and Evaluating the Plan and Plan Evaluation Criteria

Review and revision of the plan will be directed by the Emergency Manager within the Calcasieu Parish Office of Homeland Security and Emergency Preparedness (OHSEP). Progress on the Mitigation Action Plan will be monitored and evaluated by the Parish Emergency Manager and the Parish Planning Department. The Calcasieu Parish Police Jury, OHSEP and the Steering Committee will meet annually and/or following disasters to monitor and evaluate the plan. Following disasters, a meeting will be called to monitor and evaluate the Risk Assessment. The annual meetings will involve gathering necessary information and discussion of progress of action items and implementation. A review of the planning process will also be done at this time to insure any changes needed in the steering committee or overall process is needed.

The annual meetings will assist in developing a progress report designed to monitor the state of the projects and evaluate the success of each mitigation item. The report should list each action item and answers several very important questions, such as has the project begun? If not, why not? The status of project; is it complete? If so, did it eliminate the problem? Are there changes needed to better implement the mitigation actions? These questions serve to address the progress being made on each of the mitigation action items.

Copies of the Annual Progress Reports will be maintained by the OHSEP. If during this process of reviewing the Annual Progress Report, the Parish Emergency Manager determines that the Steering Committee should be reconvened for discussion, he or she has the option of doing so. He or she will use the following criteria to determine if a meeting needs to be held:

- Are there any changes in mitigation plan requirements for federal mitigation grant funding programs?
- Are any changes or revision required to the Mitigation Action Plan? (i.e. Have any action items been completed? Are there any new specific mitigation action items? Have any new specific mitigation action items been identified?)
- Are there any changes within the Steering Committee membership?

Although not required, FEMA recommends an annual meeting of the Steering Committee. If the Emergency Manager determines that this annual meeting needs to be conducted, he is responsible for contacting committee members, organizing the meeting and providing public notification for the meeting to solicit public input.

In addition to monitoring the progress of projects, the Plan Update is required to be evaluated, then revised or updated at least every five years from the date of FEMA approval. If a disaster occurs or as action items are completed, the Plan Update will be reviewed, revised, and updated sooner than the required five years, using the process outlined in this section.

Once approval from FEMA is received for an updated plan, the above process will begin again starting a new five-year cycle. This will ensure that the plan is continually updated on a five-year cycle. This new

cycle will begin upon the date of FEMA approval. This process is further discussed in the below sub-section entitled “Updating the Plan”.

The Steering Committee will be reconvened approximately one year before the five-year deadline and begin evaluating the Hazard Mitigation Plan. The above criteria and the following key topics and questions below will be addressed at the meeting.

- ID Hazard – Are there new hazards that affect your community? Has a disaster occurred?
- Profile Hazard Events – Are additional maps or new hazard studies available? Have chances of future events changed? Have recent and future development in the community been checked for their exposure to hazards?
- Inventory Assets – Have inventories of existing structures in hazard areas been updated? Are there any new special high risk populations? Is future land development accounted for in the inventories?
- Estimate Losses – Have losses been updated to account for recent changes?

If the answer to any of the above questions is a “Yes”, then the hazard mitigation plan will be updated accordingly. The hazard mitigation plan review and update will be accomplished by reviewing each goal and action item to determine their relevance to changing situations in the parish and in each municipality, as well as changes to state or federal policy, and to ensure that they are addressing current and expected conditions. The Steering Committee will also review the risk assessment portion and determine if this information should be updated or modified.

The Steering Committee will work together as a team, with each member sharing responsibility for completing the evaluation and updates. Each member of the Steering Committee is an equal member of the process. It will be the responsibility of the representative from each community to ensure that their section of this plan is updated to meet the required deadline.

The Parish Emergency Manager is responsible for including all changes into the plan after the Steering Committee has met and decided on the changes. Any required revisions will be implemented into existing plans, as applicable, within six months following the review process. This process will be repeated for each five year review of the plan.

After the update process is completed, the final plan will be submitted to GOHSEP’s Hazard Mitigation Officer for review and then on to FEMA for review and approval to remain eligible for continued Hazard Mitigation Grant Program (HMGP) funding.

FEMA and GOHSEP have the authority to evaluate the progress of existing mitigation plans to determine if the plan is fulfilling program requirements.

The following basic schedule will be undertaken for monitoring, evaluating and updating the plan:

- At a minimum, monitoring activities by the Calcasieu Parish OHSEP should be done every six months;
- Best practice is that the update should start a year and a half prior to plan expiration date, taking into consideration one year of development and six months to receive plan approval.

Notices regarding annual evaluations should be sent by the Calcasieu Parish OHSEP to the Calcasieu Parish Hazard Mitigation Coordination Committee.

### Updating the Plan

Updates will follow the original planning process outlined in Appendix A. The update process will entail a detailed and structured re-examination of all aspects of the original plan, followed by recommended updates. The update process will be undertaken by the Calcasieu Parish OHSEP in coordination with the Calcasieu Parish Hazard Mitigation Steering Committee. The recommendations will be presented to the Calcasieu Parish Hazard Mitigation Steering Committee for consideration and approval. It is expected that the parish and each jurisdiction's administration and will issue a letter of adoption for each update of the plan.

At a minimum, the plan will be updated and re-submitted to FEMA for re-approval every five years, as required by DMA 2000. The five-year update for FEMA re-approval requires that all the original steps outlined in Appendix A be revisited to make sure the plan assumptions and results remain valid as a basis for further decision-making and priority-setting.

The plan will also be subject to amendments as significant changes or new information is identified in the periodic evaluations described above. The degree to which the entire process is repeated will depend on the circumstances that precipitate the update.

Calcasieu Parish Steering Committee, led by the Calcasieu Parish OHSEP will initiate, coordinate and lead all plan updates in collaboration with each jurisdiction.

### 2015 Plan Version Plan Method and Schedule Evaluation

For the current plan update, the previously approved plan's method and schedule were evaluated to determine if the elements and processes involved in the required 2015 update. Based on this analysis, the method and schedule were deemed to be acceptable, and nothing was changed for this update.

### Incorporation into Existing Planning Programs

It is and has been the responsibility of the Calcasieu Parish Hazard Mitigation Plan Steering Committee and participating jurisdictions to determine additional implementation procedures when appropriate. This may include integrating the requirements of the Calcasieu Parish Hazard Mitigation Plan into each jurisdiction's planning documents, processes, or mechanisms as follows:

- Ordinances, Resolutions, Regulations
- Floodplain Ordinances (Parish and Jurisdictions)
- Emergency Operations Plan (Parish and Jurisdictions)
- Comprehensive Master Plan (Entire Parish)
- Economic Development Plan (Parish and Jurisdictions)
- Stormwater Management Plan
- Continuity of Operations Plan

Opportunities to integrate the requirements of this plan into other local planning mechanisms will continue to be identified through future meetings of the Calcasieu Parish Hazard Mitigation Steering Committee and through the five-year review process described herein. The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update and

implementation of each jurisdiction's individual plans that require specific planning and administrative tasks (e.g. risk assessment, plan amendments, ordinance revisions, capital improvement projects, etc.). The members of the Steering Committee will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the Calcasieu Parish Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability within the Parish.

During the planning process for new and updated local planning documents at the parish and jurisdiction level, such as a risk assessment, comprehensive plan, capital improvements plan, or emergency operations plan, the jurisdictions will provide a copy of the Parish Hazard Mitigation Plan to the appropriate parties and recommend that all goals and strategies of new and updated local planning documents are consistent with and support the goals of the Parish Hazard Mitigation Plan and will not contribute to increased hazards.

Although it is recognized that there are many possible benefits to integrating components of this plan into other parish and jurisdiction planning mechanisms, the development and maintenance of this stand-alone Hazard Mitigation Plan is deemed by the Steering Committee to be the most effective and appropriate method to ensure implementation of Parish and local hazard mitigation actions.

On behalf of the jurisdictions of City of Lake Charles, City of DeQuincy, City of Sulphur, City of Westlake, Town of Iowa, Town of Vinton, Calcasieu Parish has the authority to incorporate the contents of the Hazard Mitigation Plan into the parish's existing regulatory mechanisms. Agreements are currently in place with jurisdictions to allow for the parish incorporation mechanisms to take place.

The following parish and local plans incorporate requirements of this HMP Update as follows through Steering Committee member and jurisdiction representation throughout the planning process as described above:

**Calcasieu Unincorporated**

Capital Improvement Plan/Updated Annually/CPPJ

Economic Development Plan/Updated as needed/SWLA Alliance for Economic Development

Local Emergency Operations Plan/Updated annually/Calcasieu OHSEP

Continuity of Operations Plan/Updated as needed/CPPJ/Calcasieu OHSEP

Transportation Plan/Updated as needed/CPPJ/Calcasieu OHSEP

Stormwater Management Plan/Updated As needed/CPPJ/Calcasieu OHSEP

**City of DeQuincy**

Comprehensive Master Plan/Updated as needed/City DeQuincy

Capital Improvement Plan/Updated as needed/City of DeQuincy

Economic Development Plan/Updated as needed/SWLA Alliance for Economic Development

Local Emergency Operations Plan/Updated annually/City DeQuincy

Continuity of Operations Plan/Updated as needed/CPPJ/Calcasieu OHSEP

Stormwater Management Plan/Updated As needed/CPPJ/Calcasieu OHSEP

**City of Lake Charles**

Comprehensive Master Plan/Updated as needed/City of Lake Charles

Capital Improvement Plan/Updated as needed/City of Lake Charles

Economic Development Plan/Updated as needed/SWLA Alliance for Economic Development

Local Emergency Operations Plan/Updated annually/City of Lake Charles/Lake Charles Fire Department  
Continuity of Operations Plan/Updated as needed/CPPJ/Calcasieu OHSEP  
Transportation Plan/Updated as needed/CPPJ/Calcasieu OHSEP  
Stormwater Management Plan/Updated As needed/CPPJ/Calcasieu OHSEP

**City of Sulphur**

Comprehensive Master Plan/Updated As needed/City of Sulphur  
Capital Improvement Plan/Updated as needed/City of Sulphur  
Local Emergency Operations Plan/Updated Annually/Calcasieu OHSEP  
Continuity of Operations Plan/Updated as needed/City of Sulphur  
Stormwater Management Plan/Updated as needed/CPPJ, Calcasieu OHSEP

**City of Westlake**

Capital Improvement Plan/Updated as needed/City of Westlake  
Local Emergency Operations Plan/Updated Annually/Calcasieu OHSEP  
Continuity of Operations Plan/Updated as needed/City of Westlake  
Stormwater Management Plan/Updated as needed/CPPJ, Calcasieu OHSEP  
Community Wildfire Protection Plan/Updated as needed/City of Westlake

**Town of Vinton**

Capital Improvement Plan/Updated as needed/Town of Vinton  
Economic Development Plan/Updated as needed/SWLA Alliance for Economic Development  
Local Emergency Operations Plan/Updated annually/Calcasieu OHSEP

**Town of Iowa**

Local Emergency Operations Plan/Updated annually/Calcasieu OHSEP

**Continued Public Participation**

Public participation is an integral component of the mitigation planning process and will continue to be essential as this Plan evolves over time. Significant changes or amendments to the Plan require a public hearing prior to any adoption procedures. Other efforts to involve the public in the maintenance, evaluation, and revision process will be made as necessary. These efforts may include:

- Advertising meetings of the Mitigation Committee in the local newspaper, public bulletin boards, and/or city and county office buildings
- Designating willing and voluntary citizens and private sector representatives as official members of the Mitigation Committee
- Utilizing local media to update the public of any maintenance and/or periodic review activities taking place
- Utilizing city and parish web sites to advertise any maintenance and/or periodic review activities taking place
- Keeping copies of the plan in appropriate public locations



## Appendix C: Essential Facilities

## Calcasieu Parish Essential Facilities – All Jurisdictions

Calcasieu Unincorporated Essential Facilities												
Type	Name	Drought	Extreme Heat	Floods	Sinkholes	Hail	Wind	Lightning	Tornado	Tropical Cyclones	Wildfire	Winter Storm
Fire and Rescue	Bell City - Hayes Fire Station			X	X	X	X	X	X	X		
	Carlyss Fire Department Station 3					X	X	X	X	X		
	Carlyss Fire Department Station 4					X	X	X	X	X		
	Carlyss Volunteer Fire Department					X	X	X	X	X		
	Carlyss Volunteer Fire Department Station No. 2					X	X	X	X	X		
	Fire District 3				X	X	X	X	X	X	X	
	Fire Protection District No. 1 - Station No. 3			X		X	X	X	X	X		
	Fire Protection District No. 2 of Ward 3			X		X	X	X	X	X		
	Fire Station			X	X	X	X	X	X	X		
	Gillis Station					X	X	X	X	X	X	
	Holmwood Fire Station			X		X	X	X	X	X		
	LeBleu Settlement Fire Department					X	X	X	X	X		
	Manchester Fire Department					X	X	X	X	X		

	Moss Bluff Fire Station					X	X	X	X	X		
	Northeast Ward 3 Fire Station					X	X	X	X	X		
	Opal Gray Substation Ward 7 FPD #1			X		X	X	X	X	X		
	Southeast Ward 3 Fire Station			X		X	X	X	X	X		
	Starks Volunteer Fire Department					X	X	X	X	X		
	Sulphur Fire Station					X	X	X	X	X		
	Sutherland Station					X	X	X	X	X		
	Ward 1 Fire Rescue - Birdnest Station					X	X	X	X	X	X	
	Ward 5 Fire Department					X	X	X	X	X	X	
	Ward 5 FPD #1 - Big Woods Substation			X		X	X	X	X	X		
	Ward 5 FPD #1 - Green Moore Substation					X	X	X	X	X		
	Ward 6 Fire Protection					X	X	X	X	X		
	Ward 6 Fire Protection District 1					X	X	X	X	X	X	
	Ward 6 Fire Protection District 1					X	X	X	X	X	X	
	Ward 7 Fire Department					X	X	X	X	X	X	
	Ward 7 FPD #1 - Edgerly Station					X	X	X	X	X		
	Ward 8 Fire District No. 2			X		X	X	X	X	X	X	
	Westlake Fire			X		X	X	X	X	X	X	
Government	Bretty Geymann State Representative			X		X	X	X	X	X	X	

	Calcasieu Parish Department of Special Services					X	X	X	X	X	X	
	Calcasieu Parish Public Works					X	X	X	X	X	X	
	Calcasieu Waterworks Ward 5 District 14			X		X	X	X	X	X		
	East Maintenance Facility					X	X	X	X	X		
	Louisiana DOTD District 7 Headquarters					X	X	X	X	X		
	NOAA National Weather Service					X	X	X	X	X		
	Trash Facility					X	X	X	X	X		
	US Department of Energy					X	X	X	X	X		
	USDA					X	X	X	X	X		
	Water Works District No. 1					X	X	X	X	X	X	
Law Enforcement	Calcasieu Parish Sheriff's Office					X	X	X	X	X		
	Calcasieu Parish Sheriff's Office			X	X	X	X	X	X	X		
	Calcasieu Parish Sheriff's Office			X		X	X	X	X	X		
	Calcasieu Parish Sheriff's Office Carlyss Law Enforcement Ctr			X		X	X	X	X	X	X	
	Calcasieu Parish Sherriff Office			X		X	X	X	X	X		
	Calcasieu Parish Sherriff Office			X		X	X	X	X	X		

	Calcasieu Police Jury/Emergency Response Training Center					X	X	X	X	X		
	Calcasieu Sheriff Office					X	X	X	X	X		
	Police Impound Lot					X	X	X	X	X		
Public Health	Lake Charles Memorial Hospital for Women					X	X	X	X	X		
Schools	Bee Haven Childcare & Learning Center, LLC.					X	X	X	X	X		
	Bell City School			X	X	X	X	X	X	X	X	
	Cypress Cove Elementary School					X	X	X	X	X		
	Gillis Elementary					X	X	X	X	X		
	Kaufman Elementary			X		X	X	X	X	X		
	LeBeau Settlement Elementary School					X	X	X	X	X		
	Moss Bluff Elementary					X	X	X	X	X		
	Moss Bluff Middle School					X	X	X	X	X		
	Moss Bluff Middle School 2					X	X	X	X	X		
	Parkview Baptist School					X	X	X	X	X		
	Sam Houston High					X	X	X	X	X		
	St. John Elementary			X		X	X	X	X	X		
	St. Theodore					X	X	X	X	X	X	
	Starks Elementary School			X		X	X	X	X	X	X	
	Starks High School					X	X	X	X	X	X	

	Victory Baptist Academy			X		X	X	X	X	X		
	Vincent Settlement Elementary School			X		X	X	X	X	X	X	

Lake Charles Essential Facilities												
Type	Name	Drought	Extreme Heat	Floods	Sinkholes	Hail	Wind	Lightning	Tornado	Tropical Cyclones	Wildfire	Winter Storm
Fire and Rescue	Company No. Five					X	X	X	X	X		
	Engine Company No 3					X	X	X	X	X		
	Fire Station					X	X	X	X	X		
	Fire Station					X	X	X	X	X		
	Lake Charles Fire Administration					X	X	X	X	X		
	Lake Charles Fire Department No. 2					X	X	X	X	X		
	Lake Charles Fire Department No. 7					X	X	X	X	X		
	Lake Charles Fire Department Station No. 4			X		X	X	X	X	X		
	Lake Charles Fire Department Training Division					X	X	X	X	X		
	Lake Charles Station No. 8					X	X	X	X	X		
Government	Allen P. August Sr. Multi-Purpose Building - Calcasieu Parish Police Jury					X	X	X	X	X		
	Allen P. August, Sr. Multi-Purpose Annex - Calcasieu Parish Police Jury					X	X	X	X	X		

	Armed Forces Career Center					X	X	X	X	X		
	Calcasieu Parish Government Building			X		X	X	X	X	X		
	Calcasieu Judicial Center					X	X	X	X	X		
	Calcasieu Parish Police Jury Animal Services					X	X	X	X	X		
	Calcasieu Parish Police Jury M.A.R.C.			X		X	X	X	X	X		
	Calcasieu Parish Police Jury Office Of Juvenile Justice Services			X		X	X	X	X	X		
	Calcasieu Parish Police Jury Public Works					X	X	X	X	X		
	Calcasieu Parish Public Defender's Office					X	X	X	X	X		
	Calcasieu Parish Sales Tax Office			X		X	X	X	X	X		
	Calcasieu Parish School Board			X		X	X	X	X	X		
	Calcasieu Parish School Board Assessment					X	X	X	X	X		
	Calcasieu Parish Schoolboard Warehouse & Maintenance					X	X	X	X	X		
	Carl Shetler Army Reserve Center			X		X	X	X	X	X		
	City Hall					X	X	X	X	X		



	City of Lake Charles Department of Public Works					X	X	X	X	X		
	City of Lake Charles Transit and Customer Service Center					X	X	X	X	X		
	City Recycle Center					X	X	X	X	X		
	Department of Child and Family Services					X	X	X	X	X		
	Department of Homeland Security Immigration & Customs Enforcement					X	X	X	X	X		
	Department of Public Safety & Corrections Probation & Patrol			X		X	X	X	X	X		
	Department of Social Services					X	X	X	X	X		
	Edwin F. Hunter Jr. U.S. Courthouse					X	X	X	X	X		
	Family & Juvenile Court					X	X	X	X	X		
	Lake Charles City Court			X		X	X	X	X	X		
	Lake Charles Green Recycling Station					X	X	X	X	X		
	Lake Charles Housing Authority					X	X	X	X	X		
	Lake Charles Housing Authority Central Office					X	X	X	X	X		
	Lake Charles Housing Authority Maintenance Facility					X	X	X	X	X		
	Louisiana Court of Appeal Third Circuit					X	X	X	X	X		

	Louisiana Department of Children & Family Services					X	X	X	X	X		
	Louisiana Department of Environmental Quality					X	X	X	X	X		
	Louisiana Department of Motor Vehicles					X	X	X	X	X		
	Louisiana Department of Wildlife and Fisheries			X		X	X	X	X	X		
	Louisiana DNR L.E.R.C.at McNeese State University					X	X	X	X	X		
	Louisiana National Guard					X	X	X	X	X		
	National Guard Recruitment Center					X	X	X	X	X		
	Office of the District Attorney					X	X	X	X	X		
	Parish Police Jury					X	X	X	X	X		
	Police Impound Lot					X	X	X	X	X		
	Public Defender's Office					X	X	X	X	X		
	Safety Council SWLA - Safety Training Complex			X		X	X	X	X	X		
	Social Security Administration			X		X	X	X	X	X		
	Social Security Administration Office					X	X	X	X	X		
	The Magnolia Building					X	X	X	X	X		

	U.S. Customs and Border Protection			X		X	X	X	X	X		
	U.S. Customs And Border Protection Station			X		X	X	X	X	X		
	United States Coast Guard Station					X	X	X	X	X		
	USDA Service Center			X		X	X	X	X	X		
Law Enforcement	Calcasieu Parish Reg Law Enforcement Training Academy					X	X	X	X	X		
	Central Police Station					X	X	X	X	X		
	Lake Charles Police					X	X	X	X	X		
	Lake Charles Police					X	X	X	X	X		
	Lake Charles Police					X	X	X	X	X		
	Lake Charles Police Annex					X	X	X	X	X		
	Lake Charles Police Dept. K-9 Training Division					X	X	X	X	X		
	Lake Charles Police Detective Division					X	X	X	X	X		
	Louisiana State Police Troop D					X	X	X	X	X		
	McNeese Police					X	X	X	X	X		
	Port of Lake Charles Harbor Police Security Center					X	X	X	X	X		
	Wilbert Shepard Building - Calcasieu Parish Sheriff's Office			X		X	X	X	X	X		
Public Health	Christus St. Patrick Hospital			X		X	X	X	X	X		
	Lake Charles Memorial Hospital					X	X	X	X	X		

	Lake Charles Memorial Hospital					X	X	X	X	X		
	Lake Charles Memorial Hospital - Intensive Outpatient Services					X	X	X	X	X		
Schools	A.A. Nelson Elementary					X	X	X	X	X		
	Academy of Acadiana			X		X	X	X	X	X		
	Alfred M. Barbe High School					X	X	X	X	X		
	Barbe Elementary			X		X	X	X	X	X		
	Brenda Hunter's Headstart					X	X	X	X	X		
	Brentwood Elementary School					X	X	X	X	X		
	Calcasieu Parish Alternative School					X	X	X	X	X		
	Central School			X		X	X	X	X	X		
	College Oaks Elementary					X	X	X	X	X		
	College st Vocational Center			X		X	X	X	X	X		
	Combre-Fondel Elementary School			X		X	X	X	X	X		
	Dolby Elementary					X	X	X	X	X		
	F. K. White Middle School					X	X	X	X	X		
	Fairview Elementary School					X	X	X	X	X		
	Hamilton Christian Academy					X	X	X	X	X		
	Henry Heights Elementary			X		X	X	X	X	X		

	Immaculate Conception Cathedral School			X		X	X	X	X	X		
	Jessie D. Clifton Elementary School					X	X	X	X	X		
	John F. Kennedy Elementary School					X	X	X	X	X		
	John Johnson II Elementary					X	X	X	X	X		
	Lagrange Senior High			X		X	X	X	X	X		
	Lake Charles Charter Academy					X	X	X	X	X		
	Oak Park Elementary School					X	X	X	X	X		
	Oak Park Middle School					X	X	X	X	X		
	OLQH School					X	X	X	X	X		
	Our Lady Queen of Heaven School					X	X	X	X	X		
	Our Lady Queen of Heaven School Extension					X	X	X	X	X		
	Pearl Watson Elementary					X	X	X	X	X		
	Prien Lake Elementary					X	X	X	X	X		
	Ralph F. Wilson Elementary School					X	X	X	X	X		
	Ray D. Molo Middle School					X	X	X	X	X		
	Reynaud Middle School					X	X	X	X	X		
	Rosteet Junior High					X	X	X	X	X		
	S.J. Welsh Middle School					X	X	X	X	X		

	Sacred Heart Elementary					X	X	X	X	X		
	Southwest Louisiana Charter					X	X	X	X	X		
	Southwest Louisiana Charter Academy					X	X	X	X	X		
	St. Louis Catholic					X	X	X	X	X		
	T.H. Watkins Elementary					X	X	X	X	X		
	The Robinswood School					X	X	X	X	X		
	TS Cooley Elementary					X	X	X	X	X		
	Washington-Marion Magnet High School					X	X	X	X	X		
Nursing Homes	Carriage House			X		X	X	X	X	X		
	Emeritus					X	X	X	X	X		
	Grand Cove			X		X	X	X	X	X		
	Harbor Hospice					X	X	X	X	X		
	Landmark of Lake Charles					X	X	X	X	X		
	Resthaven					X	X	X	X	X		
	St. Martin de Porres Multi-Care Center					X	X	X	X	X		
	The Gardens					X	X	X	X	X		

Sulphur Essential Facilities												
Type	Name	Drought	Extreme Heat	Floods	Sinkholes	Hail	Wind	Lightning	Tornado	Tropical Cyclones	Wildfire	Winter Storm
Fire and Rescue	East Side Fire Station				X	X	X	X	X	X		
	Fire Station				X	X	X	X	X	X	X	
	Fire Station				X	X	X	X	X	X	X	
Government	Automotive Service Center					X	X	X	X	X	X	



	Business Center					X	X	X	X	X		
	City Council Chambers					X	X	X	X	X		
	City Hall					X	X	X	X	X		
	City of Sulphur Municipal Business Center					X	X	X	X	X		
	DMV					X	X	X	X	X		
	DOTD			X		X	X	X	X	X		
	Office of City Prosecutor					X	X	X	X	X		
	Sabine River Authority					X	X	X	X	X		
	Sulphur Judicial Center					X	X	X	X	X		
	Traffic Division Warehouse					X	X	X	X	X		
Law Enforcement	Calcasieu Sheriff's Office			X	X	X	X	X	X	X		
	Law Enforcement Center				X	X	X	X	X	X		
Public Health	West Calcasieu Cameron Hospital				X	X	X	X	X	X		
	West Calcasieu Cameron Hospital				X	X	X	X	X	X		
Schools	DS Perkins Elementary				X	X	X	X	X	X		
	E K Key Elementary					X	X	X	X	X		
	Frasch Elementary					X	X	X	X	X		
	Hope Christian School				X	X	X	X	X	X		
	Jake Drost School for Exceptional Children			X		X	X	X	X	X	X	
	Leblanc Middle School					X	X	X	X	X		

	Maplewood Middle School				X	X	X	X	X	X		
	Our Lady's School					X	X	X	X	X		
	Sulphur High			X		X	X	X	X	X		
	Sulphur High 2			X		X	X	X	X	X	X	
	Vincent Elementary School					X	X	X	X	X		
	W W Lewis Middle School					X	X	X	X	X		
	WT Henning Elementary			X		X	X	X	X	X	X	

Iowa Essential Facilities												
Type	Name	Drought	Extreme Heat	Floods	Sinkholes	Hail	Wind	Lightning	Tornado	Tropical Cyclones	Wildfire	Winter storm
Fire and Rescue	Iowa Fire District 1					X	X	X	X	X		
	Iowa Volunteer Fire Dept.					X	X	X	X	X		
Government	Calcasieu Parish Gravity Drainage Dist. #7 Ward 8					X	X	X	X	X		
	Housing Authority of the Town of Iowa					X	X	X	X	X		
	Iowa City Hall					X	X	X	X	X		
Law Enforcement	Calcasieu Parish Sheriff's Office					X	X	X	X	X		
	Iowa Police Department					X	X	X	X	X		
Schools	Iowa High School					X	X	X	X	X		
	J.I. Watson Elementary School					X	X	X	X	X		
	J.I. Watson Middle School					X	X	X	X	X		

Vinton Essential Facilities												
Type	Name	Drought	Extreme Heat	Floods	Sinkholes	Hail	Wind	Lightning	Tornado	Tropical Cyclones	Wildfire	Winter storm
Fire and Rescue	Vinton Fire Station			X		X	X	X	X	X		
	Vinton South Side Fire Station					X	X	X	X	X		
Government	Housing Authority of the Town of Vinton					X	X	X	X	X		
	Town of Vinton Maintenance Building			X		X	X	X	X	X		
	Vinton Municipal Center					X	X	X	X	X		
Law Enforcement	Calcasieu Parish Sheriff's Office			X		X	X	X	X	X		
	Courville-Dupre Law Enforcement Center					X	X	X	X	X		
Schools	Lions Den Day School					X	X	X	X	X		
	Vinton Elementary School					X	X	X	X	X		
	Vinton High School					X	X	X	X	X		
	Vinton Middle School					X	X	X	X	X		
Nursing Homes	Vinton Senior Manor					X	X	X	X	X		

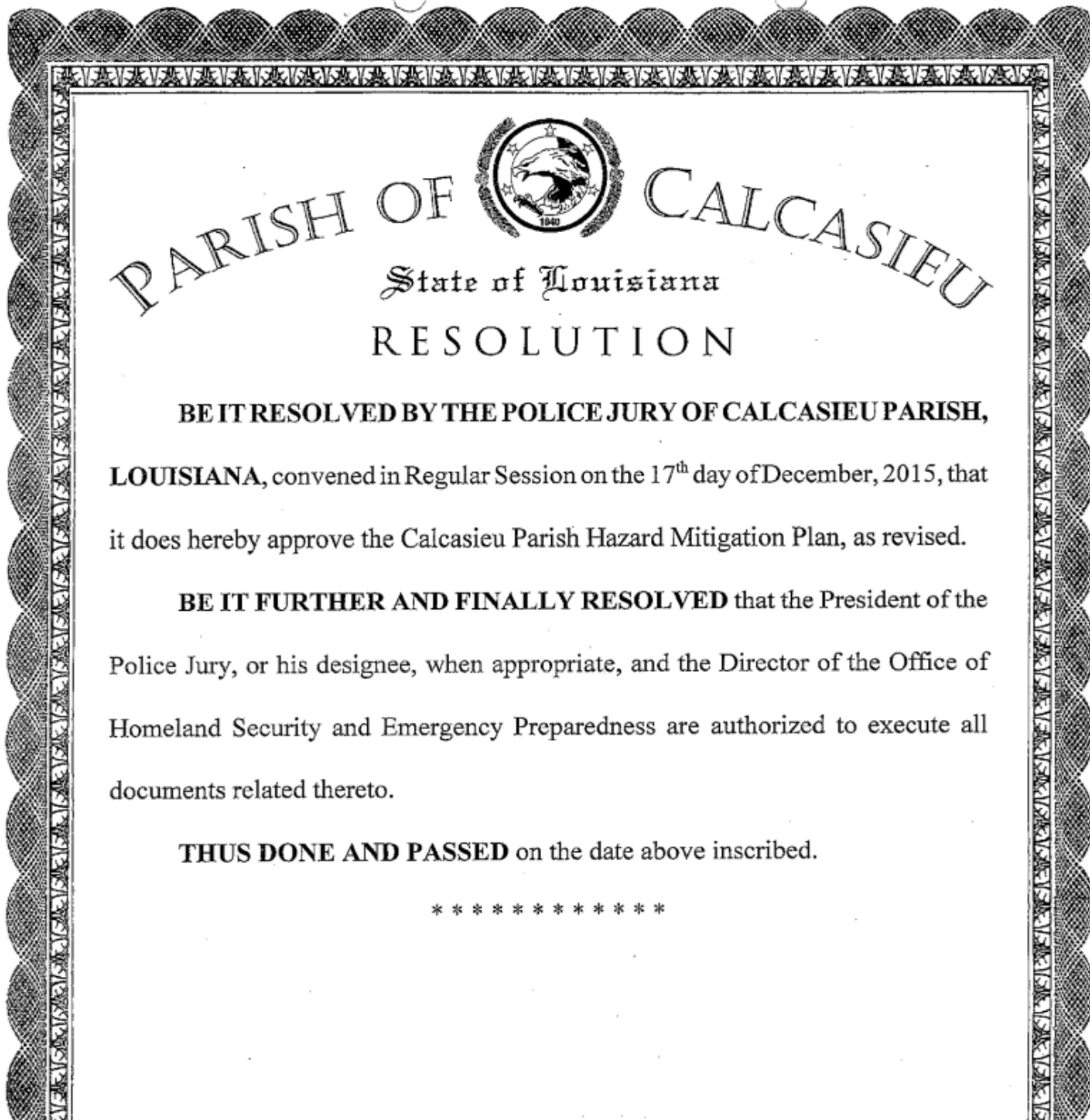
Westlake Essential Facilities												
Type	Name	Drought	Extreme Heat	Floods	Sinkholes	Hail	Wind	Lightning	Tornado	Tropical Cyclones	Wildfire	Winter storm
Fire and Rescue	Westlake Fire			X	X	X	X	X	X	X	X	
Government	Westlake City Hall			X		X	X	X	X	X	X	

Schools	SP Arnett Middle School			X	X	X	X	X	X	X	X	
	Western Heights Elementary			X	X	X	X	X	X	X	X	
	Westlake High			X	X	X	X	X	X	X	X	
	Westwood Elementary			X	X	X	X	X	X	X	X	

DeQuincy Essential Facilities												
Type	Name	Drought	Extreme Heat	Floods	Sinkholes	Hail	Wind	Lightning	Tornado	Tropical Cyclones	Wildfire	Winter storm
Fire and Rescue	DeQuincy Fire Station					X	X	X	X	X	X	
	DeQuincy Fire Station					X	X	X	X	X	X	
Government	Community Outreach Center					X	X	X	X	X	X	
	DeQuincy City Hall					X	X	X	X	X		
	Historic Municipal Building					X	X	X	X	X		
	Louisiana National Guard Armory			X		X	X	X	X	X	X	
	Public Service and Safety Building					X	X	X	X	X		
Law Enforcement	Calcasieu Parish Sheriff's Office			X		X	X	X	X	X	X	
Schools	DeQuincy Elementary School					X	X	X	X	X		
	DeQuincy High School					X	X	X	X	X		
	DeQuincy Middle School					X	X	X	X	X		
	DeQuincy Primary School					X	X	X	X	X	X	
	Toddler Junction					X	X	X	X	X		

## Appendix D: Plan Adoption

Calcasieu Unincorporated



DOCUMENTS RELATED HERETO.

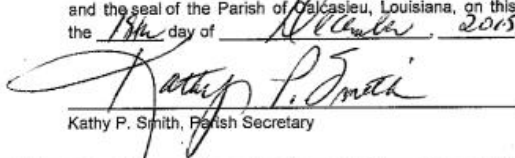
**THUS DONE AND PASSED** on the date above inscribed.

\* \* \* \* \*

STATE OF LOUISIANA  
PARISH OF CALCASIEU

I HEREBY CERTIFY that the foregoing is a true and correct copy of the original resolution as adopted by the Calcasieu Parish Police Jury in Regular Session convened on the 17<sup>th</sup> day of December, 2015.

IN TESTIMONY WHEREOF, witness my official signature and the seal of the Parish of Calcasieu, Louisiana, on this the 18th day of December, 2015.

  
Kathy P. Smith, Parish Secretary



City of Lake Charles

**City of Lake Charles****Signature Copy****Ordinance: 17421**

326 Pujo Street  
P.O. Box 1178  
Lake Charles, LA  
70602-1178

**File Number: 422-15****Enactment Number: 17421**

**An ordinance authorizing the City of Lake Charles to participate in the Comprehensive Parish-wide Hazard Mitigation Plan (Calcasieu Parish) dated December 1, 2015 and adopting said plan as the City of Lake Charles Hazard Mitigation Plan.**

WHEREAS, Calcasieu Parish is subject to tropical storms, hurricanes, flooding, tornadoes, and other natural hazards that can damage property, close businesses, disrupt traffic and present public health and safety hazards; and

WHEREAS, several Federal programs require that the Parish and jurisdictions have an adopted Hazard Mitigation Plan to qualify for Federal benefits; and

WHEREAS, the City of Lake Charles, a participating municipality, adopted the City of Lake Charles Hazard Mitigation Plan in 2010; and

WHEREAS, the adopted plan required the participation and support of different public and private agencies and organizations that are impacted by natural hazards and/or that can help mitigate the impacts of natural disasters; and

WHEREAS, the Hazard Mitigation Plan is required by the Federal Emergency Management Agency (FEMA) to be updated and revised every five (5) years; and

WHEREAS, the Hazard Mitigation Plan 2015 update has been completed and forwarded to FEMA for review and requires the adoption of the changes by the Parish and participating municipal councils; and

WHEREAS, this Calcasieu Parish Hazard Mitigation Plan 2015 update will include the municipalities, including the City of Lake Charles, which in the past had an individual plan. The addition of the municipalities will make this Hazard Mitigation Plan a comprehensive Parish-wide jurisdiction plan.

THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LAKE CHARLES, LOUISIANA, in regular session convened, that:

SECTION 1: The City of Lake Charles, Louisiana, is hereby authorized to participate in the Comprehensive Parish-Wide Hazard Mitigation Plan (Calcasieu Parish Update 2015) and to adopt said plan as the City of Lake Charles Hazard Mitigation Plan.

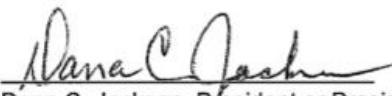
At a meeting of the City Council on 12/2/2015, this Ordinance was adopted by the following vote.

**For:** 7 Luvertha August, Mark Eckard, Rodney Geyen, John Ieyoub, Mary Morris, Stuart Weatherford, and Dana C. Jackson

**Against:** 0

**Absent:** 0

**Passed and Adopted**

  
Dana C. Jackson, President or Presiding  
Officer

**Date** 12-2-15

WHEREAS, this Calcasieu Parish Hazard Mitigation Plan 2015 update will include the municipalities, including the City of Lake Charles, which in the past had an individual plan. The addition of the municipalities will make this Hazard Mitigation Plan a comprehensive Parish-wide jurisdiction plan.

THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LAKE CHARLES, LOUISIANA, in regular session convened, that:

SECTION 1: The City of Lake Charles, Louisiana, is hereby authorized to participate in the Comprehensive Parish-Wide Hazard Mitigation Plan (Calcasieu Parish Update 2015) and to adopt said plan as the City of Lake Charles Hazard Mitigation Plan.

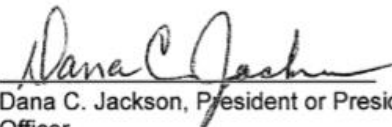
At a meeting of the City Council on 12/2/2015, this Ordinance was adopted by the following vote.

For: 7 Luvertha August, Mark Eckard, Rodney Geyen, John Ieyoub, Mary Morris, Stuart Weatherford, and Dana C. Jackson

Against: 0

Absent: 0

Passed and Adopted

  
Dana C. Jackson, President or Presiding Officer

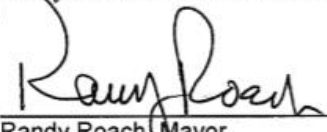
Date 12-2-15

Attest

  
Lynn F. Thibodeaux, Clerk of the Council

Date 12-2-15

Approved by

  
Randy Roach, Mayor  
City of Lake Charles, Louisiana

Date 12-4-15

City of DeQuincy

**RESOLUTION**


The City Council of the City of DeQuincy, State of Louisiana, met in regular session on the 14<sup>th</sup> day of December, 2015, and adopted the following resolution:

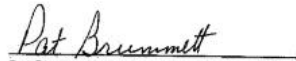
BE IT RESOLVED that the City of DeQuincy does hereby approve the Calcasieu Parish Multi-Hazard Mitigation Plan as revised.

BE IT FURTHER AND FINALLY RESOLVED that Lawrence Henagan, Mayor of DeQuincy, when appropriate, is authorized to execute all documents related thereto.

This Resolution was adopted this 14<sup>th</sup> day of December, 2015, in regular session, and the votes were recorded as follows:

Yeas: 5 Nays: 0 Absent: 0


  
Lawrence Henagan, Mayor

  
Pat Brummett, Secretary to the Council  
and City Clerk

\*\*\*\*\*

I certify that the above and foregoing constitutes a true and correct copy of a resolution duly adopted at a meeting of the City Council of the City of DeQuincy held on December 14, 2015, at which meeting a quorum was present and voted in favor of said resolution, and said resolution has never been modified or rescinded and is still in full force and effect.

Date: December 14, 2015

  
Pat Brummett, Secretary to the  
Council and City Clerk

Town of Iowa

## RESOLUTION 2015-16

**Resolution adopting the Calcasieu Parish Hazard Mitigation Plan (2015 version)  
as required by the State of Louisiana and FEMA.**

**BE IT RESOLVED** by the governing authority of the Town of Iowa, Louisiana in regular session convened on the 14<sup>th</sup> day of December 14, 2015, that they do hereby adopt the Calcasieu Parish Hazard Mitigation Plan (2015 version) as required by the State of Louisiana and FEMA.

APPROVED AND ADOPTED this 14<sup>th</sup> day of December, 2015.


Yeas: Hardy, Talbot, Guidry

Nays: none

Absent: Fontenot, Marshall

  
Carol Ponthieux, Mayor

ATTEST:

  
Sandra Turley, Municipal Clerk

## Town of Vinton

It was moved by Council Member Merchant that the following Resolution be adopted. The motion was seconded by Council Member Loyd and the vote cast thereon was as follows:

YEAS: Council Members Bujard, Loyd, Merchant, Patin and Renfrow

NAYS: None

ABSENT: None

## RESOLUTION

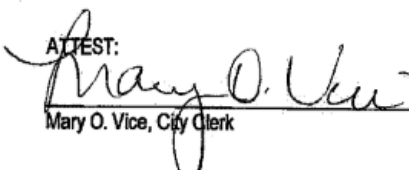
BE IT RESOLVED by the Governing Authority of the Town of Vinton, Louisiana, in regular session convened that it does hereby approve the Calcasieu Parish Multi-Hazard Mitigation Plan, as revised.

BE IT FURTHER AND FINALLY RESOLVED that the President of the Police Jury, or his designee, when appropriate, and the Director Homeland Security and Emergency Preparedness, are authorized to execute all documents related thereto.

APPROVED AND ADOPTED this 15<sup>th</sup> day of December, 2015:

  
Kenneth O. Stinson, Mayor

ATTEST:

  
Mary O. Vice, City Clerk

City of Westlake

RESOLUTION NO. 3244

A RESOLUTION APPROVING THE CALCASIEU PARISH  
MULTI-HAZARD MITIGATION PLAN.

BE IT RESOLVED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF  
WESTLAKE, LOUISIANA, in Regular Session convened on the 14<sup>th</sup> day  
of December, 2015, that:

WHEREAS, on December 14, 2015 the Mayor and City Council of  
the City of Westlake, Louisiana, in Regular Session convened, do  
hereby approve the Calcasieu Parish Multi-Hazard Mitigation Plan,  
as revised.

NOW THEREFORE BE IT RESOLVED, that the Mayor and City  
Council of the City of Westlake, Louisiana do hereby approve the  
Calcasieu Parish Multi-Hazard Mitigation Plan.

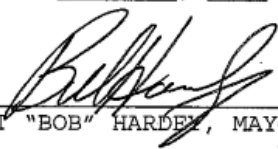
THIS RESOLUTION having been read section by section, and as  
a whole, and having been submitted to a vote, the vote thereon  
was as follows:

YEAS: Hayes, Cryer, Bates, Racca and Brown

NAYS: None.

ABSENT: None

THUS ADOPTED AND APPROVED by the City Council of the City of  
Westlake, Louisiana, on the 14<sup>th</sup> day of December, 2015.

  
\_\_\_\_\_  
ROBERT "BOB" HARDER, MAYOR

ATTEST:

  
\_\_\_\_\_  
ANDREA MAHFOUZ, CITY CLERK



STATE OF LOUISIANA  
PARISH OF CALCASIEU

C E R T I F I C A T E

I, the undersigned Clerk of the City of Westlake, State of Louisiana, do hereby certify that the foregoing is a true and correct copy of Resolution No. 3244 which was adopted on December 14, 2015.

IN FAITH WHEREOF, witness my official signature and the impress of the official seal of said City of Westlake, on this, the 18<sup>th</sup> day of December, 2015.

  
ANDREA MAHFOUZ, CITY CLERK

(Seal)

City of Sulphur

RESOLUTION NO. 2918, M-C SERIES

Resolution approving the Calcasieu Parish Multi-Hazard Mitigation Plan as revised.

BE IT RESOLVED by the City Council of the City of Sulphur, Louisiana, the governing authority thereof, that they do hereby approve the Calcasieu Parish Multi-Hazard Mitigation Plan as revised.

APPROVED AND ADOPTED by the  
City Council of the City of Sulphur,  
Louisiana, on this 14<sup>th</sup> day of  
December, 2015.

Dr. Ellender  
DRU ELLENDER, Chairman

ATTEST:

Arlene Blanchard  
ARLENE BLANCHARD, Clerk

## Appendix E: State Required Worksheets

During the planning process (Appendix A) the Hazard Mitigation Plan Update Steering Committee was provided state-required plan update process worksheets to be filled out by each jurisdiction. The worksheets were presented at the Kickoff Meeting by the contractor as tools for assisting in the update of the Hazard Mitigation Plan. The plan update worksheets allowed for collection of information such as planning team members, community capabilities, critical infrastructure and vulnerable populations and NFIP information. The following pages contain documentation of the worksheets.

## Mitigation Planning Team

Member/Title	Jurisdiction/Entity	Address	Phone/Email
<b>Dick Gremillion Director</b>	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:dgregmillion@cppj.net">dgregmillion@cppj.net</a>
<b>Norman Bourdeau Operations Manager</b>	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:nbourdeau@cppj.net">nbourdeau@cppj.net</a>
<b>Marc Ferguson Emergency Response Coordinator</b>	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:mferguson@cppj.net">mferguson@cppj.net</a>
<b>Rob Daughdril Emergency Response Coordinator</b>	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:rdaughdril@cppj.net">rdaughdril@cppj.net</a>
<b>Cade McLemore Emergency Planner</b>	Calcasieu Parish OHSEP	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3800 <a href="mailto:jmclemore@cppj.net">jmclemore@cppj.net</a>
<b>Emily Abshire Finance Analyst</b>	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:eabshire@cppj.net">eabshire@cppj.net</a>
<b>Jennifer Cobian Senior Finance Analyst</b>	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jcobian@cppj.net">jcobian@cppj.net</a>
<b>Mary Jo Bayles Planner</b>	City of Dequincy	300 N. Holly St. DeQuincy, LA 70633	337-786-8211 <a href="mailto:mjbayles@cityofdequincy.com">mjbayles@cityofdequincy.com</a>
<b>Louis Coats Police Chief</b>	City of Sulphur	500 N. Huntington Sulphur, LA 70663	337-527-4550 <a href="mailto:lcoats@sulphur.org">lcoats@sulphur.org</a>
<b>John Reon Superintendent</b>	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:jreon@bellsouth.net">jreon@bellsouth.net</a>
<b>Eddie Hebert Superintendent in Training</b>	Gravity Drainage Dist. 8, Ward 1	2841 Goos Rd., Westlake, LA 70611	337-855-4388 <a href="mailto:eddie@gdd8.net">eddie@gdd8.net</a>
<b>Terri Hawes Permit Technician</b>	City of Westlake	P.O. Box 700, Westlake, LA 70669	337-433-0691 <a href="mailto:terrihawes@hotmail.com">terrihawes@hotmail.com</a>
<b>Sandra Turley Municipal Clerk</b>	Town of Iowa	P.O. Box 1707 Iowa, LA 70647	337-582-3535 <a href="mailto:sandra@iowala.org">sandra@iowala.org</a>
<b>Lori Marinovich Executive Director</b>	City of Lake Charles	326 Pujio Street, Lake Charles, La 70601	(337)491-1429 <a href="mailto:lmarinovich@cityoflc.us">lmarinovich@cityoflc.us</a>
<b>Jennifer Wallace</b>	Calcasieu Parish Planning and Development	P.O. Drawer 3287, Lake Charles, LA 70602-3287	337-721-3600 <a href="mailto:jwallace@cppj.net">jwallace@cppj.net</a>
<b>Carl Chance IT Director</b>	Sabine River Authority	15091 Texas Hwy., Many, LA 71449	318-256-4114 <a href="mailto:carl.chance@la.gov">carl.chance@la.gov</a>
<b>Lennie LaFleur</b>	Lake Charles Fire Department	Lake Charles, LA	<a href="mailto:Lennie.lafleur@cityoflc.us">Lennie.lafleur@cityoflc.us</a>
<b>Mary Vice Municipal Clerk</b>	Town of Vinton	1200 Horridge St. Vinton, LA 70668	337-589-7453 <a href="mailto:cityclerk @cityofvinton.com">cityclerk @cityofvinton.com</a>

Capability Assessment  
Calcasieu Unincorporated

Worksheet 4.1: Capability Assessment Worksheet - Unincorporated Calcasieu		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place		
Plans	Yes / No	
Comprehensive / Master Plan	yes	
Capital Improvements Plan	yes	
Economic Development Plan	yes	
Local Emergency Operations Plan	yes	Revised Mar 2015
Continuity of Operations Plan	yes	
Transportation Plan	yes	March 2015, annual ex.
Stormwater Management Plan	yes	
Community Wildfire Protection Plan	No	
Other plans (redevelopment, recovery, coastal zone management)	Yes	Coastal Zone Management Plan
Building Code, Permitting and Inspections	Yes / No	
Building Code	yes	
Building Code Effectiveness Grading Schedule (BCEGS) Score	yes	6 of 6 requirements met
Fire Department ISO/PIAL rating	yes	all districts
Site plan review requirements	yes	
Land Use Planning and Ordinances	Yes / No	
Zoning Ordinance	yes	
Subdivision Ordinance	yes	
Floodplain Ordinance	yes	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	no	
Flood Insurance Rate Maps	yes	adopted feb 2011
Acquisition of land for open space and public recreation uses	yes	via HMPG
Other		

Administration and Technical		
Administration	Yes / No	
Planning Commission	yes	Planning/zoning board
Mitigation Planning Committee	yes	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	yes	public works
Staff	Yes / No; FT/PT; % Hazard	
Chief Building Official	yes	FT, 5%
Floodplain Administrator	yes	FT, 15%
Emergency Manager	yes	FT, 20%
Community Planner	yes	FT, 5%
Civil Engineer	yes	FT, 5%
GIS Coordinator	yes	FT, 5%
Grant Writer	yes	FT, 75%
Other	yes	Coastal Zone Manager: FT, 60%
Technical	Yes / No	
Warning Systems / Service (Reverse 911, outdoor warning signals)	yes	Code Red, Sirens, Weather Radio, Media, Social Media
		Tier 2 Reports, Facility Emergency Response Plans
Hazard Data & Information	yes	
Grant Writing	yes	Planning
Hazus Analysis	no	



Financial		
Funding Resource	Yes / No	
Capital Improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	Not currently utilized
Fees for water, sewer, gas, or electric services	yes	Not currently utilized
Impact fees for new development	yes	Not currently utilized
Stormwater Utility Fee	yes	Not currently utilized
Community Development Block Grant (CDBG)	Yes	
Other Funding Programs		RESTORE Act, CPRA
Education and Outreach		
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	LEAN, MEAN, GREEN
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental	yes	Media, Social Media, CRS Public Meetings
Natural Disaster or safety related school program	yes	Local agency outreach programs,
Storm Ready certification	yes	
Firewise Communities certification	no	
Public/Private partnership initiatives addressing disaster-related issues	Yes	Mutual Aid, CAER, LAIA

City of DeQuincy

Worksheet 4.1: Capability Assessment Worksheet - DeQuincy		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
Plans	Yes / No	Comments
Comprehensive / Master Plan	Yes	
Capital Improvements Plan	Yes	
Economic Development Plan	Yes	
Local Emergency Operations Plan	Yes	Work with OEP
Continuity of Operations Plan	Yes	
Transportation Plan	No	Work with Parish OEP
Stormwater Management Plan	Yes	Updated yearly
Community Wildfire Protection Plan	Yes	
Other plans (redevelopment, recovery, coastal zone management)		
Building Code, Permitting and Inspections	Yes / No	
Building Code	Yes	Use Parish Ordinances
Building Code Effectiveness Grading Schedule (BCEGS) Score	Yes	
Fire Department ISO/PIAL rating	Yes	
Site plan review requirements	Yes	
Land Use Planning and Ordinances	Yes / No	
Zoning Ordinance	Yes	
Subdivision Ordinance	Yes	
Floodplain Ordinance	Yes	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	Yes	
Flood Insurance Rate Maps	Yes	
Acquisition of land for open space and public recreation uses	Yes	
Other		

Administration and Technical		
Administration	Yes / No	
Planning Commission	Yes	Work with parish
Mitigation Planning Committee	Yes	Work with parish
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Yes	City Crew Does This
Staff	Yes / No; FT/PT; % Hazard	
Chief Building Official	Yes	Work with parish
Floodplain Administrator	Yes	Work with parish
Emergency Manager	Yes	Work with Parish and OEP
Community Planner	No	Work with parish
Civil Engineer	No	Work with parish
GIS Coordinator	No	Work with parish
Grant Writer	Yes	PT City Planner
Other		
Technical	Yes / No	
Warning Systems / Service (Reverse 911, outdoor warning signals)	Yes	
Hazard Data & Information	Yes	
Grant Writing	Yes	Consultants
Hazus Analysis	No	Work with Parish
Other		
Financial		
Funding Resource	Yes / No	
Capital Improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	City Gas, Sewer, Garbage
Impact fees for new development	No	
Stormwater Utility Fee	No	
Community Development Block Grant (CDBG)	Yes	
Other Funding Programs		

Education and Outreach		
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	No	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Yes	Distribute flyers 2/yr
Natural Disaster or safety related school program	Yes	Work with Parish
Storm Ready certification	Yes	Work with OEP and Parish
Firewise Communities certification	Yes	Vol Fire Dept
Public/Private partnership initiatives addressing disaster-related issues	Yes	Work with Parish
Other		

City of Lake Charles

**Worksheet 4.1: Capability****Assessment Worksheet - Lake Charles**

Local mitigation capabilities are existing authorities, policies and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.

**Planning and Regulatory**

Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.

Plans	Yes / No	
Comprehensive / Master Plan	yes	
Capital Improvements Plan	yes	
Economic Development Plan	yes	SWLA Alliance for economic dev.
Local Emergency Operations Plan	yes	CoLC LCFD
Continuity of Operations Plan	yes	CoLC
Transportation Plan	yes	CoLC & CPPJ/OEP
Stormwater Management Plan	yes	
Community Wildfire Protection Plan	N/A	
Other plans (redevelopment, recovery, coastal zone management)		
Building Code, Permitting and Inspections	Yes / No	
Building Code	yes	
Building Code Effectiveness Grading Schedule (BCEGS) Score	no	
Fire Department ISO/PIAL rating	yes	2
Site plan review requirements	yes	
Land Use Planning and Ordinances	Yes / No	
Zoning Ordinance	yes	
Subdivision Ordinance	yes	
Floodplain Ordinance	yes	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	yes	
Flood Insurance Rate Maps	yes	
Acquisition of land for open space and public recreation uses	yes	

Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	Yes / No	
Planning Commission	yes	
Mitigation Planning Committee	yes	Dept Heads and their reps make up our committee
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	yes	
Staff	Yes / No; FT/PT; % Hazard	
Chief Building Official	yes	
Floodplain Administrator	yes	
Emergency Manager	yes	CoLC, LCFD
Community Planner	no	
Civil Engineer	no	
GIS Coordinator	yes/parish	
Grant Writer	yes	
Other		
Technical	Yes / No	
Warning Systems / Service (Reverse 911, outdoor warning signals)	yes	CAER
Hazard Data & Information	yes	HMP and plan
Grant Writing	yes	
Hazus Analysis	N/A	
Other		



Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes / No	
Capital Improvements project funding	Yes	\$23M FY 2015
Authority to levy taxes for specific purposes	Yes	Currently levy 15.35 PTX mills and 2.25% STX
Fees for water, sewer, gas, or electric services	Water and sewer	24.3M projected FY2015
Impact fees for new development	No	
Stormwater Utility Fee	No	
Community Development Block Grant (CDBG)	Yes	\$663,782 budgeted FY2015
Other Funding Programs	Total budget, all programs	\$120.8M BY 2015
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Team Green and others
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	yes	LCFD
Natural Disaster or safety related school program	yes	
Storm Ready certification	no	
Firewise Communities certification	no	
Public/Private partnership initiatives addressing disaster-related issues	Yes	CPPJ OEP EOC

City of Sulphur

Worksheet 4.1: Capability Assessment Worksheet - Sulphur		
Local mitigation capabilities are existing authorities, policies and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
Plans	Yes / No	Comments/Responsible Agency
Comprehensive / Master Plan	Yes	
Capital Improvements Plan	Yes	
Economic Development Plan	No	
Local Emergency Operations Plan	Yes	
Continuity of Operations Plan	Yes	
Transportation Plan	No	
Stormwater Management Plan	Yes	
Community Wildfire Protection Plan	NO	
Other plans (redevelopment, recovery, coastal zone management)	Yes	
Building Code, Permitting and Inspections	Yes / No	
Building Code	Yes	
Building Code Effectiveness Grading Schedule (BCEGS) Score	NO	
Fire Department ISO/PIAL rating	Yes	
Site plan review requirements	Yes	
Land Use Planning and Ordinances	Yes / No	
Zoning Ordinance	Yes	
Subdivision Ordinance	Yes	
Floodplain Ordinance	Yes	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	Yes	
Flood Insurance Rate Maps	Yes	
Acquisition of land for open space and public recreation uses	N/A	

Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	Yes / No	
Planning Commission	Yes	
Mitigation Planning Committee	No	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Yes	
Staff	Yes / No; FT/PT; % Hazard	
Chief Building Official	Yes	
Floodplain Administrator	yes	
Emergency Manager	Yes	
Community Planner	no	
Civil Engineer	yes	
GIS Coordinator	yes	
Grant Writer	yes	
Other	no	
Technical	Yes / No	
Warning Systems / Service (Reverse 911, outdoor warning signals)	yes	
Hazard Data & Information	no	
Grant Writing	no	
Hazus Analysis	no	
Other	no	

Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes / No	
Capital Improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	
Impact fees for new development	No	
Stormwater Utility Fee	no	
Community Development Block Grant (CDBG)	no	
Other Funding Programs	no	
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental	yes	
Natural Disaster or safety related school	yes	
Storm Ready certification	no	
Firewise Communities certification	no	
Public/Private partnership initiatives addressing disaster-related issues	no	

City of Westlake

**Worksheet 4.1: Capability****Assessment Worksheet - Westlake**

Local mitigation capabilities are existing authorities, policies and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.

**Planning and Regulatory**

Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.

Plans	Yes / No	Comments
Comprehensive / Master Plan	NO	
Capital Improvements Plan	YES	
Economic Development Plan	NO	
Local Emergency Operations Plan	YES	
Continuity of Operations Plan	YES	
Transportation Plan	NO	
Stormwater Management Plan	YES	
Community Wildfire Protection Plan	YES	
Other plans (redevelopment, recovery, coastal zone management)	NO	
<b>Building Code, Permitting and Inspections</b>	<b>Yes / No</b>	
Building Code	YES	
Building Code Effectiveness Grading Schedule (BCEGS) Score	NO	
Fire Department ISO/PIAL rating	YES	
Site plan review requirements	YES	
<b>Land Use Planning and Ordinances</b>	<b>Yes / No</b>	
Zoning Ordinance	YES	
Subdivision Ordinance	YES	
Floodplain Ordinance	YES	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	YES	
Flood Insurance Rate Maps	YES	
Acquisition of land for open space and public recreation uses	NO	
Other	NO	

Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes / No	
Capital Improvements project funding	YES	
Authority to levy taxes for specific purposes	YES	
Fees for water, sewer, gas, or electric services	YES	
Impact fees for new development	NO	
Stormwater Utility Fee	NO	
Community Development Block Grant (CDBG)	YES	
Other Funding Programs	YES	
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	NO	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	NO	
Natural Disaster or safety related school program	NO	
Storm Ready certification	NOT SURE	
Firewise Communities certification	NOT SURE	
Public/Private partnership initiatives addressing disaster-related issues	Yes / No	



Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	Yes / No	
Planning Commission	NO	
Mitigation Planning Committee	NO	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	YES	
Staff	Yes / No; FT/PT; % Hazard	
Chief Building Official	NO	CONTRACT WITH CPPJ
Floodplain Administrator	YES	
Emergency Manager	YES	
Community Planner	NO	
Civil Engineer	YES	
GIS Coordinator	YES	
Grant Writer	YES	
Other	NO	
Technical	Yes / No	
Warning Systems / Service (Reverse 911, outdoor warning signals)	NO	
Hazard Data & Information	NO	
Grant Writing	YES	
Hazus Analysis	NO	
Other	NO	

Town of Iowa

**Worksheet 4.1: Capability****Assessment Worksheet - Iowa**

Local mitigation capabilities are existing authorities, policies and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.

**Planning and Regulatory**

Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.

Plans	Yes / No	Comments
Comprehensive / Master Plan	No	
Capital Improvements Plan	No	Nothing specifically written
Economic Development Plan	No	
Local Emergency Operations Plan	Yes	Thru the Police Dept.
Continuity of Operations Plan	No	
Transportation Plan	No	
Stormwater Management Plan	No	
Community Wildfire Protection Plan	No	Fire dept protects all
Other plans (redevelopment, recovery, coastal zone management)	No	
<b>Building Code, Permitting and Inspections</b>	<b>Yes / No</b>	
Building Code	Yes	
Building Code Effectiveness Grading Schedule (BCEGS) Score	No	
Fire Department ISO/PIAL rating	Yes	PIAL rating is 4
Site plan review requirements	No	
<b>Land Use Planning and Ordinances</b>	<b>Yes / No</b>	
Zoning Ordinance	NO	
Subdivision Ordinance	Yes	
Floodplain Ordinance	Yes	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	No	
Flood Insurance Rate Maps	Yes	
Acquisition of land for open space and public recreation uses	No	
Other		

Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	Yes / No	
Planning Commission	No	
Mitigation Planning Committee	No	CPPJ
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Yes	Gravity Drainage Dist. And our own Public Works
Staff	Yes / No; FT/PT; % Hazard Mitigation	
Chief Building Official	No	Town has agreement with Calcasieu Parish to handle building inspections
Floodplain Administrator	Yes	Town Clerk wears this hat
Emergency Manager	No	Mayor would be responsible
Community Planner	No	
Civil Engineer	No	Town does have a Town Engineer
GIS Coordinator	No	Town uses Calcasieu Parish Police Jury
Grant Writer	Yes	
Other		
Technical	Yes / No	
Warning Systems / Service (Reverse 911, outdoor warning signals)	No	
Hazard Data & Information	No	CPPJ
Grant Writing	No	
Hazus Analysis	No	
Other		

Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes / No	
Capital Improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	Water, Sewer Utility
Impact fees for new development	No	
Stormwater Utility Fee	No	
Community Development Block Grant (CDBG)	Yes	
Other Funding Programs	Yes	LGAP, CWEF
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Resilency Team, public meeting several times a year
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Yes	Town works on keeping citizens informed
Natural Disaster or safety related school program	No	
Storm Ready certification	No	
Firewise Communities certification		
Public/Private partnership initiatives addressing disaster-related issues	No	Town works with Parish
Other		

Town of Vinton

**Worksheet 4.1: Capability****Assessment Worksheet - Vinton**

Local mitigation capabilities are existing authorities, policies and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.

**Planning and Regulatory**

Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.

Plans	Yes / No	Comments
Comprehensive / Master Plan	No	
Capital Improvements Plan	Yes	
Economic Development Plan	Yes	
Local Emergency Operations Plan	Yes	
Continuity of Operations Plan	No	
Transportation Plan	No	
Stormwater Management Plan	No	
Community Wildfire Protection Plan	No	
Other plans (redevelopment, recovery, coastal zone management)	No	
<b>Building Code, Permitting and Inspections</b>	<b>Yes / No</b>	
Building Code	Yes	
Building Code Effectiveness Grading Schedule (BCEGS) Score	No	
Fire Department ISO/PIAL rating	Yes	
Site plan review requirements	Yes	
<b>Land Use Planning and Ordinances</b>	<b>Yes / No</b>	
Zoning Ordinance	Yes	
Subdivision Ordinance	No	
Floodplain Ordinance	Yes	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	Yes	
Flood Insurance Rate Maps	No	
Acquisition of land for open space and public recreation uses	No	
Other	No	

Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
Administration	Yes / No	
Planning Commission	No	
Mitigation Planning Committee	No	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Yes	
Staff	Yes / No; FT/PT; % Hazard Mitigation	
Chief Building Official	Yes	
Floodplain Administrator	Yes	
Emergency Manager	Yes	
Community Planner	No	
Civil Engineer	No	
GIS Coordinator	No	
Grant Writer	Yes	
Other	No	
Technical	Yes / No	
Warning Systems / Service (Reverse 911, outdoor warning signals)	Yes	
Hazard Data & Information	No	
Grant Writing	Yes	
Hazus Analysis	No	
Other	No	



Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
Funding Resource	Yes / No	
Capital Improvements project funding	Yes	
Authority to levy taxes for specific purposes	No	
Fees for water, sewer, gas, or electric services	Yes	
Impact fees for new development	Yes	
Stormwater Utility Fee	No	
Community Development Block Grant (CDBG)	Yes	
Other Funding Programs	No	
Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Yes	
Natural Disaster or safety related school program	No	
Storm Ready certification	No	
Firewise Communities certification	No	
Public/Private partnership initiatives addressing disaster-related issues	No	
Other	No	

## Building Inventory

Critical Facility (If Yes, Mark X)	Name of Building	Purpose of Building	Address	City	Latitude	Longitude	Assessed Value	Date Built	Construction Type
<b>Unincorporated Calcasieu</b>									
	Concession Stand	Concession Stand	831A-1 Third St.	Bell City	30.113507	-92.961219	\$16,800.00	1980	Wood
	Baseball Dugout	dugout	831C Third St.	Bell City	30.113507	-92.961219	\$735.00	1980	Metal
	Baseball Dugout	dugout	831D Third St.	Bell City	30.113507	-92.961219	\$735.00	1980	Metal
	Rossignol Boat Launch Pavilion	Pavilion	Rossignol Rd	Bell City	30.129764	-92.908113	\$2,500.00	1980	Wood
	Alligator Park Pavilion	Pavilion	5316 Alligator Park Rd	Starks	30.363447	-93.722375	\$127,519.00	2006	Wood
	Alligator Park Caretakers Residence	Caretakers Residence	5316 Alligator Park Rd	Starks	30.363447	-93.722375	\$88,982.00	2006	Wood
	Alligator Park Fencing	Fencing	5316 Alligator Park Rd	Starks	30.363447	-93.722375	\$12,000.00	2006	Metal
	Irby Gore Baseball Park Recreation Building	restrooms	220 Ball Park Rd	Starks	30.313288	-93.673391	\$32,350.00	1975	Wood
	Irby Gore Baseball Park Grandstands	grandstands	220 Ball Park Rd	Starks	30.313288	-93.673391	\$13,650.00	1975	Wood
	Irby Gore Baseball Park Dugout	dugout	220 Ball Park Rd	Starks	30.313288	-93.673391	\$735.00	1975	Wood
	Irby Gore Baseball Park Dugout	dugout	220 Ball Park Rd	Starks	30.313288	-93.673391	\$735.00	1975	Wood
	Irby Gore Baseball Park Restroom/Concession	restroom/concession	220 Ball Park Rd	Starks	30.313288	-93.673391	\$32,327.00	1975	Steel
	Library	Library	113 South Hwy. 109	Starks	30.318261	-93.661813	\$165,104.00	1968	Wood
	Library	Library	7709 Perier Street	Hayes	30.107874	-92.921524	\$98,009.00	1958	Wood
	Lorraine Park Restrooms Bldg	Restrooms	7803 Lorain Road	Hayes	30.07775	-92.54498	\$71,089.00	2006	Concrete
	Lorraine Park Storage Bldg	Storage	7803 Lorain Road	Hayes	30.07775	-92.54498	\$995.00	2006	Metal
	Lorraine Park Covered Pavilion	Pavilion	7803 Lorain Road	Hayes	30.07775	-92.54498	\$3,800.00	2006	Wood
	Lorraine Park Storage Bldg with Overhang	Storage	7803 Lorain Road	Hayes	30.07775	-92.54498	\$1,400.00	2006	Wood
	Lorraine Park Covered Picnic Area	Picnic Area	7803 Lorain Road	Hayes	30.07775	-92.54498	\$2,500.00	2006	Wood
	Lorraine Park	Park Keeper Residence	7803 Lorain Road	Hayes	30.07775	-92.54498	\$88,477.00	2006	Wood
X	WD1 Fire Station	Fire Station	1000 Topsy Road	Gillis	30.373702	-93.191767	\$171,947.00	2010	Steel
X	WD1 Fire Station	Fire Station	1738 Southerland Rd.	Moss Bluff	30.328502	-93.258092	\$177,135.00	2000	Steel
X	WD1 Fire Station	Fire Station	134 Firehouse Rd.	Moss Bluff	30.300167	-93.208142	\$427,402.00	2000	Steel
X	WD1 Fire Station Bird's Nest	Fire Station	2888 Cardinal Ln	Moss Bluff	30.361178	-93.141582	\$171,947.00	2000	Steel
X	WD1 Fire Station	Fire Station	1240 Joe Miller Rd	Moss Bluff	30.345343	-93.224728	\$584,253.00	2007	Steel

Dequincy									
X	Sheriff's Office	Law Enforcement	618 E. Center St.	Dequincy	30.450064	-93.428488	\$263,447.00	1958	Reinforced Masonry
	Library - DeQuincy	Library	102 W. Harrison St.	Dequincy	30.448987	-93.435725	\$335,141.00	1993	Wood
X	City Hall	City Administrative Office	30 North Holly	Dequincy	30.2706.63	93.2602.64	\$800,000.00	1977	Concrete
X	Public Safety Building	Public building open for rent/holding events	101 South Pine	DeQuincy	30.2658.87	932607.45	1,000,000	2003	Metal
	DeQuincy Railroad Museum	Tourism revenue	400 Lake Charles Ave	DeQuincy	30.2700.64	93.2607.60	500,000.00	1923	Unreinforced Masonry
	Old town Hall Museum	Tourism revenue	218 East 4th Street	DeQuincy	30.2652.61	93.2601.49	300,000.00	1951	Reinforced Masonry

Sulphur									
X	Health Unit Sulphur	Medical	201 Edgar	Sulphur	30.241296	-93.375926	\$786,055.00	1958	Reinforced Masonry
	Holbrook Caretaker Dwelling	Caretaker Dwelling	1868 A Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$60,920.00	1990	Wood
	Holbrook Park Pavilion 1	Pavilion	1868 C Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$49,394.00	2000	Wood
	Holbrook Park Pavilion 2	Pavilion	1868 B Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$6,300.00	2000	Wood
	Holbrook Park Pavilion 3	Pavilion	1868 F Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$7,350.00	2000	Wood
	Holbrook Park Restroom Building	Restrooms	1868 G Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$50,031.00	2000	Reinforced Masonry
	Holbrook Park Shop Building	Shop	1868 J Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$3,300.00	1970	Wood
	Holbrook Park Main Pavilion	Pavilion	1868 K Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$49,394.00	1970	Wood
	Holbrook Park Picnic Shelter	Picnic Shelter	1868 L Holbrook Park Rd	Sulphur	30.348419	-93.294745	\$3,150.00	1970	Wood
	Public Works West Pavillion Post Oak	Pavilion	2911 Post Oak Rd.	Sulphur	30.21018	-93.349688	\$424,184.00	2007	Steel
	Library - Maplewood	Library	91 Center St.	Sulphur	30.233658	-93.317692	\$413,228.00	1993	Wood
	Library - Sulphur	Library	1160 Cypress St.	Sulphur	30.231882	-93.364294	\$3,004,108.00	1993	Steel
	Intracoastal Park Keeper's Residence	Caretaker Dwelling	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$90,002.00	2003	Reinforced Masonry
	Intracoastal Park Restroom 2	Restrooms	7955 Intercoastal park Rd	Sulphur	30.074846	-93.338314	\$121,636.00	2005	Reinforced Masonry
	Intracoastal Park Restroom 1	Restrooms	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$44,137.00	1998	Concrete
	Intracoastal Park Covered Picnic Pavilion 1	Picnic Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$16,075.00	2005	Reinforced Masonry
	Intracoastal Park Covered Picnic Pavilion 2	Picnic Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$16,075.00	1998	Reinforced Masonry
	Intracoastal Park Large covered Picnic Pavilion	Picnic Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$11,586.00	1998	Steel
	Intracoastal Park Activity Center	Activity center	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$207,415.00	2005	Reinforced Masonry
	Intracoastal Park Playground Area	Playground	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$33,250.00	1998	Steel
	Intracoastal Park Storage Building	Shop	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$8,000.00	1998	Wood
	Intracoastal Park Picnic Pavilion 3	Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$17,713.00	2007	Reinforced Masonry
	Intracoastal Park Picnic Pavilion 1	Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$5,801.00	2007	Metal
	Intracoastal Park Picnic Pavilion 2	Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$5,801.00	2007	Metal
	Intracoastal Park Picnic Pavilion 3	Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$5,801.00	2007	Metal
	Intracoastal Park Picnic Pavilion 4	Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$5,801.00	2007	Metal
	Intracoastal Park Picnic Pavilion 5	Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$5,801.00	2007	Metal
	Intracoastal Park Picnic Pavilion 6	Pavilion	7955 Intercoastal Park Rd	Sulphur	30.074846	-93.338314	\$5,801.00	2007	Metal
X	CERTC - Training Center	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$310,836.00	2012	Steel
	CERTC - Shed	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$22,117.00	2012	Steel
	CERTC Rescue Training Tower	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$126,385.00	2012	Steel
	CERTC Training Equipment Storage	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$80,057.00	2012	Metal
	CERTC Oil/Water Separation Plant	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$22,535.00	2012	Metal
X	CERTC Emergency Response Fuel Storage	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$35,865.00	2012	Metal
	CERTC Trailer Storage	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$25,000.00	2012	Steel

## Sulphur

	CERTC Pump House	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$126,000.00	2012	Steel
	CERTC Pump House	Fire/Training	1601 Holbrook Park Rd	Sulphur	30.354058	-93.319	\$13,379.00	2012	Steel
X	Public Works West Administration Bldg	Public Works	2915 Post Oak Road	Sulphur	30.211403	-93.350779	\$418,331.00	2007	Steel
X	Public Works West-Crew Building	Public Works	2915 Post Oak Road	Sulphur	30.211403	-93.350779	\$403,662.00	2007	Steel
X	Public Works West-Equipment Shed	Public Works	2915 Post Oak Road	Sulphur	30.211403	-93.350779	\$155,680.00	2007	Steel
X	Public Works West-Fuel Storage/Wash Bldg	Public Works	2915 Post Oak Road	Sulphur	30.211403	-93.350779	\$183,402.00	2007	Steel
X	Public Works West-Shop/Chemical Shed	Public Works	2915 Post Oak Road	Sulphur	30.211403	-93.350779	\$1,202,344.00	2007	Steel
X	Public Works West-Storage	Public Works	2915 Post Oak Road	Sulphur	30.211403	-93.350779	\$149,110.00	2007	Steel
X	Public Works West-Truck Shed	Public Works	2915 Post Oak Road	Sulphur	30.211403	-93.350779	\$364,285.00	2007	Steel
	West Calcasieu Business Center	Business Office	500 North Huntington	Sulphur	<a href="#">30.242869</a>	<a href="#">93.377074</a>	info not available	not available	Reinforced Masonry
X	Law Enforcement Center	Police Department	500 B North Huntington	Sulphur	<a href="#">30.243034</a>	<a href="#">93.376738</a>	info not available	not available	Reinforced Masonry
X	City Hall	Administration Building	101 North Huntington	Sulphur	<a href="#">30.238059</a>	<a href="#">93.377633</a>	info not available	2009	Reinforced Masonry
X	City of Sulphur Business Center	Inspections/Permits	110 North Huntington	Sulphur	<a href="#">30.238122</a>	<a href="#">93.377288</a>	info not available	2009	Reinforced Masonry
	Storage Building	Storage	105 West Verdine	Sulphur	<a href="#">30.238094</a>	<a href="#">93.376216</a>	info not available	not available	Metal
	Judicial Center	Court House	802 South Huntington	Sulphur	<a href="#">30.231719</a>	<a href="#">93.376988</a>	info not available	not available	Wood
	Marshal's Office	Marshal's Office	800 South Huntington	Sulphur	<a href="#">30.231953</a>	<a href="#">93.376809</a>	info not available	not available	Wood
	Vacant Building	Vacant Building	810 Ruth Street	Sulphur	<a href="#">30.23167</a>	<a href="#">93.375782</a>	info not available	not available	Reinforced Masonry
	Senior Citizens Center	Senior Citizens Center	601 Maple Street	Sulphur	<a href="#">30.23412</a>	<a href="#">93.368179</a>	info not available	not available	Reinforced Masonry
	Portable Building 25X20	Storage	601 Maple Street	Sulphur	<a href="#">30.233755</a>	<a href="#">93.368023</a>	info not available	not available	Metal
x	Central Fire Station	Fire Station	602 North Huntington Str	Sulphur	<a href="#">30.243412</a>	<a href="#">93.377274</a>	info not available	not available	Reinforced Masonry
x	Southside Fire Station	Fire Station	201 West Darbonne	Sulphur	<a href="#">30.225477</a>	<a href="#">93.377791</a>	info not available	not available	Reinforced Masonry
	Training Tower	Fire Training	201 West Darbonne	Sulphur	<a href="#">30.225124</a>	<a href="#">93.378001</a>	info not available	2002	Steel
	Portable Building 23x25	Storage	602 North Huntington Str	Sulphur	<a href="#">30.243412</a>	<a href="#">93.377274</a>	info not available	not available	Metal
	SPD Detective Building	Detective Office	622 Live Oak Street	Sulphur	<a href="#">30.243269</a>	<a href="#">93.3762</a>	info not available	not available	Wood
	Storage Building	Storage Building	210 East Burton	Sulphur	<a href="#">30.242292</a>	<a href="#">93.37623</a>	info not available	not available	Metal
	Maintenance Office	maintenance	220 East Burton	Sulphur	<a href="#">30.242292</a>	<a href="#">93.37623</a>	info not available	not available	Wood
	Equipment Garage	Storage of Equipment	220 East Burton	Sulphur	<a href="#">30.242292</a>	<a href="#">93.37623</a>	info not available	not available	Metal
X	Mechanic Shop	Mechanic Shop	610 Live Oak	Sulphur	<a href="#">30.242702</a>	<a href="#">93.375916</a>	info not available	2003	Steel
X	Water Treatment Plant	Water Plant	119 East Verdine Street	Sulphur	<a href="#">30.238025</a>	<a href="#">93.376029</a>	info not available	not available	Metal



**Sulphur**

Radio Tower	Communication Tower	3400 Bayou D'inde	Sulphur	<a href="#">30.193166</a>	<a href="#">93.304776</a>	info not available	2005	Steel
Sludge Metal Building	Water Plant	3400 Bayou D'inde	Sulphur	<a href="#">30.193166</a>	<a href="#">93.304776</a>	info not available	2005	Metal
WareHouse/Auto Storage	Storage	604 Live Oak	Sulphur	<a href="#">30.242995</a>	<a href="#">93.375968</a>	info not available	not available	Metal
Animal Control Office (Mobile Home)	Office	3410 Bayou D'inde	Sulphur	<a href="#">30.198119</a>	<a href="#">93.305807</a>	info not available	2007	Wood
Metal Building	Dog Pins	3410 Bayou D'inde	Sulphur	<a href="#">30.198119</a>	<a href="#">93.305807</a>	info not available	not available	Metal
Incinerator Building	incinerator	3410 Bayou D'inde	Sulphur	<a href="#">30.198119</a>	<a href="#">93.305807</a>	info not available	2011	Metal
Eastside Fire Station	Fire Station	3504 Maplewood Drive	Sulphur	<a href="#">30.228375</a>	<a href="#">93.336762</a>	info not available	not available	Steel
Sewer Pump Building	Sewer Pump	Shasta Street	Sulphur	<a href="#">30.22291</a>	<a href="#">93.346369</a>	info not available	not available	Unreinforced Masonry
Pump Building	Pumps	Driftwood	Sulphur	<a href="#">30.225015</a>	<a href="#">93.318964</a>	info not available	2003	Metal
Police Training	Poice Training	600 Live Oak	Sulphur	<a href="#">30.243009</a>	<a href="#">93.375947</a>	info not available	not available	Wood
Pump Building	Pumps	Hildebrandt Street	Sulphur	<a href="#">30.241378</a>	<a href="#">93.374618</a>	info not available	2003	Wood
Sewer Pump Building	Pumps	1590 South Huntington	Sulphur	<a href="#">30.2259</a>	<a href="#">93.377076</a>	info not available	2010	Unreinforced Masonry
Pump Building	Pumps	Est End Avenue	Sulphur	<a href="#">30.227691</a>	<a href="#">93.31332</a>	info not available	not available	Metal
Pump Building	Pumps	4114 Maplewood Drive	Sulphur	<a href="#">30.227896</a>	<a href="#">93.324191</a>	info not available	2003	Metal
Pump Building	Pumps	Kingston Road	Sulphur	<a href="#">30.230325</a>	<a href="#">93.329046</a>	info not available	2003	Unreinforced Masonry
Pump Building	Pumps	C/O Francis and Bernade	Sulphur	N/A	N/A	info not available	not available	Wood
Pump Building	Pumps	945 Starlin	Sulphur	<a href="#">30.220573</a>	<a href="#">93.364851</a>	info not available	2005	
Pump Building	Pumps	1110 West Napoleon	Sulphur	<a href="#">30.236687</a>	<a href="#">93.386372</a>	info not available	2003	Metal
Pump Building	Pumps	Center Avenue & Lee Street	Sulphur	<a href="#">30.234458</a>	<a href="#">93.31749</a>	info not available	2003	Metal
Pump Building	Pumps	4000 Petro Drive	Sulphur	<a href="#">30.204148</a>	<a href="#">93.327851</a>	info not available	not available	Wood
Pump Building	Pumps	South Beglis Parkway	Sulphur	N/A	N/A	info not available	not available	Wood
Pump Building	Pumps	East Napoleon	Sulphur	N/A	N/A	info not available	not available	Wood
Tower	Communication Tower	East Burton	Sulphur	N/A	N/A	info not available	not available	Steel
Radio Equipment	Communication Tower	East Burton	Sulphur	N/A	N/A	info not available	not available	Unreinforced Masonry



Westlake									
	Library-Westlake	Library	937 Mulberry St.	Westlake	30.253155	-93.260681	\$681,511.00	1993	Wood
	Westlake Police Department	Police Department	701 Johnson Street	Westlake	N/A	N/A	info not available	not available	not available
	Westlake Senior Center	Senior Center	2001 Jones Street	Westlake	N/A	N/A	info not available	not available	not available
	Westlake Water Filter Plant	Water Filter Plant	1002 Shady Lane	Westlake	N/A	N/A	info not available	not available	not available
	Water Treatment Plant	Water Plant/Office	1004 Hilma Street	Westlake	N/A	N/A	info not available	not available	not available
	Water Treatment Plant	Water Treatment Plant	1004 Hilma Street	Westlake	N/A	N/A	info not available	not available	not available
	Westlake Post Office	Post Office	1504 Guillory Street	Westlake	N/A	N/A	info not available	not available	not available
	Westlake City Hall	City Hall	1001 Mulberry Street	Westlake	N/A	N/A	info not available	not available	not available
	Mechanic Shop	Mechanic Shop	512 Cedar Street	Westlake	N/A	N/A	info not available	not available	not available
	Water Treatment Plant	Water Treatment Plant	1907 Jones Street	Westlake	N/A	N/A	info not available	not available	not available
Iowa									
	Library-Iowa	Library	107 First St.	Iowa	30.236806	-93.014265	\$298,283.00	1993	Wood
X	Iowa Town Hall	Town administrative office/ police department	115 N. Thomson Ave.	Iowa	N/A	N/A	1,000,000	2005	not available
	Community Center	Iowa Community Center open for rent/holding events	207 W. Hwy. 90	Iowa	N/A	N/A	1,000,000	2005	not available
	Iowa Fire Department	Iowa Fire Department	105 S. Thomson Ave.	Iowa	N/A	N/A	250,000	1975	not available
	Substation	Iowa Fire Department Substation	797 W. Miller	Iowa	N/A	N/A	350,000	2015	not available
	Public Works	Iowa Public Works Maintenance Bldg/yard	102 S. Kenney Ave.	Iowa	N/A	N/A	250,000	2003	not available
Vinton									
	Library-Fontenot	Library	1402 Center St	Vinton	30.190908	-93.579983	\$280,506.00	1993	Wood
X	VINTON CITY HALL	MUNICIPAL BUILDING	1200 HORRIDGE STREET	VINTON, LA	30.192367	93.581828	N/A	2005	Reinforced Masonry
X	VINTON POLICE DEPARTMENT	POLICE DEPARTMENT	1201 HORRIDGE STREET	VINTON, LA	30.192353	93.581123	N/A	1963	Reinforced Masonry
X	MAINTENANCE SHOP	PUBLIC WORKS	1300 HAMPTON STREET	VINTON, LA	30.193116	93.579726	N/A	2007	Metal
X	FIRE STATION	HOUSE TRUCK	1405 HAMPTON STREET	VINTON, LA	30.193116	93.579726	N/A	2006	Metal
X	SOUTHSIDE FIRE STATION	MAIN FIRE STATION	1301-1303 SOUTH STREET	VINTON, LA	30.185192	93.579103	N/A	1996	Metal
	SENIOR CENTER	MEETING PLACE FOR SR	915 WEST STREET	VINTON, LA	30.197913	93.587062	N/A	2000	Metal
X	SEWER PLANT	SEWER TREATMENT	1010 WASTEWATER AVE	VINTON, LA	30.195783	93.563811	N/A	1990	Unreinforced Masonry
X	CENTER STREET LIFT PUMP STATION	WATER/SEWER	1611 CENTER STREET	VINTON, LA	30.190768	93.584322	N/A		Unreinforced Masonry

National Flood Insurance Program (NFIP)

Calcasieu Parish

**ELEMENT F: STATE REQUIREMENT****National Flood Insurance Program (NFIP)****Parish: Calcasieu Parish**

	Calcasieu Parish	Dequincy	Lake Charles	Sulphur	Westlake	Vinton	Iowa
Insurance Summary							
How many NFIP policies are in the community? What is the total premium and coverage?	Calcasieu Parish - 6,885 PIF; Premium - \$4,285,518; Coverage - \$1,267,325,600	Policies: 53 Total Coverage; \$10,648,400	Policies: 5,139 Total Coverage:\$1,272,002,200	Policies: 1,178 Total Coverage: \$263,992,300.00	Policies: 221 Total Coverage: \$45,802,300.00	Policies: 61 Total Coverage: \$15,701,200	Policies: 169 Total Coverage:\$30,468,300
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	Total Losses - 2,885; Total Payments - \$68,260,152.47	Paid Claims: 19; Total payments:\$319,252	Total losses: \$56,960,487 Paid Claims: 2,412	Paid claims: 419 Total Losses: \$9,159,846.40	Paid claims: 130 Total Losses: \$3,708,777.32	Paid claims: 7 Total Losses: \$34,488.38	Paid Claims: 47 Total Losses: \$763,632
How many structures are exposed to flood risk with in the community?	SFHA areas are abundant in the Parish. There are many bayous, rivers, and drainage laterals that contribute to flooding.	53	5139	1163	154	84	169
Describe any areas of flood risk with limited NFIP policy coverage.	There are no areas in which NFIP is not available or limited.	none	none	None	None	None	None

	Calcasieu Parish	Dequincy	Lake Charles	Sulphur	Westlake	Vinton	Iowa
<b>Staff Resources</b>							
Is the Community FPA or NFIP Coordinator certified?	Yes	Use the parish representative	no	Yes Keith Barry	Yes Terri Hawes	Yes Judy Anderson	Yes
Is flood plain management an auxiliary function?	No	No	no	No	No	No	No
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	The Parish has permit review, GIS, education & outreach, inspections, and engineering capabilities.	Depend on parish	permits, review, outreach, inspections	Outreach	Outreach	Outreach	Outreach
What are the barriers to running an effective NFIP program in the community, if any?	No	No staff	staffing	n/a	n/a	n/a	None noted
<b>Compliance History</b>							
Is the community in good standing with the NFIP?	Yes	Yes	yes	Yes	Yes	Yes	Yes
Are there any outstanding compliance issues(i.e., current violations)?	None noted	no	no	No	No	No	No
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact(CAC)?	2013	2005	2013	CAV: 03/14/2013 CAC: 09/22/2008	CAV: 01/22/2013 CAC: 01/28/2009	CAV: 01/11/2011 CAC: 01/18/2008	2008
Is a CAV or CAC scheduled or needed? If so when?	None noted	no	no	No	No	No	no
<b>Regulation</b>							
When did the community enter the NFIP?	1978	4/2/1979	10/16/1979	8/16/1988	2/3/1982	7/16/1971	
Are the FIRMs digital or paper?	Digital	Both	both	Digital	Digital	Digital	
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Yes. Regulations are adhered to with no noted exceptions.	meet	yes, 1' freeboard	Yes	Yes	Yes	Meet
<b>Community Rating System (CRS)</b>							
Does the community participate in CRS?	Yes	No/parish	yes	No	No	No	No/Parish
What is the community's CRS Class Ranking?	Class 8	N/a	8	n/a	n/a	n/a	N/A